ARUP

INDAVER

Meath Waste-to-Energy

Site **Sustainability** Project 2020

Environmental Impact Assessment Report

Vol 2: Main Text

Preface

This Environmental Impact Assessment Report (EIAR) for the proposed Site Sustainability Project consists of three volumes, of which this is the second:

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Glossary of Terms

µg	microgram (10^{-6} gram)
AA	Appropriate Assessment
ACA	Architectural Conservation Area
AER	Annual Environmental Report (submitted to the EPA under the IE licence)
AGI	Above Ground Installation
Alluvium	Sediment deposited by flowing water
aOD	Above Ordnance Datum
AQS	Air Quality Standards
Aquifer	A geological unit that stores and transmits significant quantities of groundwater under normal hydraulic conditions
barg	A unit used for the measurement of pressure (referred to as gauge pressure)
BAT	Best Available Techniques
Berm	Raised bank, artificial embankment
BGE	Bord Gáis Éireann, the Irish gas board (now called Gas Networks Ireland GNI)
bgl	Below ground level
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
BTO	British Trust for Ornithology
BREF	BAT reference document published by the European Commission under the Industrial Emissions Directive IED, 2010/75/EU)
Carboniferous	The geological period between 355 and 290 million years ago
CCGT	Combined Cycle Gas Turbine
CCTV	Close Circuit TV
CD	Chart Datum
CDM	Clean Development Mechanism
CEMP	Construction Environmental Management Plan
C.Eng	Chartered Engineer
CHP	Combined Heat and Power
CMLI	Chartered Member of the Landscape Institute
CITES	Convention of International Trade of Endangered Species
CIRIA	Construction Industry Research and Information Association
CO_2	Carbon Dioxide
COP21	Conference of the Parties to the Convention (United Nations Framework Convention on Climate Change)
cSAC	Candidate Special Areas of Conservation
CRTN	Calculation of Road Traffic Noise
CSO	Central Statistics Office
CV	Calorific Value
dB	decibel

$dB_{(A)}$	The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing.
DAHG	Department of Arts, Heritage and Gaeltacht
DEFRA	Department of the Environment Food and Rural Affairs (UK)
$DeNO_x$	Removal of nitrogen oxides
DETR	Department of the Environment, Transport & the Regions (UK)
DOC	Dissolved Organic Carbon
DOEHLG	Department of the Environment, Heritage and Local Government
EHS	Environmental Health and Safety
EIAR	Environmental Impact Assessment Report
ELV	Emission Limit Value
EPA	Environmental Protection Agency
ERT	Emergency Response Team
ETS	Emission Trading Scheme
EU	European Union
EWC	European Waste Catalogue
Excavation (Archaeology)	For archaeology, excavation means the manual and mechanical excavation by an archaeologist-led team with specific objectives as regards information, preservation, recording, etc. of archaeological information. Its purpose is to fully investigate archaeological deposits and features
Ferrous metals	Term for a group of metals that contain iron and share similar properties e.g. aluminium
fg	femtogram (10^{-15} gram)
Flue Gas	Combustion exhaust gas produced during the incineration process
Fluorinated Gases	Gases containing fluoride that are classed as a greenhouse gas
Gasification	Gasification is the conversion of a solid or liquid feedstock into combustible gas by partial oxidation under the application of heat and water.
GHG	Greenhouse Gas
GHS	Geological Heritage Site
GLC	Ground Level Concentration
Groundwater	Water that occupies pores and crevices in rock and soil, below the surface and above a layer of impermeable material
GSI	Geological Survey of Ireland
GWP	Global Warming Potential
Ha	Hectares
Habitat	The dwelling place of a species or community which provides a particular set of environmental conditions
HAZID	Hazard Identification and Risk Assessment
HAZOP	Hazard and operability study
HEFS	High End Future Scenarios
HEPA	High Efficiency Particulate Air (filter)

HF	Hydrogen fluoride
HGU	Hydrogen Generation Unit
HGV	Heavy Goods Vehicle
HSA	Health and Safety Authority
HVL	High Value Landscape
IAH	International Association of Hydrogeologists
ICOMOS	International Council of Monuments and Sites
IED	Council Directive 2010/75/EU on Industrial Emissions Directive
IEEM	Institute of Ecology and Environmental Management
IGI	Institute of Geologists of Ireland
IGV	Interim Guideline Values
In-situ	In its original place, for archaeology it refers to the preservation of archaeological sites/features without disturbance
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
ISO	International Standards Organisation
I-TEQ	International Toxic Equivalents
I-WeBS	Irish Wetland Bird Survey
JI	Joint Implementation
JT	Joint Implementation
kph	Kilometres per hour
L_{A90}	Sound level that is exceeded for 90% of the sample period (A-weighted). It is typically used to describe background noise
L_{Aeq}	The equivalent continuous sound level, used to describe a fluctuating noise in terms of a single noise level over the sample period (A-weighted).
$L_{Aeq\ T}$	The equivalent continuous sound level, used to describe a fluctuating noise in terms of a single noise level over a particular time period (A-weighted).
L_{Amax}	The instantaneous maximum sound level measured during the sample period.
$L_{Ar,\ T}$	The equivalent continuous sound level at a particular residential location, used to describe a fluctuating noise in terms of a single noise level over a particular time period (A-weighted).
LAP	Local Area Plan
L_{AX}	The “A-weighted” Sound Exposure Level of the event considered (dB)
Leachate	Water that has percolated through soil or other material and contains soluble or suspended solids, or any other component of the material through which it has passed.
LEL	Lower explosive limit
Limit value	Specified in European Union directives or Irish regulation as a concentration of a pollutant which must not be exceeded in order to protect health or the environment
Lithology	Of a rock unit that describes its physical characteristics such as colour, texture, grain size or composition

LOAEL	Lowest Observed Abnormal Effect Levels
LoLo	Lift-on, Lift-off
LoW Codes	List of waste codes (replacing original EWC terminology)
$L_{w(A)}$	Combined Sound Power
Made Ground	Deposits which have accumulated through human activity and may consist of natural materials, e.g. clay and/or man made materials, e.g. refuse
MBT	Mechanical Biological Treatment
Methodology	The specific approach or techniques use to analyse impacts or describe environments
MIAI	Member of the Institute of Archaeologists of Ireland
MIEI	Member of the Institute of Engineers Ireland
MIOA	Member of Institute of Acoustics
mg/Nm^3	milli grams per normal metres cubed
MJ/Kg	Mega Joules per kilogram
Mn	Manganese
mOD	metres above Ordnance Datum
MRFS	Mid-range future scenarios
MSW	Municipal Solid Waste
Mt	Million tonnes
MTCE	Metric tonnes of carbon equivalent
MW	Mega Watts
MWh	Mega Watts per Hour
NAAQS	National Ambient Air Quality Standards
NCDWC	National Construction and Demolition Waste Council
NDP	National Development Plan
ng	nanogram (10^{-9} gram)
NG4	Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Schedules Activities, Environmental Protection Agency (2012)
NHA	Natural Heritage Area
NIAH	National Inventory of Architectural Heritage
NHWMP	National Hazardous Waste Management Plan
NIS	Natura Impact Statement
NMI	National Museum of Ireland
NMS	National Monuments Service
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPWS	National Parks and Wildlife Service
NRA	National Roads Authority
NSL	Noise Sensitive Locations
NSS	National Spatial Strategy
O_2	Oxygen

OD	Ordnance Datum
ODM	Ordnance Datum Malin
OEL	Occupational Exposure Limit
OPW	Office of Public Works
OSI	Ordnance Survey Ireland
Outcrop	An exposure of bedrock
PCDD	Polychlorinated Dibenzo-p-Dioxin
PCDF	Polychlorinated Dibenzofuran
PCU	Passenger Car Units
PEL	Probable effect level
pg	Picogram (10^{-12} gram)
pH	Potential of Hydrogen, measure of acidity or alkalinity of solution
PM_{10}	Particulate matter less than 10μg (dust)
$PM_{2.5}$	Particulate matter less than 2.5μg (dust)
pNHA	proposed Natural Heritage Area
Pollution	The direct or indirect alteration of the physical, chemical, thermal, biological, or radioactive properties of any part of the environment in such a way as to create a hazard or potential hazard to the health, safety or welfare of living species.
POP	Persistent Organic Pollutant
PPE	Personal Protection Equipment
PSD	Prevention of significant deterioration
QESH	Quality, Environmental, Health & Safety
QNHS	Quarterly National Household Survey
Quaternary	The most recent Period of geological time (the last two million years)
Red List	In relation to protected species of birds
Rhizome	Underground stem of plants, laterally growing and capable of producing the root and shoot system of a new plant
River Basin District (RBD)	The area of land from which all surface run-off flows through a sequence of streams rivers, and possibly lakes into the sea at a single river, mouth, estuary or delta
RMP	Record of monuments and places
RPS	Record of Protected Structures
Run-off	The flow of water under gravity in open channels
SAC	Special Area of Conservation
SI	Statutory Instrument
SMR	Sites and Monuments Records
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulphur Dioxide
SPA	Special Protection Area
STEL	Short Term Exposure Limit

Subsoils	Soil lying immediately under the surface soil.
SuDS	Sustainable Drainage System
SWDS	Solid Waste Disposal Sites
SWL	Still water level
t/a	tonnes/annum
TA Luft	Technical Instructions on Air Quality Control – TA Luft. In accordance with article 48 of the Federal Emission Control Law (BimSchG) dated 15 March 1974 (BGBI. Ip. 721) Federal Ministry for Environment, Bonn 1986.
TFL	Traffic Modelling Guidelines
TFS	Transfrontier Shipment
TII	Transport Infrastructure Ireland
TOC	Total Organic Carbon
tpa	Tonnes per annum
TU	Toxicity Unit
TRL	Transport Research Laboratory
UN	United Nations
UPS	Un-interruptible Power Supply
USEPA	United States Environmental Protection Agency
VRP	Viewshed Reference Points
Visual envelope	The extent of potential visibility of the proposed development to or from a specific area or feature in the landscape - defined by topography and vegetation
WeBS	Wetland Bird Survey
WEEE	Waste Electrical and Electronic Equipment
WFD	Water Framework Directive
WHO	World Health Organisation
WMP	Waste Management Plan
WWTP	Wastewater Treatment Plant
ZAP	Zone of Archaeological Protection

1 Introduction

1.1 Introduction

Indaver Ireland Limited (Indaver) currently operate a Waste to Energy (WtE) facility (waste incinerator) at its site in Carranstown, Duleek, Co Meath. The existing facility has been in operation since August 2011 and is licensed under an Industrial Emissions Licence (No. W0167-03) by the Environmental Protection Agency (EPA).

Indaver proposes to carry out a new development at its existing WtE facility in Carranstown. The proposed development is collectively referred to as a *Site Sustainability Project* in this Environmental Impact Assessment Report (EIAR) and in the planning application.

In accordance with Section 37E of the Planning and Development Act, 2000 as amended, Indaver gives notice of its intention to make an application to An Bord Pleanála for permission in relation to the proposed development. A 10 year planning permission for the proposed development, is sought. The proposed development will consist of the following main elements:

1. Increase in the amount of hazardous waste accepted at the facility for treatment in the waste to energy plant from the current permitted 10,000 tonnes per annum (tpa) up to a maximum of 25,000 tpa;
2. It is also proposed to increase the annual total waste accepted at the site for treatment in the waste to energy facility from the currently permitted 235,000 tpa to 250,000 tpa;
3. Development of an aqueous waste tank farm and unloading area for the storage and processing of aqueous liquid wastes currently accepted at the facility;
4. Development of a $10MW_e$ hydrogen generation unit for connection to the natural gas transmission/distribution network and for mobile hydrogen transport applications and other potential uses;
5. Development of a bottom ash storage building for the storage of up to 5,000 tonnes of bottom ash which is currently produced on site;
6. Additional waste acceptance capacity and infrastructure to accept up to 30,000 tpa (bringing the site total to 280,000 tpa) of third party boiler ash and flue gas cleaning residues and other similar residues for treatment in the existing ash pre-treatment facility on site;
7. Development of a warehouse, workshop and emergency response team (ERT)/office building to support existing maintenance activities on the site;
8. Development of a new concrete yard and parking area for up to 10 trucks, tankers or containers on the site;
9. Demolition and re-building of an existing single storey modular office building on site with a slightly increased footprint; and

10. Other miscellaneous site upgrades.

This chapter outlines the background to the project and summarises the applicable planning procedure. This chapter also describes the methodology used to prepare this EIAR, provides details on competent experts and the consultation process that has been carried out to date. For ease of reference, the Site Sustainability Project is referred to as "*proposed development*" in this chapter and throughout the EIAR.

1.2 Proposed Development Location

The existing Waste to Energy (WtE) facility is located in Carranstown, Duleek, Co. Meath. Refer to **Figures 1.1** to **1.3**. The site is owned by Indaver.

The facility is located 1.8km west of the M1, bound to the south by the R152 regional road and surrounded by greenfield on all other sides. A clustering of large-scale industrial activities including Irish Cement Platin is to the immediate north of the site and the rest of the surrounding land is used for industrial, agricultural and residential purposes. Duleek is located to the south of the facility.

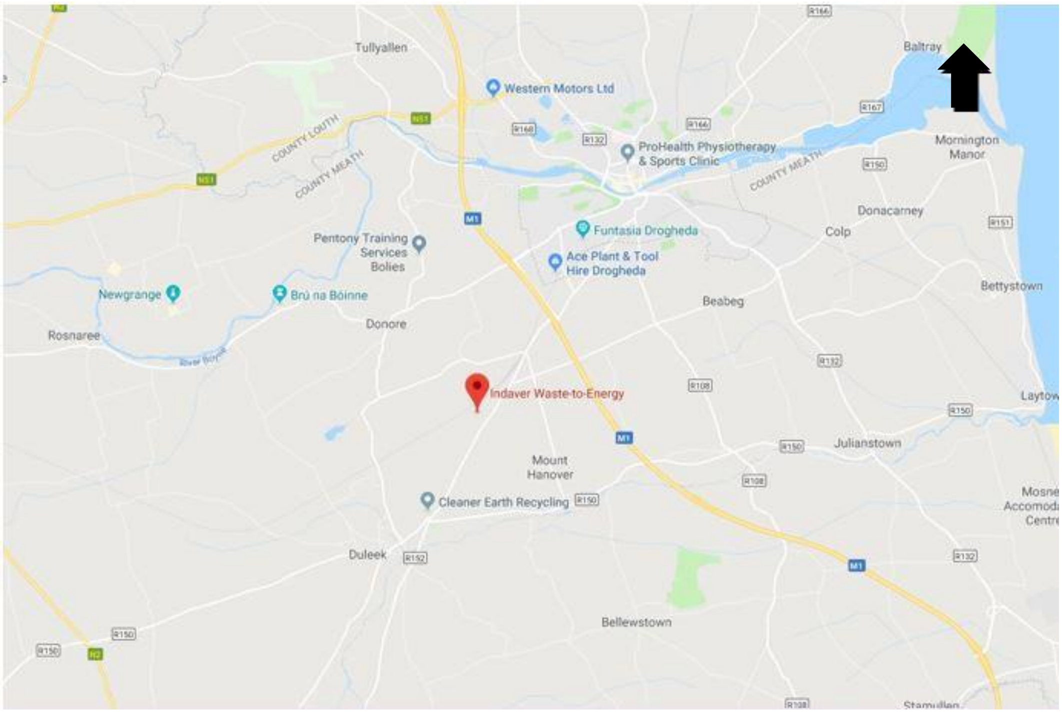

Figure 1.1: Location of the existing Indaver Waste-to-Energy Facility in the context of the wider Duleek/Drogheda area. Location indicated by red pin | Not to Scale | Source: Google Maps

1.3 Site History

This facility has successfully operated since 2011 and currently accepts 235,000 tonnes per annum of household, commercial and industrial non-hazardous waste. Each year since 2011, this facility has diverted over 200,000 tonnes of waste annually away from landfills and export, recovering over 6,000 tonnes of ferrous metals, and generated approximately 138 gigawatt hours of electricity.

The production of 138 gigawatt hours is enough to power the equivalent of 30,000 homes per annum, or a town the size of Drogheda and Navan combined.

Like any large-scale industrial facility, the facility in Meath is subject to an extremely rigorous environmental and compliance regime and is licensed by the EPA under register number W0167-03 pursuant to the Industrial Emissions Directive (IED) and relevant national regulations which strengthens the application of Best Available Techniques (BAT). This stringent licensing regime will also apply in the context of the proposed development.

The systems on-site are designed to continuously monitor 14 individual aspects of the Meath facility in order to ensure compliance with licence conditions.

This Waste to Energy facility has successfully integrated into the local area. A Community Liaison Committee was set up in 2008 which ensures that any issues that arise are quickly identified and speedily resolved.

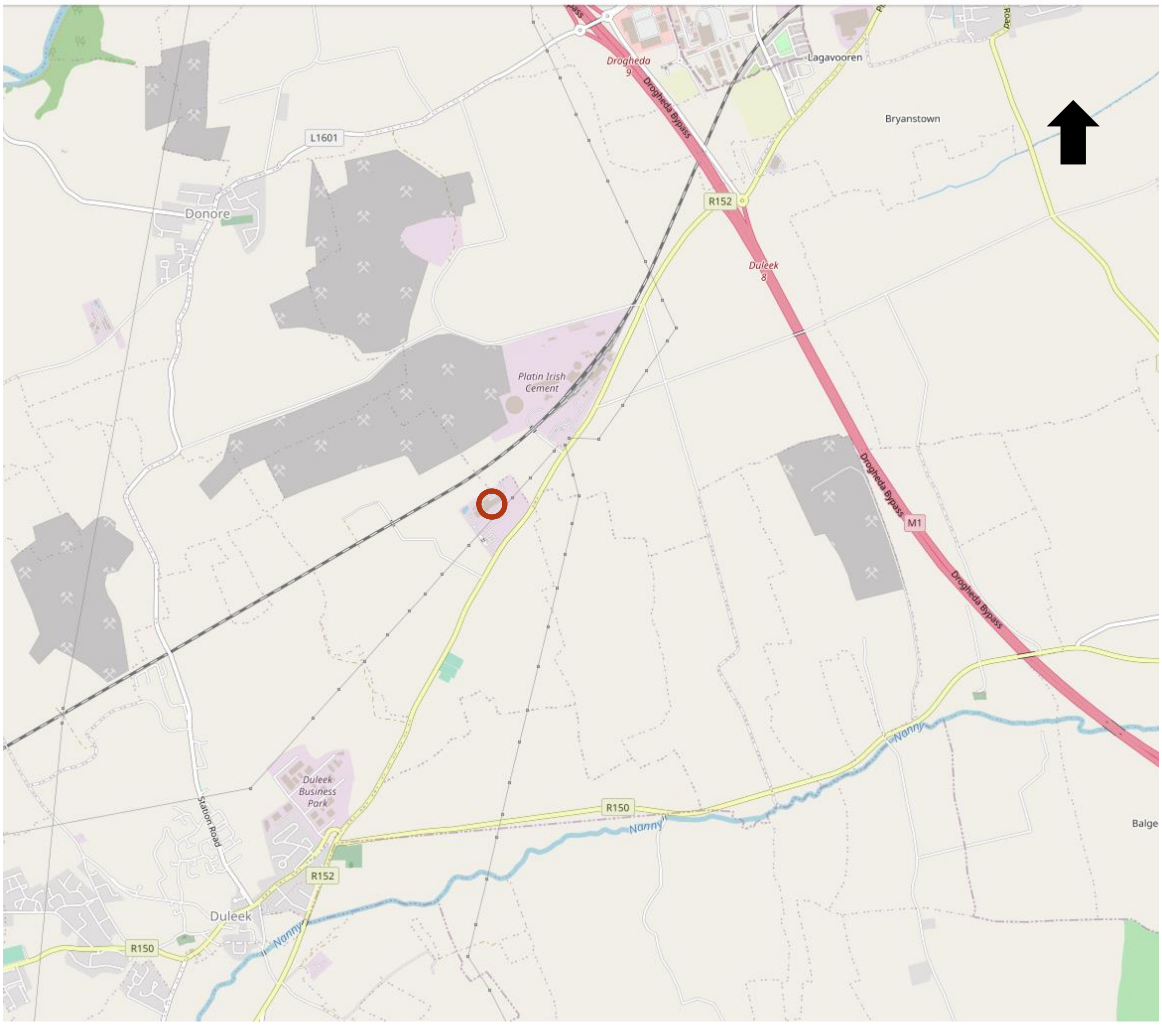

Figure 1.2: Indaver site (red circle showing general location) and wider surrounds | Not to Scale | Source: EPA Envision mapping (https://gis.epa.ie/EPAMaps/)

Figure 1.3: Approximate site boundary of the Indaver Waste-to-Energy Facility | Not to Scale | Source: EPA Envision mapping (https://gis.epa.ie/EPAMaps/)

1.4 Overview of the Planning History of the site

A brief overview of the planning history for the existing facility is provided below.

- 2006 – Consent granted by Meath County Council (MCC) for the original facility (Ref. SA/60050). Appealed to An Bord Pleanála and permission upheld by ABP in 2007 (Ref. PL 17.219721).
- 2009 - Permission for amendments and alterations granted by MCC in September 2009 (Ref. SA/901467).
- 2013 – Consent granted permission under Strategic Infrastructure Act for increase in tonnage to 220,000 tpa and to include 10,000 tpa hazardous waste (Ref. 17.PA0026).
- 2014 – Consent granted by ABP to amend previous condition on 220,000 to 235,000 for 5 years to end of 2019 (Ref. 17.PM0004).
- 2016 – Consent granted by ABP for alterations for the pre-treatment plant (Ref. 17.PM0007).
- 2017 – Consent granted by Meath County Council to extend the duration of existing permission 17.PA0026 until 2023 to enable construction of pre-treatment plant on site (Ref. LB/171077).

- 2019 – Alteration to remove 5 year life of 235,000 tpa granted under 17.PM0004 into perpetuity (Ref. ABP-302447-18).

In August 2019, Indaver submitted an application to An Bord Pleanála to enter into pre-application consultations under Section 37(B) of the Planning and Development Act 2000, as amended.

A pre-application consultation meeting was held with An Bord Pleanála on 11th December 2020. A request was made by Indaver that a Notice of Pre-application Consultation Opinion be issued pursuant to section 37(B)(4)(a) of the Act on 14th April 2020 and confirming that an application for permission for the proposed development must be made to An Bord Pleanála.

An Bord Pleanála, in a letter to Indaver on XX, X, 2020, confirmed that the proposed development may be regarded as strategic infrastructure for the purposes of the Planning and Development Act 2000, as amended (Letter is presented in **Appendix 1.1**) and directed Indaver to submit an application to An Bord Pleanála (ABP) under Section 37E of the Planning and Development Act 2000, as amended.

1.5 EIA Legislation, Guidance and EIAR Structure

1.5.1 EIA Guidance

In preparing the EIAR, regard has been had to the following overarching EIA related guidance:

- Department of Housing, Planning and Local Government (2018) Circular PL 05/2018 -Transposition into Planning Law of Directive 2014/52/EU amending Directive 2011/92/EU on the effects of certain public and private projects on the environment (the EIA Directive) And Revised Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment;
- Department of Housing, Planning, Community and Local Government (2017) Key Issues Consultation Paper on the Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems;
- Department of Housing, Planning, Community and Local Government (2017) Circular PL 1/2017 - Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive): Advice on the Administrative Provisions in Advance of Transposition;
- Department of the Environment, Community and Local Government (2013) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment;
- Environmental Protection Agency (2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft August 2017);
- Environmental Protection Agency (2003) Advice Notes on Current Practice in the preparation of EIS;

- European Commission (2017) Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report;
- European Commission (2012) Interpretation suggested by the Commission as regards the application of the EIA Directive to ancillary/associated works;
- European Commission (1999) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions;
- European Union (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment;
- Government of Ireland (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).

Additional topic-specific guidance utilised to undertake assessments is identified in the individual topic chapters where appropriate.

1.5.2 EIA Legislation

A European Directive for EIA has been in force since 1985 since the adoption of Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment.

The EIA Directive of 1985 has been amended three times by Council Directives 97/11/EC, 2003/35/EC and 2009/31/EC. It was ultimately codified and repealed by Council Directive 2011/92/EU on 13 December 2011. Directive 2011/92/EU has now been amended in 2014 by Directive 2014/52/EU.

In Ireland, the requirements for EIA in relation to planning consents are specified in Part X of the Planning and Development Act, 2000, as amended and in Part 10 of the Planning and Development Regulations, 2001, as amended. The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) transpose the requirements of the 2014 EIA Directive into existing planning consent procedures.

The definition of EIA provides for a clear distinction between the process of environmental impact assessment to be carried out by the competent authority and the preparation by the developer of an Environmental Impact Assessment Report (EIAR). This EIAR accompanies the application for the proposed development which has been submitted to An Bord Pleanála. The EIA for the purposes of planning consent will be undertaken by An Bord Pleanála.

A key objective of the 2014 amendments to the EIA Directive has been to improve the quality of EIA, including with respect to the collection and assessment of environmental information and to the EIA Report's (EIAR) content. The key changes include:

- The coverage of environmental issues required in the EIAR is extended as new requirements related to climate change, biodiversity, risk of major accidents and/or disasters are introduced.

  - In this EIAR, climate change is discussed in **Chapter 9 *Climate*** and **Chapter 2 *Planning and Policy Framework and Need for Scheme*** (in relation to climate policy).
  - Biodiversity is presented in **Chapter 11 *Biodiversity***. In addition, an Appropriate Assessment Screening Report (AA) and Natura Impact Statement (NIS) has been submitted as part of this planning application to An Bord Pleanála.
  - Risks of major accidents and/or disasters are presented in **Chapter 17 *Major Accidents and Disasters*.**

- The assessment of reasonable Alternatives is broadened: Alternatives studied by the Developer e.g. Alternatives to Project design, technologies, location, size, and scale, must be described in the EIAR and an indication of the main reasons for the option chosen must be given. In this EIAR, Alternatives are addressed in **Chapter 3 *Alternatives***.
- Provisions related to the completeness and quality of EIARs have been introduced. In this EIAR, the details of the competent experts who were responsible for the preparation of the specialist reports is presented in **Appendix 1.2.**

1.5.3 Structure of the Environmental Impact Assessment Report

This Environmental Impact Assessment Report (EIAR) has been prepared to provide information on the likely significant effects of the proposed development on the environment as per the Planning and Development Regulations 2001 (as amended by Schedule 6 of the European Union (Planning and development) (Environmental Impact Assessment) Regulations 2018, (S.I. No. 296 of 2018) and includes the following information specified in the Regulations:

1. A description of the proposed development comprising information on the site, design, size and other relevant features of the proposed development;
2. A description of the likely significant effects on the environment of the proposed development;
3. A description of the features, if any, of the proposed development and the measures, if any, envisaged to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment of the development;
4. A description of the reasonable alternatives studied by the person or persons who prepared the EIAR, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed development on the environment;
5. A Non-technical summary of the information referred to in the above four points.

In relation to likely significant effects on the environment:

1. The EIA must identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

   (a) population and human health;

   (b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;

   (c) land, soil, water, air and climate;

   (d) material assets, cultural heritage and the landscape;

   (e) the interaction between the factors referred to in points (a) to (d).
2. The effects referred to above on the factors set out therein must include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned.

This EIAR has been prepared on behalf of Indaver by a multi-disciplinary consultancy team of competent experts led by Arup with input from specialist sub-consultants. The format used in the EIAR is the grouped format, in which each topic is addressed in a separate section. This is designed to allow readers to access the issues of interest to them as easily as possible. However, there is overlap of some topics.

For example, effects on water are addressed in **Chapter 14** ***Land and Soils*** (under the heading of Hydrogeology) and **Chapter 15** ***Water*** (Hydrology).

Effects on human beings are addressed in several chapters including **Chapter 6** ***Population and Human Health,*** **Chapter 13** ***Landscape and Visual*** **Chapter 8** ***Air Quality,*** **Chapter 9** ***Climate,*** **Chapter 10** ***Noise and Vibration*** whilst water quality and supply is addressed in **Chapter 14** ***Land and Soils*** and **Chapter 15** ***Water.***

Effects on land are addressed in **Chapter 13** ***Landscape and Visual***, **Chapter 16** ***Material Assets*** (Land take/land use) and **Chapter 14** ***Land and Soils*** (Soils and Geology).

The effects on the environment from the vulnerability of the proposed development to risks of major accidents and/or disasters are presented in **Chapter 17** ***Major Accidents and Disasters*****.**

Waste management in the context of residues produced during the operational phase is addressed in **Chapter 16** ***Material Assets*** whilst construction waste management is addressed in **Chapter 5** ***Construction Activities*** and in **Appendix 5.1** ***Construction Environment Management Plan***.

Issues not directly addressed in individual chapters and interactions between environmental factors are described in **Chapter 18** ***Cumulative Effects, Other Effects and Interactions*** of this EIAR. Each of the environmental assessment chapters (**Chapters 6-17**), consider the potential for cumulative effects. **Chapter 18** contains an overall concluding summary as to the potential for cumulative effects from the proposed development acting in combination with other planned and permitted developments.

Each of the environmental assessment chapters includes a description of the receiving environment, methodology, the likely significant effects of the proposed development specific to the specialist environmental topic, the baseline (Do-Nothing) scenario, the features and measures to mitigate adverse significant effects and residual effects.

For clarity, the Do-Nothing Scenario (i.e. a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline thereof without implementation of the proposed development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge) is provided in each of the chapters which describe relevant environmental aspects and likely significant effects. Refer to **Chapters 6-17** and also **18** of this EIAR for further details.

The Do-Nothing scenario in the context of a "Do-Nothing Alternative" is discussed in **Chapter 3** ***Alternatives***.

The EIAR comprises the following volumes:

- **Volume 1** provides the non-technical summary. This summarises the findings of the EIAR in a clear, accessible format that uses non-technical language and supporting graphics. The non-technical summary describes the proposed development, existing environment, effects and mitigation measures and relevant aspects of the EIAR in a manner that can be easily understood by the general public or lay person;
- **Volume 2** encompasses the main EIAR including introductory chapters in addition to 'assessment' chapters for each environmental aspect in accordance with Article IV of the EIA Directive. The front end chapters (Chapters 1 – 5) provide the relevant project context whilst the assessment chapters (Chapters 6 -17) provide a description of the relevant environmental aspects and likely significant effects with summary chapters provided thereafter (Chapters 18 and 19). Figures are also included;
- **Volume 3** provides the technical appendices that support and are cross-referenced with Volume 2. This may include other relevant drawings, modelling outputs, background reports and/or supporting documents.

Reference should also be had to the full set of planning drawings accompanying the planning application and a summary set of drawings in A3 format included as an appendix to **Chapter 5** ***Construction Activities***, presented in **Appendix 5.2** of **Volume 3**.

In addition, an Appropriate Assessment Screening Report (AA) and Natura Impact Statement (NIS) have been prepared by Dixon-Brosnan on behalf of Indaver and submitted as part of this planning application to An Bord Pleanála. The conclusion of the NIS, in summary, is that the proposed development (with the implementation of mitigation measures) does not pose a risk of adversely affecting (either directly or indirectly) the integrity any European site, either alone or in combination with other plans or projects. Refer to the AA Screening Report and NIS for further details.

1.6 Details of Competent Experts

This EIAR has been prepared on behalf of Indaver by a multi-disciplinary consultancy team of competent experts led by Arup with input from specialist sub-consultants. Arup has been awarded an EIA Quality Mark by the Institute of Environmental Management and Assessment in recognition of its excellence in EIA activities.

Further, all technical leads are deemed to be qualified and competent experts in their fields in accordance with Article 5(3) of the EIA Directive, given their academic qualifications, professional affiliations and demonstrable and professional experience on other EIAs for major infrastructure projects. Refer to **Appendix 1.2** for further detail on the competent experts that have prepared this EIAR.

1.7 Consultation Undertaken

A pre-application consultation meeting was held with An Bord Pleanála on 11th December 2020. A request was made by Indaver that a Notice of Pre-application Consultation Opinion be issued pursuant to section 37(B)(4)(a) of the Act on 14th April 2020 and confirming that an application for permission for the proposed development must be made to An Bord Pleanála.

ABP, in a letter to Indaver on XX, X, 2020, confirmed that the proposed development may be regarded as strategic infrastructure for the purposes of the Planning and Development Act and the relevant application for permission for the proposed development be made to An Bord Pleanála (Refer to **Appendix 1.1**).

The following pre-application consultations were also undertaken:

- Health and Safety Authority – 14th January 2020
- Meath County Council - 13th February 2020
- Environmental Protection Agency - 13th February 2020
- Commission for Regulation of Utilities (via letter on 10th April 2020 & by conference call on May 15th), and
- Eastern-Midlands Waste Regional Office – 5th February 2020.

Indaver has also consulted the public and interested parties regarding its plans for the proposed development. This has been carried out through the Indaver Community Liaison Committee (ICLC) during various stages of the development of this project and was more recently presented at an ICLC meeting on 6th February 2020.

Indaver also met with representatives from the Irish Cement, Platin facility on December 13th, 2019 to explain details of the proposed development. In addition, an application was made to Gas Networks Ireland (GNI) in July 2019 for connection of the Hydrogen Generation Unit to the natural gas grid.

Information relating to the project is also available on the Department of Housing, Planning and Local Government's EIA Portal (Portal ID number 2020XXX).

The EIA Portal provides information on applications for development consent subject to EIA and submitted to relevant competent authorities since 16 May 2017. The EIA Portal identifies, on a map, the location of each application for development consent accompanied by an EIAR. It also lists the name of the applicant, the type of development proposed and the competent authority to which the application is made.

A copy of the confirmation notice from the EIA Portal is provided in **Appendix 1.3.** A link to the newspaper notice relating to the application is also provided on the portal.

The portal can be accessed at: https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal. The newspaper notice and site notice have been prepared as per the requirements of the Planning and Development Regulations 2001 (as amended). The newspaper notice was published on XXXXX and the site notice was erected on site on YYYY. Details of the public notices are included in **Appendix 1.4.**

Full details of the application including all of the associated drawings and documents can be readily accessed on the dedicated website established for this application to the Board at www.carranstownssp.ie.

1.8 Difficulties Encountered During the Assessment

No difficulties were encountered during the preparation of this EIAR that were considered to have a material impact on this EIAR.

2 Policy and Planning Framework and Need for the Scheme

2.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) sets out the European Union (EU), national, regional and local waste policy and planning policy framework which underpins the proposed Site Sustainability Project, hereinafter referred to as the "proposed development", to be carried out at the existing Waste to Energy facility at Carranstown, County Meath which constitutes a strategic infrastructure development within the meaning of section 37A of the Planning and Development Act 2000, as amended (a previous application at the site was also considered strategic infrastructure development ref: PL17.PA0026 as twice amended by ref: PL17.PM0004 and ref: PL17.PM0007).

This chapter will demonstrate the specific need for the proposed development in the context of the waste policy and planning law and policy framework and furthermore, that the proposed developments accord fully with all plans, policies and objectives at a national, regional and local level, and may thus be regarded as being in accordance with the proper planning and sustainable development of the area.

The proposed development comprises the following elements:

- Increase in the amount of hazardous waste accepted at the facility for treatment in the waste to energy plant from the current permitted 10,000 tonnes per annum (tpa) up to a maximum of 25,000 tpa;
- It is also proposed to increase the annual total waste accepted at the site for treatment in the waste to energy facility from the currently permitted 235,000 tpa to 250,000 tpa;
- Development of an aqueous waste tank farm and unloading area for the storage and processing of aqueous liquid wastes currently accepted at the facility;
- Development of a 10MW_e hydrogen generation unit for connection to the natural gas transmission/distribution network and for mobile hydrogen transport applications and other potential uses;
- Development of a bottom ash storage building for the storage of up to 5,000 tonnes of bottom ash which is produced on site;
- Additional waste acceptance capacity and infrastructure to accept up to 30,000 tpa (bringing the site total to 280,000 tpa) of third party boiler ash and flue gas cleaning residues and other similar residues for treatment in the existing ash pre-treatment facility on site;
- Development of a warehouse, workshop and emergency response team (ERT)/office building to support existing maintenance activities on the site;

- Development of a new concrete yard and parking area for up to 10 trucks, tankers or containers on the site;
- Demolition and re-building of an existing single storey modular office building on site with a slightly increased footprint; and
- Other miscellaneous site upgrades.

In summary, a review of waste, energy and climate policy at a European and national level shows that the proposed development could make a significant contribution toward:

- providing additional thermal recovery capacity for hazardous waste (up to 15,000 tpa additional), as identified in the Eastern Midlands Regional Waste Plan and the National Hazardous Waste Management Plan;
- self-sufficiency in hazardous waste treatment within the State and reducing exports of hazardous waste through the increase in hazardous waste acceptance up to a maximum of 25,000 tpa and the treatment of hazardous residues;
- compliance with the newly adopted Circular Economy Package and amended Directives on Waste and Landfill, and the Irish Government's Climate Action Plan 2019;
- more ambitious recycling targets as set out in the Circular Economy Package, by extracting ferrous and non-ferrous metals from bottom ash;
- sustainable, secure and competitive energy generation in line with energy policy objectives;
- delivering the expansion of infrastructure of strategic importance with private sector investment;
- supportive of national and regional policy which underlines the pressing need to facilitate the development of enhanced electricity and gas supplies in order to support the State's transition to a low carbon economy;
- supportive of emerging policy on the generation of hydrogen and the role that this innovative and versatile technology can play in the decarbonisation of the transport and other sectors; and
- contribution towards the enhancement of regional economic development through employment creation and provision of ancillary benefits to the wider region.

Presently, there is a lack of dedicated thermal treatment recovery capacity for hazardous waste within the State with a large quantity of such waste being exported to continental Europe. In order to tackle this deficit, additional thermal recovery capacity is needed reduce the reliance on export which is at odds with the principles of self-sufficiency, proximity and proper application of the waste hierarchy as predicated on European requirements as transposed into national regulations in Ireland.

Moreover, the management of hazardous waste in a more self-sufficient and proximate manner is in alignment with the National Hazardous Waste

Management Plan as reaffirmed in the recent Progress Report on its implementation. The treatment of additional hazardous waste at an existing installation also provides an associated environmental benefit of avoiding the transport of the hazardous waste over longer distances or via export which in turn is compatible with wider climate mitigation policy positions and the envisaged transition to a low carbon economy as set out in the national Climate Action Plan.

With regard to the management of residues produced at the existing Carranstown facility the proposed development includes the development of a bottom ash storage facility for ash currently produced on-site. In this regard, the proposed development also provides for the additional acceptance of flue gas cleaning residues and other similar residues for treatment in the existing ash pre-treatment at the facility.

This will ensure a co-ordinated and integrated approach to residue management and will in turn ensure that all residues are managed in an environmentally sound manner in line with stringent permitting requirements. This is further supported by the policy objectives underlined in the National Hazardous Waste Management Plan and the stated need to strive for improved self-sufficiency in the management of hazardous wastes in the State.

The development of a hydrogen generation unit for connection to the gas transmission/distribution network and for use in mobile transport applications as a constituent part of the proposed development to be undertaken at the existing facility will improve the energy efficiency and sustainability of the facility which is therefore compatible with wider national climate mitigation policy measures.

In addition, the production of hydrogen to be utilised in mobile hydrogen transport applications also accords with the developing policy landscape on decarbonising the transport sector in the State and more broadly with emerging policy whereby this versatile technology can play a beneficial role in assisting with the State’s broader decarbonisation and mitigation objectives.

Additionally, from a planning policy perspective and having regard to appropriate national, regional and county development plans and related policies and objectives, namely the National Planning Framework and associated National Development Plan, the Eastern & Midland Regional Spatial & Economic Strategy and the Meath County Development Plan, all provide policy support for the proposed development at a national and regional level.

The National Planning Framework underlines the need for waste to energy thermal recovery facilities which treat residual municipal waste that cannot be recycled in a sustainable manner. It further provides that the development of necessary and appropriate hazardous waste management facilities to avoid the need for treatment elsewhere is required and is necessary for the effective management of waste to 2040. The above increase in hazardous waste acceptance for treatment at the facility would mean that additional hazardous waste could be effectively treated without the need for export thus, conforming with the requirements of the statutory National Planning Framework in relation to the proper management of hazardous waste management.

Similarly, the National Development Plan underlines that investment in waste management infrastructure is critical to Ireland's environmental and economic well-being for a growing population and to achieving circular economy and climate objectives. In this regard, the proposed development and continued investment at the Carranstown facility is not only beneficial from an environmental viewpoint but will also deliver associated economic benefits in a regional context.

The proposed development may thus be regarded as being in compliance with both national and EU policies relating to the sustainable management of waste and the planning law and policy framework as a plan-led development based on the overarching principles of proper planning and sustainable development as set out below.

2.2 Waste Policy

2.2.1 European Union (EU) Law and Policy

The context for the development of Irish waste and energy policy is set by overarching EU policy as well as EU legal instruments that implement this policy. These key EU policy and legislative documents are detailed in full below.

2.2.1.1 7th Environmental Action Programme 2013

The 7th *Environmental Action Programme* ("7th EAP") (European Commission 2014) was formally adopted by the European Parliament and the Council of the European Union in November 2013 and covers the period up to 2020.

This document oversees the implementation of environmental policy for Member States until 2020. It builds on a vision for 2050 that is set out as follows:

> *"In 2050, we live well, within the planet's ecological limits. Our prosperity and healthy environment stem from an innovative, circular economy where nothing is wasted and where natural resources are managed sustainably, and biodiversity is protected, valued and restored in ways that enhance our society's resilience. Our low-carbon growth has long been decoupled from resource use, setting the pace for a safe and sustainable global society."*

In line with these objectives, the programme for action to 2020 aims to (amongst other things):

- Turn waste into a resource based on strict application of the waste hierarchy.
- Limit energy recovery to non-recyclable materials.
- Phase out landfilling of recyclable or recoverable waste.
- Ensure high quality recycling where the use of recycled material does not lead to overall adverse environmental or human health impacts.
- Manage hazardous waste so as to minimise significant adverse effects on human health and the environment.

- Remove barriers facing recycling activities in the European Union internal market and review existing prevention, re-use, recycling, recovery and landfill diversion targets so as to move towards a lifecycle-driven ‘circular’ economy, with a cascading use of resources and residual waste that is close to zero.

The European Commission adopted a more ambitious framework in 2015 which aimed to create conditions for the development of a circular economy as described in the Circular Economy Roadmap (European Commission 2015a) and Communication “Closing the loop – An EU action plan for the Circular Economy” (European Commission 2015b)[1].

The European Commission’s Circular Economy Package (‘CEP’) forms a constituent part of this framework and is centred on key waste legislative proposals which set ambitious targets to increase municipal waste recycling and to reduce landfill across Europe. As part of the CEP, the EU has amended and updated four waste Directives, including the Landfill and Waste Framework Directives.

In June 2018, the four amending Directives which constitute the European CEP were adopted by the European institutions and published in the Official Journal of the European Union (OJEU). In particular, the amendments to the Waste Framework Directive and the Landfill Directive[2] are particularly important in the context of the Carranstown facility and are outlined in full below.

In a circular economy the value of the materials and energy used in products in the value chain is retained for as long as possible while waste and resource use are minimised. This provides consumers with more durable and innovative products that save money and increase quality of life.

The circular economy requires action at all stages of the life cycle of products: from the extraction of raw materials, through material and product design, production, distribution and consumption of goods, repair, remanufacturing and re-use schemes, to waste management and recycling. All these stages are linked and improvements in terms of resource and energy efficiency can be made at all stages.

The European CEP's intent is to ensure the European Union's transition to a circular economy[3]. Ireland’s Regional Waste Plans (as detailed below) already apply the principles of the Circular Economy, focusing in particular on transitioning from a waste management economy to a green circular economy and increasing the value recovery and recirculation of resources. This is described in greater detail below.

The proposed development will support the 7th EAP and Circular Economy objectives including the recently adopted CEP which includes revised and enhanced targets on the landfilling and recycling of municipal waste which

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[1] European Commission 2015a and Communication ‘Closing the Loop – An EU action plan for the Circular Economy, European Commission 2015b

[2] Directive 2018/850 of May 30, 2018, amending Directive 1999/31/EC on the landfill of waste and Directive 2018/851 of May 30, 2018, amending Directive 2008/98/EC on waste

[3] http://ec.europa.eu/environment/circular-economy/index_en.htm

Ireland is obliged to adhere to by diverting non-recyclable resources from landfill and recovering valuable energy from the same.

Thermal recovery also supports high quality recycling by treating polluted and complex hazardous waste, thereby keeping harmful substances out of the Circular Economy. In this regard, the proposed development includes the treatment of additional hazardous waste including hazardous aqueous waste, thereby avoiding the export of such waste to Europe which is at odds with the self-sufficiency and proximity principles enshrined in EU and national legislation.

In addition, thermal recovery at the facility can also contribute to recycling through the extraction of ferrous and non-ferrous metals as laid out in the revised Directive on Waste under Article 49 whereby metals that are separated after the incineration of municipal waste may be included by Member States including Ireland when calculating their preparing for re-use and recycling targets.

Circular Economy Package (CEP)

According to the European Commission, the CEP should:

> *"help European businesses and consumers to make the transition to a stronger and more circular economy where resources are used in a more sustainable way."*

Thus, the CEP's primary intent is to ensure the European Union's transition to a circular economy as opposed to the typical linear economy in which resources are created, used, and disposed. A circular economy is one in which resources are used for as long and as productively as possible, and at the end of their useful life, their products and materials are recovered and regenerated. The CEP is thus centered on ‘designing waste out of the system’.

The four amending Directives that constitute the Circular Economy Package include:

- Directive 2018/850 of May 30, 2018, amending Directive 1999/31/EC on the landfill of waste;
- Directive 2018/851 of May 30, 2018, amending Directive 2008/98/EC on waste;
- Directive 2018/852 of May 30, 2018, amending Directive 94/62/EC on packaging and packaging waste; and
- Directive 2018/849 of May 30, 2018, amending Directives 2000/53/EC on end-of-life vehicles; 2006/66/EC on batteries and accumulators and waste batteries; accumulators; and 2012/19/EU on waste electrical and electronic equipment.

Whilst the main objective of the circular economy is to cover all phases of the product's life cycle, from production and consumption to waste management, the European CEP is primarily focused on waste.

Accordingly, the four Directives have been built on the following principle:

"Waste management in the Union should be improved, with a view to protecting, preserving and improving the quality of the environment, protecting human health, ensuring prudent, efficient and rational utilization of natural resources and promoting the principles of the circular economy."

New Circular Economy Package Targets

In order to facilitate the move to a European circular economy and reach a high level of resource efficiency, the Package through amendments to the above Directives[4], imposes several ambitious targets which Member States, including Ireland, must comply with.

These targets include:

- 55% of municipal waste must be prepared for re-use and recycling by 2025, 60% by 2030, and 65% by 2035;
- The amount of municipal waste landfilled must be reduced to 10% or less of the total amount of municipal waste generated by 2035;
- As of 2030, all waste suitable for recycling or other recovery, in particular in municipal waste, must not be accepted in a landfill, excepted for waste for which landfilling delivers the best environmental outcome;
- The total amount of recycled packaging waste must be at 65% by 2025 and 70% by 2030. Member States can ask for derogations to the EU Commission under certain circumstances;
- Specific minimum targets for recycling some materials contained in packaging waste (plastic, wood, ferrous metals, aluminium, glass, paper, and cardboard) are imposed;
- By December 31, 2023, Member States must ensure that bio-waste[5] is either separated and recycled at source or is collected separately and not mixed with other types of waste; and
- Separate collection obligations extended to include hazardous household waste by 2025.

These ambitious and stringent targets are likely to pose challenges for many Member States including Ireland once they are given effect in national law from 2020. Thereafter, Ireland will be obliged to meet the new targets on reuse and recycling and the strict limitation on the amount of municipal waste which can be landfilled. Whilst the Environmental Protection Agency in its recent National Waste Statistics report[6] to be submitted to Eurostat, has confirmed that the State is on track to meet 2020 Waste Framework Directive municipal waste recycling

[4] Member States including Ireland are required to bring into force laws, regulations and administrative provisions necessary to comply with the revised CEP Directives by 5 July 2020 and which entered into force on 4 July 2018 following publication in the Official Journal of the European Union.

[5] 'bio-waste' means biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises and comparable waste from food processing plants.

[6] http://www.epa.ie/nationalwastestatistics/targets/

targets, the new and enhanced targets to apply from 2025 and beyond will be hugely challenging to achieve.

The Irish Government's Climate Action Plan 2019 also acknowledges the need to regulate the materials that go to landfill in order to meet the target of just 10% going to landfill by 2035.

The proposed development to be carried out at the Carranstown facility will through the continued diversion of municipal waste from landfill to a higher tier of the waste hierarchy and the recovery of valuable resources from the waste to energy process and the treatment of hazardous wastes will contribute to the achievement of the new and enhanced targets as set out in the CEP.

The revised Directive on Waste now requires that hazardous waste that is produced by households, such as hazardous waste from paints, varnishes, solvents or cleaning products, should also be collected separately in order to avoid contamination of municipal waste with hazardous waste fractions that could lower recycling quality and to ensure the environmentally sound management of that hazardous waste.

In the context of the proposed development and the specific aspect relating to the treatment of additional hazardous waste, the obligation to separately collect hazardous household waste by 2025 will necessarily require a safe and environmentally sound treatment option for such collected waste from as can be provided by this element of the proposed development in due course.

2.2.1.2 Directive (EU) 2018/851 amending Directive 2008/98/EC on waste

The Waste Framework Directive (2008/98/EC) ("the WFD") previously set out the legal framework for waste management in the European Union, including the basic concepts and definitions related to waste management.

The amended Directive (2018/851) on waste amends the 2008 Waste Framework Directive to increase the targets laid down and to avoid methods of waste treatment which lock in resources at the lower levels of the waste hierarchy. The waste hierarchy as established in the previous Waste Framework Directive has also been enshrined in this amended Directive with the result that it must be applied as a priority order in waste prevention and management legislation and policy.

The waste hierarchy establishes the following order of priority:

- Prevention;
- Preparing for re-use;
- Recycling;
- Other recovery e.g. energy recovery, and
- Disposal.

Waste hierarchy by increasing waste prevention, increase preparing for re-use and recycling rates, enable high-quality recycling and boost the uptake of quality secondary raw materials. In addition, as set out in the previous WFD, the newly amended Directive on waste continues to impose on Member States a number of obligations regarding waste management, including:

- The application of the waste hierarchy as a priority in waste prevention and waste management legislation and policy.
- To ensure that waste is recovered (including separate collection to facilitate recovery where technically, environmentally and economically practicable) or, where it is not recovered, to ensure that waste is disposed of without causing risks to human health and the environment.
- To establish an integrated and adequate network of waste disposal installations and of installations for the recovery of mixed municipal waste - aiming for EU self-sufficiency and for member states individually to move towards self-sufficiency.

The amended Directive on waste continues to apply the hierarchy of waste management as detailed above, with the preferred waste management option at the top of the hierarchy and the least preferred option at the bottom.

This waste hierarchy has been transposed into Irish law (section 21A of the Waste Management Act 1996 (as inserted by article 7 of the European Communities (Waste Directive) Regulations 2011 [S.I. No. 126 of 2011][7]) and, for ease of reference, is demonstrated in Figure 6.4.(*Source: EPA 2016, Irelands Environment 2016, An Assessment)*[8].

The waste hierarchy shows that waste prevention is the most preferred option, with disposal being the least desirable option. Re-use, recycle and recovery fall in the middle of the waste hierarchy.

Annex II of the WFD sets out a non-exhaustive list of recovery operations, which includes material recovery (i.e. recycling), energy recovery (i.e. use principally as a fuel or other means to generate energy) and biological recovery (e.g. composting). This Annex also sets out energy efficiency criteria for energy recovery activities such as waste-to-energy known as the "*R1 formula*". Any new facilities meeting or exceeding an efficiency of 0.65 according to the R1 formula can be classified as recovery activities (R1) according to the waste hierarchy[9].

At the bottom of the hierarchy is disposal, which in Ireland generally involves waste being sent to landfill. Landfilling results in resources being disposed of without a possibility of recovery, with risks such as emissions from methane generated from decomposing biodegradable waste, leachate and groundwater contamination.

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[7] As referred to above, national laws and regulations necessary to give effect to the revised Directives which form part of the CEP, must be enacted by 2020 and thereafter this statutory instrument will necessarily require amendment.
[8] http://www.epa.ie/pubs/reports/indicators/SoE_Report_2016.pdf
[9] This R1 classification covers all types of waste acceptable at the MSWI plant as defined in IPPC and WID

The waste hierarchy thus gives priority to the options that deliver the best overall environmental outcome. The existing Carranstown waste to energy facility is classified as an R1 recovery facility (thermal treatment coupled with energy recovery). The proposed development will also be carried out in line with the recovery component of this hierarchy. The existing R1 classification will not be affected by the treatment of additional hazardous waste as the facility will remain primarily dedicated to treatment of municipal solid waste (MSW).

Thus, the treatment of unavoidable and hazardous waste by the waste to energy process may be regarded as paying due regard to this principle and is in full alignment with the proper and correct application of the waste hierarchy as stipulated by EU legislation and transposed into national law.

2.2.1.3 Directive (EU) 2018/850 amending Directive 1999/31/EC on landfill of waste

Under this amended Directive, the European Union has set out new rules for the landfill of waste and it establishes stringent and legally binding targets. This Directive amends Directive 1999/31/EC on the landfill of waste to ensure that Member States move towards a more circular economy and is intended to prevent or reduce the adverse effects of the landfill of waste on the environment, soil, air, surface and groundwater.

The objective of this Directive is to improve waste management in the EU and its primary aim is to ensure a progressive reduction of landfilling of waste in the EU.

The Directive also sets new binding landfill reduction targets, including:

- By 2030 all waste suitable for recycling or recovery will not be accepted in a landfill, except when landfilling provides the best environmental outcome. This target will be reviewed in late 2024 with a view to maintaining or possibly reducing, and
- By 2035 municipal waste that is landfilled must only account for 10% that is generated (by weight)[10].

The proposed development which includes the treatment of additional hazardous waste will be carried out in line with the thermal treatment process of the facility which is designed to meet the R1 efficiency criteria. The proposed development at the existing facility will therefore assist in the diversion of hazardous waste from export to a more sustainable recovery solution in an indigenous existing facility.

This aligns with the objectives of the CEP and the amended EU Directives on waste and the landfilling of waste and national policy positions regarding the environmentally sound management of hazardous waste which underline the need to continue to strive for self-sufficiency in the management of this challenging waste stream.

[10] A derogation by a Member State to postpone the above targets by up to 5 years may only be granted if landfilled more than 60% of its municipal waste generated in 2013 as reported to the OECD and Eurostat

Furthermore, the existing treatment of residual waste at the facility will continue to contribute to the achievement of the enhanced and more ambitious targets as contained within the CEP including the new stringent target on the limitation of the landfilling of municipal waste.

2.2.1.4 Circular Economy Action Plan for a Cleaner and more Competitive Europe 2020

The European Commission in March 2020 has adopted a new **Circular Economy Action Plan** - one of the main building blocks of the **European Green Deal**, Europe's new agenda for sustainable growth (European Commission 2020).[11]

The new Action Plan aims to make the European economy fit for a green future, strengthen competitiveness while protecting the environment and providing for new consumer rights. Building on the work carried out since the previous 2015 Roadmap and the Circular Economy Package as outlined above, the new Plan focuses on the design and production for a circular economy, with the aim to ensure that all resources used are kept in the EU economy for as long as possible.

The Plan is ambitious in scope and contains a suite of proposed legislative and non legislative measures. These proposals include:

- Sustainability principles to improving product durability, reusability, upgradability and reparability, addressing the presence of hazardous chemicals in products, and increasing their energy and resource efficiency;
- Provision of information on lifespan, repair services and spare parts to consumers and substantiation of environmental claims by companies;
- Promotion of key product value chains (i.e. mobile phones, laptops) through a Circular Electronics Initiative and introduction of new EU wide take back scheme.
- Packaging to be reusable or recyclable by 2030 with labelling to ensure correct recycling and mandatory requirements for recycled content;
- Aims to ensure that the EU does not export its waste challenges to third countries;
- Proposes to assess the scope to develop EU-wide end-of-waste (EoW) criteria for certain waste streams to improve circularity of products and raw materials in the EU;
- Reduction of total waste generation and halving of the amount of residual (non-recycled) municipal waste by 2030 and harmonisation of separate waste collection systems;
- Encourage the broader application of well-designed economic instruments, such as environmental taxation, including landfill and incineration taxes;

[11] European Commission Communication 2020, Circular Economy Action Plan for a cleaner and more competitive Europe: https://ec.europa.eu/environment/circulareconomy/pdf/new_circular_economy_action_plan.pdf

- In combination with the forthcoming Comprehensive European Strategy on Sustainable and Smart Mobility, enhance synergies with the circular economy transition and use of sustainable alternative transport fuels; and
- Consideration of a revision of material recovery targets set in EU legislation for construction and demolition waste and its material-specific fractions.

Whilst the intent behind the above proposals is to be commended and in particular those which aim to improve product circularity, it is difficult to envisage how the proposals regarding the reduction of municipal waste can be achieved in practice given the short timeframe outlined.

In light of the Circular Economy Package recycling and landfill reduction targets which are ambitious in nature and which must be adhered to by 2025 as outlined above, many Member States are already likely to face difficulties in meeting these targets given projected levels of population growth and increasing waste arisings throughout the EU.

In addition, large quantities of municipal waste are currently being diverted to landfill in the EU and the amended Landfill Directive provides that derogations may be availed of by certain Member States.

Accordingly, it remains to be seen how such a waste reduction target could be achieved in practice given the challenging timeframe and moreover, how a uniform approach to the same could be applied throughout the EU as currently significant differences exist as to the extent to which integrated waste management systems have been established in certain Member States.

2.2.1.5 Other EU Initiatives

The Europe 2020 strategy (European Commission 2010), an EU document which aims to ensure smart, sustainable and inclusive growth, puts forward seven flagship initiatives to set the EU on the path to this transformation, including the "resource efficient Europe" roadmap.

The Roadmap for a Resource Efficient Europe roadmap (European Commission 2011) sets out key milestones which include:

> *"By 2020, waste is managed as a resource. Waste generated per capita is in absolute decline. Recycling and re-use of waste are economically attractive options for public and private actors due to widespread separate collection and the development of functional markets for secondary raw materials. More materials, including materials having a significant impact on the environment and critical raw materials, are recycled. Waste legislation is fully implemented. Illegal shipments of waste have been eradicated. Energy recovery is limited to non-recyclable materials, landfilling is virtually eliminated and high quality recycling is ensured."*

In 2014-15, the Commission performed a mid-term review[12] of the Europe 2020 strategy. This included a public consultation that showed that the strategy is still seen as an appropriate framework to promote jobs and growth.

Following the review, the Commission decided to continue the strategy, monitoring and implementing it through a process known as the European Semester.

As the proposed development will be carried out at an existing recovery facility, the same will continue to contribute towards the reduction of landfill within Ireland, treating non-recyclable and hazardous waste while supporting high quality recycling. It is therefore in alignment with the Strategy's key milestones centred on resource efficiency and the virtual elimination of landfill.

2.2.1.6 The European Green Deal 2019

In 2019, the European Commission adopted the European Green Deal (COM(2019) 640) which is a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use.

The Deal includes a roadmap with actions to:

- boost the efficient use of resources by moving to a clean, circular economy; and
- restore biodiversity and cut pollution.

In the context of waste management, the Deal states that sustainable product policy has the potential to reduce waste significantly and where waste cannot be avoided, its economic value must be recovered and its impact on the environment and on climate change avoided or minimised.

The Deal also aims to accelerate the shift to sustainable and smart mobility and states that achieving sustainable transport means putting users first and providing them with more affordable, accessible, healthier and cleaner alternatives to their current mobility habits. In this regard, the Commission will adopt a strategy for sustainable and smart mobility in 2020 that will address this challenge and tackle all emission sources as referred to above in relation to the new Circular Economy Action Plan.

As such, the aspect of the proposed development concerning the generation of hydrogen for use in transport applications is compatible with the European Green Deal policy objectives which aim to bring about a shift to sustainable and smart mobility. More generally, the continued generation of renewable energy at the existing Carranstown facility and the treatment of additional hazardous waste and residues as part of the proposed development aligns with the Deal's objective to transform the EU into a resource-efficient economy.

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[12] https://ec.europa.eu/info/sites/info/files/europe2020_consultation_results_en.pdf

2.2.1.7 Relevant International Initiatives

The European policy framework detailed above and relating to the development of and transition to a circular economy is also reflected in international policy frameworks.

In this regard, the United Nations has developed 17 Sustainable Development Goals (UN SDG's). In the context of the proposed development, Goal 12, *Sustainable Production and Consumption*, sets out a series of targets that include resource efficiency, wasted food, waste management, reuse and recycling, public procurement, education, and removal of fossil fuel subsidies[13] all of which may be said to relate to the transition to a more circular economy and linked to the ambitious new legislative framework for waste management, as set out in the EU Circular Economy Action Plan as detailed above in **Section 2.2.1.4**.

An important target contained within this Sustainable Development Goal requires that:

> *by 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.*

The proposed development is consistent with the proper application of the waste hierarchy whereby all wastes including those that are hazardous must be managed in an environmentally safe and sound manner. Furthermore, stringent permitting requirements in the form of Industrial Emissions Directive (IED) which consolidates the requirements of the Large Combustion Plant Directive (LCPD), the Waste Incineration Directive (WID) and the Integrated Pollution Prevention and Control (IPPC) Directive which strengthens the application of Best Available Techniques (BAT) must be adhered to on an ongoing basis in the context of all elements of the proposed development.

Accordingly, the proposed development may also be said to compatible with this significant and related international target and the envisaged transition to a more circular economy on a global scale.

2.2.2 National Waste Policy

2.2.2.1 A Resource Opportunity – Waste Management Policy in Ireland

The Department of Environment, Community and Local Government published *A Resource Opportunity. Waste Management Policy in Ireland*' in July, 2012.

[13] United Nations, Sustainable Development Goal 12: https://www.un.org/sustainabledevelopment/sustainable-consumption-production/

In the context of the previous EU WFD, this national policy document sets out the measures through which Ireland will make the further progress necessary to become a recycling society, with a clear focus on resource efficiency and the virtual elimination of landfilling of municipal waste.

This Policy Statement covers the period to 2020 and a review of the same commenced in 2019[14] with a view to having a new policy in place in 2020 as detailed in the Climate Action Plan 2019[15] (as detailed below).

This review will be informed by a wide range of issues and initiatives including the progress achieved to date on implementing the measures set out in *A Resource Opportunity* and the implementation of the Circular Economy Package including the challenging new municipal waste recycling rate which has stagnated since 2016. It will also review and analyse whether there is sufficient domestic capacity to properly manage municipal waste and recycling and other appropriate infrastructure needed in the State.

In addition, waste enforcement legislation will be reviewed as will the definition of waste, and relating to the development of a circular bioeconomy, the review will identify and address key regulatory barriers and whether a designation is necessary for residual waste flows to be manged for use in the bioeconomy.

Finally, this policy review will also include the development of a new Circular Economy Action Plan to be in place by 2020. In this regard, the Climate Action Plan 2019 states that a Circular Economy Policy and Action Plan for Ireland will be developed to replace the current suite of policy, plans and programmes in 2020-21.

The same shall be inspired by the EU's Circular Economy Action Plan, and Ireland's response will provide policy direction on waste prevention, eco-design, reuse, repair, recycling, recovery and diverting waste from landfill, and will include a cross-Government reflection on how these principles can be embedded throughout the public policy frameworks.[16]

For present purposes, there are a number of guiding principles[17] in the existing policy document *A Resource Opportunity* as set out below:

- "*Firstly, we must place prevention and minimisation at the forefront of waste policy by ensuring that we minimise the generation of waste through better design, through smart green purchasing and through a keener awareness of locally produced goods which boost jobs and the economy and can reduce impacts associated with transportation.*
- *Secondly, when waste is generated we must extract the maximum value from it by ensuring that it is reused, recycled or recovered, including by the*

[14] Department of Communications, Climate Action and Environment, Public Consultation Document on a Waste Action Plan for a Circular Economy as of February 2020: https://www.dccae.gov.ie/en-ie/environment/consultations/Pages/Public-Consultation-Waste-Action-Plan-for-a-Circular-Economy.aspx
[15] Climate Action Plan 2019, Chapter 12, Waste and the Circular Economy, pages 112-120: https://www.dccae.gov.ie/documents/Climate%20Action%20Plan%202019.pdf
[16] Climate Action Plan, Section 7, Waste and the Circular Economy at page 120: https://www.dccae.gov.ie/documents/Climate%20Action%20Plan%202019.pdf
[17] Refer to **Section 1** – Introduction of A Resource Opportunity. Waste Management Policy in Ireland' (2012).

appropriate treatment of mixed municipal waste or residual waste collected in our black bins[18].

- *Thirdly, disposal of municipal waste to landfill must be a last resort – in fact, we must now work to effectively eliminate our use of landfill for this purpose within the next decade, in line with the 2011 EU roadmap to a resource efficient Europe*" (see **Section 2.2.1.3**).

The policy notes[19] that the waste projections set out in the Environmental Protection Agency's National Waste Report 2010, which are based on the ESRI's sustainable development model for Ireland, anticipate that municipal waste arisings will increase by 825,000 tonnes (to 3.7m tonnes) within the next 15 years[20]. The report also states:

> *"While there may be sufficient management capacity in the immediate future, the predicted growth of municipal waste within the coming decade will necessitate investment in waste management infrastructure".*

The policy[21] required the preparation of a regional waste management plan for each of the three waste regions, in recognition of the nature of the Irish waste market and the movement of waste across existing boundaries to avail of waste management infrastructure. In keeping with the proximity and self-sufficiency principles, a key objective of waste management plans is to ensure a sufficiency of waste management infrastructure within the State to manage municipal waste. The three waste regions are shown in **Figure 2.1** below.

[18] See below text on recovery for what the strategy considers to be "appropriate treatment of mixed municipal waste"
[19] Refer to **Section 3** – Planning for the Future of *A Resource Opportunity. Waste Management Policy in Ireland'* (2012).
[20] Note that this ESRI model was reviewed and updated annually in EPA national waste reports until 2012, but is no longer funded (so it is unclear whether it will continue to be used as a forecasting tool). The Regional Waste Plans adopted a waste forecasting approach that takes into account the ESRI modelling as well as other indicators, as outlined in **Chapter 15** of each of the plans.
[21] Refer to **Section 3** – Planning for the Future of *A Resource Opportunity. Waste Management Policy in Ireland'* (2012).

Figure 2.1 Waste Management Regions

It is stated in the 2012 policy that it is important to harness the potential of waste to contribute in a significant manner to displacing the use of finite fossil fuel resources[22].

In considering measures for the encouragement of recovery, the policy advocates that a balance must be struck between the development of essential infrastructure and the importance of ensuring that material, which could be reused or recycled, is not drawn down the hierarchy and that waste generation is not encouraged in order to provide feedstock for recovery processes.

In this context, it is stated that the technical guidance document published by the EPA on *Municipal Solid Waste: pre-treatment and residuals' management* (EPA 2009) is of particular importance, given its provision that residual municipal waste delivered to a waste to energy facility must first have been collected through a source separated system and mechanical treatment for the extraction of metals and other marketable recyclables must be applied to the bottom ashes that are generated following combustion.

Section 9.2 sets out key policy measures and actions in relation to recovery, as follows:

> "*Recovery*

[22] Refer to **Section 9** – Recovery of A Resource Opportunity. Waste Management Policy in Ireland' (2012).

- *the reform of the waste collection permitting system will provide the opportunity for the application of such conditions as are necessary to give effect to the waste hierarchy, reflecting the legal status of the hierarchy and the range of recovery options emerging, to promote self-sufficiency and to drive a move away from disposal and towards recovery;*
- *conditions imposed on each waste collection permit to prohibit waste which has been source segregated by the waste producer for the purposes of recycling, from being sent for recovery or for disposal, will be rigorously enforced;*
- *the careful design and use of incentives and economic instruments will be a key focus for ensuring that waste is not drawn down the waste hierarchy;*
- *government will ensure that the relevant Departments and agencies pursue a coordinated approach in support of the development of recovery infrastructure;*
- *Ireland requires an adequate network of quality waste treatment facilities. A review of recovery infrastructure will be completed by 31 December 2012 and the EPA will advise on requirements in this regard. In particular, this will examine capacity for managing municipal waste in conformity with the principles of proximity and self-sufficiency."*

Furthermore, since the publication of the above guidance document, the European Union (Food Waste and Bio-waste) Regulations 2015[23] have been enacted. These Regulations stipulate that waste collectors shall ensure, as a minimum, that they provide or arrange for the provision of a separate collection service for food waste from households for population agglomerations in accordance with the time schedule set out in Regulation 4 of the 2015 Regulations.

As such, food waste must be source segregated and collected by authorised waste collectors and should not be mixed with other waste, other than specified bio waste and food waste, or other material with different residual municipal waste prior to delivery to authorised facilities including waste to energy facilities.

The EPA review of recovery infrastructure, in the *National Municipal Waste Recovery Capacity* report (EPA 2014), recommended that more data be acquired on facilities handling municipal waste due to confusion over waste acceptance categories, availability or capacity of permitted sites and harmonisation of processing capacities in regulatory classes. The report was followed up with a detailed assessment of facilities handling municipal waste by the Regional Waste Authorities in preparation of the Regional Waste Plans, in collaboration with the EPA. This led to the recommendations referred to below (**Section 2.2.3**) in the Regional Waste Plans.

[23] Statutory Instrument No. 430 of 2015: http://www.irishstatutebook.ie/eli/2015/si/430/made/en/print

The proposed development will provide additional hazardous waste treatment capacity and this will in turn contribute toward self-sufficiency of hazardous waste treatment in the State without impacting on material which could be reused or recycled.

This treatment further avoids the export of such hazardous waste to Europe thus significantly reducing the adverse environmental impacts of unnecessary transport which is not compatible with the self-sufficiency and proximity principles as required by the national Hazardous Waste Management Plan as detailed in the next section.

2.2.2.2 Ireland's National Hazardous Waste Management Plan 2014-2020

The National Hazardous Waste Management Plan 2014-2020 ("NHWMP 2014-2020") (EPA 2014) is the third national hazardous waste plan. It updates and revises the previous plan covering the period 2008 – 2012 (Proposed Revised National Hazardous Waste Management Plan 2013).

Whilst the current Plan covers the period to 2020, the Waste Management Act 1996 as amended, provides that at least once in each period of 5 years after the date of making of the hazardous waste management plan, the Environmental Protection Agency shall review the plan and make such revisions thereto as it thinks fit[24].

In this regard, a Progress Report on the implementation of the National Hazardous Waste Management Plan has been recently published by the Environmental Protection Agency[25] and is detailed below.

Along with this report, any additional information gathered will be used to inform the development of the next Plan, which is due to commence in 2020. It is presently envisaged that a draft replacement Plan will be developed early in 2021 for public consultation in line with the applicable legislation. In addition, the Environmental Protection Agency has published updated hazardous waste figures for 2018 (and detailed in **Section 2.2.2.3** below).

The current NHWMP 2014-2020 sets out the priorities for 2014-2020, taking into account the progress made and the waste policy and legislative changes that have occurred since the previous plan. One area where insufficient progress was made on the previous plan was in achieving self-sufficiency (as described in previous plan), with levels of exported waste staying steady while the proportion of hazardous waste being treated in Ireland is slowly declining.

The NHWMP 2014 – 2020 plan sets out a number of objectives including:

(i) To prevent and reduce the generation of hazardous waste by industry and society generally.

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[24] http://www.irishstatutebook.ie/eli/1996/act/10/section/26/enacted/en/html#sec26
[25] http://www.epa.ie/pubs/reports/waste/haz/EPA_NationalHazardousWasteManagementPlan_web.pdf

(ii) To maximise the collection of hazardous waste with a view to reducing the environmental and health impacts of any unregulated waste.

(iii) To strive for increased self-sufficiency in the management of hazardous waste and to minimise hazardous waste export.

(iv) To minimise the environmental, health, social and economic impacts of hazardous waste generation and management.

The objective of moving towards increased self-sufficiency in the management of hazardous waste continues to be recommended, where it is strategically / environmentally advisable, and technically and economically feasible.

This recommendation is in line with several objectives (Refer to section 6.2 of the NHWMP). It recognises the proximity principle established in the WFD and maintained in the amended Directive on waste and it seeks to maximise the re-use and recovery potential of, for example, materials, precious metal and secondary fuels, through provision of a range of local treatment options where practical.

The EU principles of self-sufficiency and proximity require that:

1. *Member States shall take appropriate measures, in cooperation with other Member States where this is necessary or advisable, to establish an integrated and adequate network of waste disposal installations and of installations for the recovery of mixed municipal waste collected from private households including where such collection also covers such waste from other producers, taking into account best available techniques.*
2. *The network shall be designed to enable the Community as a whole to become self-sufficient in waste disposal as well as in the recovery of waste referred to in paragraph 1, and to enable Member States to move towards that aim individually, taking into account geographical circumstances or the need for specialised installations for certain types of waste.*
3. *The network shall enable waste to be disposed of or waste referred to in paragraph 1 to be recovered in one of the nearest appropriate installations, by means of the most appropriate methods and technologies, in order to ensure a high level of protection for the environment and public health.*

The NHWMP 2014-2020 finds that, if Ireland is to become self-sufficient, suitable hazardous waste treatment options would be required. This is further explained in section 6.2 of the NHWMP:

- *There are ancillary environmental benefits deriving from self-sufficiency. Firstly international transport of hazardous waste is minimised eliminating associated risks, and avoiding transport related greenhouse gas emissions. Secondly, it increases availability of recovery and disposal outlets for hazardous waste if problems arise in the export agreements for hazardous treatment in other Member States. However, it is noted that hazardous waste destined for recovery is subject to an open and competitive waste market in the EU.*

Greater self-sufficiency would therefore maximise the treatment and disposal of hazardous waste in Ireland, where strategically advisable, and economically and technically feasible, with policy, environmental and availability-of-outlet benefits.

Section 6.4 of the NHWMP 2014-2020 notes there is a quantity of hazardous waste that is currently exported for incineration for which incineration will remain the most likely management route. It must therefore be concluded that, in combination with the blending of waste solvent for use in cement kilns, and in the absence of alternative techniques that are capable of treating a wide range of diverse waste streams, incineration in Ireland will be needed for some waste streams in order for Ireland to move towards self-sufficiency in the treatment of hazardous waste.

Taking this into consideration, three overarching strategic needs have been identified for action if additional hazardous waste is to be treated in Ireland and exports of hazardous waste are to be reduced (Refer to section 6.2 of the NHWMP), including:

- Expansion of recovery and treatment capacity in Ireland for waste that does not need thermal treatment or landfill – generally referred to as physico-chemical treatment;
- Addressing the deficit in thermal treatment capacity in Ireland (i.e., use as fuel, co-incineration or incineration) for Irish wastes currently being exported (e.g., solvents), and
- Securing of long-term disposal arrangements for hazardous waste streams not suitable for thermal treatment or recovery.

Section 6.2 of the NHWMP 2014-2020 states that consideration should be given to co-location of hazardous waste treatment at existing waste facilities or brownfield sites for the purposes of sustainability and land-use planning.

Two significant public policy constraints were taken into account in preparing the revised Plan (Refer to section 1.1 of the NHWMP).

First, current government policy indicates that large-scale public investment in hazardous waste infrastructure will not be made. The hazardous waste industry in Ireland is entirely owned and operated by the private sector.

No public authorities are involved in the commercial collection of hazardous waste, the provision of storage facilities or the treatment of hazardous waste.

The only exception is the provision of civic amenity sites by local authorities for the deposit of small quantities of household hazardous waste.

Second, in this context, options for private sector investment are presented solely as options and the NHWMP 2014-2020 does not seek to carry out a detailed evaluation of the actual economic feasibility of any such potential investments. Any proposals for hazardous waste management infrastructure would, however, be expected to have regard to the NHWMP 2014-2020 and describe how its overarching objectives would be met.

As regards self-sufficing versus export of hazardous waste and the requirement to strive for increased self-sufficiency in hazardous waste management, the Plan notes that there are ancillary environmental benefits deriving from self-sufficiency.

Firstly, international transport of hazardous waste is minimised (eliminating associated risks, and avoiding transport related greenhouse gas emissions, see **Section 9.4.2.1** of **Chapter 9** ***Climate***). Secondly, it increases availability of recovery and disposal outlets for hazardous waste if problems arise in the export agreements for hazardous treatment in other Member States.

In this regard the Environmental Protection Agency in *Ireland's Environment 2016 – An Assessment*, has also identified that Ireland is dependent on export for the treatment of many hazardous waste streams. It goes on to state that the three strategic needs identified in the National Hazardous Waste Management Plan as detailed above, must be implemented if Ireland is to strive for the achievement of self-sufficiency in hazardous waste management and as such minimise the environmental, health and social and economic impacts of hazardous waste generation and management.[26]

Thus, the treatment of additional hazardous waste, including hazardous aqueous waste as a component of the proposed development, will contribute to the State becoming more self-sufficient in the management of hazardous waste generated and furthermore, is in alignment with such waste being treated in a more proximate manner and wider climate mitigation measures through the associated reduction in transport emissions through domestic treatment at an existing recovery facility in the State.

Moreover, it should also be noted that as a Party to the United Nations Basel Convention,[27] Ireland has committed to minimising the movement of waste for disposal, consistent with the principles of proximity, self-sufficiency and priority for recovery, and to reducing the quantities of hazardous wastes generated[28].

One of the guiding principles of the Basel Convention is that, in order to minimise the threat to human health and the environment, hazardous wastes should be dealt with as close to where they are produced as possible. Thus, in line with the proposed development and its compatibility with Ireland's National Hazardous Waste Management and the 2018 Progress Report on its implementation, it is also consistent with the principles of proximity, self-sufficiency and priority for recovery laid down in the Basel Convention on the Control of Transboundary Movements of Hazardous Waste.

[26]Ireland's Environment 2016 – An Assessment, Chapter 6, Hazardous Waste Management at page 10: http://www.epa.ie/pubs/reports/indicators/SoE_Report_2016.pdf
[27] http://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx
[28]The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal: http://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx

2.2.2.3 Progress Report on the implementation of Ireland's National Hazardous Waste Management Plan 2014-2020

Additionally, and as referred to above, the Environmental Protection Agency in 2018 published a Progress Report on the implementation of the National Hazardous Waste Management Plan. This Progress Report once again underlines the key objective of increasing Ireland's level of self-sufficiency regarding hazardous waste management.

The report also presents the progress of the recommended actions outlined in the NHWMP 2014-2020 and underlines that while many recommended actions have been advanced, a stronger focus is needed in the areas of hazardous waste prevention and the development of waste management infrastructure if Ireland is to become more self-sufficient in the treatment and management of hazardous waste.

In this regard, the Report finds that whilst Ireland has moved towards greater self-sufficiency regarding hazardous waste management since the publication of the last NHWMP 2014-2020, the often more favourable cost option of treatment and disposal abroad has meant that export continues to be a significant treatment route for Ireland's hazardous wastes and further warns that the overreliance on any one export market for the treatment of hazardous waste is not advisable. The Report further notes that the impending departure of the UK from the European Union will have implications for hazardous waste export routes such as Northern Ireland and Great Britain.In terms of the provision of hazardous waste treatment infrastructure, the Report finds that Ireland's self-sufficiency for the environmentally sound management of hazardous waste is contingent upon commercial decisions taken by private sector service providers regarding the provision of infrastructure for hazardous waste and specifically states:

> *'While the introduction of economic and other instruments to provide incentives to potential investors remains under consideration, Ireland's self-sufficiency for the environmentally sound management of hazardous waste is contingent upon commercial decisions taken by private sector service providers regarding the provision of infrastructure for hazardous waste'.* [29]

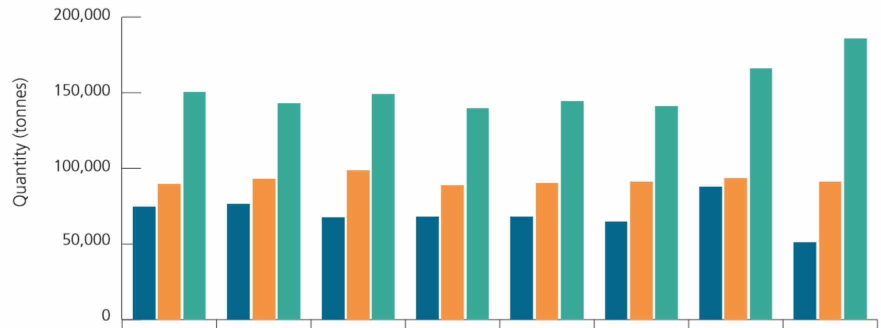
This Report states that in 2016, 371,000[30] tonnes of hazardous waste was generated with 409,000[31] tonnes of hazardous waste managed in Ireland.

[29] Progress Report National Hazardous Waste Management Plan, Infrastructure and Self-Sufficiency Section at page 20

[30] Hazardous waste generated figure discounts (a) hazardous waste partially treated waste for export, (b) onsite treatment with recovery (R2) code and (c) waste imported for treatment. Generated (rather than managed) figure is reported for Ireland under Basel Convention requirements.

[31] Figure excludes contaminated soil (at time of writing, the EPA Report referred to this figure as being included, figure, however, the EPA has since confirmed that this figure should be excluded).

Almost 186,000 tonnes[32] was exported which is an increase of 11 % on 2015 and 6% on 2014[33], thus demonstrating an increase on the previous figures from 2012 as contained within the EPA National Waste Report 2012 (EPA 2014). This data can be seen in **Figures 2.2a** and **2.2b** below which are directly extracted from the report[34].



	2009	2010	2011	2012	2013	2014	2015	2016
On-site at industry (t)	74,668	76,655	67,772	68,100	68,100	64,752	88,121	51,013
Off-site in Ireland (t)	89,992	93,048	98,838	88,866	90,401	91,256	93,778	91,083
Exported	150,395	143,180	149,037	139,872	144,321	141,126	165,920	186,000

Figure 2.2a Trend data for hazardous waste treated on-site, off-site within Ireland and exported outside of Ireland. Source EPA National Hazardous Waste Management Plan 2014-2020.

[32] Figure excludes contaminated soil. Exclusion of contaminated soil brings exports to 50% of total hazardous waste managed in Ireland.
[33] As per Figure 2 Trend Data for hazardous waste treated on-site, off-site within Ireland and exported outside of Ireland and Figure 3 Comparison of hazardous waste managed (off site & onsite), exported and contaminated soil, 2012 and 2016 of the Progress Report at pages 7 and 8.

[34] Note: hazardous waste partially treated waste for export: Regulation (EC) No. 2150/2002 on Waste Statistics require a distinction to be made between waste generation and waste treatment figures. The waste generated figure should not include the waste treated at economic operators, which is known as secondary waste, this requirement is detailed in full in the Eurostat Manual on Waste Statistics: https://ec.europa.eu/eurostat/documents/3859598/5926045/KS-RA-13-015-EN.PDF/055ad62c-347b-4315-9faa-0a1ebcb1313e

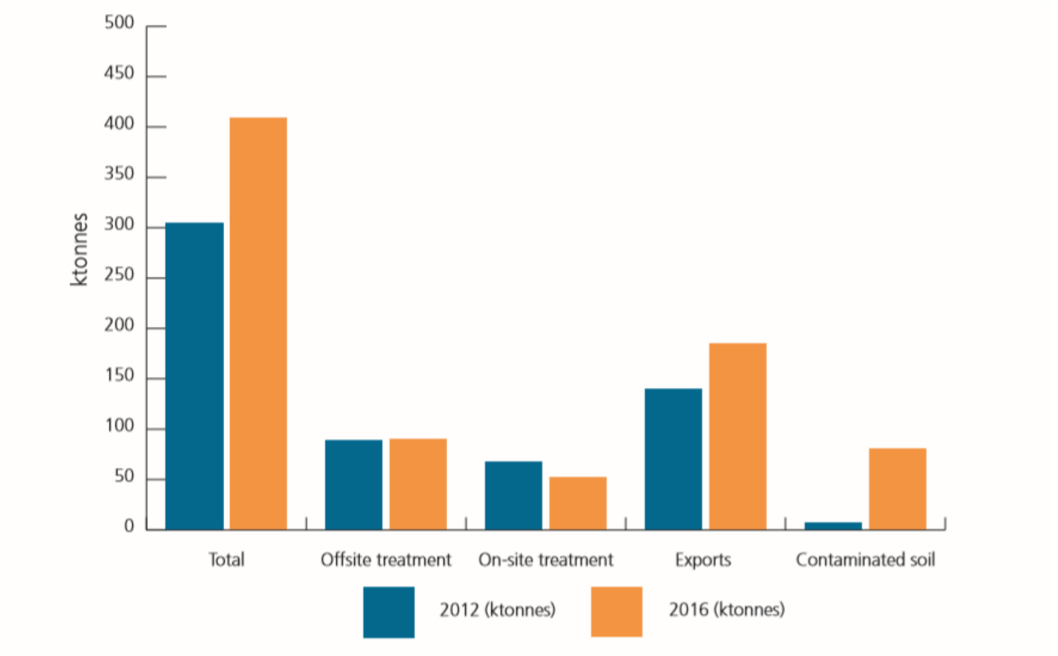


Figure 2.2b Comparison of hazardous waste managed (off site & onsite), exported contaminated soil, 2012 and 2016. Source EPA National Hazardous Waste Management Plan 2014-2020.

Thus, given such increases in the generation of hazardous waste and in the export of the same, the need for additional treatment capacity is once again highlighted by virtue of such increased figures. In this regard, the Progress Report underlines a priority action for the remaining lifetime of the NHWMP 2014-2020 (up to 2020) which includes the promotion of Ireland’s self-sufficiency goals regarding the treatment and management of hazardous waste which the proposed development will contribute to through the treatment of additional hazardous waste.

In this context, the aspect of the proposed development which involves the thermal recovery of additional hazardous waste including hazardous aqueous waste currently accepted at the facility in a tank farm, will help to address the deficit in thermal treatment capacity in Ireland for suitable hazardous waste and will make a significant contribution toward hazardous waste self-sufficiency thereby reducing exports (by an additional 15,000 tonnes per annum) and minimising hazardous waste export.

The proposed development is also consistent with the provisions of the EMRWMP (as detailed below) which identifies an additional 50,000 tonnes of thermal recovery capacity for the treatment of hazardous wastes on a national basis. The additional acceptance of hazardous residues for treatment at the facility is also compatible with the overarching objectives of the National Hazardous Waste Management Plan and the recent progress report on its implementation and which once again underlines the key objective of increasing Ireland’s level of self-sufficiency regarding hazardous waste management.

Moreover, one of the key strategic objectives of the National Hazardous Management Plan in section 6.2 provides for the expansion of recovery and treatment capacity for waste that does not need thermal treatment or landfill and is generally referred to as physico-chemical treatment. In this regard, the solidification of boiler ash and flue gas cleaning residues as a constituent part of the proposed development, gives effect to and is compatible with this key policy objective of the National Plan.

In line with plan led and evidence-based development which underpin the National Planning Framework objectives (detailed below) and sustainable land-use planning goals, the proposed facility will co-locate hazardous waste treatment with the existing treatment of residual municipal waste treatment. Furthermore, it will represent a further significant private sector investment in hazardous waste infrastructure, which is clearly identified as necessary in order to deliver hazardous waste infrastructure and enhanced self-sufficiency within the State

Accordingly, the proposed development may be regarded as being in alignment with both the National Hazardous Waste Management Plan 2014-2020 and the 2018 Progress Report on its implementation, as it will contribute to the achievement of self-sufficiency in the treatment in hazardous waste within the State as prioritised and underlined in clear terms in both policy documents.

Furthermore, the proposed development will also contribute to wider climate mitigation policy measures and the State’s transition to a low carbon economy as there is an associated environmental benefit of avoiding the transport (see **Section 9.4.2.1** of **Chapter 9** ***Climate)*** of hazardous waste over longer distances through export to Europe and the avoidance of transport related greenhouse gas emissions.

This ancillary environmental benefit deriving from self-sufficiency is expressly recognised in the National Hazardous Waste Management Plan and the guiding principles of the Basel Convention centered on minimising the movement of hazardous waste for disposal, consistent with the principles of proximity, self-sufficiency and priority for recovery.

2.2.2.4 Climate Action Plan 2019

The Irish Government published its Climate Action Plan 2019 which aims to lay down measures to enable Ireland to meet its EU targets to reduce its carbon emissions by 30 per cent between 2021 and 2030 and furthermore, lays the foundations for achieving net zero carbon emissions by 2050.

In total, the Plan sets out 180 actions that need to be taken and which extend to all sectors of the economy including a specific chapter dedicated to Waste and the Circular Economy[35]. The Plan notes that waste emissions per capita are lower in Ireland than the EU average, contributing 1.5% of greenhouse gas emissions in 2017. However, Ireland’s material consumption is well above the EU average and continues to increase with economic growth.

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[35] Climate Action Plan 2019, Chapter 12, Waste & Circular Economy, pages 112-119: https://assets.gov.ie/10206/d042e174c1654c6ca14f39242fb07d22.pdf

The Plan also lays out timeframes to be adhered to in the context of sector specific policy updates as referred to above in the context of the upcoming review of the national waste policy document ‘A *Resource Opportunity’* and the Regional Waste Management Plans.

For present purposes, the chapter on Waste and the Circular Economy is detailed in this waste policy section with a general overview of the Plan including the introduction of a carbon tax and carbon budgets, and specific chapters relating to renewable energy and transport detailed in the national energy policy section below. Broadly speaking, all such chapters are relevant to the proposed development to be carried out at the facility, most notably those on waste and the circular economy, renewable energy and transport.

In terms of managing waste, The Climate Action Plan states that the Government will lead the transformation from waste management to circular economy practice through delivery of a new national policy (as detailed above). The Plan also reiterates in clear terms that Irish and regional waste policy is based on the waste hierarchy: waste prevention; preparing for reuse; recycling; and energy recovery; with disposal, namely landfill, being the least desirable option. As the proposed development will be carried out at a dedicated recovery facility, it is therefore considered that the same is compatible with the national Climate Action Plan 2019 objectives relating to the proper management of waste.

The Plan also provides that waste legislation will be revised to incorporate new circular economy requirements, including the legally binding waste and recycling targets. In this regard, all Member States, including Ireland are obliged to introduce national laws and regulations necessary to give effect to the revised Directives which form part of the CEP by 2020.

The aim under the Plan is to reduce landfill to 10% of all waste and to recycle 70% of all waste by 2030. The Plan also proposes banning single-use plastic and ensuring that all packaging is recyclable by 2030.

In terms of targets, the Plan lays down the following specific targets relating to landfill reliance, recycling, food waste and single-uses plastics.

With regard to landfill reliance, the Plan lays down the following targets:

- Reduce diversion of municipal waste to 10% by 2035; and
- Limit diversion of biodegradable municipal waste to landfill to maximum limit of 427k tonnes by 2020 and for every year after.

With regard to recycling, the Plan sets out the following targets which are broadly in line with the Circular Economy Plan targets as adopted in the revised Directive on Waste:

- Recycle 65% of municipal waste by 2035;
- Recycle 70% of packaging waste by 2030;
- Recycle 55% of plastic packaging waste by 2030; (not present in the CEP);
- Separate collection obligations extended to include hazardous household waste (by end 2022), bio-waste (by end 2023), and textiles (by end 2025).

The Plan also includes a food waste reduction target to:

- Reduce food waste by 50% by 2030.

In terms of single-use plastics, the Plan sets out a number of policy objectives including:

- Ban specific single-use plastic convenience items including polystyrene food containers, cups and drinks containers in line with the EU Single Use Plastics Directive;
- Provide for 90% collection of plastic drinks containers by 2029;
- Determine and introduce reduction targets and measures no later than 2022 to be achieved no later than 2026; and
- Ensure all plastic packaging is reusable or recyclable by 2030.

In terms of policy updates and actions, the Plan provides that a new National Waste Prevention Programme will be developed with revisions to the existing national waste policy document 'A Resource Opportunity' and Regional Waste Management Plans also to be introduced with the intention of guiding a transition to a circular economy by the EPA and Local Authorities. A new Circular Economy Policy and Action Plan for Ireland will also be developed.

In this regard, the Plan lays down key milestones in terms of carrying out public consultation and implementing the updated and newly developed plans. As detailed above, a revised national waste policy is expected to be in place (following review of submissions) by Q2 2020. This will in turn lead to revised regional waste management plans by early 2022.

The Plan also states that opportunities will be identified to strengthen the regulatory and enforcement frameworks and structures for the waste collection and management system, to maximise the collection of clean, segregated materials for reuse and/or recycling from all households and businesses, and to incentivise consumers to reduce, reuse and recycle.

In addition, a number of possible environmental levies will be scoped, including a possible levy on single use plastics, as part of the review of the Environment Fund.

Finally, the Climate Action Plan provides that measures to address the key regulatory barriers to the development of the bioeconomy, including exploring opportunities to establish "End of Waste" criteria for certain bio-wastes, will also be identified and delivered.

With regard to the ambitious policy objectives contained in the Plan relating to the use of single-use plastics, it is important to highlight an associated issue concerning the management of soft plastics. Currently in Ireland such material is not accepted at kerbside for recycling and must be placed in the general waste (black/residual) bin.

This measure was taken in 2017 by the Department of Communications, Climate Action and the Environment (DCCAE) as a result of the ban on the import of a number of types of plastic to China.[36] With regard to the existing treatment of waste and the proposed development to be carried out at the Carranstown facility, the treatment of soft plastics rapidly increase the calorific value of waste which in turn causes municipal waste-to-energy facilities to reach their thermal output at an accelerated rate.

This ultimately reduces the amount of waste that the facility can treat and therefore, diversion would prevent such material from being landfilled or exported abroad for thermal treatment. In this regard, if this material was separately collected by householders, it could be used to fuel cement kilns that benefit from its high calorific content, thereby facilitating a more sustainable solution that is much needed for this plastic waste stream.

In general terms, the proposed development may be regarded as being consistent with the policy objectives laid down in the Climate Action Plan as these are focused on the transition to a circular economy.

Specifically, the Plan underlines the significance of the circular economy in delivering sustainable growth and promoting climate change mitigation as reflected in the UN Sustainable Development Goals (as detailed above) and specifically Goal 12. This Goal sets out a series of targets that include resource efficiency, wasted food, waste management, reuse and recycling, public procurement, education, and removal of fossil fuel subsidies.

In terms of the waste management target, the management of all wastes including those that are hazardous must be handled in an environmentally sound manner for the duration of their life cycle.

The proposed development through the sustainable and environmentally sound management of all waste including those that are hazardous in line with stringent operating conditions as predicated on European and national legislative requirements, accords with this goal and the broad circular economy policy underpinnings of the national Climate Action Plan.

2.2.3 Regional Waste Policy

2.2.3.1 Eastern Midlands Region Waste Management Plan 2015-2021

The Eastern Midlands Region Waste Management Plan [EMRWMP] 2015 – 2021 is one of three regional waste plans made in line with statutory obligations and incorporating certain requirements of the WFD. The Eastern Midlands Region covers the administrative areas of the following local authorities – Dublin City Council, Dun Laoghaire-Rathdown County Council, South Dublin County Council, Fingal County Council, Wicklow County Council, Kildare County Council, Laois County Council, Offaly County Council, Westmeath County

[36] See https://www.mywaste.ie/about-mywaste/

Council, Longford County Council, Meath County Council and Louth County Council. The region has a population of 2,249,603.

The approach of the regional waste plans is to put into place coherent policy objectives and actions which align with European and national policy and support Ireland’s move to an economy defined by higher resource efficiency and productivity. The regional waste plans cover the period from 2015 to 2021 and in line with statutory requirements are required to be revised or replaced every six years.

The evaluation of these plans is scheduled to commence with a pre-draft consultation in 2020, the draft Regional Waste Plans to be consulted upon in 2021 and the implementation of the replacement plans to take place in 2022 as detailed in the Climate Action Plan 2019.

The strategic vision of the EMRWMP is to view waste streams as valuable material resources, leading to a healthier environment and sustainable commercial opportunities. The EMRWMP seeks to encourage a transition from a waste management economy to a green circular economy by increasing the value recovery and recirculation of resources.

In line with this vision, the EMRWMP sets out targets to 2030. These include:

- Absolute decoupling of household waste from economic growth and disposable income. Preparing for reuse and recycling rate of 60-70% of municipal waste by the end of 2030 (since the adoption of the Circular Economy Package, fifty-five percent of municipal waste must be prepared for re-use and recycling by 2025, 60 percent by 2030, and 65 percent by 2035).
- Reduce and where possible eliminate the use of landfilling of all major waste streams including municipal, industrial and construction and demolition wastes in favour of the recovery of residual wastes.

Section 16 of the EMRWMP assesses the current availability of waste treatment capacity and future capacity requirements. The EMRWMP states that the need for future treatment capacity requires careful consideration and must take into account predicted waste growth, growing recycling rates, future targets, the continued move away from landfill and the conversion of pending capacity into active treatment.

The development of future thermal recovery facilities will be viewed as national facilities addressing the needs of the State and will not be defined by regional markets alone.

With regards to future treatment capacity requirements, the EMRWMP recommends the following regarding hazardous waste treatment capacity:

- **Objective E15b** of the plan supports the need for thermal recovery capacity to be developed specifically for the on-site treatment of industrial process wastes and where justifiable, the treatment of such wastes at merchant thermal recovery facilities; and
- **Objective E16** supports the development of up to 50,000 tonnes of additional thermal recovery capacity for the treatment of hazardous wastes nationally to

ensure that there is adequate active and competitive treatment in the market to facilitate self-sufficiency needs where it is technically, economically and environmentally feasible.

The EMRWMP also confirms that the development of waste infrastructure will be driven by the private sector. The local authorities in the Eastern Midlands Region do not foresee any capital investments and furthermore, the Plans states:

> *"Private sector investment is anticipated in the development of other recovery facilities to treat residual municipal wastes and residual hazardous wastes"*

In summary, the EMRWMP is underpinned by the principles of self-sufficiency and proximity. The region will promote sustainable waste management in keeping with the waste hierarchy and the move towards a circular economy and greater self-sufficiency.

The proposed development constitutes a private sector development, which will provide additional thermal recovery capacity for the treatment of additional hazardous wastes in accordance with policy Objective E16 of the EMRWMP.

2.3 Energy and Climate Change Policies

The proposed development will take place at the Carranstown facility which currently generates 21.5MW of electricity of which 19MW is exported to the national grid. A portion of this electricity[37] will be generated from the biodegradable fraction of industrial and municipal waste and is therefore considered to be energy from renewable sources. Waste is also an indigenous energy resource.

As such, the treatment of additional hazardous waste at the facility is compatible with the existent treatment of hazardous waste and will not affect the generation of renewable energy already produced at the facility in any regard.

In addition, the development of a hydrogen generation unit as part of the proposed development for connection to the gas transmission/distribution network and for use in mobile transport applications is compatible with broad policy objectives and the obligation to use energy at all stages of the energy chain in the most efficient manner possible as detailed below.

For these reasons, as the proposed development will be carried out at the existing thermal recovery facility at Carranstown, it may be said to align in broad terms with and contribute towards the attainment of European and national energy policy objectives as set out below.

[37] Based on experience at the Meath waste to energy facility, the fraction of electricity generated from renewable sources is estimated to be approximately 50%.

2.3.1 European Climate & Energy Policy

In terms of targets for 2020, the 2020 Climate and Energy Package included a suite of Directives including the Renewable Energy Directive ((2009/28/EC) and the Energy Efficiency Directive (Directive 2012/27/EU). The Renewable Energy Directive (2009/28/EC) required the EU to fulfil at least 20% of its total energy needs with renewables by 2020 through mandatory Member State renewable targets.

Since then, the EU has adopted a range of legislative acts to achieve its ambition to develop an Energy Union. Its aim of is to make energy more secure, affordable and sustainable. It is made up of five closely related and mutually reinforcing dimensions:

- security, solidarity and trust: diversifying Europe's sources of energy and ensuring energy security through solidarity and cooperation between EU countries;
- a fully integrated internal energy market: enabling the free flow of energy through the EU through adequate infrastructure and without technical or regulatory barriers;
- energy efficiency: improved energy efficiency will reduce dependence on energy imports, lower emissions, and drive jobs and growth;
- decarbonising the economy: the EU is committed to a quick ratification of the Paris Agreement and to retaining its leadership in the area of renewable energy;
- research, innovation and competitiveness: supporting breakthroughs in low-carbon and clean energy technologies by prioritising research and innovation to drive the energy transition and improve competitiveness.[38]:

In 2016, the European Commission introduced a package of measures to provide the stable legislative framework needed to facilitate the clean energy transition – and thereby taking a significant step towards the creation of the Energy Union. The Clean Energy Package consists of 8 different legislative acts, which have now been agreed by institutions of the EU.

This put in place a legislative footing to meet the objectives of the 2030 framework for climate and energy policies (European Commission 2014, *A policy framework for climate and energy in the period from 2020 to 2030*) which aims to make the European Union's economy and energy system more competitive, secure and sustainable and sets targets for at least 32% share for renewable energy, at least 32.5% improvement in energy savings by 2030 and at least 40% reduction in greenhouse gas emissions compared to 1990.

The recast Renewable Energy Directive sets out a new regulatory framework which includes a binding renewable energy target for the EU for 2030 of 32% with an upwards revision clause by 2023.[39]

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[38] Refer to overview of the EU's Energy Union at https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/building-energy-union
[39] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001&from=EN

The Energy Efficiency Directive is described in further detail below.

2.3.1.1 Clean Energy Package

The package specifically notes in relation to thermal recovery that:

> *"The Commission will further establish synergies between energy efficiency policies, resource efficiency policies and the circular economy. This will include exploiting the potential of "waste to energy".*

In February 2015, the European Commission published an Energy Union framework package (European Commission COM/2015/080) which aimed to build on the 2030 and 2050 frameworks and integrate a series of policy areas into one cohesive strategy with a cohesive set of measures.

In this regard, in 2017 the Commission published a waste to energy Communication to enhance synergies between the circular economy, resource efficiency and waste-to-energy. The European Commission's Waste-to-Energy communication, *The role of waste-to-energy in the circular economy*,[40] seeks to provide guidance to Member States on how to achieve properly balanced waste-to-energy capacity. It also affirms that the waste hierarchy remains as the cornerstone of EU policy and legislation and is a key to a transition to a circular economy.

In this regard, the Communication states:

> *'Waste-to-energy processes can play a role in the transition to a circular economy provided that the EU waste hierarchy is used as a guiding principle which ranks waste management options according to their sustainability and gives top priority to preventing and recycling of waste[41]'.*

In the context of energy recovery, the Communication goes on to state that when waste cannot be prevented, prepared for reuse or recycled, recovering the energy embedded in it and injecting it back in the economy is the next best environmental and economic option. The treatment of unavoidable wastes and residues and hazardous wastes by the energy to waste process may be regarded as paying due regard to the waste hierarchy as it falls within the recovery tier of the waste hierarchy and is to be favoured over landfill whereby such wastes would contribute to greenhouse gas emissions, leachate and would necessarily involve significant after care and which may by implication may be regarded as the least favoured environmental option and the least preferred tier of the waste hierarchy.

Energy from waste is also presented as a means of producing low-cost heat and often initiates development of a city's district heating network, utilising the energy content embedded in the waste according to the Communication.

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[40] http://ec.europa.eu/environment/waste/waste-to-energy.pdf
[41] As above.

Whilst the Communication does state that investments in treatment facilities for industrial waste for residual waste, such as extra incineration capacity should only be granted in limited and well justified cases, where there is no risk of overcapacity and the objectives of the waste hierarchy are fully respected, in Ireland and many other Member States a risk of such overcapacity does not exist and can be justified from a long term perspective given the lack of treatment capacity as set out in national policy documents.

Furthermore, given that the proposed development will take place at an existing facility classed as a recovery operation pursuant to the waste hierarchy and will contribute to the continued diversion of waste from landfill and associated negative and harmful environmental impacts, it may therefore be regarded as according with the proper application of the waste hierarchy and furthermore, may be said to be in broad alignment with this Communication.

In addition, the Energy Efficiency Directive (Directive 2012/27/EU), promotes the use of cogeneration, district heating and cooling, and waste industrial heat recovery. The directive also provides that all EU countries are required to use energy more efficiently at all stages of the energy chain, including energy generation, transmission, distribution and end-use consumption.

The development of a hydrogen generation unit as part of the proposed development for connection to the gas transmission/distribution network and for use in mobile transport applications is thus supportive of this obligation to use energy at all stages of the energy chain in the most efficient manner possible. By implication, such improvements in energy use and efficiency will therefore improve the sustainability of the Carranstown facility in broad terms.

The production of hydrogen and the relevant technical aspects of the same are referred to in **Section 4.5.4** of **Chapter 4** ***Description of the Proposed Development*** and **Section 9.5.3** of **Chapter 9** ***Climate***, of this EIAR.

The proposed development through the generation of hydrogen will contribute towards objectives of energy and resource efficiency and the circular economy as highlighted in the Energy Union package.

The revised Renewable Energy Directive (2018/2001), due to be transposed by Member States by 30 June 2021, gives member states the freedom to support hydrogen produced from renewable sources (biomass and renewable electricity). Such mechanisms could potentially include the inclusion of the hydrogen in the Biofuel Obligation Scheme and counting towards meeting renewable energy targets.

Also, whilst transport applications utilising hydrogen may not be regarded as 'zero emissions', it is important to note that they have zero tailpipe emissions, similar to electric vehicles. Hydrogen fuel cells emit only water vapour and heat – no CO_2 or NO_x pollutants. Therefore, the emissions per km from hydrogen transport applications is far less than driving petrol or diesel and moreover, remove emissions from the air, preventing pedestrians and cyclists from breathing in dangerous gases. As a result, the use of hydrogen can provide both direct and indirect environmental benefits.

2.3.1.2 Revised Renewable Energy Directive

The revised Renewable Energy Directive on the promotion of the use of energy from renewable sources (recast) seeks to promote renewable forms of energy as one of the goals of the Union energy policy. The increased use of energy from renewable sources constitutes an important part of the package of measures needed to reduce greenhouse gas emissions in the European Union.

The revised Directive provides the following definitions in Article 2:

> *'energy from renewable sources' means energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and, geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases;*
>
> *biomass' means the biodegradable fraction of products, waste and residues from biological origin from agriculture, including vegetal and animal substances, forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin.*

Therefore, the energy generated from the biodegradable fraction of industrial and municipal waste is considered to be energy from renewable sources and the proposed development will be carried out at the existing Carranstown recovery facility.

To encourage the development of renewable energy, the revised Directive requires the EU to fulfil at least 32% of its total energy needs with renewables by 2030. Member States should also take additional measures in the event that the share of renewables at the Union level does not meet the Union trajectory towards the at least 32% renewable energy target. These ambitious targets continue to support the generation of electricity from waste through waste-to-energy technology.

Finally, to ensure progress, the revised Directive also requires that Member States prepare and submit Renewable Energy Action Plans and Progress Reports that set out Member States' national targets for the share of energy from renewable sources consumed in transport, electricity and heating and cooling in 2030.

The proposed development to be carried out at the Carranstown facility will continue to generate renewable electricity from the biomass contained in residual waste, thereby contributing toward achieving the EU's renewable energy targets.

2.3.2 National Climate & Energy Policy

2.3.2.1 White Paper Ireland's Transition to a Low Carbon Energy Future 2015-2030

As discussed in **Section 2.3.1.1**, Member States must set out how they plan to meet their climate and energy objectives in the National Energy and Climate Plan (NECP).

Following extensive consultation on the Green Paper on Energy Policy in Ireland (Department of Communications, Energy and Natural Resources (2014), the White Paper, Ireland's Transition to a Low Carbon Energy Future 2015-2030[42] has been published, with the primary objective being that of guiding a transition to a low carbon energy system which provides secure supplies of competitive and affordable energy.

The White Paper constitutes a complete energy policy update and sets out a framework to guide policy and the actions that Government intends to take in the energy sector from now up to 2030. The paper takes into account European and International climate change objectives and agreements, as well as Irish social, economic and employment priorities.

As Ireland progresses towards a low carbon energy system, this policy update will help to ensure secure supplies of competitive and affordable energy for Ireland's citizens and businesses, including that generated from renewable energy which will continue to be provided at the Carranstown facility where the proposed development will be carried out.

The long-term development of Ireland's abundant, diverse and indigenous renewable energy resources is a defining element of this energy policy. Not alone is renewable energy of key environmental importance, it also provides a sustainable, economic opportunity for Ireland, both in terms of providing a secure, indigenous, source of energy.

It recognises the versatility of waste and other biomass fuels that can be used for heating, transport and power generation, and states how:

- bioenergy can contribute to broader policy objectives such as waste recovery and rural development.
- it aligns with waste management policy in Ireland i.e. the need to develop efficient ways to extract as much value as possible from waste in accordance with the requirements of the waste hierarchy and the opportunity for waste to be used as an indigenous energy resource.
- the three regional waste management plans for the period 2015-2021 support the development of additional thermal recovery and biological treatment capacity within the State.
- measures in the White Paper also gives effect to national waste policy in terms of utilising waste as a resource.
- the Renewable Energy Feed in Tariff (REFIT) schemes, which support the generation of electricity and CHP technologies including waste-to-energy, anaerobic digestion and landfill gas, continue to support the use of waste as a renewable energy feedstock. REFIT provides financial support for the renewable portion of energy from waste-to-energy plants, to assist the development of waste-to-energy projects.

[42] https://www.dccae.gov.ie/en-ie/energy/publications/Documents/2/Energy%20White%20Paper%20-%20Dec%202015.pdf

The draft replacement Bioenergy Action Plan (2014)[43] further emphasises that bioenergy – including from waste - will be an essential element in contributing to Ireland's future energy needs and has the potential to provide significant economic and environmental benefits. It recognises that developing the bioenergy sector can also help in achieving wider policy objectives in areas such as waste recovery.

The proposed development will therefore continue to contribute toward the energy policy pillars of sustainability, security, competitiveness and contribution to the circular economy by generating renewable energy from indigenous biomass resources.

2.3.2.2 Climate Action and Low Carbon Development Act 2015

The Climate Action and Low Carbon Development Act 2015[44] entered into law in 2015 and provides a statutory basis to transition to a low carbon, climate resilient and environmentally sustainable economy. The Climate Act is Ireland's first overarching piece of climate change legislation and provides that annual emissions limits should be agreed at the EU level.

In summary, the Act provides the tools and structures to transition towards a low-carbon economy and it anticipates that it will be achieved through a combination of:

- a national mitigation plan (to lower Ireland's level of greenhouse emissions);
- a national adaptation framework (to provide for responses to changes caused by climate change); and
- tailored sectoral plans (to specify the adaptation measures to be taken by each Government department).

The Irish Government's Climate Action Plan 2019 has confirmed the introduction of a new Climate Action (Amendment) Bill which will introduce a new governance structure including a Long-Term Climate Strategy.

This new legislation will:

- Make the adoption of carbon budgets a legal requirement;
- Require the Government to set a decarbonisation target range for each sector, with the Minister with primary responsibility for the sector being accountable for delivering the relevant actions to meet the sectoral target;
- Establish the Climate Action Council as a successor organisation to the Climate Change Advisory Council;
- Establish that the Climate Action Plan shall be updated annually;
- Establish that a Long-Term Climate Strategy, to match the period covered by the three five-year carbon budgets, shall be published:

[43] https://www.dccae.gov.ie/documents/Draft%20Bioenergy%20Plan.compressed.pdf
[44] http://www.irishstatutebook.ie/eli/2015/act/46/enacted/en/index.html

- the first Strategy would be published for the period 2021 to 2035, and will also include a longer-term perspective to 2050;
- the Strategy will be updated at least every five years; and
- Ensure that the proposed governance arrangements retain sufficient flexibility.

The Climate Action Plan 2019 also confirms that it is intended that the Long-term Climate Strategy will be a statutory successor to the National Mitigation Plan (which is described in **Section 2.3.2.3** below).

2.3.2.3 National Mitigation Plan 2017

The National Mitigation Plan 2017[45] contains measures to address the challenge to 2020 and begins the process of developing of medium to long term options. According to the Climate Act 2015, it must specify the policy measures that Government consider are required to manage greenhouse gas emissions and the removal of emissions to meet Ireland's international obligations.

It identifies opportunities for decarbonising the heating sector by using waste as a fuel.

Related publications include:

- The UN Intergovernmental Panel on Climate Change report in 2014 (*Climate Change 2014: Impacts, Adaptation, and Vulnerability)* which clarified that electricity generated from gas and coal must be replaced with renewable electricity generation within 35 years.
- The 2030 framework for climate and energy policies (referred to above in **Section 2.3.1**), agreed in principle at the European Council meeting in October 2014, which sought a reduction in greenhouse gas emissions of 40%; an increase in EU energy from renewable sources to 27%; and an indicative target of 27% for energy efficiency.

These policies and reports all recognise the very significant contribution that renewables will make in the period to 2030, which is the next critical milestone on the EU's transition to a low-carbon European economy by 2050. The proposed development will help to reduce greenhouse gas emissions from waste management by diverting hazardous waste from export to continental Europe and recovering renewable energy from it. In addition, the provision of additional hazardous treatment capacity in the region will reduce the export of this waste for recovery to Europe thus reducing carbon emissions from the transport of waste.

As referred to above, the proposed Long-Term Climate Strategy referenced in the Irish Government's Climate Action Plan will be a statutory successor to the National Mitigation Plan.

[45] DCCAE, National Mitigation Plan, July 2017

2.3.2.4 Climate Action Plan

The Government's 2019 Climate Action Plan sets out cross-sector objectives aimed at reducing Ireland's carbon emissions and aims to lay down measures to enable Ireland to meet its EU targets to reduce its carbon emissions by 30 per cent between 2021 and 2030.

The Plan furthermore, lays the foundations for achieving net zero carbon emissions by 2050. In total, the Plan sets out 180 actions that need to be taken and which extend to all sectors of the economy. The Plan also lays out timeframes to be adhered to in the context of sector specific policy updates such as in the Plan's Waste and Circular Economy chapter as detailed above in the national waste policy section of this EIAR Chapter.

For present purposes and given the ambitious scope and policy objectives contained in the Plan, it is important to outline such objectives including the commitment given to implementing a carbon tax rate of at least €80 per tonne by 2030, accompanied by a trajectory of increases over successive annual Budgets and a carbon budgeting regime in addition to sector specific policies relating to energy, including those relevant to the generation of renewable energy and to the transport sector as the same are most relevant in the context of the proposed development.

The Plan also sets out measures relating to the introduction of a carbon tax and carbon budgets. A new Climate Act will be introduced in this regard which will make carbon budgets a legal requirement as referred to above. The Government will be required to introduce carbon budgets for three five-year periods commencing in 2021. Thereafter, a decarbonisation target will be proposed as will an annual trajectory for each sector and failure to adhere to the targets will result in the imposition of penalties.

The 2019 Plan also underlines the Government's commitment to introduce a carbon tax of at least €80 per tonne by 2030 in order to reach its carbon reduction targets by 2030. This tax will be increased gradually over successive annual Budgets and is aimed at changing behaviour and encouraging investment in low-carbon alternatives.

In this regard, the Climate Action Fund is committed to funding initiatives that make a positive contribution to the achievement of Ireland's climate targets. It is envisaged that significant investment from the private sector will be required to assist with Ireland's transition to a low-carbon society.

The Plan's policy objectives are set against a backdrop where Ireland is expected to miss its 2020 target for renewables by 12% and its targets for cumulative emissions by a little under 5%. The State is also expected to miss its target for 2030.

With regard to sector specific requirements, the Plan lays down specific policy measures and targets as seen above in the context of waste and the circular economy. The specific requirements relating to the renewable energy and transport sectors are also relevant to the proposed development and are detailed below.

Renewable Energy

The Climate Action Plan sets out a co-ordinated plan that aims to optimise the use of renewable resources as currently only 30% of Ireland's electricity comes from renewable resources. The Plan therefore aims to increase this figure to 70% by 2030.

As a result, substantial new infrastructure will be required, and the Plan identifies the potential for 3.5GW of offshore renewable energy; 1.5GW of grid-scale solar; and up to 8.2GW of more on-shore wind with 15% of demand being met by corporate Power Purchase Agreements (PPA's) by 2030.

As the proposed development will be carried out at the Carranstown facility which generates renewable energy, it is in alignment with the broad objectives of the Climate Action Plan with regard to the generation of much needed renewable energy in the State as the continued generation of renewable energy will continue to assist with the State's 2030 target.

Transport

The Plan also identifies that substantial investment in transport will be required in order to meet 2030 targets and commits to support the expansion of electric vehicle (EV) charging infrastructure in the State. It also makes reference to emerging technologies and those that may potentially assist with the decarbonisation policy objectives for the transport sector that will be undoubtedly required if the State is to meet its 2030 target.

In this regard, it specifically states that in the context of emerging technologies, there is a need to further investigate:

> *'decarbonisation options such as hydrogen vehicles, biomethane and AD substitutes for natural gas'.*

Accordingly, the element of the proposed development relating to the generation of hydrogen for connection to the natural gas transmission/distribution network and for use in mobile hydrogen transport applications is compatible with this aspect of the Climate Action Plan and the clear policy objective focused on further examining the use of this hydrogen in the decarbonisation of the transport sector going forward.

The generation of hydrogen at the Carranstown facility to be used in mobile hydrogen transport applications will therefore assist with the above 2030 target and the Plan's objective for the decarbonisation of the transport sector.

2.3.2.5 DTTAS National Policy Framework – Alternatives Fuels Infrastructure for Ireland 2017-2030

The recently published National Policy Framework on Alternative Fuels Infrastructure for Transport in Ireland: 2017 to 2030[46] by the Department of Transport, Tourism, and Sport (DTTAS) represents a first step in communicating

[46] Department of Transport, Tourism and Sport: National Policy Framework on Alternatives Fuels Infrastructure for Ireland 2017–2030 https://assets.gov.ie/26377/3075c29a37b84b10acae95da89d756ea.PDF

a long term vision for the Irish transport sector. It sets an ambitious target that by 2030 all new cars and vans sold in Ireland will be zero emissions (or zero emissions capable) with the use of fossil fuels vehicles rapidly receding.

The Framework outlines the main fuel options that could provide alternatives to oil in transport namely: electricity, hydrogen, biofuels, and natural gas, in the forms of compressed natural gas (CNG), liquefied natural gas (LNG), and liquefied petroleum gas (LPG).

Numerous and specific policy references to the use of hydrogen as a potential fuel option to replace the use of oil are included in the policy document including the following:

> "*Hydrogen is not expected to deliver mass-market uptake over this term as the costs of the refuelling infrastructure and associated vehicles are likely to remain prohibitive until the middle of the next decade. This Framework covers this 'interim' period (to 2030), which will secure the platform for achieving our longer-term objectives for 2050.*

Regarding the period post-2030, it states that:

> *'Post-2030, it is likely that hydrogen will continue its penetration across the entire fleet spectrum with a correlated decline in the predominance of vehicles being run exclusively on fossil fuels."*

> *"Electric and hydrogen fuelled technologies would appear to offer the most likely long term solution for a low emissions light duty vehicle (LDV) sector."*

The use of hydrogen in freight applications is also referred to due to its versatility:

> *"Hydrogen is considered versatile for use in freight and there are strong arguments for further investigation of this fuel despite no current market in Ireland. However, transition to a hydrogen based transport system would involve massive technological change and economic investment by consumers."*

In the context of refuelling stations, the policy is equally supportive, stating:

> *"According to the Directive 2014/94/EU, member states have discretion in relation to the consideration of targets for hydrogen refuelling points in the NPFs. Ireland has no immediate plans to establish a hydrogen refuelling network, as the cost of the infrastructure is massively disproportionate to current demand.*

> *However, Ireland is willing to support trials relating to hydrogen fuelled vehicles, and the feasibility of establishing a hydrogen refuelling network will be regularly assessed to take account of changes in technological development and market uptake."*

Finally, with regard to measures to be considered by the end of 2020, the policy provides that a broad feasibility study should be carried out and indicates that in order to support this innovative technology, incentives for the uptake of hydrogen should be given consideration in order to support investment.

Accordingly, this national study shall:

> *"Assess the feasibility, at a national strategic level, of establishing a hydrogen refuelling network based on technological development and market uptake. The feasibility study should consider what government supports, if any, and environmental assessments are required to promote hydrogen. The potential for deploying the use of hydrogen fuelled LDVs and trucks by 2025 should also be considered'*
>
> *'Consider incentives for uptake of hydrogen, including accelerated capital allowances, to support investment in refuelling infrastructure."*

Accordingly, the production of hydrogen as a constituent component of the proposed development to be carried out at the Carranstown facility and for use in mobile hydrogen transport applications is in clear alignment with this National Policy Framework on Alternatives Fuels Infrastructure for Ireland. This policy document clearly underlines the significant role that can be played by this innovative technology going forward and its ability to contribute to the decarbonisation of the transport sector as fossil fuel vehicles are significantly reduced in the medium to long term.

2.3.3 Regional Climate & Energy Policy

2.3.3.1 Meath Climate Action Strategy 2019 – 2024

Whilst the Meath County Development Plan and the Eastern Midlands Regional Spatial and Economic Strategy contain numerous policies focused on renewable sources of energy and climate mitigation as detailed in this EIAR Chapter at **Sections 2.4.2.1** and **2.4.3.5** above, at regional level, Meath County Council has adopted a dedicated regional Climate Action Strategy to apply to 2024[47].

In terms of targets, the Plan commits to reducing the County's emissions by 33% by 2020 and reducing CO_2 emissions of the County by at least 40% by 2030.

The Strategy focuses on a number of key areas, including;

- **Mobility:** Exploring polices to help the transition to a climate resilient low carbon society, with emphasis on transportation modes and types;
- **Resource management**: continuing to inspire communities to sustainably manage waste; and
- **Clean energy:** the shift to renewable sources will need to happen faster and will include a transition to clean energies in terms of how power is used in heating, buildings and transport.

In the context of the proposed development, there is clear alignment with the Strategy's policies. The treatment of additional hazardous waste and residues at an existing installation is compatible with the sustainable and proximate management of waste and the generation of hydrogen is similarly compatible with the

[47] Meath Climate Action Strategy 2019 -2024:
https://www.meath.ie/system/files/media/file-uploads/2019-09/Meath%20CC%20Report_v4.pdf

Strategy's envisaged transition to a climate resilient economy through sustainable transportation modes as can be provided by hydrogen fueled transport applications.

With the foregoing comprehensive European, national and regional energy and climate change policy framework in mind, the continued generation of renewable energy at the existing site where the proposed development will be carried out is in alignment with the above policy objectives which aim to bring about a transition to a low carbon, climate resilient and environmentally sustainable economy.

With regard to the specific aspect of the proposed development concerning the generation of hydrogen, this aspect equally accords with the existing policy framework at national and regional level which underlines the pressing need to facilitate the development of enhanced electricity and gas supplies in order to support the State's transition to a low carbon economy.

In addition, the Climate Action 2019 and the regional Meath Climate Action Plan provide that there is a need for sustainable mobility at national and regional level. The Climate Action Plan specifically provides that decarbonisation options such as hydrogen vehicles are worthy of further investigation.

Furthermore, the production of hydrogen to be utilised in mobile hydrogen transport applications also accords with the developing policy landscape on decarbonising the transport sector in the State and more broadly with emerging policy whereby this versatile technology can play a beneficial role in assisting with the State's broader decarbonisation and climate mitigation objectives.

Such objectives are also supported from a planning policy context as discussed below. In addition to policy alignment with the existing energy and climate policy framework described above, the development of hydrogen is similarly compatible with numerous policy objectives outlined in the National Planning Framework, the National Development Plan, the Eastern Midlands Regional and Economic Strategy and the Meath County Development Plan as outlined in **Section 2.4** below.

These policy objectives are centred on diversifying energy production systems away from fossil fuels and seeks to facilitate enhanced electricity and gas supplies and the movement toward more sustainable forms of fuels in the transport sector.

2.4 Planning Policy

2.4.1 National Policy

The Department of Housing Planning and Local Government, on behalf of the Government, has prepared and published the National Planning Framework ('NPF') under Project Ireland 2040, the overarching policy and planning framework for the social, economic and cultural development to apply in Ireland to 2040.

The newly launched Project Ireland 2040 contains two parts:

- The National Planning Framework (NPF). The NPF along with the Regional Spatial and Economic Strategies (RSES) will determine how to achieve balanced regional development in Ireland, and
- A National Development Plan (NDP) which complements the Planning Framework detailing how €116 billion worth of investment will be spent over the next 10 years.

Finalisation of the NPF alongside the ten-year National Development Plan puts together one plan to guide strategic development and infrastructure investment and thus represents a coordinated policy between spatial development and capital investment at national level.

2.4.1.1 The National Planning Framework (NPF)

The NPF is a national document that will guide at a high-level strategic planning and development for the country over the next 20 years to ensure that as the population grows, this growth is sustainable in economic, social and environmental terms.

The NPF in conjunction with the NDP will also set the context for each of Ireland's three regional assemblies to develop their Regional Spatial and Economic Strategies (RSES's) taking account of and coordinating local authority County and City Development Plans in a manner that will ensure national, regional and local plans align. The formulation process of the Regional Strategies will enable the implementation of the NPF at regional and local levels.

Each of the Regional Assemblies, including the Eastern Midlands Regional Assembly, has now prepared and adopted a Regional Spatial and Economic Strategy (RSES) which will provide regional level strategic planning and economic policy in support of the implementation of the National Planning Framework.

The NPF was adopted on 29 May 2018 and supersedes the previous National Spatial Strategy[48].

It has also been given statutory effect in the Planning and Development (Amendment) Act 2018[49] which amends the principal Planning and Development Act 2000. This Act was signed into law on the 19 July 2018 and the provision which sets out the statutory underpinning for the recently adopted NPF has since been commenced by statutory instrument (section 18 and Schedule 3 pursuant to S.I. No. 436 of 2018)[50] and thus replaces the previous non-statutory National Spatial Strategy.

[48] As per Section 20 of the Planning and Development (Amendment) Act 2018 'the National Spatial Strategy, as amended having regard to the provisions of this Chapter including any document published by the Government which amends or replaces that Strategy shall be known as the National Planning Framework'. Schedule 3

[49] Whilst the Act was signed into law on the 19 July 2018, certain amendments to the Principal Act including the establishment and operation of the Office of the Planning Regulator shall be subject to a Ministerial Order prior to commencement: http://www.irishstatutebook.ie/eli/2018/act/16/enacted/en/html

[50] Planning and Development (Amendment) Act 2018 (Commencement) Order 2018: http://www.irishstatutebook.ie/eli/2018/si/436/made/en/pdf

Section 20A of the principal Panning Act as inserted by section 18 of the Planning and Development (Amendment) Act 2019 provides that the National Planning Framework is to replace the National Spatial Strategy, and this involves setting out a set of objectives to establish a broad National Plan for Government in relation to strategic planning and sustainable development of urban and rural areas.

The objectives of the NPF are set forth in section 18 of the Amendment Act.

These objectives are:

- To establish a broad national plan for the Government in relation to the strategic planning and sustainable development of urban and rural areas;
- To secure balanced regional development by maximising the potential of the regions, and support proper planning and sustainable development, and
- To secure the co-ordination of regional spatial and economic strategies and city and county development plans[51].

In terms of planning for waste treatment requirements to 2040, the NPF's National Strategic Outcome 9 – Sustainable Management of Water and other Environmental Resources[52], expressly provides that this will require:

- Waste to energy facilities which treat the residual waste that cannot be recycled in a sustainable way delivering benefits such as electricity and heat production.

This National Strategic Outcome goes on to provide that the effective management of waste will include the following elements:

- Regional Spatial and Economic Strategies and the core strategies of Metropolitan Area Strategic Plans (MASPs) and city and county development plans will support national and regional waste policy and efficient use of resources;
- District heating networks will be developed, where technically feasible and cost effective, to assist in meeting renewable heat targets and reduce Ireland's GHG emissions;
- Development of necessary and appropriate hazardous waste management facilities to avoid the need for treatment elsewhere; and
- Adequate capacity and systems to manage waste, including municipal and construction and demolition waste in an environmentally safe and sustainable manner and remediation of waste sites to mitigate appropriately the risk to environmental and human health.

[51] As per section 14 of the Amendment Act amending Section 12 of the Principal Act (Making of development plan) 'statutory obligations' includes, in relation to a local authority, the obligation to ensure that the development plan is consistent with (a) the national and regional development objectives specified in (i) the National Planning Framework; and (ii) the regional spatial and economic strategy and (b) specific planning policy requirements specified in guidelines under subsection (1) of section 28.
[52] National Planning Framework, National Strategic Outcome 9, Effective Waste Management at page 149: http://npf.ie/wp-content/uploads/Project-Ireland-2040-NPF.pdf

Thus, the proposed development may be regarded as being in alignment with the NPF as the same will carried out at the Carranstown facility which is designed to treat residual waste that cannot be recycled in a safe and environmentally sound manner and which also generates renewable electricity. The proposed development will accordingly contribute to the sustainable management of waste as provided for in the NPF's National Strategic Outcome 9 which focuses on the sustainable use of environmental resources.

This Strategic Outcome also provides for the development of necessary and appropriate hazardous waste management facilities to avoid the need for treatment elsewhere. As a constituent element of the proposed development will involve the additional treatment of hazardous waste and the development of infrastructure to treat hazardous aqueous waste in the form of a tank farm prior to treatment in in the furnace, thereby avoiding the need for export to Europe, this serves to further underscore the compatibility of the proposed development with the policy objectives of the NPF relating to the effective management of hazardous waste.

In terms of planning for the transition to a low carbon and climate resilient economy the NPF's National Strategic Outcome 8,[53] provides that this will require the diversification of existing energy production systems away from fossil fuels and towards green forms of energy together with the electrification of transport fleets and will require the progressive and strategic development of a different form of energy grid.

In this regard, the NPF's Strategic Outcome 4 'Sustainable Mobility[54]' specifically states that:

> *'In line with Ireland's Climate Change mitigation plan, we need to progressively electrify our mobility systems moving away from polluting and carbon intensive propulsion systems to new technologies such as electric vehicles and introduction of electric and hybrid traction systems for public transport fleets, such that by 2040 our cities and towns will enjoy a cleaner, quieter environment free of combustion engine driven transport systems'.*

In this regard, the National Development Plan makes provision for investment in public transport and sustainable mobility solutions to progressively put in place a more sustainable alternative.

Accordingly, the development of hydrogen as an element of the proposed development to be carried out at the Carranstown facility, accords with the NPF policy objectives and those of the NDP, as the same will contribute to the diversification of existing energy production systems and the envisaged transition to a low carbon and climate resilient economy and the transition away from the use of fossil fuels.

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[53] National Planning Framework, National Strategic Outcome 8, Transition to a Low Carbon and Climate Resilient Economy page 149: http://npf.ie/wp-content/uploads/Project-Ireland-2040-NPF.pdf
[54] National Planning Framework, National Strategic Outcome 4, Sustainable Mobility at page 144: http://npf.ie/wp-content/uploads/Project-Ireland-2040-NPF.pdf

2.4.1.2 The National Development Plan 2018-2017

The National Development Plan (NDP) as a constituent part of Project Ireland 2040 was adopted by the Government on 29 May 2018[55]. The Plan sets out the investment priorities that will underpin the successful implementation of the new National Planning Framework that will guide national, regional and local planning and investment decisions in Ireland over the next two decades, to cater for an expected population increase of over 1 million people.

It may therefore be regarded as a companion document to the National Planning Framework and comprises a ten-year strategy for public capital investment of almost €116 Billion.

In the context of waste management and resource efficiency, National Strategic Outcome 9 as laid out in both the NPF and NDP underlines that Investment in waste management infrastructure is critical to Ireland’s environmental and economic well-being for a growing population and to achieving circular economy and climate objectives.

The NDP goes on to provide that:

> *‘capacity will continue to be built in waste facilities, including anaerobic digestion, hazardous waste treatment, plastics processing, recycling, waste to energy, and landfill and landfill remediation, to meet future waste objectives’.*

The Plan also notes that the infrastructure to deliver waste management policy has been, to date, largely delivered through private investment with some public-sector investment. Accordingly, the proposed development is in alignment with the newly adopted NDP, as the Plan underlines the need for waste treatment facilities to meet future waste objectives.

Given that the proposed development involves the treatment of additional hazardous and hazardous residues and the development of hazardous waste treatment infrastructure in the form of a tank farm, it may be regarded as being in alignment with the NDP which underlines that continued investment in waste management infrastructure including private sector investment is critical to Ireland’s environmental and economic wellbeing as laid down in the NDP.

2.4.1.3 Planning Policy Statement

The Government published its first Planning Policy Statement in January 2015, which is intended to act as a general guiding document to the operation of the planning system and to outline the key values, principles and priorities that should underpin it. Through the non-statutory Planning Policy Statement 2015, the Government wishes:

> *“to reaffirm its strong belief in the value of a forward-looking, visionary and dynamic planning process, because it will ensure that the right development takes place in the right locations and at the right time and in*

[55] https://www.per.gov.ie/en/national-development-plan-2018-2027/

> *providing the social, economic and physical infrastructure necessary to meet the needs of our people in a way that protects the many qualities of our natural and built environment".*

The policy statement sets out ten key principles, the following of which are relevant to the proposed development:

1. *Planning must be plan-led and evidence based so that at the appropriate level, from the National Spatial Strategy, Regional Spatial and Economic Strategies, City and County Development Plans and Local Area Plans, the Government, local authorities and local communities, work together to set out a cohesive vision for the future of our country.*
2. *Planning must proactively drive and support sustainable development, integrating consideration of its economic, social and environmental aspects at the earliest stage to deliver the homes, business and employment space, infrastructure and thriving urban and rural locations in an economically viable manner that will sustain recovery and our future prosperity.*
4. *Planning must support the transition to a low carbon future and adapt to a changing climate taking full account of flood risk and facilitating, as appropriate, the use of renewable resources, particularly the development of alternative indigenous energy resources.*
6. *Planning will encourage the most efficient and effective use of previously developed (brownfield) land over the use of greenfield land to ensure the most efficient use of existing infrastructure, enhancing and strengthening the continued vitality of existing communities through regeneration.*
9. *Planning will support the protection and enhancement of environmental quality in a manner consistent with the requirements of relevant national and European standards by guiding development towards optimal locations from the perspective of ensuring high standards of water and air quality, biodiversity and the minimisation of pollution risk.*

As detailed above, the overarching planning framework is now underpinned by the statutory National Planning Framework which incorporates the above key principles and as such, the proposed development may be regarded as a plan-led development as the planned expansion of the Carranstown facility aligns with the objectives of both the National Planning Framework, the National Development Plan and the Regional Spatial and Economic Strategy for the Eastern Midlands Region (as fully outlined below).

Moreover, the existing site is located in a heavily industrialised area which may be characterised as constituting a 'cluster' of heavy industry now established as a de facto land use and where the expansion of existing activities may be considered as appropriate when regard is had to the proper planning and sustainable development objectives of the County Development Plan.

In addition, it will support proper and sustainable development and support the transition to a low carbon economy through the provision of enhanced gas supplies in the form of hydrogen generation and accompanying contribution to stated climate mitigation policy objectives.

2.4.2 Regional Planning Policy

2.4.2.1 Regional Spatial & Economic Strategy (RSES) for the Eastern & Midlands Region 2019-2031

As detailed above, each of the Regional Assemblies are now required to adopt a Regional Spatial & Economic Strategy (RSES) to provide regional level strategic planning and economic policy in support of the implementation of the National Planning Framework.

The Eastern and Midlands Regional Assembly (EMRA) commenced the statutory process for the formulation of the Eastern & Midlands RSES in 2017 and the strategy was adopted on June 28th 2019[56]. The RSES replaces the Regional Planning Guidelines (RPGs) 2010 – 2022 which previously provided strategic policy and recommendations at a regional level.

The Planning and Development (Amendment) Act 2018 has now amended section 11 of the Principal Planning Act (draft development plans) to provide for the incorporation of the National Planning Framework and a regional and economic strategy into a development plan.

The new section 20B states that the objectives of the National Planning Framework are:

a) To establish a broad national plan for the Government in relation to the strategic planning and sustainable development of urban and rural areas;

b) To secure balanced regional development by maximising the potential of the regions, and support proper planning and sustainable development; and

c) To secure the co-ordination of regional spatial and economic strategies and city and county development plans.

In line with this statutory framework, the RSES sets out the manner in which this regional planning policy framework is aligned with the provisions of the NPF. The principal statutory purpose of the RSES is to support the implementation of Project Ireland 2040 - National Planning Framework and National Development Plan 2019-2027 by providing a long-term strategic planning and economic framework for the development of the Region.

In preparing the RSES, the Eastern & Midlands Regional Assembly carried out the required statutory policy making process which included formal public consultation periods, an Issues Paper, Draft RSES and Material Amendments stage and a parallel iterative process of carrying out a Strategic Environmental

[56] Eastern & Midland Regional Spatial and Economic Strategy 2019 – 2031: https://emra.ie/dubh/wp-content/uploads/2019/07/Regional-Spatial-and-Economic-Strategy-EMRA-optimised-for-web-viewing-DP.pdf

Assessment (SEA).[57] In accordance with section 31A of the principal Planning Act, on the 14th January 2020 the Minister for Housing Planning and Local Government, issued a Direction which may be cited as the Planning and Development (Eastern and Midlands Regional Assembly Regional Spatial and Economic Strategy 2019-2031) Direction 2019[58].

In this regard and pursuant to statutory requirements, the Eastern and Midlands Regional Assembly has been directed to and has amended section 5.6 and Table 8.2 of the RSES and accordingly, the RSES in its entirety may now be regarded as having come into effect.

The Eastern & Midlands (RSES) seeks to determine at a regional scale how best to achieve the shared goals set out in the National Strategic Outcomes (NSOs) of the NPF as detailed above.

To this end, the Strategy sets out 16 Regional Strategic Outcomes (RSOs), which are aligned with international, EU and national policy and which in turn set the framework for city and county development plans. Of the 16 RSO's laid out, RSO's 6, 7 and 9 are directly relevant to the proposed development to be carried out and is compatible with the same including:

Integrated Transport and Land Use (**RSO 6**):

> *Promote best use of Transport Infrastructure, existing and planned, and promote sustainable and active modes of travel to ensure the proper integration of transportation and land use planning. (NSO 2, 6, 8,9).*

Sustainable Management of Water, Waste and other Environmental Resources (**RSO 7**):

> *Conserve and enhance our water resources to ensure clean water supply, adequate waste water treatment and greater resource efficiency to realise the benefits of the circular economy. (NSO 8, 9).*

Support the Transition to Low Carbon and Clean Energy (**RSO 9**):

> *Pursue climate mitigation in line with global and national targets and harness the potential for a more distributed renewables-focused energy system to support the transition to a low carbon economy by 2050. (NSO 8, 9).*

In terms of sustainable waste management, the RSES in section 10.4 Waste Management and section 7 Environment & Climate supports a move towards achieving a circular economy which is essential if the Region is to make better use of resources and become more resource efficient.

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[57] Eastern & Midlands RSES, outline of constituent stages: https://emra.ie/regional-strategies/rses/
[58] The Ministerial Direction concerned (1) adopted Ministerial Amendments incorporate into the RSES represented a significant departure from the advices contained in submissions made by the Minister at Draft and Material Amendment stages; and (2) The adopted material amendments are not consistent with the *Transport Strategy for the Greater Dublin Area 2016-2035,* as required under Section 23 (7) (c) of the Planning & Development Act 2000 (as amended) as additional rail, metro and luas infrastructure and wording have been included which fall outside the scope of the current Transport Strategy.

The RSES supports the transition to a circular economy as this will save resources, increase resource efficiency, and help to reduce carbon emissions. It also provides that the local authorities should achieve waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal which can be achieved by:

> *'complying with the strategic objectives, targets and goals set out in the Eastern – Midlands Region Waste Management Plan 2015 – 2021 and any subsequent waste management plans and promoting a more circular economy that improves resource efficiency and innovation to keep products and materials at their highest use for as long as possible.*
>
> *Waste minimisation and waste avoidance can be encouraged through the reuse of materials and using fewer resources in the production and distribution of products.'*

The RSES seeks to provide infrastructure and services in a sustainable plan and infrastructure-led manner to ensure the sustainable management of water, waste and other environmental resources. It commits the Eastern Midlands Region to implementing the provisions of the Eastern Midlands Regional Waste Management Plan 2015-2021 and in this regard sets out specific Regional Policy Objectives (RPO's).

RPO 10.25[59] provides that account shall be taken of the requirements of the Eastern and Midlands Regional Waste Plan:

> *'Development Plans shall identity how waste will be reduced in line with the principles of the circular economy, facilitating the use of materials at their highest for as long as possible and how remaining quantams of waste will be managed and shall promote the inclusion in developments of adequate and easily accessible storage space that supports the separate collection of dry recyclables and food and shall take account of the requirements of the Eastern and Midlands Regional Waste Plan.*

The RSES also lays down numerous measures to support the transition to a low carbon, circular & climate resilient region. In this regard, the role that can be played by the bioeconomy is underlined and is stated to be consistent with Ireland's low carbon transition objective.

Favouring renewable biological resources over fossil fuel-based ones through the expansion of the bioeconomy, whilst keeping sustainability concerns to the fore, has the potential to contribute towards meeting Ireland's climate change targets. A sustainable bioeconomy which is the renewable segment of the circular economy can turn bio-waste, residues and discards into valuable resources and significantly cut food waste. It also has a wide reach and extends from farming and the agri-food businesses, marine based industries, forestry, waste management, energy suppliers, and pharma and bio-technology products.

[59] At page 114: https://emra.ie/dubh/wp-content/uploads/2019/07/Regional-Spatial-and-Economic-Strategy-EMRA-optimised-for-web-viewing-DP.pdf

The potential contribution that can be made by the bioeconomy from both an economic and environmental perspective is given effect and underlined in **RPO 7.34** which states:

> *'EMRA supports the National Policy Statement on the Bioeconomy (2018) and supports the exploration of opportunities in the circular resource-efficient economy including undertaking a bioeconomy feasibility study for the Region to identify the area of potential growth in the Region to inform investment in line with the national transition objectives to a low carbon climate resilient economy'.*

In addition to the role that the development of the bioeconomy can play in the Region, another key element of the Strategy is the need to monitor progress towards achieving a low carbon, circular and climate resilient society in all sectors including transport.

The RSES notes that overall growth in transport emissions projections contained in the Strategy is largely underpinned by growth in diesel fuel consumption which is expected to decline post 2025 with the acceleration of the deployment of electric vehicles during this period. It goes on to provide that policies are therefore needed to facilitate and encourage use of electric vehicles and to increase the potential for trips to be taken by sustainable modes of transport.

In this regard, Regional Policy Objective 7.30 provides:

> *'Within 1 year of the adoption of the RSES, the EMRA shall seek with other stakeholders to carry out an assessment of transport emissions in the Region to identify GHG forecasting and to analyse the emissions impacts of development in the Region.'*

The proposed development may therefore be regarded as complying with both National and Regional Policy Objectives, and provisions of the RSES for the Midlands and Eastern Region as regards the sustainable management of waste in line with the Regional Waste Plan and the transition to a circular economy.

In the context of a move towards a more energy-efficient society and an increase in renewable sources of energy, the RSES provides that there is a need to set a policy approach which will address an increased demand for indigenous resources and increased security of supply. A key element of the Strategy is the need to monitor progress towards achieving a low carbon, circular and climate resilient society.

It also underlines a need to diversify the Regions energy production systems away from fossil fuels and towards green energy such as wind, wave, solar and biomass, together with smart energy systems and the conversion of the built environment into both generator/consumer of energy and the electrification of transport fleets will require the progressive and strategic development of a different form of energy grid.

With regard to energy security, the Plan states that a secure and resilient supply of energy is critical to a well-functioning region, being relied upon for heating, cooling, and to fuel transport, power industry, and generate electricity. Given projected increases in population and economic growth in the Region, the demand for energy is set to increase in the coming years.

In terms of the development of energy infrastructure, RPO 10.20[60] specifically supports the following categories of renewable and other energy infrastructure which will be required in the Region:

> *'Support and facilitate the development of enhanced electricity and gas supplies, and associated networks, to serve the existing and future needs of the Region and facilitate new transmission infrastructure projects that might be brought forward in the lifetime of this Strategy.*
>
> *Including the delivery of the necessary integration of transmission network requirements to facilitate linkages of renewable energy proposals to the electricity and gas transmission grid in a sustainable and timely manner subject to appropriate environmental assessment and the planning process'.*

The foregoing Regional Policy Objectives as underlined in the recently adopted Eastern Midlands RSES provide policy support for the proposed development as the same will be carried out at an existing recovery facility which treats municipal waste and recovers renewable energy from biomass thereby diverting such waste from landfill in line with circular economy principles. The additional treatment of hazardous waste also aligns with the transition to a circular economy as the same avoids such waste being exported and has an associated environmental benefit of reduced transport emissions.

Moreover, the element of the proposed development relating to the production of hydrogen is compatible with the Regions need to develop enhanced electricity and gas supplies to serve the future needs of the Region and the need to develop a different form of energy grid. Its use in mobile transport applications is also supportive of the Strategy's objective of moving toward more sustainable forms of fuels in the transport sector and the stated policy objective centred on diversifying the Regions energy production systems away from fossil fuels. It is also compatible with the National and Regional Policy Objectives with regard to improving sustainable mobility in the region.

Thus, the proposed development may be regarded as complying with National and Regional Policy Objectives and policy provisions of the RSES for the Midlands and Eastern Region.

Following the adoption of RSES for the Eastern & Midlands Region in May 2019 and those sections subject to the Ministerial Direction described above in January 2020, the County and City Development Plan review cycles now fall in to line with the Eastern & Midlands RSES in order to ensure that the vision of the National Planning Framework is carried through to the local planning level to ensure that a policy-oriented approach to planning policy is accomplished and properly managed spatial planning achieved.

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[60] At page 226: https://emra.ie/dubh/wp-content/uploads/2019/07/Regional-Spatial-and-Economic-Strategy-EMRA-1.pdf

With this framework in mind, Meath County Council has now recommenced the review of the Draft Meath County Development Plan 2020 – 2026 which will replace the existing Meath County Development Plan (as set out below).

The draft Plan was on public display from 18 December until 6 March 2020 with public observations or submissions invited up to this date[61].

All observations or submissions received during the above time period will be taken into consideration before the making of the final updated Development Plan for County Meath.

All Local Planning Authorities are now required when adopting the relevant Development Plan to ensure that the Development Plan or Local Area Plan is consistent with the RSES in force for the respective administrative area.

2.4.2.2 Transport Strategy for the Greater Dublin Area 2016-2035

This transport strategy provides a framework for the planning and delivery of transport infrastructure and services in the Greater Dublin Area (GDA) to 2035.[62]

The purpose of the Strategy is:

> *"To contribute to the economic, social and cultural progress of the Greater Dublin Area by providing for the efficient, effective and sustainable movement of people and goods."*

This Strategy sets out the necessary transport provision, for the period up to 2035, to achieve the above objective for the region, and to deliver the objectives of existing national transport policy.

The overarching principle guiding the development of the Strategy was to meet existing and future demand with a sustainable, effective and efficient transport system.

The Strategy facilitates significant improvements in sustainable mobility and associated positive effects relating to energy usage, emissions to air (including greenhouse gas emissions and noise) and human health.

It should be noted that various policies related to climate charge, carbon emissions and associated action plans were under development at the time of preparation of this Strategy. This includes new legislation in the form of the Climate Action and Low Carbon Development Act 2015 as described in **Section 2.3.2.2** above.

This legislation provides for the preparation of a national mitigation plan and adaptation plan which establish energy related targets and actions to be adopted across the transport sector.

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[61] Meath County Council, Draft Development Plan website, updates on the progress of the Plan to date: http://countydevelopmentplanreview.meath.ie/

[62] https://www.nationaltransport.ie/wp-content/uploads/2016/08/Transport_Strategy_for_the_Greater_Dublin_Area_2016-2035.pdf

The implementation of this Transport Strategy incorporates the relevant targets and actions arising from these and related policies in the area of transport energy. In this regard, the Climate Action Plan 2019 as described in **Section 2.3.2.4** above is also applicable as this lays down measures to enable Ireland to meet its EU targets to reduce its carbon emissions by 30 per cent by 2030. The Climate Action Plan 2019 also makes reference to emerging technologies including hydrogen vehicles and those that may potentially assist with the decarbonisation policy objectives for the transport sector that will be required if the State is to meet its 2030 target.

As such, the element of the proposed development relating to the generation of hydrogen for use in mobile hydrogen transport applications is compatible with the policy objectives of the Transport Strategy for the Greater Dublin Area which aims to facilitate improvements in sustainable mobility across the region.

This aspect of the proposed development is also in alignment with the Climate Action Plan and the clear policy objective focused on further examining the use of hydrogen in the decarbonisation of the transport sector going forward and which will be incorporated in the above Transport Strategy as appropriate, in line with this developing policy framework.

2.4.3 Local Planning Policy

With regard to the planning context as regards the existing facility and the proposed development to be carried out, it is necessary to set out the planning history of the site to date, the existing land use within the surrounding area and the principle policies of the Meath County Development Plan 2013-2019 against which the proposed development will be assessed.

2.4.3.1 Planning History Zoning and Existing Land Use

The existing Waste to Energy facility at Carranstown constitutes a strategic infrastructure development within the meaning of section 37A of the Planning and Development Act 2000, as amended (ref: PL17.PA0026) as granted by An Bord Pleanála in 2013.

In 2014, an alteration application was submitted under section 146B for an additional 15,000 tonnes (235,000 tonnes total capacity) of waste to energy capacity until 2019. By order dated 1st August 2014 (reference PL17.PM0004), An Bord Pleanála granted the proposed alteration of condition 3(1) of said Permission.

In 2015, a further application was submitted to An Bord Pleanála under section 146B to request an alteration to facilitate the pre-treatment process of air pollution control residues on site. The proposed alteration consisted of the extension of the existing ash residue loading bay and the construction of a pre-treatment process plant enclosure at the facility. By order dated 15th April 2016 (ref: PL17.PM0007) An Bord Pleanála granted the proposed alteration.

In 2017, an application was submitted to Meath County Council under section 42 of the Planning and Development Act 2000 as amended to extend the appropriate period as regards the planning permission (ref: PL 17.PA0026) approved by An Bord Pleanála on 4th February 2013 and subsequently amended (ref: PL 17.PM0004) on 1st August 2014 (ref: PL 17.PM0007) and on 15th April 2015. This application for extension was granted by Meath County Council on 2nd November 2017 (Ref: LB 17/1077).

Taking into account the above planning history of the site and the nature of the proposed development to be carried out, it is submitted that the nature of the above mentioned development proposal and extension of ancillary activities to be carried out at the site are consistent with the planning history of the site to date and may accordingly be granted pursuant to section 37A of the Planning and Development Act 2000, as amended.

2.4.3.2 Zoning and Existing Land Use

Whilst the Carranstown site is located outside of any designated zoned lands in the Meath County Development Plan, it is however located in an area that has been subject to a number of decisions to permit the clustering of large-scale industrial activities including the existing cement works in the area (Ref. PL17.PC0221) which includes an electricity substation and an existing limestone quarry (Ref.17.243795). In this regard, two related approvals relating to the Platin Cement works are in place including the installation of a flue dust portland cement silo at Kiln 3 (Ref. LB150375) and approval relating to the increase in the quantity of alternative fuels and further quantities of raw materials to be used in the manufacture of cement at the Platin facility (Ref. PL17.PA050).

In addition to the above, other recent planning applications within the surrounding area of the Carranstown site include an application for a proposed Air Insulated Switchgear (AIS) Transmission Substation at Platin, Duleek, County Meath on behalf of SSE Generation Ireland Limited (Ref. PL17.303678) which was granted planning in January 2020. A second related application was made, comprising of an 208MW (electricity output) Open Cycle Gas Turbine (OCGT) Power Plant (Peaker) as a separate planning application to Meath County Council (LB190031) was subsequently refused planning by An Bord Pleanála on appeal (Ref. PL17.305028) in December 2019.

In addition, a planning application (Ref. LB160898) was appealed to An Bord Pleanála (Ref. PL17.248146) for a solar farm on land within close proximity to Duleek. The solar farm was granted planning by An Bord Pleanála in March 2019 and the Bord ruled that the substation be part of separate planning application. The 110kV substation was subsequently granted planning permission in July 2019 pursuant to the strategic infrastructure provisions of the Planning and Development Act as amended (Ref. PL17.303568).

Accordingly, the Carranstown site at which the proposed development will be carried out is located in a heavily industrialised area which may be characterised as constituting a ‘cluster’ of heavy industry. In this regard, this designation, namely that the site is located in an unzoned area which has been developed as a de facto land use characterised by existing heavy industrial activities.

This designation may be justified when reference is had to the planning history of the site as detailed above and to An Bord Pleanála's findings regarding this now accepted designation as laid out in previous planning documentation pertaining to the site.

With regard to the original granting of permission for the waste to energy facility at Carranstown (Ref: PL17.126307) in 2003, the Inspector's Report stated that the development comprised approximately 20 hectares of *'heavy industrial facilities'* classed as constituting a *'significant heavy industrial land use'*. Moreover, An Bord Pleanála in granting permission had regard to the established nature and character of the surrounding area.

The Board cited under reason (e) that due to "*the location of the proposed development in an area where there is an established and permitted industrial land-use pattern*", the development was deemed to be acceptable.

In a subsequent application case (Ref. PL17.219721) for an expansion of the Carranstown facility in 2007, the established nature and character of the surrounding area to permit the development was again cited by the Board: Specifically, under reason (g) the Board stated: "*The location of the proposed development in an area characterised by established and permitted industrial land use pattern…*"

The Inspector's report also noted that:

> *"the vertical scale and overall massing of the cement plant together with its extensive footprint has resulted in it becoming a landmark structure in the wider Meath/Louth area with views of the plant visible even in long distance panoramic views from locations as far away as Skrene and the Hill of Tara some 18 to 20 kilometres distant to the south-west."*

Subsequent permissions/ changes to the existing facility also recognise that the permitted and established use of the land in question should be considered when assessing the proposed development as requested.

In this regard, the Inspectors Report (PA.0026) relating to amendments sought to the terms conditions of the permission specifically states that:

> *'The application site is not zoned land per se, therefore the permitted established use of the lands should be duly weighted as a consideration in assessing the principle of the now proposed development'.*
>
> *'Having regard to the now established use of the overall application site as a waste to energy facility utilising residual municipal and commercial waste, I consider there should be some presumption in favour of permitting those elements of the proposed development which are consistent with the reasonable expansion and modification of the existing operation'.*

In light of the foregoing, and notwithstanding the fact that the site is not zoned land per se, the existing site at which the proposed development will be carried out may be regarded as being consistent with the now long-established use of the lands namely an established and permitted industrial land use pattern.

Therefore, having regard to the now established use of the overall application site as a waste to energy facility there exists a presumption in favour of permitting the proposed development which is consistent with the reasonable expansion and modification of the existing operation of the Carranstown site.

This is further underlined by the other planning permissions in the area as referred to above which serve to underline the area as a ‘cluster’ of industrial related activities as supported by now long established planning precedent.

2.4.3.3 Meath Development Plan 2013-2019

The proposed development will be carried out at the existing Carranstown waste to energy facility which is located within the administrative area of Meath County Council and are therefore subject to the provisions of the Meath County Development Plan 2013-2019.

As referred to in **Section 2.4.2.2** above, Meath County Council has now published a draft Development Plan 2020 – 2026 which will replace the existing Meath County Development Plan.

The relevant period for public observations and submissions on the draft Plan has now closed with the same now being considered by Meath County Council.[63]For present purposes, the Meath Development Plan 2013-2019 is applicable, and it is the provisions of this Plan that must be assessed in the context of the proposed development.

In this regard, the proposed development may be said to be wholly consistent with the specific sectoral polices of the Plan, namely those relating to economic development, waste management, energy and employment.

Chapter 4 of the Plan outlines the Economic Development Strategy for the county and includes the following statements included within section 4.4.2 (Bio-Fuels and Renewable Energy) and also refers specifically to this ‘cluster’ of activity in the context of the Carranstown facility:

> “*The geographical location of Meath adjacent to the national Gateway and the proximity of the routes, through which significant energy transmission networks (electricity and gas) traverse, present key potential and synergies for future”*; and
>
> “*there is particular merit in examining significant landholdings associated with quarrying and extractive industries to develop energy related infrastructure projects. The existing example to support such a clustering argument is Carranstown and Caulstown, Duleek adjacent to Irish Cement operation at Platin – Indaver 70MW waste to energy facility and the permitted Scottish and Southern Energy Plc 60MW open cycle gas turbine power generation plant.*”
>
> “*The accommodation of such energy related infrastructure projects which tend to absorb large areas of land and cannot be facilitated within*

[63] Meath County Council, Draft Development Plan website, updates on the progress of the Plan to date: http://countydevelopmentplanreview.meath.ie/

> *traditional industrial zonings in towns around the county is worthy of further detailed consideration*."

In addition to the above statements, this Chapter of the Plan also includes a number of associated policies, a number of which are applicable to the proposed development and are identified as follows:

ED POL 6 recognises the contribution of rural employment to the continued and sustainable growth of the economy and to promote this continued growth by encouraging rural enterprise generally, especially those activities that are resource dependent, including energy production, extractive industry, small scale industry and tourism in a sustainable manner and at appropriate locations.

Similarly, Policy **ED POL 9** promotes innovative economic sectors and encourages clustering which positively exploits synergies between interconnected companies (as seen above in the context of the Carranstown facility where the facility is specifically stated to be an existing example supportive of a clustering arrangement.

ED POL 17 in the context of rural economic development aims to:

> *'To promote rural economic development by recognising the need to advance the long term sustainable social and environmental development of rural areas and encouraging economic diversification and facilitating growth of rural enterprises'.*

ED POL 18 recognises that energy production enterprises are more readily accommodated in rural areas:

> *'To recognise and develop the full potential of biomass for energy production and manufacturing including the export of green electricity to the national grid. The Development Plan acknowledges that such enterprises are more readily accommodated in rural areas due to the extent of lands required to ensure security of supply of raw materials and that proximity to the medium to high voltage national electricity transmission network for green electricity exportation is a key locational consideration for development proposers. All proposals for biomass energy production and manufacturing will require screening to determine if a full Appropriate Assessment of the likely significant effects on Natura 2000 sites, is required'.*

In this regard, ED POL 20 provides that any such proposal must not lead to unacceptable traffic impacts:

> *'To normally permit development proposals for the expansion of existing authorised industrial or business enterprises in the countryside where the resultant development does not negatively impact on the character and amenity of the surrounding area. In all instances, it should be demonstrated that the proposal would not generate traffic of a type and amount inappropriate for the standard of the access roads. This policy shall not apply to the National Road Network.'*

ED POL 21:

Such development proposals for industrial or business enterprises in the countryside will be considered where the following criteria are met:

i. *the proposed use has locational requirements that can more readily be accommodated in a rural location than an urban setting and this has been demonstrated to the satisfaction of Meath County Council;*

ii. *the development will enhance the strength of the local rural economy;*

iii. *the resultant development is of a size and scale which remains appropriate and which does not negatively impact on the character and amenity of the surrounding area;*

iv. *the proposal demonstrates that it has taken into account traffic, public health, environmental and amenity considerations:*

v. *the proposal is in accordance with the policies, requirements and guidance contained in this plan; and*

vi. *it is demonstrated to the satisfaction of Meath County Council that the proposal would not generate traffic of a type and amount inappropriate for the character of the access roads or would require improvements which would affect the character of these roads. This policy shall not apply to the National Road Network.*

With regard to potential traffic impacts, it is necessary to ascertain that the proposed development would not generate traffic of a type and amount inappropriate for the character of the access roads pursuant to ED POL 20 and 21 of the Development Plan. The effects of the construction and operational traffic associated with the proposed development are outlined in **Chapter 7 *Traffic & Transportation*** of this EIAR.

Therefore, and taking into account the Development Plans economic development policies, the proposed development may be regarded as being in line with the established land use pattern within the area and which may now be regarded as a de facto and established use. In addition, the ongoing clustering of industrial activities in the area is fully compatible with the Development Plan’s economic development policies which provide that expansion of existing industrial uses are permitted provided that the requirements of ED POL 20 and 21 are complied with. The Plan also recognises that such proposals and those for extensions of existing activities can be more readily accommodated in rural areas such as at the existing Carranstown site.

Consequently, the Plans policy in relation to economic development and the growth of employment in the County through support for objectives which promote economic, social and cultural development and in assisting the provision of employment opportunities for all will be advanced by the proposed development through the expansion of activities and the creation of employment opportunities at the construction and post-construction phases.

2.4.3.4 Meath Development Plan Sectoral Policies – Waste Management

Chapter 7 of the Plan provides that waste management policy is predicated on the EU Waste Hierarchy of prevention, preparing for reuse, recycling, energy recovery and sustainable disposal. Under the Waste Management legislation, the Development Plan of a Local Authority is statutorily deemed to include the objectives contained in the Waste Management Plan in force in relation to its functional area and this is given effect in the Meath County Development Plan as set out below.

The Plan sets out policy objectives **WM OBJ 1 - 20** with regard to the sustainable management of waste including:

- *To facilitate the provision of appropriate waste recovery and disposal facilities in accordance with the principles set out in the appropriate Waste Management Plan applicable from time to time made in accordance with the Waste Management Act 1996;*
- *To update the Sludge Management Plan for County Meath and seek to implement the recommendations of that plan;*
- *To promote the implementation of Waste Management Activities in accordance with 'Best Practice' and national policy;*
- *To facilitate the implementation of national legislation and national and regional waste management policy;*
- *To support the development of facilities to cater for commercial waste not provided for in the kerbside collection system such as WEEE, C&D type waste and hazardous materials in accordance with the requirements of the North East Waste Management Plan;*
- *To support developments necessary to manage food waste in accordance with the requirements of the Waste Management (Food Waste) Regulations and the Regional Waste Management Plan; and*
- *To seek to ensure in cooperation with relevant authorities that waste management facilities are appropriately managed and monitored according to best practice to maximise efficiencies and to protect human health and the natural environment.*

In terms of the Plans specific policies relating to the waste management, the Plan provides that all waste management facilities must adhere to the requirements of the Regional Waste Management Plan as set out in policies **WM POL 1 – 12** and including:

- *To adopt the provisions of the waste management hierarchy and implement policy in relation to the county's requirements under the current or any subsequent waste management plan. All prospective developments in the county will be expected to take account of the provisions of the regional waste management plan and adhere to the requirements of the Plan. Account shall also be taken of the proximity principle and the inter regional movement of* *waste as provided for under appropriate Minister Directives from time to time;*

- *To encourage the development of waste infrastructure and associated developments in appropriate locations, as deemed necessary in accordance with the requirements of the Regional Waste Management Plan;*
- *To encourage the recycling of construction and demolition waste and the reuse of aggregate and other materials in future construction projects; and*
- *To ensure that hazardous waste is addressed through an integrated approach of prevention, collection, and recycling and encourage the development of industry led producer responsibility schemes for key waste streams.*

As the proposed development will be carried out at the existing Carranstown thermal recovery facility which generates renewable energy from residual waste treated, it may be regarded as being in alignment with the above waste and energy policy objectives. The Plan also incorporates the relevant Regional Waste Management plan and thus provides that all developments must accord with the proper application of the waste hierarchy and the proximity principle.

The treatment of additional hazardous waste at the facility accords with such policy objectives in real terms.

In addition, the proposed development also represents a significant contributor to the achievement of stated policy objectives regarding the sustainable management of waste and the provision of renewable energy and will therefore support the maintenance and growth of economic development in the local and wider region.

2.4.3.5 Meath Development Plan Sectoral Policies – Energy Infrastructure Policy

Chapter 8 of the Plan details a number of policies and objectives which seek to promote the development of sustainable energy infrastructure in the County and which are relevant to the proposals at hand. The Plan provides that:

> *'Meath is committed to pursuing sustainable energy policies in accordance with the White Paper, 'Towards a Sustainable Energy Future for Ireland 2007-2020'. The White Paper sets out the Government's ambitious target of 33% of electricity being produced from renewable sources by 2020. This goal was subsequently increased to 40%.*
>
> *As a Planning Authority, it is important to recognise the range of new and developing technologies that can contribute to minimising greenhouse gas emissions and to securing a greater proportion of our energy needs from renewable sources. This document sets out a number of strategic goals which together act as a road map for the delivery of a highly efficient, competitive energy sector characterised by innovation and driven by research and technology-led development."*

In terms of specific policies which seek to promote the development of sustainable energy infrastructure in the County, the Plan provides that:

> **EC POL 1:** *'To facilitate energy infrastructure provision, including the development of renewable energy sources at suitable locations, so as to provide for the further physical and economic development of Meath';*
>
> **EC POL 2:** *'To support international, national and county initiatives for limiting emissions of greenhouse gases through energy efficiency and the development of renewable energy sources which makes use of the natural resources of the county in an environmentally acceptable manner, where it is consistent with proper planning and sustainable development of the area';*
>
> **EC POL 3***: 'To encourage the production of energy from renewable sources, such as from biomass, waste material, solar, wave, hydro, geothermal and wind energy, subject to normal proper planning considerations, including in particular, the potential impact on areas of environmental or landscape sensitivity and Natura 2000 sites';*
>
> **EC POL 4***: 'To support the National Climate Change Strategy and, in general, to facilitate measures which seek to reduce emissions of greenhouse gases';*
>
> **EC POL 9***: 'To support the development of innovative energy efficient technologies such as district-heating and combined heat and power';*
>
> **EC POL 10***: '*To facilitate the provision of charging infrastructure for electric vehicles*';
>
> **EC POL 11***: '*To support and facilitate the development of enhanced electricity and gas supplies, and associated networks, to serve the existing and future needs of the County';*
>
> **EC POL 12***: To co-operate and liaise with statutory and other energy providers in relation to power generation in order to ensure adequate power capacity for the existing and future needs of the County'; and*
>
> **EC POL 24***: To ensure that development proposals, including quarrying and operations involving explosives, do not negatively impact on the gas network. Meath County Council may refer applications for developments in proximity to the natural gas network to Bord Gais Eireann and will have regard to their comments in the assessment of the application.'*

In terms of objectives relating to energy infrastructure, the Plan provides in **EC OBJ 1**:

> *'To ensure that all plans and projects associated with the generation or supply of energy or telecommunication networks will be subject to an Appropriate Assessment Screening and those plans or projects which could, either individually or in-combination with other plans and projects, have a significant effect on a Natura 2000 site (or sites) undergo a full Appropriate Assessment'.*

As the proposed development will be carried out at the Carranstown facility which produces energy from renewable sources and is supportive of national climate change policy as provided for in the Plans policies as set out above, they may also be regarded as being consistent with the proper planning and sustainable development of the area.

The element of the proposed development relating to hydrogen production accords with the Plan's broad policy objectives centered on sustainable energy infrastructure in the County and also with EC POL11 regarding the need to facilitate the development of enhanced electricity and gas supplies, and associated networks, in order to ensure that the existing and future needs of the County are served.

In terms of protected sites and EC OBJ 1 as outlined above, an Appropriate Assessment Screening Report (AA) and Natura Impact Statement (NIS) have been prepared by Dixon-Brosnan on behalf of Indaver and submitted as part of this planning application to An Bord Pleanála. The conclusion of the NIS, in summary, is that the proposed development (with the implementation of mitigation measures) does not pose a risk of adversely affecting (either directly or indirectly) the integrity any European site, either alone or in combination with other plans or projects. Refer to the AA Screening Report and NIS for further details.

Furthermore, the production of hydrogen as a constituent aspect of the proposed development to be carried out is definitively provided for in policy EC POL 11, as the same will be capable of supporting the development of enhanced gas supplies and associated networks which are needed to serve the existing and future energy needs of the County.

In addition to the above mentioned waste, energy and economic development policies, it should be noted that other Plan policies may also be deemed to be relevant to the proposed development, including:

- To have regard to the "*Planning System and Flood Risk Management – Guidelines for Planning Authorities"* (DoEHLG/OPW, 2009)[64] through the use of the sequential approach and application of the Justification Tests for Development Management and Development Plans, during the period of this Plan (WS POL 29);
- Seek to preserve and maintain air and noise quality in the county (PC POL 1);
- To ensure the protection of the existing roads infrastructure while improving the capacity and safety of the road network to meet future demands (TRAN SP 14);
- To promote and facilitate the provision of the necessary transport infrastructure to fully accommodate existing and future population needs

[64] https://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/DevelopmentandHousing/Planning/FileDownLoad%2C21709%2Cen.pdf

and the demand for economic development in an environmentally sustainable manner (Plan Goal); and

- To provide for the efficient movement of goods and people in the interest of commerce and enterprise (TRAN SP 3).

With regard to the Planning System and Flood Risk Assessment Guidelines, a flood risk assessment has been carried out for the proposed development and is presented as **Appendix 15.1** ***Site Specific Flood Risk Assessment*** and the results of same are addressed in **Section 15.3.1.2** of **Chapter 15** ***Water*** of this EIAR. There is no flood risk as a result of the proposed development.

Secondly as regards PC POL 1 which seeks to preserve and maintain air and noise quality, Chapters 8 and 10 of this EIAR, assess both air and noise relating to the proposed development and the mitigation measures to be undertaken during both the construction and operational phases.

Thirdly, with regard to potential traffic impacts and the Plans policies regarding the same, it is necessary to ascertain that the proposed development would not generate traffic of a type and amount inappropriate for the character of the access roads pursuant to ED POL 20 and 21 of the Development Plan.

In this regard, the Duleek Written Statement[65] which forms part of the Meath County Development Plan also states that:

> *'The volume of through traffic in Duleek is recognised as a challenge for the Planning Authority to manage and alleviate over the life of the County Development Plan and beyond'.*

Accordingly, **Chapter 7** ***Traffic & Transportation*** of this EIAR has assessed the potential traffic impact of the proposed development during both the construction and operational phases.

In conclusion and from a planning policy perspective, it is considered that the proposed development accords fully with the applicable provisions of the Meath County Development Plan. The clustering of existing and permitted industrial and energy related infrastructure projects at the location site is specifically cited as an example which can be replicated at other locations in Meath and as such, the expansion of existing facilities fully accords with this principle. The history of the site to date also underlines that the expansion of existing activities may be regarded as being in accordance with this principle and contributing to the proper and sustainable development of the region.

The proposed development also adheres to the Plan's policies with regard to the management of waste as the same are predicated on the requirements of the Regional Waste Plan which underline the waste hierarchy and the principles of proximity and self-sufficiency which will be satisfied through the treatment of additional hazardous waste on the island thereby avoiding export.

[65] https://meathcountydevelopmentplan.files.wordpress.com/2011/01/duleek-written-statement.pdf

In addition, the proposed development is supported by the policy objectives of the Meath Development Plan 2014 in relation to waste management, as it is consistent with the provisions of Ireland's national waste policy and contributes towards the delivery of an effective and efficient waste management service in line with the Eastern Midlands Regional Waste Plan.

Furthermore, the proposed development is also compatible with the Plan's energy policies relating to the continued generation of renewable energy at the site and the contribution to diversity in energy generation through the production of hydrogen that can be provided by this element of the proposed development.

Finally, the proposed development is similarly consistent with the Plan's policy relating to economic development and those relating to rural economic development as the Plan specifically recognise the contribution of rural employment to the continued and sustainable growth of the regional economy as will be provided by the expansion of the existing Carranstown site. The proposed development represents a significant contributor to local employment within the region and is therefore supportive of the maintenance and growth of economic development in the local and wider region.

The proposed development may therefore be regarded as plan led and in alignment with the provisions of the National Planning Framework, the National Development Plan, the Eastern & Midlands Region Spatial and Economic Strategy and the Meath County Development Plan.

This planning policy framework is designed to ensure that future development will be evidence based and plan-led such that balanced and sustainable regional development can take place as can be provided by proposed development at hand.

2.5 Need for the Proposed Development

2.5.1 Introduction

This section outlines the need for the proposed development in order to deliver thermal recovery capacity to manage residual hazardous waste generated in the Eastern Midlands Region and at a national level. The quantities of this waste stream and residues which will require thermal treatment, are addressed. The proposed development will be designed to meet this need.

In addition, the other constituent elements of the proposed development and relating to the development of additional infrastructure at the existing facility including a tank farm for the storage and processing of aqueous liquid hazardous wastes, the development of a hydrogen generation unit and other ancillary infrastructure related to the facility's day to day operational activities and the rationale for the same will also be laid out below.

2.5.2 Hazardous Waste Thermal Treatment Capacity Required

2.5.2.1 Reported Hazardous Waste

The EPA National Waste Report 2012 (EPA 2014) provides information on waste generation and management in 2012 including hazardous waste statistics. However, these figures have since been updated in the EPA 2018 Progress Report on the implementation of the National Hazardous Waste Management Plan 2014 - 2020[66] and in 2018, when the EPA published updated hazardous waste data for that year[67].

These statistics demonstrate that Ireland currently does not have the facilities required to treat the full range of hazardous wastes it produces thereby once again underlining the need for greater self-sufficiency nationally in the management of Ireland's hazardous waste as previously underlined in the National Hazardous Waste Management Plan and the 2018 Progress Report on its implementation.

This data release now provides the most recent data available on hazardous waste management in Ireland at the time of writing. The data available on hazardous waste generation and treatment is set out in **Table 2.1** below.

Table 2.1 Hazardous Waste Management in 2018

	Proportion managed in 2018	Tonnes managed 2018	Typical treatment type
On-site treatment at integrated pollution prevention and control facilities	6%	30,127	Incineration, solvent recycling, landfill and use as fuel
Off-site treatment at authorised facilities in Ireland	18%	93,635	Authorised hazardous waste treatment facilities (e.g. autoclaving, physic-chemical treatment)
Export to disposal and recovery facilities abroad	76%	383,903	Thermal treatment as well as metal recovery, solvent recovery and landfill
Total	100%	507,665	

[66] http://www.epa.ie/pubs/reports/waste/haz/EPA_NationalHazardousWasteManagementPlan_web.pdf
[67]**EPA Waste Data Release, March 11th 2020, latest reference year 2018:**
http://www.epa.ie/nationalwastestatistics/hazardous/

In 2018, 526,397 tonnes of hazardous waste was generated (as detailed in Figure 1 of the EPA statistics release). This was an increase of over 90,000 tonnes since 2017.

In 2018, 30,127 tonnes of hazardous waste was generated and treated on-site at 13 industrial facilities. Of this waste, 78% was disposed of and 22% was treated by recovery activities. 93,635 tonnes of hazardous waste was treated at Irish hazardous waste treatment facilities in 2018 (excluding soils).

In terms of contaminated soils, the total amount of contaminated soil generated in Ireland in 2018 was 93,645 tonnes, a slight decrease from 2017 (see Figure 4 of the EPA statistics). A total of 74,912 tonnes of contaminated soil was exported for treatment and the remainder was treated in Ireland. Contaminated soil accounted for 20% of Ireland's hazardous waste exports in 2018.

In terms of hazardous waste exports, almost 383,903 tonnes of hazardous waste (73% of all hazardous waste) was exported to EU Member States and beyond (as per Figure 3 of the statistics). Almost 75,000 tonnes of this was contaminated soils and a total of 308,991 tonnes was various waste types such as chemicals, medical waste, cement kiln dust and ash from municipal waste incinerators.

The figures which show an upward trajectory in terms of the amount of hazardous waste generated and exported from the State, underscore the need for further indigenous hazardous waste treatment capacity in order to progress towards self-sufficiency in the management of hazardous waste and to reverse this trend which has been increasing year on year.

As noted previously in this EIAR, in order to reduce the level of these exports and improve self-sufficiency, the EMRWMP supports the development of 50,000tpa thermal recovery capacity for hazardous waste nationally in **Objective E16.**

Furthermore, the increase in the generation of hazardous waste shown in the figures above and similarly, the increase in hazardous waste exported abroad for treatment in 2018 further underline the need for additional indigenous treatment capacity which is capable of contributing to the State's self-sufficiency requirements for the recovery of hazardous waste as set out in both the NHWMP, the 2018 Progress Report on its implementation and the 2018 Environmental Protection Agency hazardous waste statistics.

2.5.2.2 Unreported Hazardous Waste

The NHWMP notes that an amount of hazardous waste remains 'unreported'. That is, it is not recorded as having entered the formal waste management industry.

The NHWMP estimates that unreported waste was 26,024 tonnes of hazardous waste in 2011. The source of this waste is primarily small business, households and farms. One aim of the NHWMP 2014-2020 is to channel this waste into appropriate hazardous waste treatment facilities. Due to the small volumes arising per waste generator, this waste would need to be bulked up at a transfer station before being sent for disposal or recovery.

2.5.2.3 All Island Solution to Hazardous Waste

Economies of scale and the potentially erratic nature of hazardous waste markets mean that it is essential that all island markets are available. To achieve economies of scale the NHWMP suggests full opening of the Northern Ireland and Republic of Ireland waste markets, recognising that some companies are already operating on this basis. In relation to incineration capacity, the NHWMP 2014-2020 also states that,

'*… it is still possible for all-island incineration and physico-chemical treatment capacity to be planned for and taken into consideration by treatment operators*'.

The latest data on hazardous waste arising in Northern Ireland is provided in the Arc21 region Waste Management Plan (October 2014). This finds that in 2010/11 approximately 75,400 tonnes hazardous waste was generated in Northern Ireland of which approximately 6,050 tonnes were exported for energy recovery or incineration (R1, D10).

2.5.2.4 Capacity Required to Thermally Treat Hazardous Waste Streams

In summary the identified potential for thermal recovery of hazardous waste as outlined above is summarised in **Table 2.2.**

Table 2.2 Potential Capacity Required to Treat Hazardous Waste Streams

Source	Estimated tonnage	Notes
Hazardous waste	50,000 tonnes	Eastern Midlands Region Waste Management Plan
Unreported hazardous waste	26,024 tonnes	Potential additional hazardous waste requiring treatment (NHWMP aims to channel this waste into appropriate hazardous waste treatment facilities)
Northern Ireland hazardous waste	6,050 tonnes	Material exported for R1 / D10 from Northern Ireland
Total	82,074 tonnes	Recognising not all of the unreported / Northern Ireland waste will be available, this figure represents the potential capacity required in total from all sources

The Indaver Meath waste-to-energy facility operating licence W0167-03 currently permits the treatment of 10,000tpa suitable hazardous waste. In 2019, the Meath facility accepted 9,310 tonnes of suitable hazardous waste.

Therefore, there remains a gap of at least 40,000tpa thermal treatment capacity for hazardous waste treatment (based on the need identified in the EMRWMP and excluding unreported or Northern Ireland waste).

By combining the management of non-hazardous residual municipal solid waste (MSW), industrial waste, and suitable hazardous waste on a single grate incineration line it will be possible to deliver a "technically, economically and environmentally feasible" treatment facility that will contribute to the self-sufficiency objectives outlined in **Policy E16** of the EMRWMP.

The treatment of additional hazardous waste up to 25,000 tpa as a constituent part of the proposed development will also fulfil the policy objectives laid down in the National Hazardous Waste Management Pan which are centred on the need to strive for improved self-sufficiency in hazardous waste management in the State and to reduce hazardous waste export as reaffirmed in the 2018 Progress Report on its implementation.

2.5.3 Capacity required to treat boiler ash, flue gas cleaning residues and other residues

Another component of the proposed development also related to the treatment of residues produced at the facility includes the development of infrastructure to enable the treatment of an additional 30,000 tonnes per annum of boiler ash, flue gas cleaning residues and other similar residues requiring treatment (see **Section 4.5.6** of **Chapter 4** ***Description of the Proposed Development*** of this EIAR) in the existing pre-treatment facility at the Carranstown facility prior to recovery at an authorised facility in Northern Ireland.

This element of the proposed development will facilitate a coordinated approach to the management of boiler ash, flue gas cleaning residues and other similar residues from other thermal treatment facilities on the island as all such residues can then be combined in the existing pre-treatment plant at the Carranstown facility prior to export for recovery to a saltmine in Northern Ireland. Such a combined and integrated approach will in turn facility an economy of scale which could not be achieved at present as the vast majority of this material is currently exported to Europe.

Also, the expansion of recovery and treatment capacity for hazardous waste that does not need thermal treatment or landfill and which is referred to as physico-chemical treatment is specifically recognised as a key strategic objective of the National Hazardous Waste Management Plan, can be achieved through this aspect of the proposed development to be carried out at the existing Carranstown facility.

Additionally, the treatment of this material on an all-island basis prior to final recovery in Northern Ireland is supported by the principles of self-sufficiency and proximity and is further underpinned by the policy objectives of the National Hazardous Waste Management Plan and the Progress Report on the Implementation where a need to strive for improved self-sufficiency is underlined in clear terms.

As regards self-sufficing versus export of hazardous waste and the requirement to strive for increased self-sufficiency in hazardous waste management, the Plan notes that there are ancillary environmental benefits deriving from self-sufficiency as international transport of hazardous waste is minimised thereby eliminating associated risks, and avoiding transport related greenhouse gas emissions, as outlined in **Section 9.4.2.1** of **Chapter 9** ***Climate*** of this EIAR.

Finally and of equal significance is the fact that this element of the proposed development is further strengthened by the requirements of the United Nations Basel Convention pursuant to which Ireland has committed to minimising the movement of waste for disposal, consistent with the principles of proximity, self-sufficiency and priority for recovery.

Thus, this aspect of the proposed development is fully supported by the above policy framework and will contribute to the need for increased self-sufficiency in the management of hazardous waste on an all island basis and will further provide associated environmental benefits of avoiding the transport of the hazardous waste via export which is in turn is compatible with wider climate mitigation policy positions and the envisaged transition to a low carbon economy as set out in the Climate Action Plan.

2.5.4 Capacity to Store Bottom Ash Residues produced by the Facility

The proposed development includes the development of a bottom ash storage building to permit the storage of up to 5,000 tonnes of bottom ash (see **Section 4.5.5** of **Chapter 4** ***Description of the Proposed Development*** of this EIAR) produced by the existing Carranstown facility. This element of the proposed development will provide the flexibility to export bottom ash to continental Europe for recovery in the event that a dedicated recycling facility for this material is not developed within the State within in the medium to long term.

In practical and contingency terms, this development is required as presently there is no limited landfill capacity for this material. Previously, this material was sent to local landfills where it was accepted for recovery as engineering material being used as daily cover for MSW intakes and for building roads and profiles within the landfill. However, due to more stringent enforcement of licence conditions by the EPA at local landfills, it has become more challenging to secure local solutions for the treatment of IBA and as such, an alternative as can be provided by this element of the proposed development is now required.

Whilst Indaver is keen to reuse this material in a sustainable and environmentally sound manner and in line with circular economy principles, notwithstanding the above reduction in landfill capacity in order that circular economy thinking can be applied going forward and greater use made of this material, the necessary policy landscape in the State has not yet evolved to the point where such reuse can be facilitated.

In the interim, a solution whereby this material can be reused in Europe and where this material is routinely processed for use as an aggregate in construction of roads or other large-scale projects provides the most practical available solution.

In this regard, it is hoped that the above mentioned review of the national policy document '*A Resource Opportunity'* and the Regional Waste Management Plans will give consideration to policy mechanisms aimed at reusing this material in a sustainable and circular manner in the State thus avoiding the need for export to Europe.

Such indigenous reuse would not only promote sustainable waste management in keeping with the proper application of the waste hierarchy, it would also support the move towards a circular economy, where all wastes including those that are unavoidable such as residues are regarded as being capable of being transformed into useful and valuable resources.

The proposed introduction of a Circular Economy Action Plan as part of the upcoming waste policy review as detailed in the Climate Action Plan 2019 provides an ideal opportunity to introduce such much needed policy mechanisms as an element of the State's transition to a circular economy.

2.5.5 Need for a Hydrogen Generation Unit

The development of a hydrogen generation unit for connection to the gas transmission/distribution network and for mobile transport applications as a constituent part of the proposed development to be undertaken at the existing facility will improve the energy efficiency and sustainability of the facility in broad terms. In the national context, and considering the scale of the decarbonisation challenge, it has the potential to provide low-carbon solutions for both heat and transport.

A report from the Low Emission Vehicle (LEV) Taskforce, established to consider the range of measures and options available to Government to accelerate the take-up of low carbon technologies in the transport sector, includes a number of fiscal recommendations specifically aimed at incentivising hydrogen use across a range of modes of transport.

The hydrogen produced may be either distributed to the national gas grid or stored on site for transport application purposes. This element of the proposed development will also encapsulate the development of a storage tank for the hydrogen produced and to be utilised for re-fuelling of buses, HGV's or for bulk transport off-site to dedicated fuelling stations.

This aspect of the proposed development is thus compatible with wider national climate mitigation policy measures at national and regional level. In this regard, the Regional Spatial and Economic Strategy for the Eastern Midlands stated policy objective centred on diversifying the Regions energy production systems away from fossil fuels specifically states that the development of enhanced electricity and gas supplies, and associated networks will be needed to serve the existing and future needs of the Region. The Strategy also includes the policy objective of moving toward more sustainable forms of fuels in the transport sector.

In a similar vein, the Meath County Development Plan seeks to promote the development of sustainable energy infrastructure in the County and also supports and seeks to facilitate the development of enhanced electricity and gas supplies, and associated networks in order to serve the existing and future needs of the County.

Furthermore, the production of hydrogen to be utilised in mobile hydrogen transport applications also accords with the developing policy landscape on decarbonising the transport sector in the State and more broadly with emerging policy whereby this versatile technology can play a beneficial role in assisting with the State's broader decarbonisation and climate mitigation objectives.

This compatibility with policy objectives centered on shifting to more sustainable transport fuels is underlined in the Department of Transport, Tourism and Sport, National Policy Framework, Alternatives Fuels Infrastructure for Ireland 2017 – 2030, the Transport Strategy for the Greater Dublin Area 2016 – 2035 and the Climate Action Plan 2019.

Moreover, at EU level, the European Commission in its analysis on developing a carbon neutral Europe in its *2050 Long Term Strategy* (2019)[68] and where the Commission presented its strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050 also indicates significant roles for bioenergy/renewable gas, CCS and hydrogen in the future energy mix.

The European Commission Green Deal also aims to accelerate the shift to sustainable and smart mobility in the EU and the forthcoming comprehensive European Strategy on Sustainable and Smart Mobility will also seek to enhance synergies with the circular economy transition and use of sustainable alternative transport fuels.

Whilst a more comprehensive policy framework and other supports will be required to facilitate the role out of this innovative technology at a widespread scale, Gas Networks Ireland (GNI) in its Vision 2050 *A Net Zero Carbon Gas Network for Ireland*[69] lays down in clear terms the contribution that can be played by hydrogen in the State's transition to a low carbon economy which will necessarily require a variety of low carbon and renewable energy options to be explored and integrated across every sector of society.

2.5.6 Need to rebuild the existing modular office building

This aspect of the proposed development involves the demolition of an existing single storey modular office building and re-building of same with a new single storey permanent office and staff welfare building.

This new building will have a slightly increased footprint in place of the old building. Additional car parking spaces are also proposed to accommodate the additional staff and also to facilitate visitors and contractors to the site.

Whilst this element of the proposed development is not significant in nature and involves only minimal changes, it is nonetheless in line with the existing planning permission as per planning permission (Ref. 17.PA0026) relating to the existing modular office building.

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[68] https://ec.europa.eu/clima/policies/strategies/2050_en
[69] https://www.gasnetworks.ie/vision-2050/future-of-gas/GNI_Vision_2050_Report_Final.pdf

As such, this aspect of the proposed development is compatible with the existing zoning and planning permission relating to the Carranstown site and may thus be regarded as ancillary to the existing operation of the site.

2.6 Summary

EU and national waste policy requires waste to be managed in an economic, sustainable and environmentally sound manner. Implementing the EU waste hierarchy, waste should be managed as a resource and disposal should be the last resort. EU and national policies support the recovery of energy from residual waste.

As regards self-sufficiency in the management of hazardous waste, the National Hazardous Waste Plan, the progress report on its implementation and the Eastern Midlands Regional Waste Plan underline the need for hazardous waste treatment capacity and for enhanced self-sufficiency in the State.

Specifically, the requirement of the Eastern Midlands Plan includes 50,000 tonnes capacity for hazardous waste and an additional but unspecified capacity for industrial waste. There is currently a lack of hazardous waste treatment capacity in the State with a large quantity being exported to continental Europe. This is not a sustainable option in the long term as it infringes the proximity principle and does not meet the objective of moving towards self-sufficiency as underlined in numerous policy positions.

The treatment of additional hazardous waste, the development of a tank farm and the development of infrastructure required to treat residues which are hazardous in nature as elements of the proposed development to be carried out, may be regarded as being in alignment with both the National Hazardous Waste Management Plan 2014-2020 and the recent Progress Report on its implementation as the same will contribute to the achievement of self-sufficiency in the treatment of hazardous waste within the State and will minimise hazardous waste export as prioritised and underlined in both national policy documents. It is also compatible with stated policy positions regarding climate mitigation through an associated reduction in transport emissions.

From a national planning policy perspective, the National Planning Framework, specifically provides that planning for waste treatment requirements to 2040 will require waste to energy facilities which treat residual waste that cannot be recycled in a sustainable manner. It also provides that the development of necessary and appropriate hazardous waste management facilities to avoid the need for treatment elsewhere are required.

In this regard, the element of proposed development which will provide additional thermal treatment of hazardous waste is in alignment with this objective and the broader overarching aim of the Framework centred on achieving balanced regional and sustainable development. This need for hazardous waste infrastructure is also underlined in the National Development Plan.

From a local and regional planning perspective, the policies and objectives as set out in the Eastern and Midlands Spatial and Economic Strategy and the Meath

County Development Plan, are similarly supportive of the proposed development. The Regional Spatial and Economic Strategy seeks to provide infrastructure and services in a sustainable and infrastructure-led manner to ensure the sustainable management of water, waste and other environmental resources as can be provided by the proposed development in the context of the treatment of additional hazardous waste and associated infrastructure.

The proposed development is further supported by policy objective WS 7-1 of the Meath County Development Plan 2014-2020 in relation to Waste Management, as it is consistent with the provisions of Ireland's national waste policy and contributes towards the delivery of an effective and efficient waste management service in line with the requirements of the Eastern Midlands Region Waste Management Plan 2015. The proposed development is also consistent with the Development Plans objectives relating to economic development.

The proposed development is furthermore in alignment with the Meath County Development Plan as the developments comprise an infrastructural and industrial extension of activities at the existing Carranstown site and whilst this is in an unzoned area, it has been developed as a de facto land use industrial area characterised by existing heavy industrial activities as evidenced by a number of planning grants in the area and a now established land use pattern of development.

It is therefore submitted that the appropriate clustering of these activities is wholly compatible with good land use planning practice and policy, and is furthermore supported by strong planning precedent having regard to the pattern of development in the area and therefore the permitted established use of the lands should be duly weighted as a consideration in assessing the principle of the now proposed development.

As such, the proposed development and extension of the existing facility may be regarded as contributing to the proper planning and sustainable and economic development of the area while observing strict environmental standards as underpinned by the Development Plan's overarching objectives and which will be adhered to pursuant to licence conditions as laid down by the Environmental Protection Agency. The proposed development will accordingly enhance the overall economic performance of the region through employment creation and through the provision of ancillary benefits for the surrounding area.

The element of the proposed development relating to the development of hydrogen equally accords with the existing policy framework at national and regional level which underlines the pressing need to facilitate the development of enhanced electricity and gas supplies in order to support the State's transition to a low carbon economy. This need is underlined in the National Planning Framework, the National Development Plan, the Regional Spatial and Economic Strategy for the Eastern Midlands Region and in the Meath County Development Plan. The use of this versatile technology in mobile transport applications further accords with the developing policy landscape on sustainability mobility as underlined in European, national and regional policy positions.

In conclusion, the proposed development may be regarded as warranted from an EU and national perspective given that the same fulfils the objectives of self-sufficiency and proximity with regard to the treatment of hazardous waste and moreover with a number of policies pertaining to climate change mitigation.

In addition, it may also be justified from a national policy perspective as the same adheres to the requirements laid out in the Eastern Midlands Region Waste Management Plan, the National Hazardous Waste Plan and may be regarded as a plan-led development, consistent with regional, spatial and national planning policy including the statutory National Planning Framework.

It is therefore submitted that the above mentioned development proposal has been demonstrated to be fully in compliance with all plans, policies and objectives at a national, regional and local level, and may thus be regarded as being in accordance with the proper planning and sustainable development of the area.

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Site Sustainability Project

Environmental Impact Assessment Report

EIAR Ch 3 Alternatives

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3 Alternatives

3.1 Introduction

This chapter provides a description of the reasonable alternatives studied by Indaver, which are relevant to the proposed Site Sustainability Project (hereinafter referred to as the proposed development) and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transpose the requirements of Directive 2014/52/EU (the EIA Directive) on the assessment of the effects of private projects on the environment into national law require that information provided in the Environmental Impact Assessment Report (EIAR) shall include a description of the reasonable alternatives studied by the developer.

These are reasonable alternatives which are relevant to the project and its specific characteristics and must also indicate the main reasons for the option chosen taking into account the effects of the project on the environment and may relate to matters such as project design, technology, location, size and scale as set out in Annex IV (2) of the 2014 Directive and Schedule 6(2)(b) to the 2018 EIA Regulations.

Section 3.2 below presents the legislative framework and guidance which has been considered during the preparation of this chapter. **Sections 3.3** (*Alternative Sites*), **3.4** (*Alternative Processes*) and **3.5** (*Alternative Designs*) present the alternatives (and comparison of environmental effects, where relevant) that were considered by Indaver.

Chapter 2 of this EIAR, ***Policy and Planning Framework and Need for the Scheme***, should be read in conjunction with the assessment on alternatives below as the analysis contained therein is relevant in the context of the reasoning applied in the assessment of alternatives carried out in this Chapter and informs the reasoning applied throughout. In this context, the Do-Nothing Scenario (Do-Nothing Alternative) (in terms of reinforcing the Need for the Scheme) is discussed in **Section 3.6** below.

For clarity, the Do-Nothing Scenario (i.e. a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge) is provided in a number of chapters of the EIAR. Refer to **Chapters 6-17** and also **Chapter 19** of this EIAR for further details.

3.2 Legislative Framework

3.2.1 Background

The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transpose the requirements of Directive 2014/52/EU (the EIA Directive) on the assessment of the effects of private projects on the environment into national law require that information provided in the Environmental Impact Assessment Report (EIAR) shall include a description of the reasonable alternatives studied by the developer.

Annex 5(1) of the 2014 Directive now provides that the EIAR shall contain:

> "*1d) a description of the reasonable alternatives studied by the person or persons who prepared the EIAR, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed development on the environment*".

Furthermore, Annex IV states that the EIAR shall contain:

> " *a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects".*

Thus, these are reasonable alternatives which are relevant to the project and its specific characteristics and must also indicate the main reasons for the option chosen taking into account the effects of the project on the environment and may relate to matters such as project design, technology, location, size and scale.

The amended EIA Directive requires that the environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the prescribed environmental factors which include:

a) population and human health;

b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;

c) land, soil, water, air and climate;

d) material assets, cultural heritage and the landscape;

e) the interaction between the factors referred to in points (a) to (d).

These prescribed factors in relation to the proposed development are considered in each of the relevant Chapters of this EIAR as appropriate.

With the above legislative framework in mind, this Alternatives Chapter of the EIAR has been prepared in accordance with the European Union EIA Directive 85/337/EC as amended by Directive 2014/52/EU and the European Union

(Planning and Development) Environmental Impact Assessment) Regulations 2018.

Moreover, it has similarly been prepared in accordance with a suite of guidance documents at national and European level aimed at assisting in the interpretation of the amended EIA Directive and the new transposing regulations as detailed in full below and pertaining to the assessment of alternatives that may be considered as reasonable.

3.2.2 Guidance Documents

In carrying out an assessment of reasonable alternatives relevant to the proposed developments, a systematic and stringent approach has been adopted with a view to fulfilling the legislative obligations as described above and in order that the requirements therein are adhered to in full.

In this regard, consideration was given to a number of guidance documents in the preparation of this chapter of the EIAR. The table below sets out the relevant key EIA Guidance which has been consulted in the preparation of this chapter.

All such guidance and documentation have informed the assessment of reasonable alternatives as carried out and detailed in this chapter of the EIAR.

- Department of Housing, Planning and Local Government (2018) Circular PL 05/2018 -Transposition into Planning Law of Directive 2014/52/EU amending Directive 2011/92/EU on the effects of certain public and private projects on the environment (the EIA Directive) And Revised Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment;
- Department of Housing, Planning, Community and Local Government (2017) Key Issues Consultation Paper on the Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems;
- Department of Housing, Planning, Community and Local Government (2017) Circular PL 1/2017 - Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive): Advice on the Administrative Provisions in Advance of Transposition;
- Environmental Protection Agency (2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft August 2017);
- European Commission (2017) Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report;
- Government of Ireland (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).

3.2.3 Examination of Alternatives

Taking into account the above guidance framework, it is important to highlight what is underscored therein regarding the interpretation to be applied as to what constitutes a reasonable alternative in practice, the selection of alternatives in terms of feasibility and the requisite level of detail to be provided in the assessment of any reasonable alternatives to the proposed developments to be carried out.

There is limited European and national guidance on what constitutes a 'reasonable alternative'. It is noteworthy however, that the aforementioned European Commission guidance document (2017) states that reasonable alternatives:

> *"Reasonable Alternatives must be relevant to the proposed Project and its specific characteristics, and resources should only be spent assessing these Alternatives. In addition, the selection of Alternatives is limited in terms of feasibility. On the one hand, an Alternative should not be ruled out simply because it would cause inconvenience or cost to the Developer.*
>
> *At the same time, if an Alternative is very expensive or technically or legally difficult, it would be unreasonable to consider it to be a feasible Alternative……. Ultimately, Alternatives have to be able to accomplish the objectives of the Project in a satisfactory manner, and should also be feasible in terms of technical, economic, political and other relevant criteria'.*

The European Commission guidance also states that:

> *"The feasibility of the Alternatives proposed can be determined on a case-by-case basis. The final set of reasonable Alternatives identified will then undergo a detailed description and assessment in the EIA Report….. It should be noted that each Project and each EIA is different, and there can be no definitive list prescribing how Alternatives are to be identified and assessed…….*
>
> *In some cases, Alternatives will have been developed at the plan stage (e.g. a plan for the transport sector, a regional development plan, or a spatial plan) or by the Developer during the Project's initial design. In such cases, some Alternatives may have already been excluded, in which case, it would likely be unnecessary to consider them again".*

On environmental considerations and the level of detail to be provided, the EPA guidance (draft August 2017) notes that a mini EIA of each alternative is not required:

> *"the objective is for the developer to present a representative range of the practicable alternatives considered. The alternatives should be described with an "indication of the main reasons for selecting the chosen option".*
>
> *It is generally sufficient to provide a broad description of each main alternative and key issues associated with each, showing how environmental considerations were taken into account in deciding on the*

selected option. A detailed assessment (or mini EIA) of each alternative is not required".

Pursuant to section 3.4.1 of the EPA guidance, the consideration of alternatives also needs to be cognisant of the fact that:

"in some instances some of the alternatives described below will not be applicable – e.g. there may be no relevant 'alternative location'…"

Taking the foregoing guidance and legislative framework into account, the alternatives in relation to this proposed development are considered in terms of alternative site locations **(Section 3.3)**, alternative processes **(Section 3.4)**, and alternative layouts **(Section 3.5)** at the preferred site and a 'do-nothing' alternative **(Section 3.6)**.

3.3 Alternative Sites

In order to assess whether alternative sites should be considered as reasonable alternatives to the existing Indaver site at Carranstown where the proposed development will be carried out, it was necessary to commence any such consideration with an examination of the existent and established use, the planning history and context of the site and the overarching policy and planning framework relevant to the site and surrounding area.

The assessment must necessarily also consider the feasibility of all such alternatives and it should be noted that the selection of alternatives is limited in terms of feasibility and most notably must be feasible in terms of technical, economic, political and other relevant criteria as stated in the European Commission (2017) guidance document as detailed above.

Moreover, in conducting such an assessment of alternative sites, the concept of reasonableness must be applied throughout and whilst no legal definition of this concept is provided in the aforementioned legislative framework, applying the ordinary rules of statutory interpretation, the meaning to be ascribed may be said to be fundamentally dependent on the particular facts relevant to the proposed developments at hand.

Thus, a common sense approach has been applied throughout the assessment process in order to determine if alternatives sites may be regarded as reasonable or warranted in the present instance and applies the reasoning outlined in **Chapter 2 *Policy and Planning Framework and Need for the Scheme*** of this EIAR which details fully the national and regional planning policy framework applicable to the proposed developments.

3.3.1 Planning History and Existent Site Use

With regard to the existent use of the Carranstown site, the Indaver Waste to Energy facility at Carranstown constitutes a strategic infrastructure development within the meaning of section 37A of the Planning and Development Act 2000, as amended (Ref. PL17.PA0026) as granted by An Bord Pleanála in 2013 (and as detailed in full in **Chapter 2 *Policy and Planning Framework and Need for the***

Scheme of this EIAR) thus altering the previous planning permission as granted by Meath County Council.

The now enduring planning history of the existent site including a number of subsequent and ancillary amendments (by PL17.PM0004 and PL17.PM0007) as granted by An Bord Pleanála serve to demonstrate that the proposed development to be carried out at the site represent the optimal choice for extending the activities on site.

Consequently and taking into account the planning permission attached to the existent site and approval of a number of subsequent amendments, the proposed development as an extension of the same may be regarded as being in line with the established land use pattern within the area and by implication may now be regarded as a de facto and established use.

However, the aspect of the proposed development involving the rebuilding of the existing modular office building and re-building of same with a new single storey permanent office and staff welfare building may be differentiated from the above.

Whilst this element of the proposed development is not significant in nature and involves only minimal changes, it is nonetheless in line with the existing planning permission as per 17.PA0026 relating to the existing modular office building.

As such, this aspect of the proposed development is compatible with the existing zoning and planning permission relating to the Carranstown site and may thus be regarded as ancillary to the existing operation of the site.

In addition, the Eastern Midlands Regional Waste Management Plan 2015 -2021 supports the development of up to 50,000 tonnes of additional thermal recovery capacity for the treatment of hazardous wastes nationally to ensure that there is adequate active and competitive treatment in the market to facilitate self-sufficiency needs where it is technically, economically and environmentally feasible. A number of elements of the proposed development regarding the treatment of additional hazardous waste and residues may be regarded as the most sustainable option as the same will facilitate the continued treatment of hazardous waste which is in line with the dual national policy objectives of self-sufficiency and proximity.

The Waste Plan for the region also provided that all proposals for waste management development must meet the Environmental Protection Criteria set out in the Plan. In this regard and also relevant to the Development Plan's requirements, the facility has since the commencement of operations, being governed pursuant to an operating licence (Ref: W0167-03) as granted by the Environmental Protection Agency (EPA).

Thus, stringent licence requirements giving effect to the requirements of the Industrial Emissions Directive (IED) which consolidates the requirements of the Large Combustion Plant Directive (LCPD), the Waste Incineration Directive (WID) and the Integrated Pollution Prevention and Control (IPPC) Directive which strengthens the application of Best Available Techniques (BAT) must be adhered to on an ongoing basis in the context of the existent activities carried out at the site. This permitting and oversight regime will also apply to the proposed development to be carried out at the Carranstown site.

In a similar vein, the Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland Region 2019 -2031 designed to provide regional level strategic planning and economic policy in support of the implementation of the National Planning Framework seeks to provide infrastructure and services in a sustainable plan and infrastructure-led manner to ensure the sustainable management of water, waste and other environmental resources in the region. It also commits the Eastern Midland Region to implementing the provisions of the Eastern Midland Regional Waste Management Plan 2015-2021.

In light of the foregoing, the existent site may be said to have an established use of waste management since 2006 (planning permission was granted by Meath County Council) and is now part of the essential waste recovery infrastructure of the area and may therefore from a planning policy perspective be regarded as the most reasonable site to carry out the proposed development. It may also be regarded as the most reasonable option in terms of feasibility.

From a licensing perspective, the existent site also may also be regarded as the most reasonable and feasible option given the ongoing stringent nature of regulation that applies in the context of the site's current activities.

3.3.2 Overarching Policy Framework

In addition to the planning policies referred to above, a review of the overarching waste and planning policy framework also (as detailed in full in **Chapter 2 *Policy and Planning Framework and Need for the Scheme*** of this EIAR) serves to demonstrate that the existent site represents the most reasonable and feasible choice for the proposed development to be carried out.

From a national planning policy perspective, the National Planning Framework (NPF) and associated National Development Plan (NDP) provide that planning for waste treatment requirements to 2040 will require the development of necessary and appropriate hazardous waste management facilities to avoid the need for treatment elsewhere.

The Plans also underline that investment in waste management infrastructure is critical to Ireland's environmental and economic well-being for a growing population and to achieving circular economy and climate objectives and further notes that to date the infrastructure to deliver waste management policy has been largely delivered through private investment.

In addition, from a waste policy perspective, the National Hazardous Waste Management Plan, the Regional Spatial and Economic Strategy (RSES) for the Eastern Midlands Region and the Regional Waste Management Plan for the Eastern Midlands Region all underline the need for hazardous waste treatment infrastructure on a national basis.

The National Hazardous Waste Management Plan 2014–2020 and the 2018 Progress Report on its implementation underline in clear terms the need to strive for improved self-sufficiency in the management of hazardous wastes in the State.

The Plan also provides that there is a need to address the deficit in thermal treatment capacity in Ireland (i.e. use as fuel, co-incineration or incineration) for Irish wastes currently being exported and also states that consideration should be given to co-location of hazardous waste treatment at existing waste facilities or brownfield sites for the purposes of sustainability and land-use planning.

As such, the co-location of hazardous waste treatment and associated infrastructure at the existing waste facility at Carranstown where the proposed development will treat additional volumes of hazardous waste and residues, may be regarded as being consistent with this policy objective of the Plan and may therefore be regarded as the most practical and reasonable solution given that the existent site is designed to treat municipal and hazardous waste pursuant to licence number W0167-03 as granted by the EPA.

In addition, the Environmental Protection Agency Progress Report on the implementation of the National Hazardous Waste Management Plan 2014 - 2020[1] also specifies that there is a continued need to strive for self-sufficiency in the management of hazardous waste in the State.

It specifically states in this regard that Ireland's self-sufficiency for the environmentally sound management of hazardous waste is contingent upon commercial decisions taken by private sector service providers regarding the provision of infrastructure for hazardous waste:

> '*While the introduction of economic and other instruments to provide incentives to potential investors remains under consideration, Ireland's self-sufficiency for the environmentally sound management of hazardous waste is contingent upon commercial decisions taken by private sector service providers regarding the provision of infrastructure for hazardous waste'*.[2]

The above policies when combined the Eastern Midland Regional Waste Plan's policy which identifies a need for up to 50,000 tonnes of additional thermal recovery capacity for the treatment of hazardous wastes nationally to ensure that there is adequate active and competitive treatment in the market to facilitate self-sufficiency needs, further enhance the finding that the existent site provides the optimum solution for carrying out the proposed developments.

As such, the treatment of additional hazardous waste, hazardous residues and the development of a dedicated tank farm at the existent site may be regarded as being fully compatible with the requirements of the above policy framework.

The element of the proposed development regarding the development of a hydrogen generation unit for connection to the gas transmission/distribution network and for use in mobile transport applications equally accords with the existing policy framework at national and regional level which underlines the

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[1] http://www.epa.ie/pubs/reports/waste/haz/EPA_NationalHazardousWasteManagementPlan_web.pdf

[2] Progress Report National Hazardous Waste Management Plan, Infrastructure and Self-Sufficiency Section at page 20

pressing need to facilitate the development of enhanced electricity and gas supplies in order to support the State's transition to a low carbon economy.

This need is underlined in the National Planning Framework, the National Development Plan, the Regional Spatial and Economic Strategy for the Eastern Midlands Region and in the Meath County Development Plan. The use of this versatile technology in mobile transport applications further accords with the developing policy landscape on sustainability mobility as underlined in national and regional policy positions.

3.3.3 Economic Considerations

Moreover from an economic perspective the extension of activities at the existent site may also be regarded as the most practical and reasonable option for the proposed development as the same will provide economy of scale that cannot be replicated at alternative sites. In this regard, the technology required for the proposed developments is already present at the existent site. Crucially, the existing plant and equipment at the Carranstown site has the capacity to treat increased quantities of hazardous waste and residues.

Furthermore, the necessary associated infrastructure including the turbine, pipelines, foul and surface water infrastructure etc. necessary for day-to-day operational activities are also present at the existent site.

Thus, the consideration of alternative sites or processes may not be said to be economically justified or feasible when the above numerous and important factors are considered. Additionally, the existent site and the surrounding area have the environmental capacity to accommodate the proposed development without any significant risk of impact upon environmental sensitivities due to the site location as the existent facility has been operating pursuant to a now long established planning and licensing precedent.

The delivery of the proposed development, and associated processes on a new site would require the development of already existent infrastructure and constructing supporting infrastructure and would require an unnecessary duplication of resources which may only be regarded as uneconomical and unreasonable in the circumstances and equally cannot be regarded as an environmentally sound option.

Thus, the assessment of alternatives to treat such hazardous waste at sites other than the existent Carranstown site may not be regarded as reasonable when the above extensive policy framework is considered and applied to the present proposed developments.

As such, the extension of activities to be carried out at the Carranstown in the form of the proposed development is considered to be most optimum choice when the planning history of the site is taken into account, the existent and long established waste management use and adherence to the overarching waste and planning policy framework at regional and national level.

The existent site is therefore considered to be the preferred/optimum site based on the foregoing significant rationale.

Therefore, having considered the planning history of the existent site, the applicable planning law and policy framework, the comprehensive waste, energy and climate change policy framework, the existent waste management processes carried out at the facility, the characteristics of the proposed development to be carried out and a do-nothing alternative, there are no reasonable alternatives to the existent Carranstown site.

3.3.4 Overview of Relevant Criteria

Environmental Rationale
• Existent facility licence giving effect to stringent requirements as laid down in the Industrial Emissions Directive (IED)
• Avoided emissions through the treatment of additional hazardous waste at an existent facility
• Avoidance of the use of a greenfield site
• Avoidance of the duplication of resources and associated impacts
• Capacity to minimize potential impacts to sensitive receptors
• Existing ground conditions
• Existing site services that can accommodate the proposed developments

Technical Criteria
• Existent proven technology and processes
• Existing authorisation to accept waste and existing processing capacity
• Sufficient power available and at the correct voltage
• Existing trained and experienced personnel.

Development, Infrastructure and Economic Criteria
• Existent planning permission for strategic infrastructure
• Extension of activities at the existent site will provide an economy of scale that cannot be replicated at an alternative site
• Site location is in compliance with an established land use pattern as recognized in the site planning history and in the Meath County Development Plan
• Existent site access and local and regional road network capacity
• Existent access to foul and storm water infrastructure etc.

3.3.5 Alternative Locations on the Existent Site

3.3.5.1 Overview

After the foregoing assessment was carried out, it was then necessary to consider if any elements of the proposed development should be carried out at an alternative location within the existent Carranstown site.

Alternative locations for the following three main elements of the proposed development were screened individually based on specific criteria for each element:

1. Tank farm;
2. Hydrogen generation unit;
3. Bottom ash storage building.

The outcome of each screening option was then compared with each other based on a further set of criteria in order to provide the most optimal result. The other ancillary elements such as the warehouse, workshop and truck parking areas were then integrated into the outcome of this exercise.

Five possible areas on site were identified to accommodate the above developments. Each area was labelled alphabetically (A, B, F, I & J) and each development numbered 1 to 3 as per the list above. The five areas are briefly described below and their locations are shown below in **Figure 3.1**.

Area A

Flat green area to the rear of the existing ammonia and fuel oil storage tanks. This area is also adjacent to the Western boundary of the site.

Area B

Towards the Northern corner of the site. This area partially covered by a grassed-earthern berm and the other part comprises a compacted stone area.

Area F

A flat stoned area to the north-east of the existing office accommodation (and to the east of the 110kV power lines traversing the site) in the contractors compound. This area is partially covered by a large grassed-earthen berm to the north.

Area I

Flat, compacted stone area to the north-east of the existing staff car park. This area is to the east of the wayleave for the underground gas transmission main and the landscaped berm at the site boundary with the R152.

Area J

Narrow strip of land between the roadway and adjacent to the eastern external wall of the bunker and tipping hall area. This area is consists of a grassed-earthen berm which accommodates the local gradients between the roadway and the tipping hall entrance.

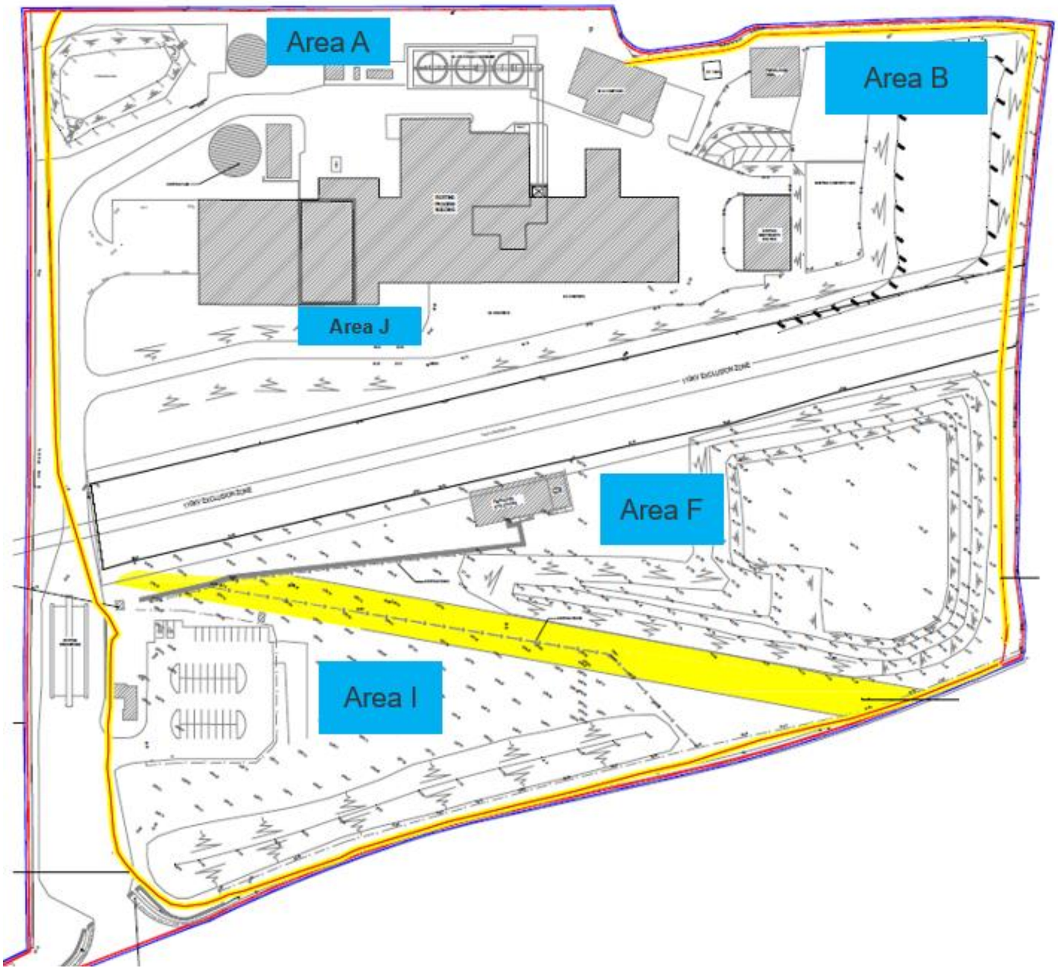


Figure 3.1 Five alternative locations identified for the proposed development

3.3.5.2 Tank Farm (Element 1)

Three alternative locations on site (A, B and J) were considered to locate the tank farm (denoted for element 1 as 1A, 1B & 1J in **Figure 3.2** below) with the main criteria being:

- the availability of space on site
- constructability (in the context of constructing on a fully operational site)
- the proximity to the existing tanker unloading area
- proximity to the ultimate treatment point in the furnace.

The three locations considered for the tank farm are shown in **Figure 3.2** below.

Figure 3.2 Three alternative locations considered for tank farm

3.3.5.3 Based on the criteria identified, Area J was ruled out as a possibility mainly due to space restrictions and constructability.Hydrogen Generation Unit (Element 2)

Three alternative locations on site (Areas B, F and I) were considered to locate the hydrogen generation unit with the main criteria being:

- the availability of space on site
- proximity to electrical supply and feed into the gas main
- compatibility of associated traffic movements with existing site activities.

The three locations for the hydrogen generation unit are shown in **Figure 3.3** below.

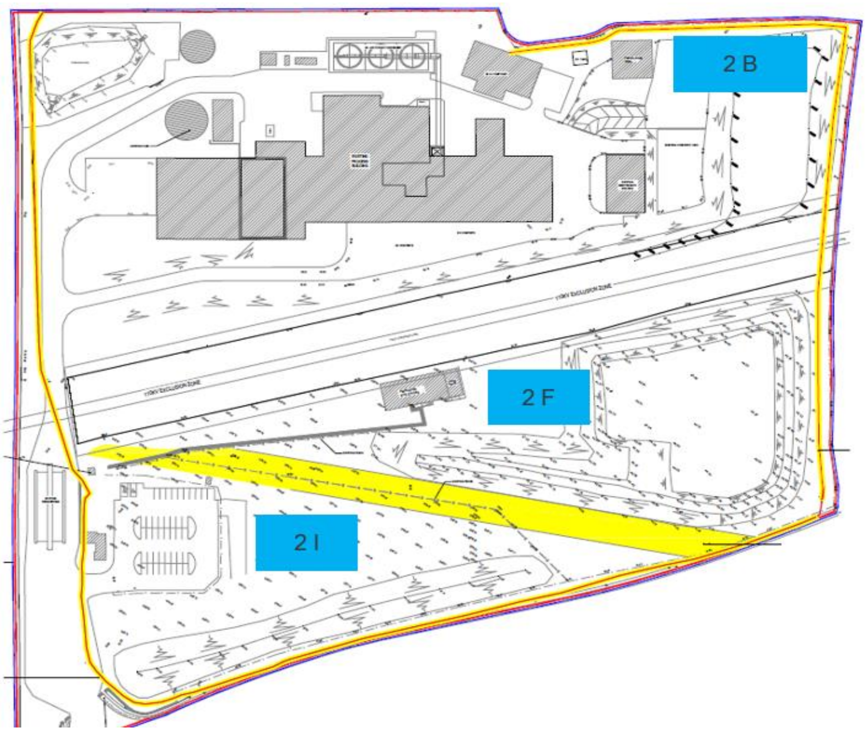


Figure 3.3 Three alternative locations considered for the HGU

Based on the criteria selected, sites 2B and 2F were deemed suitable and site 2I was ruled out due to the distance from the power supply.

3.3.5.4 Bottom Ash Storage Building (Element 3)

Three alternative locations on site (Areas B, F and I) were considered to locate the bottom ash storage building with the main criteria being:

- the availability of space on site
- proximity to existing bottom ash hall.

The three locations for the bottom ash storage building are shown in **Figure 3.4** below.

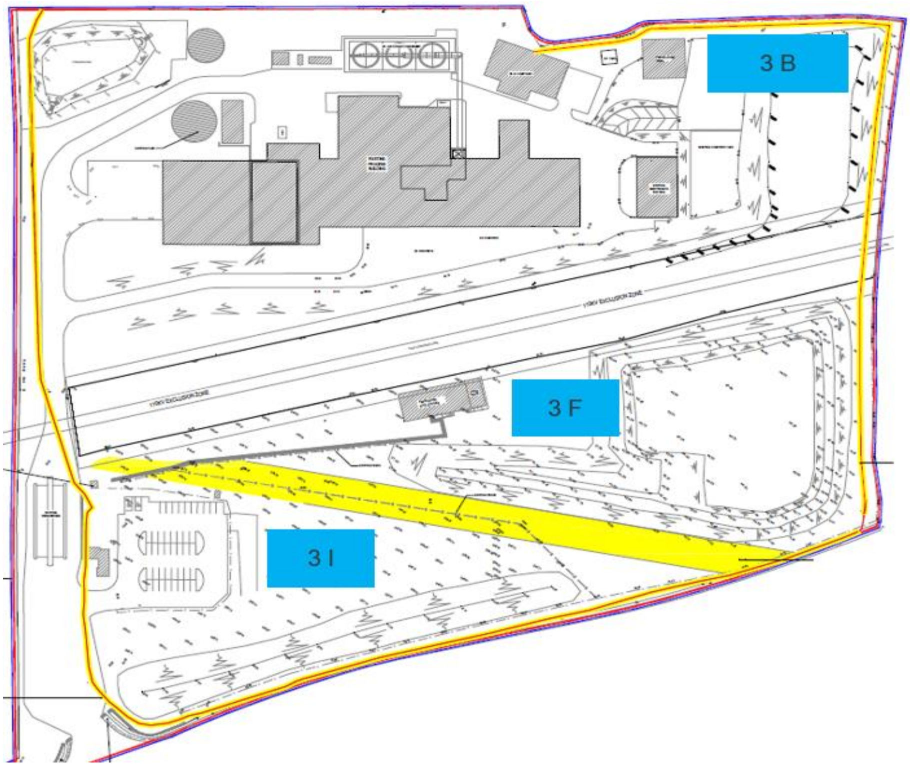


Figure 3.4 Three alternative locations considered for Bottom Ash Storage Building

Based on the criteria selected, sites 3B & 3F were deemed suitable and site 3I was ruled out as not only was it the furthest distance from the existing bottom ash hall, but also that outgoing vehicles would not easily be able to cross the weighbridge on site and would add un-necessary traffic movements to the site.

This exercise identified that there was competition in areas B and F on site between the different parts of the development as per **Table 3.1** below.

Table 3.1 Areas on site suitable for the 3 elements of the proposed development

Area A	Area B	Area F
Tank Farm (1)	Tank Farm (1)	
	HGU (2)	HGU (2)
	Ash Storage (3)	Ash Storage (3)

In order to finally determine the locations for each of the elements, relevant environmental factors were identified for consideration. A lot of environmental factors are neutral due to their nature and in the context of choosing different areas on the same site. These are as follows:

- Population & Human Health
- Traffic
- Climate
- Biodiversity
- Cultural Heritage
- Land & Soils
- Water
- Major Accidents & Disasters.

Emissions to air has the potential to differ in impact for local sensitive receptors but in the case of the proposed development, there are no potential significant impacts and certainly no differences due to the location of the different elements on the same site. The remaining environmental factors have been set out in **Table 3.2** below for each of the elements of the proposed development in each of the areas.

Starting with the optimal location for the tank farm, it is clear that with no other part of the development competing for area A, and the fact that this area is closer to both the furnace and the existing tanker unloading area, area A was the preferred location for the tank farm. This choice is also supported by the fact that the height of the tanks (24m) is best screened at this location as identified in **Table 3.2** below.

This results in a competition between the HGU and the ash storage building for areas B & F. From an evaluation of the noise impact in **Table 3.2**, there is no real difference between the two, as both have operational traffic noise associated with them and excellent screening is offered in both areas by the site contours and berms.

It is clear from **Table 3.2** below that from a visual impact perspective, the positioning of the ash storage building in area B is the preferred option, due to the height and scale difference between the two buildings and the elevation difference between areas B & F.

It is also apparent from **Table 3.2** above that there is less material to be excavated and removed from site by locating the ash storage building in Area B. An additional benefit of choosing Area F for the HGU are that it is closer to the proposed injection point to the natural gas grid.

Table 3.2 Comparison of environmental effects for alternative locations on site

Environmental Factor	Area	Development	Advantages	Disadvantages
Material Assets	A	Tank Farm	Close to treatment (furnace) of the waste in the process and the existing tanker unloading area.	Working area is relatively confined
	B	Tank Farm	Large area of land available. Short cable runs from power distribution in main process plant.	Material excavation and removal required from existing berm. Long distance (more materials and infrastructure required) to treatment and unloading of the waste.
		HGU		Material excavation and removal required from existing berm. Long run of pipeline required to transport gas to connection point.
		Ash Storage		Material excavation and removal required from existing berm.
	F	HGU	Large area of land available Proximate to gas line connection point.	Material excavation and removal required from existing berm.
		Ash Storage	Large area of land available.	More material to be excavated and more surplus material to be sent off-site

Environmental Factor	Area	Development	Advantages	Disadvantages
Noise	A	Tank Farm	Farthest area from sensitive receptors (off-site) and screened by main process building but this activity is not noisy when in operation.	None
	B	Tank Farm	None	Closer to site boundary and sensitive receptors but operation is not noisy.
		HGU		
		Ash Storage	Closest available area to where ash is produced on site. Less noise from traffic movements on site.	Furthest available area on site from sensitive receptors (off-site).
	F	HGU	Noise Screening provided by adjacent berm	Closest area on site to noise sensitive receptors (off-site) but operation is not noisy. HGV traffic to and from the HGU close to noise sensitive receptors (off-site)
	F	Ash Storage	Noise Screening provided by adjacent berm.	On site traffic noise higher due to the distance required to transport the ash here. Closest area on site to noise sensitive receptors (off-site).
Landscape & Visual	A	Tank Farm	Adjacent to air-cooled condenser and also screened by main process building minimises visual impact.	None

Environmental Factor	Area	Development	Advantages	Disadvantages
Landscape & Visual	B	Tank Farm	Significant screening still offered due to the natural site contours and berms to the east.	Height of tanks means that they are more visible to nearest sensitive receptors (off-site) than Area A.
		HGU	Excellent screening due to the relatively low height (11m) and small scale (24m X 33m) of this building	None
		Ash Storage	Optimal position of the areas considered due to the screening offered and the scale (60m X 24m) and height (14m) of the building.	May be slightly visible to nearest sensitive receptor (off-site).
	F	HGU	Ample screening offered by adjacent berm (+51m OD) as ridge of building is at 48.5m OD	More visible from R152 approaching site from the North (but not at any sensitive receptor sites) than Area B.
		Ash Storage	Good screening of building but ridge height (51.5m OD) is slightly above the adjacent berm (51m OD)	Much more visible from R152 approaching from the North than the HGU building in this position due to its increased height and mass

3.4 Alternative Processes

3.4.1 Hazardous Waste Treatment (Waste to Energy)

No changes are required to the existing waste to energy treatment process itself to facilitate the treatment of an additional 15,000 tonnes per annum. A permanent storage facility is however required for aqueous waste prior to treatment and this is outlined in **Section 3.4.3** below. The current process is working successfully with regard to the treatment of hazardous and aqueous wastes and this is largely attributable to the advanced screening of the waste (profiled prior to acceptance, and further determined at collection and delivery) prior to treatment in the waste-to-energy plant.

As referred to above in relation to alternative sites, the facility and processes required are already in place at the Carranstown facility and are operating in a safe and efficient manner. Operation of the facility with an intake of 235,000 tonnes of hazardous and non-hazardous waste since 2014 has proven that there is available capacity and environmental controls in place at this facility.

Use of the existing process at Carranstown is considered the optimum method to efficiently treat up to 25,000 tonnes of hazardous waste annually. Therefore, it is considered that there is no reasonable alternative for hazardous waste treatment in this context given that the current process is working successfully.

3.4.2 Hazardous Waste Treatment (Pre-treatment of boiler ash and FGT residues)

The only changes required to the existing hazardous ash pre-treatment process to facilitate the acceptance of up to an additional 30,000 tonnes per annum is the addition of two storage silos within the main process building and a small unloading area. The current process is working successfully with regard to the treatment of boiler ash and flue gas cleaning residues generated on site.

There are other processes such as the “Carbon8” process which uses Accelerated Carbonation Technology to bind the residues into an aggregate that can be utilised in the construction industry. However, a market for the aggregate produced and also end of waste status from the Environmental Protection Agency would be required and neither are in place in Ireland currently. In addition, the technology and equipment is already installed and operational with adequate capacity to treat these residues. Therefore, there is no reasonable alternative for the recovery of these hazardous wastes on the island of Ireland.

3.4.3 Tank Farm – Aqueous Waste Storage

The accepted and proven way of storage of aqueous waste is using a tank farm designed to the required standards. No other alternative aqueous waste storage process was considered but alternative designs considered are outlined in **Section 3.5** below.

3.4.4 Alternative Processes relating to the Hydrogen Generation Unit

Alternative processes were explored for the utilisation of waste steam or the resultant waste electricity when power is not required by the grid. Several options were investigated over the past five to seven years including those listed below:

- Fly-wheel technology for energy storage
- Electric battery storage
- Users for steam off-take
- Use of the electricity for Hydrogen generation.

With the exception of Hydrogen generation, none of the other options provided a viable technical or economic case for further investigation. Fly wheel or battery storage are more efficient ways to store electricity for re-use but the energy they store cannot be released back onto the electricity grid when grid restrictions released as the size of the export line and rated MEC (Maximum Export Capacity) for the site cannot facilitate this.

The use of steam instead of producing electricity is environmentally more desirable and more energy efficient but requires constant heat demand within close proximity to the site from either an industrial source or high density of population. No such usage demand exists in this area.

Although the energy efficiency associated with an alkaline electrolysis unit to generate Hydrogen is lower than the storage solutions mentioned above, the case for this clean, non-carbon based fuel in the context of climate change policy and sustainability as outlined in **Section 9.5.3** of **Chapter 9 *Climate*** is very compelling.

Alkaline electrolysis is 60% efficient at converting the electricity input from the waste to energy plant into a hydrogen fuel and is the only power to hydrogen gas process which is proven and has operating plants at the scale required (10MW$_e$) for this development. Hence there is no reasonable alternative process to alkaline electrolysis for hydrogen generation taking into account the characteristics of this project.

3.4.5 Bottom ash storage for off-site treatment

The only alternative process that could be considered on site to the storage of bottom ash prior to off-site treatment is the full treatment of bottom ash to recover remaining residual metals and to produce an aggregate material for onward sale to the construction industry. With only 40,000 tonnes per annum of bottom ash currently produced on site, the scale of investment would not be economical and in addition, the amount of space required would be significant and could not be accommodated on the existing site. Thus, no reasonable alternative exists.

3.5 Alternative Designs

3.5.1 Aqueous Waste Storage

Some alternatives were considered with regards to the type and size of tanks to be utilised for the unloading, storage, mixing of aqueous waste prior to transfer to the furnace for treatment. These alternatives would be considered standard in process engineering terms and would also be in accordance with the applicable BAT guidelines (see **Section 4.11 in Chapter 4 *Description of the Proposed Development*).** They are summarised in **Table 3.3** below. Some environmental factors were also considered during this process (such as material assets and visual impacts) as summarised in **Table 3.3:**

Based on the above considerations in the case of this application, avoiding quality issues with fabrication on site and the space required to fabricate wider diameter tanks (>5m), it was decided to utilise tall and thin tanks. Although there was a potential for increased visual impact, the location chosen on site ensured that this did not arise (refer to **Chapter 13 *Landscape & Visual***).

Table 3.3 Factors considered for alternative aqueous waste storage tank design

Design Consideration	Pro’s	Con’s
Single Skin in bund	Cheaper tank costs	Bund and additional civil works costs required Higher impact on material assets
Double skinned with no bund	No bund required Lower impact on material assets	Higher tank costs Bottom discharge from tank not possible
Tall and thin tanks	Can be fabricated off site to a higher quality standard and installed quickly on site.	Increased visual impact potential
Short and fat tanks	Lower visual impact potential	Fabrication on site requires a large area, process is slow and quality can be an issue
Small number of larger tanks	Lower investment cost per m^3 storage	Limited ability to segregate different wastes
Large number of smaller tanks	High degree of waste segregation possible	Higher investment cost per m^3
Conical bottom	Excellent solids extraction	Double Skin not possible
Flat bottom	Double skin possible	Solids build-up in tank

Conical bottoms were also chosen to ensure that any solids could be easily extracted from the tanks in the waste and pumped to the furnace. Choice of a conical bottom excluded the possibility for a double skinned tank, so single skinned tanks within a bund was required.

Two larger tanks (each $300m^3$ capacity) were chosen instead of many smaller tanks as there is no significant need for the segregation of aqueous wastes due to the high water content.

3.5.2 Hydrogen Generation Unit

As the layout of the equipment is standard for such a plant and the visual impact is not significant (see **Section 13.8.2** of **Chapter 13 *Landscape & Visual***), no alternative designs were considered. Colour finishes for the exterior cladding have been chosen to match the existing on site.

3.5.3 Bottom Ash Storage

Apart from the pitch of the roof (based on the orientation of ash trucks within the building when tipping) no other alternative designs were considered. Colour finishes for the exterior cladding were chosen to match the existing on site.

3.6 Do Nothing Scenario

3.6.1 Overview

In terms of this scenario, the overarching planning, waste and climate change law and policy framework applicable to the proposed development is comprehensively detailed in **Chapter 2 *Policy and Planning Framework and Need for the Scheme*** of this EIAR and must be referred to in this regard. This chapter and **Section 3.3.2** above demonstrates in clear terms that the proposed development may be regarded as being in alignment with this overarching framework at both national and EU level and is capable of giving effect to the policy positions underlined therein.

Specifically, the treatment of additional hazardous waste, including hazardous aqueous waste as a component of the proposed development, will contribute to the State becoming more self-sufficient in the management of hazardous waste generated as prioritised in the National Hazardous Waste Management Plan. Furthermore, this is in alignment with such waste being treated in a more proximate manner and wider climate mitigation measures through the associated reduction in transport emissions through domestic treatment at an existing recovery facility in the State.

The proposed development is also consistent with the provisions of the Eastern Midland Regional Waste Management Plan which identifies an additional 50,000 tonnes of thermal recovery capacity for the treatment of hazardous wastes on a national basis.

From a planning perspective, the treatment of additional hazardous waste and residues and the development of a tank farm accords with the National Planning Framework, the National Development Plan and the Eastern Midland Region Regional Spatial and Economic Strategy.

This overarching planning framework provides for the development of necessary and appropriate hazardous waste management facilities to avoid the need for treatment elsewhere and underlines that continued investment in waste management infrastructure including private sector investment is critical to Ireland's environmental and economic wellbeing.

With regard to the development of a hydrogen generation unit for connection to the natural gas transmission/distribution network and for use in mobile hydrogen transport applications equally accords with the existing policy framework at national and regional level which underlines the pressing need to facilitate the development of enhanced electricity and gas supplies in order to support the State's transition to a low carbon economy.

This need is underlined in the National Planning Framework, the National Development Plan, the Regional Spatial and Economic Strategy for the Eastern Midlands Region and in the Meath County Development Plan.

In addition, the production of hydrogen to be utilised in mobile hydrogen transport applications also accords with the developing policy landscape on decarbonising the transport sector in the State and more broadly with emerging policy whereby this versatile technology can play a beneficial role in assisting with the State's broader decarbonisation and mitigation objectives.

The Climate Action 2019 and the regional Meath Climate Action Plan provide that there is a need for sustainable mobility at national and regional level. The Climate Action Plan specifically provides that decarbonisation options such as hydrogen vehicles are worthy of further investigation with the National Policy Framework on Alternative Fuels Infrastructure for Transport in Ireland: 2017 to 2030 similarly underlining the significant role that can be played by this innovative technology going forward and its ability to contribute to the decarbonisation of the transport sector as fossil fuel vehicles are significantly reduced in the medium to long term.

Given the significant policy alignment of the proposed development with all relevant plans, policies and objectives at national, regional and local level, it would not be reasonable in such circumstances to consider a do-nothing scenario as a reasonable alternative in the context of the proposed development.

3.6.2 Additional Hazardous Waste Treatment

In the absence of the proposed development, the Irish state will continue to be reliant on the export of aqueous waste and hazardous ash to mainland Europe. The main impacts of this would be the additional emissions associated with transport to Europe and the associated additional costs.

3.6.3 Hydrogen Generation Unit

In the absence of the development of the hydrogen generation unit, valuable renewable energy will continue to be destroyed/lost.

3.6.4 Bottom Ash Storage Building

In the absence of the development of the bottom ash storage building, the option to export bottom ash for recovery may not be economical (or possible at all) due to a reliance on third parties for the storage of the 3,000 tonnes in advance of an export shipment.

4 Description of the Proposed Development

4.1 Introduction

Indaver Ireland Limited (Indaver) currently operates a Waste to Energy (WtE) facility (waste incinerator) at its site in Carranstown, Duleek, Co Meath. Indaver proposes to carry out a new development at this site. The proposed development is collectively referred to as the Site Sustainability Project in this Environmental Impact Assessment Report (EIAR) and in the planning application. Indaver has submitted an application to An Bord Pleanála (ABP) under Section 37E of the Planning and Development Act 2000, as amended (Strategic Infrastructure Development, SID) for a 10-year planning permission to construct the proposed Site Sustainability Project.

This chapter presents a description of the proposed Site Sustainability Project. The existing site location and neighbouring land uses are described in **Section 4.2**. The current site layout and facilities are described in **Section 4.3**. The operation of the existing Waste to Energy facility is described in **Section 4.4**. The main features of the proposed Site Sustainability Project development are described in **Section 4.5**. **Section 4.6** describes the stormwater & firewater management on site and **Section 4.7** outlines additional site service requirements. Commissioning (**Section 4.8**), health, safety and environmental aspects (**Section 4.9**), regulatory control of the facility (**Section 4.10**) and references to the best available technologies (BAT) are (**Section 4.11**) also described. Decommissioning of the site is described in **Section 4.12**.

A number of figures accompany this chapter and in **Chapter 1 *Introduction*** and are referred to throughout. Refer also to the planning and engineering drawings which form part of the planning application package.

4.2 Site Location and Neighbouring Land Uses

4.2.1 Location of existing Indaver facility

Indaver currently operates a Waste to Energy (WtE) facility (waste incinerator) at the site in Carranstown, Duleek, Co Meath. Refer to **Figures 1.1** to **1.3** of **Chapter 1 *Introduction*** of this EIAR. The existing facility has been in operation since August 2011 and is licensed under an Industrial Emissions Licence (No. W0167-03) by the Environmental Protection Agency (EPA).

4.2.2 Current Activities

The existing facility treats up to 235,000 tonnes per annum of residual household, commercial and industrial non-hazardous and hazardous waste and recovers energy. Of the 235,000 tonnes of waste, up to 10,000 tonnes per annum of suitable hazardous waste is currently treated at the facility.

The existing facility extracts and recovers valuable material (in the form of ferrous and non-ferrous metals) and energy (in the form of up to 21.5 megawatts of electricity (MW_e)) resources from residual waste.

4.2.3 Neighbouring Land Uses

The facility is located 1.8km west of the M1, bound to the south by the R152 regional road and surrounded by greenfield on all other sides. Irish Cement Platin is to the immediate north of the site and the rest of the surrounding land is used for industrial, agricultural and residential purposes. There are nine private residences located within 200m of the site boundary with one directly adjacent at the north eastern site boundary. The village of Duleek is located approximately 2.7km south west of the site.

The main hydrological feature in the vicinity of the site is the River Nanny, which is located about 2km to the south of the site. Stormwater/surface water runoff from the site currently passes through a class 1 interceptor and attenuation pond before discharging to a semi-dry ditch which drains to the Cruicerath stream c.130m to the west of the site, which in turn leads to the River Nanny. Refer to **Section 4.3** for further details on drainage.

4.3 Current Site Layout and Facilities

4.3.1 Existing Site Layout

The existing site consists of the following infrastructure to accommodate the acceptance and treatment of up to 235,000 tonnes of waste per annum and the generation of up to 21.5 MW_e, of which up to 19 MW_e of electricity are exported to the national grid:

- Facility entrance, weighbridge, gatehouse (security) & staff car park;
- Waste to energy process building which includes (dimensions in L x W x H):
  - Waste tipping hall and waste bunker for solid waste acceptance and storage (tipping hall: 32m x 35m x 20m; bunker: 35m x 18m x 35m);
  - Furnace and boiler hall for waste treatment and recovery of energy (33m x 28m x 41m);
  - Steam-condensate area with associated steam turbine and electricity generator (18m x 28m x 41m);
  - Flue gas cleaning area and 65m high stack complete with emissions monitoring system (79m x 28m x 30m);
  - Bottom ash hall for metals removal and storage (45m x 28m x 12m);
  - Boiler ash and flue gas cleaning residue tanker loading area (11m x 6.5m x 12m);
  - Boiler ash and flue gas cleaning residue pre-treatment area (11m x 8.5m x 12m);

    - Control room and office accommodation for Indaver staff (22m x 8m x 21m).
- Air-cooled condenser for re-circulating low pressure steam from the turbine as condensate to the steam-condensate system;
- 38kV import/export compound for electricity;
- 70m^3 mobile tank and associated aqueous waste unloading area;
- 44m^3 Fuel oil tank for fuelling the burners used for start-up and maintaining the minimum temperature of 850°C in the furnace when required;
- 60m^3 Aqueous ammonia tank which is used for NO_x reduction in the flue gases.

The site layout can be seen in **Figure 4.1** below.

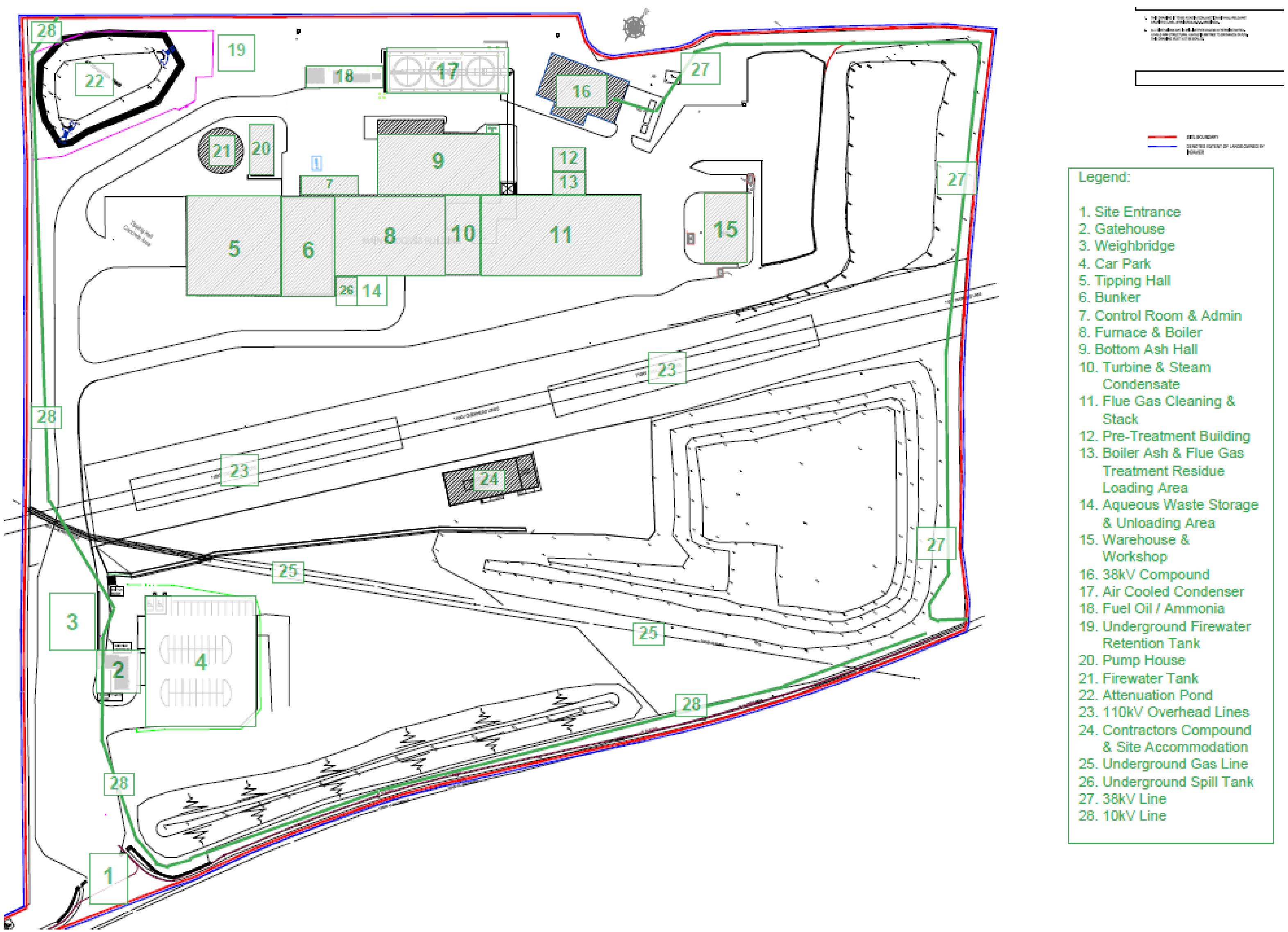


Figure 4.1 Existing Indaver Site Layout. Not to scale.

The waste to energy process and the infrastructure associated with it are described in detail in **Section 4.4** below. Also included in **Section 4.4** is a description of the acceptance of the incoming waste, the residues generated for off-site treatment, raw materials used in the process and the conversion of steam to electricity for export to the national grid.

In addition to the infrastructure for the waste to energy process listed above, the following facilities and systems are also in place to support this activity on the site:

- Warehouse for spare parts and workshop for the mechanical maintenance team;
- Contractors compound and Indaver modular site offices for ancillary Indaver staff;
- Firewater / process water tank and associated firewater pumphouse;
- Stormwater drainage network and attenuation pond of 2,887 m^3;
- Underground firewater/contaminated water retention tank of 300m^3;
- Sanitary effluent collection and treatment systems.

The warehouse is required for storage of critical spare parts and to support the routine maintenance of the plant. Safety equipment and personal protective equipment (PPE) is also stored there. The workshop comprises an office area for the mechanical maintenance team, a welding booth and workbenches for maintenance activities.

The contractors compound is primarily used for annual shutdowns for temporary contractor accommodation and welfare facilities.

The Indaver modular site office houses some specialist maintenance contractors during these shutdown periods and is also used year round by Indaver support staff that work on the site, attend site for meetings or to work on specific projects.

The stormwater, firewater and sanitary drainage systems on site are described in **Sections 4.3.2** to **4.3.4** below. Existing wayleaves for the underground 70 bar gas transmission main, 10kV underground powerline traversing the site and 38kV underground power line connecting the site for import and export of electricity are indicated on **Figure 4.1** and also described in detail in **Section 16.3.2.5** in **Chapter 16** ***Material Assets***.

4.3.2 Existing stormwater control and management

4.3.2.1 Process Building

All waters produced from wash down etc. within the waste processing building are directed to a spill tank located to the east of the bunker building and underground. The spill tank has a capacity of 100m^3. Water from this spill tank is used to supplement process water requirements. There is no process effluent from the facility.

4.3.2.2 Site Drainage

The existing site stormwater drainage system has been designed in general accordance with Sustainable Drainage Systems (SuDS) principles and collects rainwater from all roofs, hardstands, roads and landscaped areas which fall naturally towards paved areas and that can reasonably be deemed to add to the flow of water through the drainage system. The existing design has been agreed and is in accordance with the requirements of Meath County Council.

Sustainable drainage systems aim to mimic as closely as possible the natural drainage of a site in order to reduce the impact of flooding and water pollution. The site is essentially divided into two parts, firstly the northern approximately 6.5 Ha. 'developed' part of the site, and secondly the southern approximately 3.5 Ha. 'undeveloped' part of the site. The southern 'undeveloped' part of the site, is drained naturally. This is shown on drawing **29043-CD-019** in **Appendix 5.2** of **Volume 3** of this EIAR.

Due to the natural south to north slope of the ground, stormwaters emanating from the developed part of the site cannot flow naturally to the undeveloped part of the site. Landscaping works have been fully established in the undeveloped part of the site and have the beneficial effect of increasing the "residence time" of the storm flows thereby reducing downstream effects.

The design principle for the northern portion of the site is to largely manage runoff flows and pollutants on the site rather than directing them to the nearest receiving waters. In addition to good housekeeping practices, retention and regular monitoring (i.e. testing) ensure the potential for contamination is minimised.

Good housekeeping measures include reusing waste contaminated water in the process itself in the spill tank provided, as detailed above. Waste contaminated water that is not required in the waste to energy process is diverted to the spilled water tank and sent for disposal or treatment at an appropriately licensed facility.

It is therefore highly unlikely for such waste contaminated water to pollute any receiving waters. In the eight years of operations to date, no such pollution event has occurred. In accordance with SuDS, consideration was given in the original design to surfacing roads and hard standings with pervious paving. However, given the risk of spillage onto these areas from attending refuse lorries, with subsequent possible contaminated runoff, the existing stormwater drainage system routes the surface water from roads and hardstanding to a monitoring station and from there to the firewater retention tank if contaminated, or to the natural watercourse via a petrol interceptor if uncontaminated.

In order to prevent flooding of the ditches downstream of the facility a discharge rate from the site based on the Dublin City Council Stormwater Management Policy and by agreement with Meath County Council of 59.8 litres/second has been incorporated into the existing drainage design. Attenuation for a 1 in 30-year storm is provided by the stormwater attenuation pond which discharges via a pump to an external drainage ditch. Attenuation of 1 in 100-year storm occurrences are also contained within the attenuation pond.

The existing site drainage system is outlined in detail on drawing **29043-CD-001** in **Appendix 5.2** and in basic flowchart format in **Figure 4.2** below.

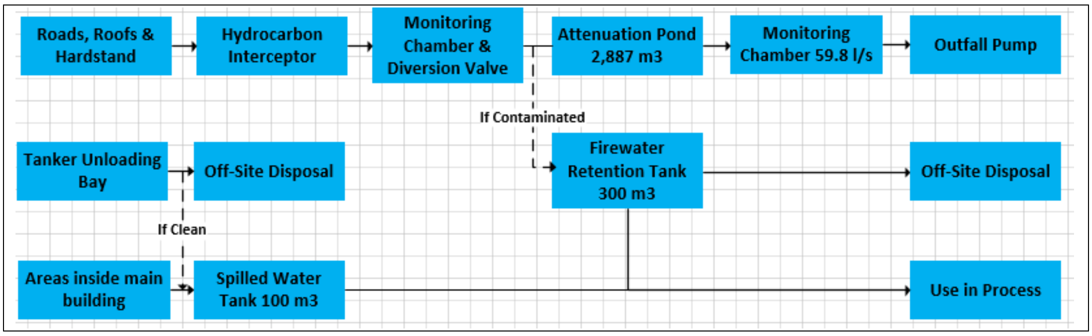


Figure 4.2 Existing Drainage System

4.3.3 Existing firefighting and firewater retention systems

Fire suppression is provided by an on-site dual-purpose water storage tank. This tank has an overall capacity of 2,185m^3 with an effective fire-fighting storage volume of 1,855m^3 and a process water storage capacity of 330m^3. The firefighting effort is supported by 3 No. diesel fire pumps connected to a fire main and hydrant system throughout both the site and buildings.

In the event of a fire, the process water requirement will not be needed and potentially all 2,185m^3 of process water is available for firefighting.

The facility has achieved compliance with the Building Regulations with particular reference to Part B (Fire), i.e. a Fire Safety Certificate has been obtained; and will continue insofar as practicable follow the recommendations in the Code of Practice for Fire Safety in Buildings – BS5588 which is referred to in Technical Guidance Document B (Fire) to the Building Regulations.

The greatest potential for fire at the facility arises within the waste bunker where localised heating can occur due to decomposition of organic material. If such a fire occurs, the waste is immediately transferred by the grab crane into the hopper and then covered with another grab of fresh waste. In the event of a larger fire where this is not possible, water cannons are used to douse the fire. Up to the level of the tipping hall, the bunker has a capacity of 5,670m^3 approximately. If a 50% voidage ratio is assumed for the waste, then there would be a retention capacity of 2,835m^3 within the waste bunker. With 2,185m^3 of water available for firefighting, this demonstrates that all of the water will be retained within the bunker even in the most extreme fire event.

If a fire occurred in the turbine area, the firefighting water would be collected in the cellar beneath the turbine which has a capacity of circa 1,000 m^3. The waste bunker has been designed conservatively with 1.1m thick walls and 800mm base and secondary containment system. It will therefore retain any fire water generated within the bunker.

4.3.4 Existing sanitary effluent collection and treatment systems

All effluent generated from toilets, showers and utility areas (with the exception of the modular offices and portacabins in the contractors compound) is collected in a domestic type effluent collection system. All effluent is passed through a septic tank and secondary treatment system (Puraflo) before being discharged to the percolation area. The wastewater treatment area is located on the northern boundary of the site . A second smaller effluent collection and discharge system is provided at the gatehouse building.

Two effluent holding tanks are also utilised on site, one for the modular offices in the contractors compound and one for the temporary portacabins which are used during the annual maintenance shutdown. The contents of these holding tanks are transported off site for treatment regularly.

4.4 Description of Current Process

4.4.1 Waste to Energy Process

In 2019, the facility accepted a total of 230,531 tonnes of waste, of which 9,310 tonnes were classified as hazardous. Energy is recovered from the combustion of the waste via a conventional steam boiler and converted to electricity for export to the national grid. In 2019 alone, approximately 141,177 megawatt hours of electricity was exported to the national grid.

The facility operates in strict compliance with an industrial emissions licence issued by the EPA (Industrial Emissions Licence Number: W0167-03).

The facility accepts waste six days per week between the hours outlined below but the installation runs 24 hours per day and for over 8,000 hours per annum.

- Monday – Friday 07:00 to 18:30
- Saturday 08:00 to 14:00.

Waste arriving at the facility must be checked in at the gatehouse and pass over the weighbridge before being directed to the tipping hall (solid waste deliveries) or to the tanker unloading area (aqueous waste deliveries). Acceptance checks are performed at both acceptance points to ensure that the waste delivered meets the required specifications. Additional controls for the acceptance of hazardous waste are included the EPA licence for the facility (W0163-03).

Solid waste is unloaded from trucks to the waste bunker from the tipping hall where two waste cranes mix the waste prior to feeding towards the waste hopper and feeding chute prior to introduction to the furnace. Aqueous waste is unloaded to the temporary storage tank (70m^3 capacity) on site and either pumped from the tank or directly from an incoming tanker for treatment in the furnace. This activity is also licensed by the EPA under W0167-03.

Energy is recovered from the resulting flue gases in the furnace using a conventional steam boiler.

The resulting steam is fed to a turbine and up to 21.5 MW of electricity is generated. Approximately 2.5 MW_e is consumed by the equipment in the plant and the other 19 MW_e is then available for export to the national grid.

Reduction of the oxides of Nitrogen (NO_x) in the flue gases is achieved via injection of aqueous ammonia into the flue gases in the boiler in a process called selective non-catalytic reduction or SNCR.

Bottom ash is produced as a residue of the combustion process in the furnace. Once extracted from the furnace via a water quench bath, the bottom ash is transported by conveyor to the bottom ash hall for metal recovery and storage. Ferrous and non-ferrous metals are recovered from the bottom ash using overband magnets and an eddy current separator. The metals and the residual bottom ash are stored in the bottom ash hall prior to sending off-site for recovery.

The bottom ash is sent to landfill for use as daily cover for the landfill cells and also for road construction on the landfill itself. Three landfills are currently utilised for this process, Knockharley Landfill Limited, Drehid Landfill and Ballynagran Landfill. Further details on the uses and destinations of bottom ash offsite are provided in **Section 16.5.3.10** of **Chapter 16 *Material Assets.*** Ferrous metals are sent for recovery in Ireland and non-ferrous metals are exported to mainland Europe for recovery. A summary of the quantities produced of each residue is provided in **Table 4.1** below.

Table 4.1 Summary of residues from furnace produced/recovered on site in 2019.

Residue	Tonnage Produced	As % of waste input
Bottom Ash	35,124	15%
Metals - Ferrous	2,760	1.2%
Metals – Non-Ferrous	437	0.2%

An overview of the complete waste to energy process can also be seen below in **Figure 4.3**.

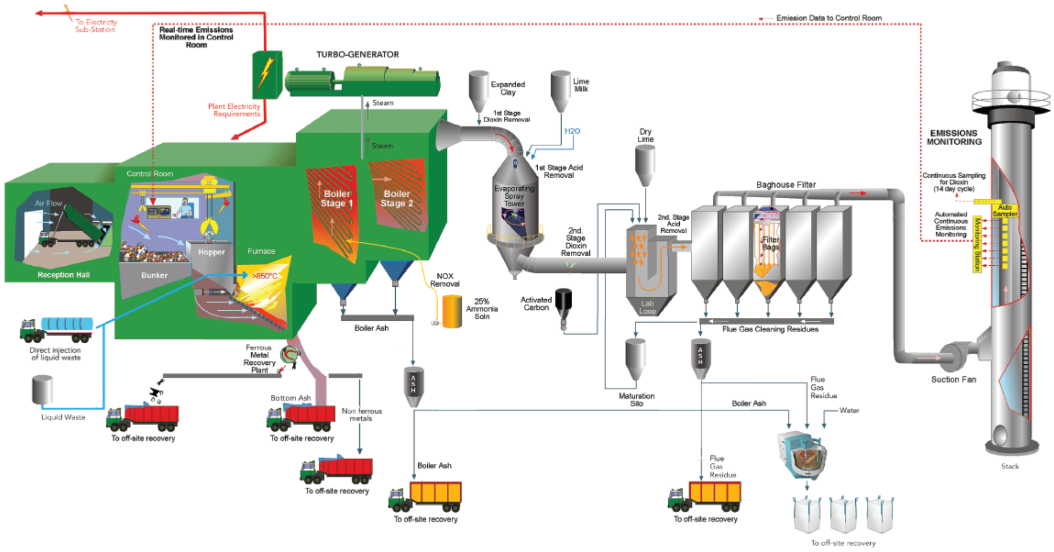


Figure 4.3 Schematic of the waste to energy process

4.4.2 Flue Gas Cleaning Process

After leaving the boiler, the flue gases must be cleaned before they can be discharged through the stack. This is done by the injection of lime and a mixture of activated carbon and expanded clay.

Lime is introduced to the process in two forms, as a slurry mixed with water and also in dry form to control the acid gas concentration in the flue gases to the levels required in the EPA licence for the site. Separate silos for the storage of quick lime and hydrated lime are provided in the flue gas cleaning part of the main process building.

A mixture of activated carbon and clay is used in the process to control the heavy metals and dioxins. This is also stored in a silo in the same area as the lime silos.

Additional water may be injected to control the temperature of the flue gases entering the baghouse filter. Water for use in the process is abstracted from a groundwater well on site and pumped to the combined firewater and process water tank, which is 2,185m^3 in capacity. The top 330m^3 of this tank is reserved for process water.

Residues are also created as a by-product of the flue gas cleaning process. Boiler ash is collected from the on-line cleaning of the boiler and flue gas cleaning residues are generated by the introduction of lime milk, dry lime, activated carbon and clay to clean the resultant flue gases. **Figure 4.3** above shows the flue gas cleaning process and the various inputs and outputs involved.

A summary of the annual quantities of boiler ash and flue gas cleaning residues produced is given in **Table 4.2** below.

Table 4.2 Boiler ash and flue gas cleaning residues produced on site in 2019.

Residue	Tonnage Produced	As % of waste input
Boiler Ash (BA)	1,908	0.7%
Flue Gas Cleaning Residues (FGCR)	10,018	4%

A baghouse filter is utilised to remove the carbon, clay and lime that has reacted to form the flue gas cleaning residues. The residues are trapped on the surface of the individual sleeves (approximately 2,000 sleeves in total) of the baghouse filter and collected in six hoppers underneath each of the six modules that comprise the baghouse filter unit. Compressed air is used to remove the residues from the sleeves and from the hoppers the residues are transported in enclosed conveyors to one of two residue silos (each of 210m^3 capacity). The residues are either discharged into road tankers for export to recovery at saltmines in Germany or are transferred by enclosed conveyors to the pre-treatment plant on site as outlined in **Section 4.4.4** below. Residues that undergo pre-treatment on-site are sent to a saltmine in Northern Ireland for recovery, as discussed in **Section 4.4.4** below.

4.4.3 Raw materials usage

In addition to lime, activated carbon/clay and water for flue gas cleaning, water is also used on site for boiler water, general site cleaning, and firefighting activities. Fuel oil is consumed in the burners primarily for start-up and shutdown activities. Aqueous ammonia is used in the SNCR process for the reduction of nitrogen oxides. **Table 4.3** below summarises the annual raw materials usage for 2019.

Table 4.3 Raw materials consumed for 2019.

Raw Material	Total Consumption 2019 Usage (tonnes)	Usage per hour (kg/h)
Quicklime (CaO)	3,543	441
Dry Hydrated Lime ($Ca(OH)_2$)	1,352	168
Activated Clay+Carbon	318	40
Aqueous Ammonia	381	47
Water	71,398	8,878
Fuel Oil	228	28

4.4.4 Pre-treatment plant for boiler ash and flue gas cleaning residues

Since October 2018, a new pre-treatment plant for treating boiler ash and flue gas cleaning residues has been operational on site. Boiler ash, flue gas cleaning residues and water are mixed together and discharged into 1m^3 flexible intermediate bulk container (FIBC) bags.

The FIBC bags are then loaded onto curtain-sided trailers and sent to a saltmine in Northern Ireland for recovery. This process avoids the need to export these residues in bulk powder form to saltmines in Germany where a similar pre-treatment process is applied prior to recovery in the mine. For operational reasons, the ability to use both routes for export is maintained. Further details on the export of boiler ash and flue gas cleaning residues are provided in Section 16.5.3.11 of **Chapter 16 *Material Assets.***

4.4.5 Emissions monitoring and control

As shown in **Figure 4.1** above, continuous sampling and monitoring of the flue gases is performed to give real time information to the operators of the plant on the performance of the flue gas cleaning systems relative to the strict emission limit values specified in the EPA Industrial Emissions (IE) licence. The dosing of rate of the re-agents is controlled automatically by the plants computerised control system. The facility has a very good compliance record and submits annual environmental reports to the EPA each year outlining the overall environmental performance of the facility. Further details on the IE licence are provided in **Section 4.10.1** below.

4.5 Main features of the proposed development

4.5.1 Overview

The main drivers for embarking on this project have already been outlined in **Chapter 3 *Alternatives*** of this EIAR but can be summarised as follows:

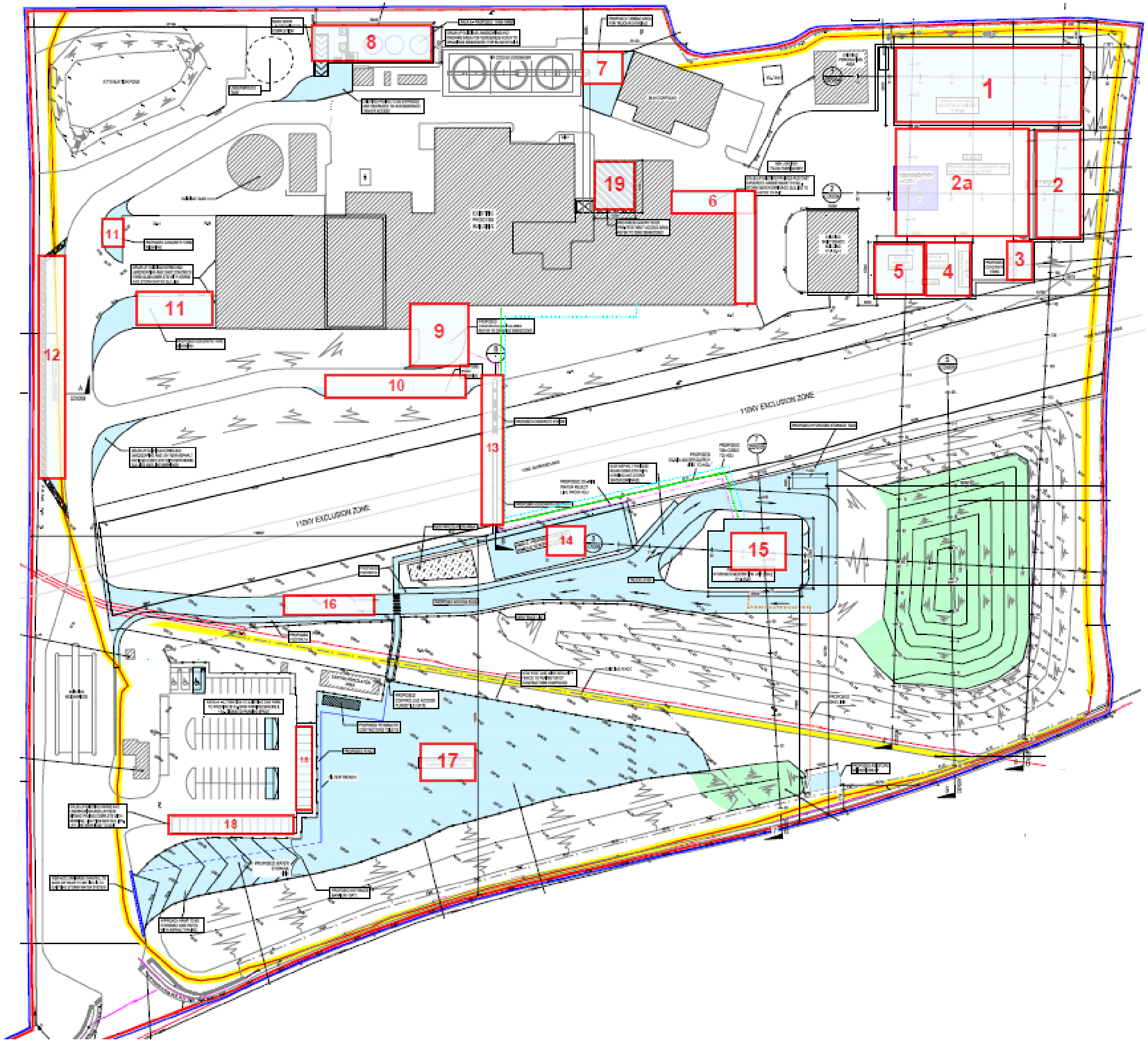
- To provide a sustainable level of treatment capacity to meet the needs of an evolving waste market.
- To improve the energy efficiency and sustainability of the facility in a new and evolving energy market.
- To provide additional buildings and infrastructure on site to adapt to changes in the residue treatment market and to provide for further employment growth on site.

The proposed development will consist of the following main elements:

1. Increase in the amount of hazardous waste accepted at the facility for treatment in the waste to energy plant from the current permitted 10,000 tonnes per annum (tpa) up to a maximum of 25,000 tonnes per annum;
2. It is also proposed to increase the annual total waste accepted at the site for treatment in the waste to energy facility from the currently permitted 235,000 tonnes per annum to 250,000 tonnes per annum;
3. Development of an aqueous waste tank farm and unloading area for the storage and processing of aqueous liquid wastes currently accepted at the facility;

4. Development of a 10MW$_e$ hydrogen generation unit for connection to the natural gas transmission/distribution network, for mobile hydrogen transport applications and other potential uses;
5. Development of a bottom ash storage building for the storage of up to 5,000 tonnes of bottom ash which is currently produced on site;
6. Additional waste acceptance capacity and infrastructure to receive up to 30,000 tpa (bringing the site total to 280,000 tpa) of third-party boiler ash, flue gas cleaning residues and other similar residues for treatment in the existing ash pre-treatment facility on site;
7. Development of a warehouse, workshop and emergency response team (ERT)/office building to support existing maintenance activities on the site.
8. Development of a new concrete yard and parking area for up to 10 trucks, tankers or containers on the site;
9. Demolition and re-building of an existing single storey modular office building on site with a slightly increased footprint; and
10. Other miscellaneous site upgrades.

Drawings **29043-CD-002** and **003** present the existing and proposed site plans reflecting the scope of works involved, refer to **Appendix 5.2** of **Volume 3**. **Figure 4.4** below shows the proposed elements of the development in the different areas of the site.



Legend:

1. Bottom Ash Storage Building (Area B)
2. Concrete Area for Tanker Truck/Container Parking (Area C)
2a. New Concrete Yard Area (Area C)
3. Canopy Maintenance Bay
4. Workshop & Office (Area D)
5. Warehouse (Area D)
6. Cast Concrete Hardstand
7. Tarmac Area for Truck Reversing
8. Tank Farm (Area A)
9. Tanker Unloading Area
10. Road Widening
11. Concrete Yard Widening
12. Truck Layby
13. Concrete Footpath & Stairs
14. Office Re-build (Area G)
15. Hydrogen Generation Unit (Area F)
16. Access Road
17. Contractors Laydown Area
18. Alterations to Car Park (Area H)
19. Canopy over Pre-Treatment Access Area

Figure 4.4 Proposed Development on the site. Not to scale.

4.5.2 Increase in overall annual total waste accepted at the site for treatment, including increase in hazardous waste

It is proposed to increase the amount of hazardous waste accepted at the facility for treatment in the waste to energy plant from the current permitted 10,000 tonnes per annum to 25,000 tonnes per annum. This will result in an increase in the annual total waste accepted at the site for treatment in the waste to energy facility from the currently permitted 235,000 tonnes per annum to 250,000 tonnes per annum.

The proposed increase to 250,000 tpa from 235,000 tpa is to allow for the acceptance of additional (15,000 tpa) hazardous wastes (including hazardous aqueous wastes in particular) but is also intended to reflect the changing nature of the average calorific value of the solid industrial and municipal non-hazardous wastes accepted at the plant. When the average calorific value (CV) of the overall blend of solid wastes decreases, then more waste can be processed per annum and when the CV increases, then less waste can be processed. Based on the experience of the past 8 years of operation, the average CV changes from year to year. As Indaver cannot control or influence these changes, the plant must be flexible to absorb these fluctuations. Based on the amount of suitable hazardous waste available in any given year and the average CV of the non-hazardous waste, the additional 15,000 tonnes of capacity requested could also be utilised for non-hazardous waste. An example of this is given as Scenario 2 in **Table 4.4** below.

A conservative approach has been taken when estimating the associated increase in raw materials required and residues produced and assumes that all of the additional proposed tonnage would be from solid waste. This is detailed further in **Chapter 16 *Material Assets***.

It is proposed to construct a tank farm and tanker unloading area for the acceptance of aqueous wastes. Since 2017, an average of over 7,200 tonnes per annum of aqueous hazardous waste were accepted and treated at the facility. By the development of this infrastructure, the annual treatment capacity of hazardous aqueous waste can be increased from 8,000 to a maximum of 20,000 tonnes per annum. The waste will predominately be delivered in bulk tankers (22 to 24 tonnes per load), as it is currently the practice.

The provision of this infrastructure will ensure that up to 20,000 tonnes of hazardous aqueous wastes can be diverted from the current export to Europe route and instead be directed to Indaver's WtE plant in Ireland. The proposed increase in hazardous waste tonnage accepted from 10,000 tpa to 25,000 tpa will also allow for further growth of the hazardous solid waste accepted on site. From past experience, it is not easy to predict what volumes of particular hazardous wastes will be suitable and available for treatment, but an outline of both the existing and proposed split between solid and aqueous hazardous waste (based on a theoretical maximum for aqueous hazardous waste) is shown as Scenario 1 in **Table 4.4** below.

As outlined in **Chapter 2 *Policy & Planning Framework and Need for the Scheme*** of this EIAR, this in turn increases Ireland's self-sufficiency for the treatment of waste on the island.

The proposed development also supports the proximity principle and is also more sustainable as it reduces the distance travelled by these waste streams dramatically.

Table 4.4 Example of two typical scenarios based on the existing and proposed waste to be accepted.

Waste	Existing Example (tpa)	Scenario 1 Proposed (tpa)	Scenario 1 Increase (tpa)	Scenario 2 Proposed (tpa)	Scenario 2 Increase (tpa)
Hazardous aqueous waste	8,000	20,000	+ 12,000	15,000	+ 7,000
Other hazardous waste (solid)	2,000	5,000	+ 3,000	3,000	+ 1,000
Non-hazardous waste	225,000	225,000	0	232,000	+ 7,000
Total waste accepted	235,000	250,000	+ 15,000	250,000	+15,000

4.5.3 Aqueous Waste Tank Farm & Unloading Area

It is proposed to develop a tank farm for the storage and processing of aqueous liquid wastes currently accepted at the facility.

Drawing **29043–CD-201** in **Appendix 5.2** shows the layout of the tank farm. There will be a total of three tanks, each with an operational capacity of 300m^3 which are 23.5m in height (+53.6m OD) and 4.5m in diameter. Only two of these tanks will be dedicated to the acceptance and storage of aqueous hazardous waste.

The third tank will be utilised for the storage of water during maintenance activities. There will be a further tank of 20m^3 operational capacity which will be used to ensure that any fine solids are constantly kept in suspension before being pumped to the furnace. All tanks will be single walled but with an additional jetting prevention shield where necessary and will be fabricated from mild steel and contained within a concrete bund. The bund will be 28.7m by 11m in plan and with a 1.2m high bund wall (north facing bund wall 2.2m). It will be designed to the required standards for water-tightness and retention capacity. **Figure 4.5** below outlines the layout of this area and the tanks within the bund.

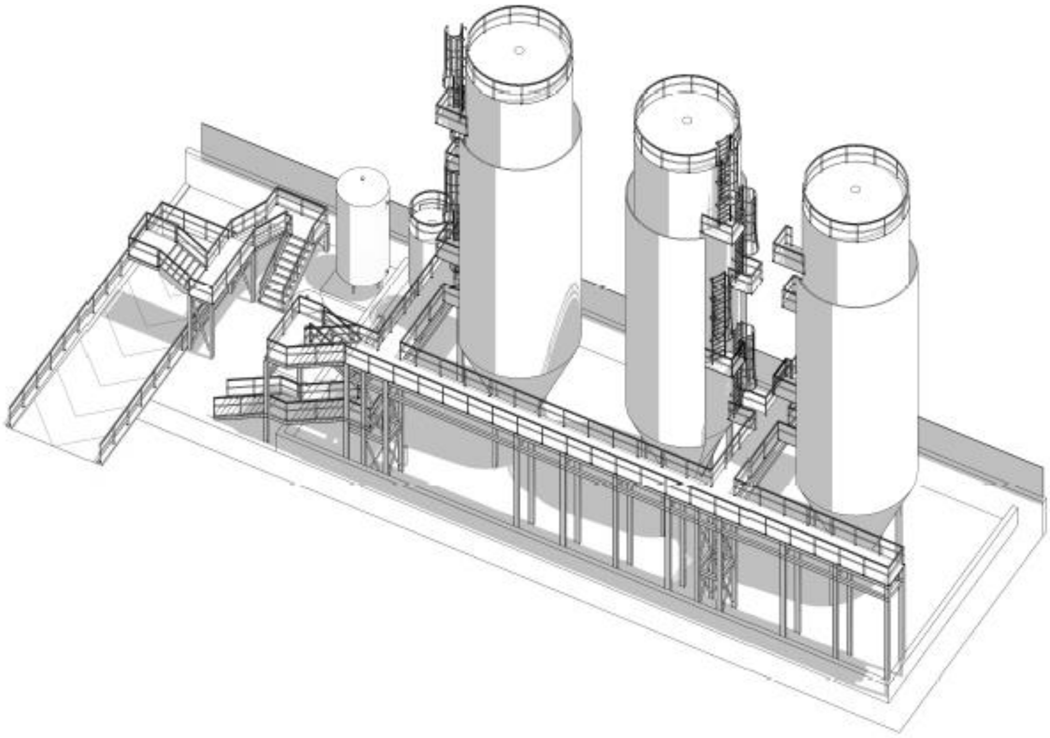


Figure 4.5 Tank Farm and Bund

To cater for the possibility of any solvents being present in the aqueous wastes, the tanks will be equipped with a nitrogen blanketing facility to ensure an inert atmosphere in the head space of the tanks. Any possible off-gases and overpressure in the tanks will be vented to the furnace for incineration. A small activated carbon unit will also be installed for times when the WtE plant is in shutdown to prevent any emissions to atmosphere. A piperack will be provided to link to the existing piperack servicing the aqueous ammonia and fuel oil area to the proposed tank farm. Walkways and staircases will provide access in and out of the bund and for access to the tanks and loading area.

An upgrade to the existing tanker unloading area, located south of the main process building is also proposed. Details are included on drawings **29043-CD-003** and **29043-CD-301** in **Appendix 5.2** of **Volume 3**. The upgrade will provide space for three tankers at a time for sampling and offloading operations. Containment for the full contents of a tanker ($25m^3$) will be provided in the event of a spillage. See the layout of this area in **Figure 4.6** below.

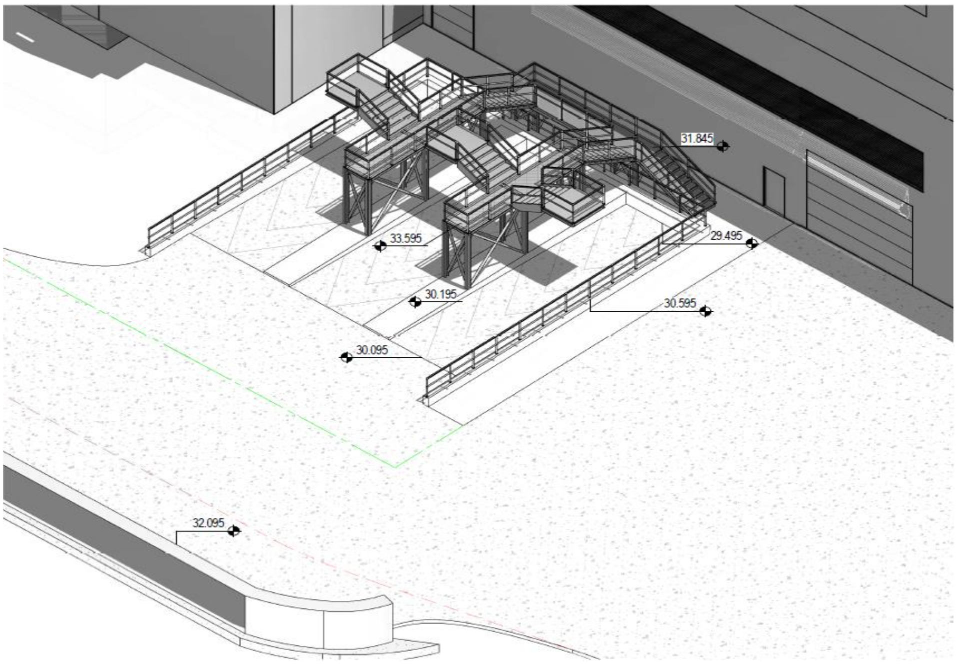


Figure 4.6 Proposed Upgrade to Existing Tanker Unloading area

The area will be 14.5m by 13.7m in plan and the height to the top of the gantry platforms will be 3.5m (33.6m OD).

An additional gantry for accessing the top of tankers will also be provided so that any of the three tanker parking spaces can be safely accessed from above. A wider turning circle for tankers reversing into place will be provided by widening a section of the road to the south of unloading area.

Tankers containing aqueous waste will be directed to the unloading area after waste acceptance and initial weighing operation at the weighbridge. Operators in the tank farm will direct the driver to one of the three unloading bays. The tanker unloading area is located south of the main process building. Details are included on drawings **29043-CD-003** and **29043-CD-301** in **Appendix 5.2** of **Volume 3**.

Once in place, the operator will access the top of the tanker to take a sample, when required. The sample is then analysed for conformity with certain key parameters such as calorific value, pH and chlorine content. This conformity check analysis ensures that the load is within specification. Compatibility testing will also be performed where required to ensure that there will be no adverse reaction with the contents of the tanks.

If the contents are not within specification, then arrangements will be made to send it off-site to an appropriately licensed facility in Ireland or abroad. In this event, the tanker may remain in the unloading area until collected or shunted to the new contained parking area proposed for the northern corner of the site.

Based on the available volume in each of the two 300m^3 tanks and by radio communication with the control room, the operator will decide which tank to offload the waste to.

Once the connections are made to the tanker, the operator controls the pumping operation locally until the tanker is empty. This takes approximately one hour.

Circulation loops in both 300m^3 tanks will ensure that the contents of the tank are well mixed prior to transfer to the 20m^3 feeding tank. From the feeding tank the control panel operator in the control room will feed the waste to the furnace at an average rate of approximately 2 tonnes per hour (tph) and up to a maximum of 2.5 tph via two lances in the furnace. The pump will be located in a pump bund local to the tank farm and the line from the pump to the furnace will be carried on an existing overhead pipe rack from the tank farm to the main process building and from there to the furnace. The line will be supported from the structural steel frame of the main process building and on the inside of the building. The line to the furnace will be fully welded with no flanged connections. The same route will also be followed by the line connecting the head spaces of the three tanks which will carry nitrogen/vapours from the tank farm for treatment in the furnace.

This transfer of nitrogen/vapours from the two 300m^3 tanks will occur when overpressure is experienced in the headspace of the tanks, either from temperature increases during the normal course of the day or when one or other of the tanks is being filled. When aqueous waste is being pumped out of the tanks, this will generate a slight under-pressure in the tanks and the nitrogen storage vessel adjacent to the tank farm will fill the head space to maintain a constant nitrogen blanket pressure of approximately 10 – 15 mbar.

A facility for direct injection from the tanker off-loading area to the furnace will also be provided for certain dedicated waste streams or in the event that the tank farm is out of commission for inspection/maintenance. The direct injection process from a tanker will take approximately 12 hours to complete.

As is currently the case under EPA licence requirements, the tanker unloading area design will provide a contained drainage system and stormwater collected in these areas will only be released into the main drainage network after local assessment confirms that there is no contamination present. The new tank farm will be contained within a bund to comply with standard EPA licence requirements and in line with BS 8007.

The feed rate from the tank farm to the furnace will be controlled in the central control room for the plant. The offloading from road tankers to the tank farm will be controlled locally by the operators in the unloading area. The level on each tank will be controlled using level transmitters and overfill protection will be provided via level switches and interlocks. Overpressure in the tanks is managed by forced ventilation to the secondary air system in the furnace. Pressure transmitters and over/underpressure venting devices will also be installed on each tank.

In the event of a build-up of a solvent top-layer in either of the tanks (which can be verified by samples taken from the tanks), both tanks will have the facility to drain off this solvent layer into a tanker which can park in the area adjacent to the nitrogen storage vessel. This tanker can then be sent off site for treatment when full. This loading area can be seen on the left-hand side of **Figure 4.5** above.

The inputs to the tank farm will be hazardous aqueous waste and nitrogen for the blanketing system. The outputs will be hazardous aqueous waste and a nitrogen/vapour mix to the furnace for thermal treatment.

The acceptance, handling and storage systems described above are considered BAT under the BREF reference documents for Waste Treatment and Emissions from Storage.

4.5.4 Hydrogen Generation Unit (HGU)

It is proposed to develop a $10MW_e$ hydrogen generation unit (HGU) for connection to the natural gas transmission/distribution network for mobile hydrogen transport and other potential applications.

The proposed HGU has been designed as an alternative means of generating energy during times of curtailment for export to the national electricity grid. On average, the existing facility is curtailed or prevented from exporting power generated from the steam turbine on site for approximately one thousand hours per year (or 12.5% of the operational time of the plant) due to lack of demand or excess wind generation capacity. As is currently the case, instead of “dumping” or destroying the steam generated from the combustion of waste over the steam turbine by-pass station and air-cooled condensers, it is proposed to generate electricity in the turbine and divert it to a hydrogen generation unit on site. The hydrogen generated can then be either fed into the natural gas grid or stored on site for fuelling trucks, buses and other vehicles that have been either designed or retrofitted to run on hydrogen fuel cells. Hydrogen can also be tankered off-site for industrial use or to fuel distribution centres. When used as a fuel, hydrogen combusts to produce water vapour and hence is a clean fuel.

As already outlined above, the development of the HGU on site will ensure that energy recovered from the combustion of waste is not destroyed when restrictions on the export of electricity are experienced. The location and layout of this unit can be seen on drawing **29043-CD-601** in **Appendix 5.2**. The building housing the equipment will be 33.1m by 24.4m in plan and 11m high (48.5m OD) at the highest point. A rendered view of the building can be seen in **Figure 4.7** below.

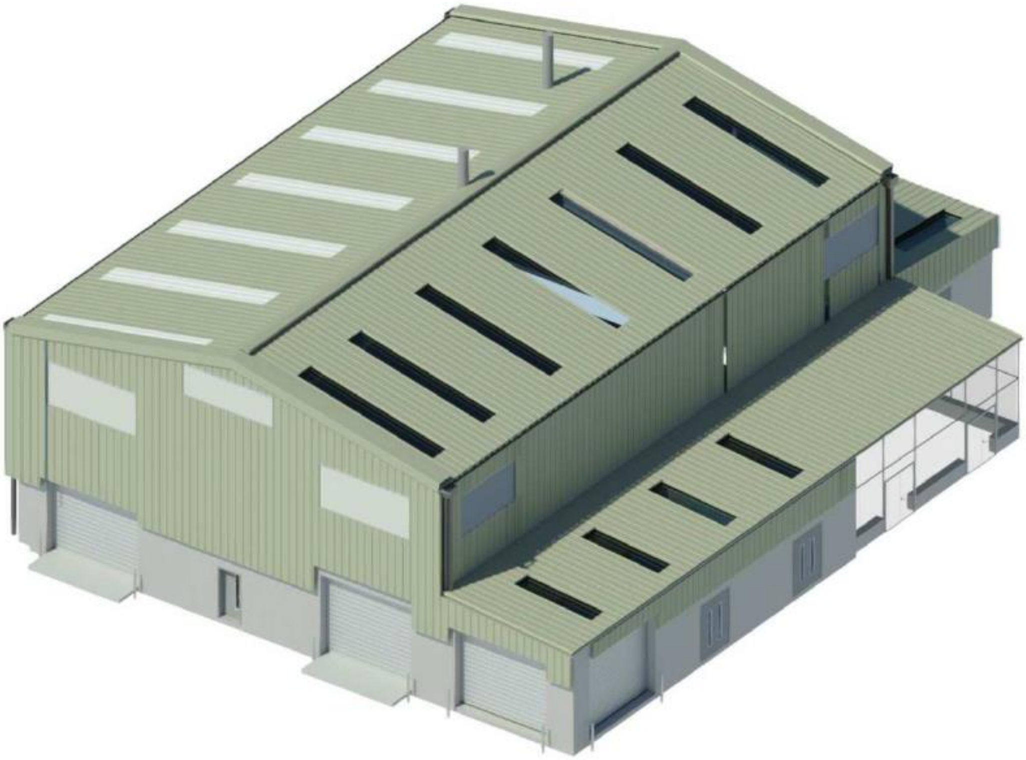


Figure 4.7 Hydrogen Generation Unit

The process employed is alkaline water electrolysis which uses water as the feedstock in the presence of an alkaline solution (Potassium Hydroxide or KOH) to generate hydrogen and oxygen. A schematic of the process is shown in **Figure 4.8**. In short, electrical current is supplied to two electrodes which are submerged in an alkaline – water solution producing Hydrogen at the cathode and Oxygen at the anode. The oxygen and hydrogen sides of the cell are separated by a diaphragm. The layout of the equipment within the building can also be seen below in **Figures 4.9** and **4.10**.

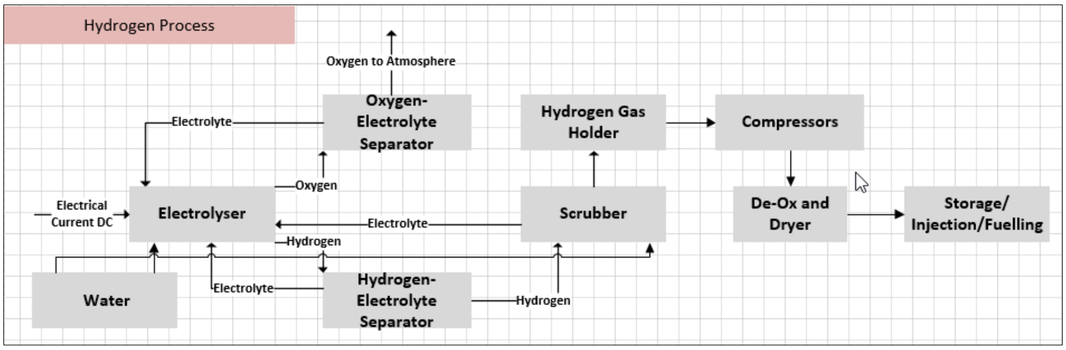


Figure 4.8 Schematic of the alkaline water electrolysis process

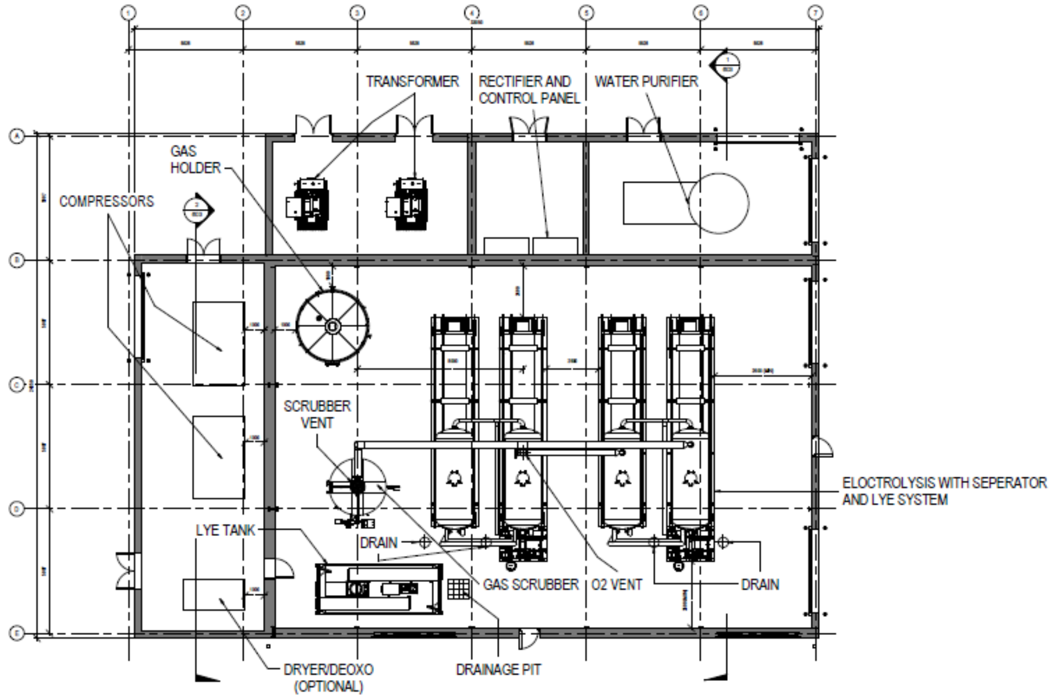


Figure 4.9 Schematic of the layout of the Hydrogen Generation Unit building.

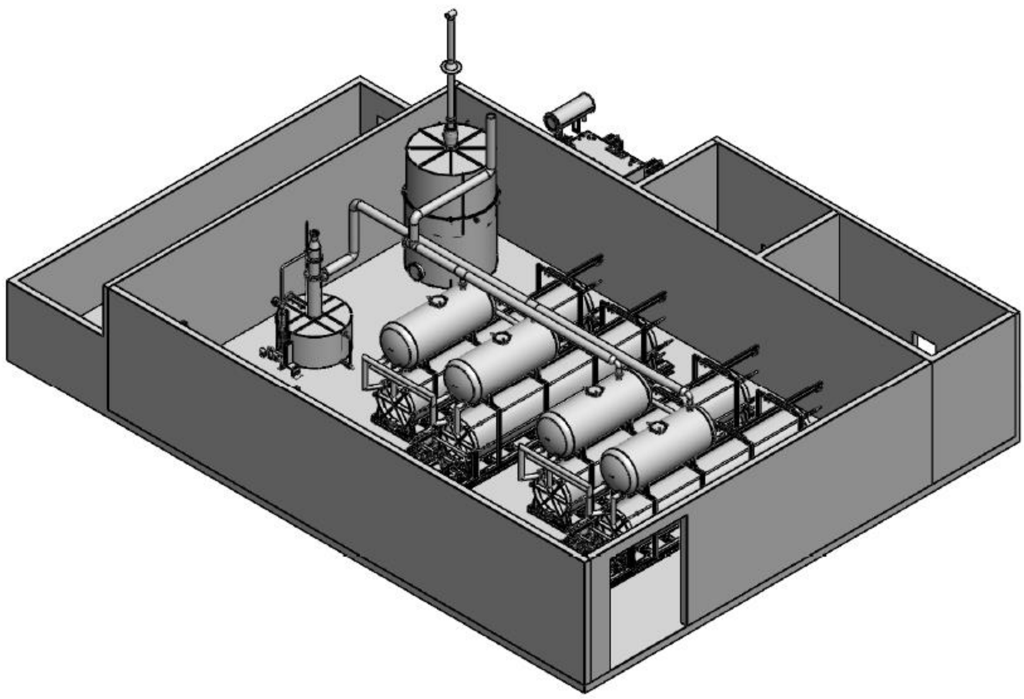


Figure 4.10 Layout (3D view) of equipment inside the HGU.

4.5.4.1 Electrolysis Unit

DC voltage is applied between the first and last electrode, thereby producing a current flow through the cells and gas is produced. The incoming AC supply from the main incomer is converted to DC via the rectifier unit. The gas from each cell is collected in the hydrogen and oxygen flow ducts which run in parallel along the top of each unit and are fed into the gas/electrolyte separators at the front of the electrolyser. The oxygen separator discharges the oxygen to atmosphere at a rate of 1,934 Nm^3/hr and the hydrogen separator sends the hydrogen to the water scrubber. The electrolyte from both separators is then recycled back into the distribution channels in the bottom of the electrolyser unit. The electrolyte is fed to this system from a $50m^3$ storage tank located in the main plant area. This tank will either be a double skinned tank or contained within a bund and the building. The separators are placed directly on top of the electrolyser units.

A series of 4 No. electrolyser units are proposed, all of which are located in the main plant area of the building. Each electrolyser has an electrical consumption of 2.5 MW_e and can produce a total of 1,930 Nm^3/hr of hydrogen or just under 500 Nm^3/hr of hydrogen per electrolyser unit. This equates to 1,930,000 Nm^3 or approximately 160 tonnes of hydrogen per annum, assuming that the unit runs for 1,000 hours per year.

Based on a calorific value of 130 MJ/kg for the produced Hydrogen fuel, the overall efficiency of the process for the conversion of electrical energy into hydrogen is approximately 60%.

The system uses purified water as a feedstock with a consumption rate of 2.2 m^3/hr.

Purified water will be supplied from the existing de-mineralised water system on site. In the event that the quality or supply is not suitable from the existing plant on site, a dedicated water purifier will be fed with process water from the existing plant. The water purifier unit, if required will be located in the northernmost corner of the building.

4.5.4.2 Scrubber Unit

Water is also used in the scrubber unit after the hydrogen/electrolyte separator. The scrubber design provides efficient removal of residual KOH droplets from the hydrogen gas to protect downstream equipment from alkali deposits and corrosion. The scrubber is a conventional, packed column type with counter flow scrubbing of the gas. The unit has a water reservoir at the bottom, the packed bed in the middle and a demister at the top. The gas enters under the packed bed and leaves through the demister located at the top of the packing column. The scrubbing water is sprayed evenly on to the top of the packed bed, collected in the bottom reservoir, and circulated back to the top by the scrubber water circulation pump. A heat exchanger is integrated in the circulation loop to cool the gas. Make-up water intake is directly into the bottom water basin.

The scrubber is made from carbon steel and provided with connections for make-up water inlet; drain; flowmeter; level switches and a differential pressure gauge.

The scrubber basin also acts as the feed water reservoir for the electrolyser and since the electrolyser is topped up with feed water from the scrubber basin, recovery of KOH from the gas is ensured.

There is one level transmitter on the scrubber basin to maintain the level in the basin and to provide alarms if the level goes below normal operating range.

4.5.4.3 Gas Holder

The hydrogen from the scrubber passes next into the gas holder which is a $50m^3$ wet, floating-bell type with a central coaxial sliding guide equipped with low friction material. A water seal is fitted immediately downstream of the gas holder and acts as a condensate drain.

The volume of the gas holder is designed to accommodate the approximate equivalent of the maximum volume of hydrogen produced by the electrolyser in 2-3 minutes. If the gas holder should overfill, the hydrogen will automatically be safely vented to atmosphere.

There is one level transmitter and one level switch which monitor how full the gas holder is. The signal from the level transmitter will be used to steer the rectifier current to increase/decrease hydrogen production to maintain the gas holder level at the chosen set point. In addition, the level transmitter is used to provide service alarms (high & low level) and trip alarms (such as HH=rectifier to zero (min)) when the gas holder level reaches various alarm set-points.

4.5.4.4 Compressor

Finally, a compressor is used to compress the hydrogen gas from the gas holder pressure of 0.02 bar up to the pressure required in the on-site storage tank for mobile hydrogen of 350 bar or to supply the above ground installation (AGI) feeding into the natural gas distribution pipeline which is located between the south-eastern site boundary and the R152 regional road. The storage tank is located on the north side of the hydrogen building and will be a horizontal, cylindrical tank of approximately $100m^3$ capacity. This tank will be capable of storing up to 2 tonnes of hydrogen at a pressure of 350 bar. The AGI for feeding into the natural gas pipeline will be located to the south of the hydrogen building near the south-eastern site boundary. The AGI will be fenced off with restricted access for authorised personnel only.

The compressor will be fitted with a gas recycle loop which returns some of the hydrogen from the compressor outlet back to the inlet side of the compressor (through the inlet side of the scrubber and gas holder). The hydrogen gas recycle volume is automatically adjusted by a control valve in the gas recycle loop and based on a signal from the level instrument installed on the gas holder.

When the hydrogen gas production rate increases, the gas holder bell will tend to rise and the recycle control valve will close. When the hydrogen volume in the gas holder decreases, the recycle control valve increases the recycle flow, returning some of the hydrogen back to the gas holder.

4.5.4.5 De-Oxidiser & Dryer

Depending on the quality of Hydrogen required, a final polishing step may be installed where any residual oxygen or water is reduced to an absolute minimum. Without the polishing step the purity of Hydrogen produced is 99% and when installed qualities of 99.99% can be achieved.

If the polishing step is required, this is achieved by the use of a deoxidiser combined with a dryer unit. Residual oxygen is removed from the hydrogen product gas by the deoxidizer, which is a small catalytic reactor. The catalyst chemically combines all the oxygen present with the hydrogen to form water vapour. This chemical reaction is exothermic and will cause a temperature rise of approximately 16°C for each 0.1% of oxygen removed.

The inlet gas to the deoxidizer is saturated and as moisture inhibits the functioning of the catalyst, the gas is electrically pre-heated to a temperature well above dew point. When the deoxidizer reaches the operating temperature, the heater is switched off.

Temperature rise across the deoxidizer gives an accurate measurement of the oxygen content in the hydrogen gas and in case of a high temperature on the outlet of the deoxidizer, which indicates high oxygen content in the hydrogen; the whole plant is automatically shut down.

There are two temperature transmitters on the deoxidizer pre-heater; one to control the temperature, and one to provide high (H) and high-high (HH) temperature alarm functions.

The pre-heated hydrogen then enters the catalytic deoxidizer column. This contains a palladium catalyst which promotes the reaction of hydrogen with residual oxygen in the gas stream. The reaction is exothermic, producing a temperature rise in the gas. There is also a temperature transmitter on the deoxidizer outlet. The increase in temperature from the pre-heater inlet to the deoxidizer outlet is used to calculate the initial oxygen content of the gas. If it is found to be higher than 1% the plant is brought to a stop by an interlock.

The gas is then dried in a twin tower gas dryer where the gas is passed over a bed of water vapour adsorbent. The adsorbent has a limited water adsorption capacity and consequently a twin tower dryer is used. Whilst one tower is drying the gas, the other tower is regenerated.

Drying of the adsorbent is carried out by a small flow of dried gas which is heated by an electric heater. On completion of the regeneration period, the adsorbent is allowed to cool before the regenerated tower is switched back to gas drying mode. The regeneration sequencing and the valve operation of the dryer unit is automatically controlled, and a complete cycle takes approximately 6 hours giving very little wear on valves etc. There is no loss of product gas during the regeneration cycle as the gas used for regeneration is re-circulated internally in the dryer.

4.5.4.6 Inputs & Outputs

The inputs to the hydrogen generation unit are electricity ($10MW_e$), de-mineralised water (2.2 m^3/h) mixed with a fixed amount of electrolyte (Potassium Hydroxide) for the production of hydrogen, cooling water for cooling the scrubber and electrolyte streams and cooling of the oxygen prior to discharge to air.

Outputs from the hydrogen generation unit will be oxygen (1,934 Nm^3/h) to atmosphere, hydrogen (1,930 Nm^3/h) for storage or injection into the gas grid, warmer air from cooling circuits and condensed water vapour to drain from the polishing stages (deoxidiser and dryers) if installed.

The efficiency factor that describes the ratio of energy input to thermal output of the produced hydrogen is approximately 60%.

Drainage from the roof of this building will be via the existing rainwater system on the site. Any spills or leaks from the process will be contained within the building and discharged to the existing spill water tank on site.

4.5.4.7 Mobile Hydrogen Storage & Transfer

Hydrogen will be stored for re-fuelling of buses, and HGV's or for bulk transport off-site to fuelling stations. As discussed in **Section 4.4.3.4**, the storage tank will be 100m^3 in capacity and will be horizontal, cylindrical and with dished ends. Normal operating pressure in the tank will be 350 bar and this tank will be capable of storing up to a maximum of 2 tonnes of hydrogen. The tank will be located to the north of the hydrogen building.

A concrete-surfaced re-fuelling area at the western end of the hydrogen unit will be provided to facilitate fuelling of truck, buses and bulk hydrogen transport tankers. This area will be equipped with a pressure reducing station, hoses and connections for fuelling of trucks and buses and with a separate set of hoses and connections for filling high pressure bulk hydrogen transport tankers.

Drainage from paved areas serving this area will be drained via a forecourt interceptor and silt trap prior to being discharged to the existing stormwater system on the site.

4.5.5 Bottom Ash Storage Building

It is proposed to develop a bottom ash storage building for the storage of up to 5,000 tonnes of bottom ash which is produced on site. This facility will provide the flexibility to export bottom ash to continental Europe for recovery in the event that there are no bottom ash recycling plants developed in the next five to ten years. The need for such a facility has been outlined in **Chapter 2 *Policy & Planning Framework and Need for the Scheme***. It will have the capacity to store up to 5,000 tonnes of bottom ash at a time and can facilitate the export of all of the ash produced in approximately 12 shipments per year out of the Port of Drogheda.

The bottom ash storage building will be located in the north-western corner of the site.

The location and layout of this building is shown on drawings **29043-CD-003** and **29043-CD-501** in **Appendix 5.2**. The building is for bottom ash produced by the plant which will be transported by truck from the bottom ash hall on site on a daily basis. The storage on site is to facilitate export of the bottom ash for recovery to mainland Europe in the event that there are no bottom ash recovery plants developed within the state. Bottom ash would be exported via ship out of Drogheda Port approximately 12 times per year, each with a capacity of 3,000 tonnes. Covered trucks would bring the bottom ash from the site to Drogheda Port for loading into a vessel, typically over a two or three-day period for each shipment. Further details on the uses and destinations of bottom ash offsite are provided in **Section 16.5.3.10** of **Chapter 16** ***Material Assets.***

The building will be 60m by 25m in plan with a single sloped roof of 14m height to accommodate tipping trucks at the highest point (44.29m OD) to 10m height at the back of the building. A large concrete yard area to the south-east of the building is also proposed (55m by 35m in plan) which will allow for circulation of trucks transporting ash to and from the building, access for trucks to the contained parking area (see **Section 4.5.8** below) and for deliveries to the new warehouse located to the south-east. There are four entrances provided for truck access to the building from the concrete yard area along the length of the front of the building. Inside, on three sides, a re-enforced concrete wall to a height of 6m will provide strength and containment for the bottom ash stored. The maximum storage capacity of the building for bottom ash will be approximately 5,000 tonnes. **Figure 4.11** below shows the orientation and appearance of the building.

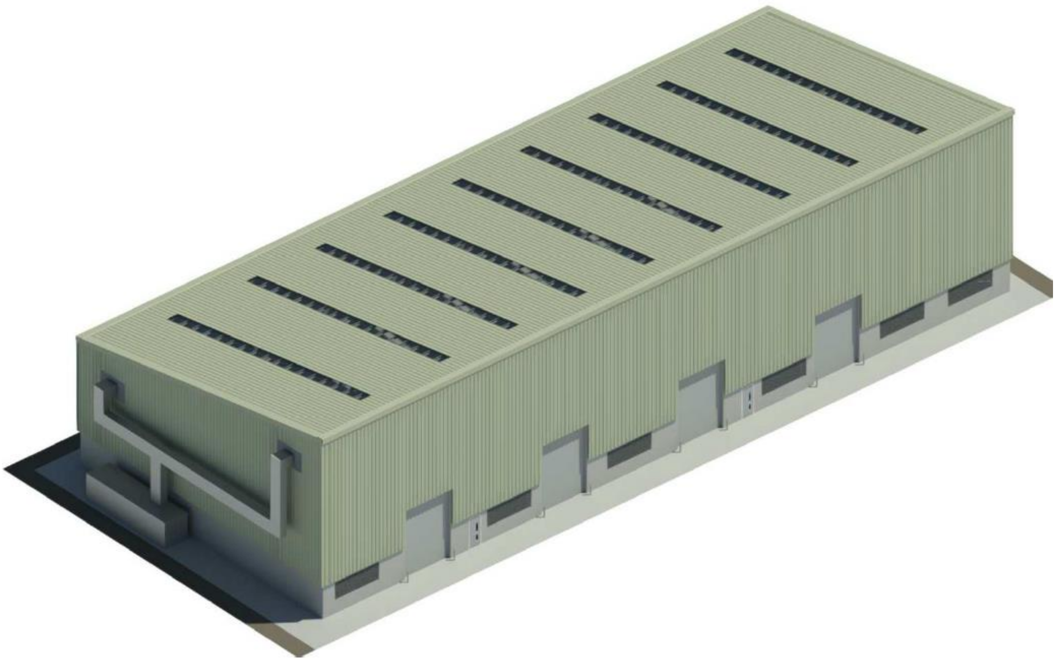


Figure 4.11: Bottom Ash Storage Building

Trucks carrying the bottom ash from the ash hall on site will reverse into one of the four doorways and tip the ash onto the concrete floor of the storage building. A front loader will then move the ash into the ash pile and clear the tipping area for the next truck to arrive. This process will be repeated until the area is full.

When an export shipment is planned, trucks will be loaded by the loading shovel and sent off site to Drogheda Port where a vessel will be loaded with approximately 3,000 tonnes of bottom ash over a two or three day period. All trucks leaving the site for the port will be weighed on the weighbridge. When there are no truck movements in or out of the building, the four access doors will remain shut.

Although the bottom ash is wet when extracted from the furnace, storage of this material for periods of weeks or months will result in the remaining water to evaporate, i.e. drying. Therefore, the entire building will be ventilated by air extraction through a particle filtration system at the southern end and outside the building. Fresh air will enter through vents at the northern end of the building and will be extracted via ducting on the southern end as shown in **Figure 4.11** above. Any residual water from the storage of the wet bottom ash will remain on the concrete floor of the storage building where it will be contained until evaporated.

As the export of this material would involve movement to another EU country, the requirements of Regulation (EC) No 1013/2006 of 2006 on shipments of waste would also need to be adhered to. Refer to **Section 4.10.4** for further details.

Inputs to the building will be bottom ash. Outputs will be air from the filtered air extraction system and bottom ash for export. The design this storage and handling building is considered BAT under the BREF for Emissions from Storage.

Rainwater collected from the roof area will be drained directly to the existing stormwater system on site.

Paved areas outside the building will be drained via a forecourt interceptor and silt trap prior to being discharged to the existing stormwater system on the site.

This building may also be used for annual waste surveys and detailed waste audits and inspections on incoming deliveries. Waste surveys involve the sampling and sorting of municipal waste and are carried out over a 3 – 5 day period. Detailed inspections may be carried out during an intensified period (1 – 2 weeks) of audits for conformity with incoming municipal waste deliveries. This activity involves tipping a waste load onto the ground and checking for oversized material or non-conforming waste prior to re-loading the truck with a loading shovel or telescopic forklift.

4.5.6 Residue Acceptance & Storage for Pre-Treatment

It is proposed to increase the capacity of the existing ash pre-treatment facility (for the acceptance of third-party boiler ash and flue gas cleaning residues) by 30,000 tonnes per annum. Acceptance of such residues would be conditional on an analysis to check that the licence or permit requirements at the saltmine in Northern Ireland can be complied with. Further, the requirements of Regulation (EC) No 1013/2006 of 2006 on shipment of waste would also need to be adhered to (as is currently the case for the existing scenario) Refer to **Section 4.10.4** for further details.

The additional infrastructure proposed for the acceptance of this material and other similar residues from other thermal treatment plants on the island of Ireland will comprise three silos housed within the main process building and an unloading area for tankers delivering this material outside the main process building. The residues will then be processed in the existing pre-treatment plant on site (as described in **Section 4.4.4** above) for export for recovery to a saltmine in Northern Ireland.

Currently, 25,000 tpa of third-party residues similar to those produced at the Meath facility are exported to Germany and Norway. This proposal would reduce the transport distances for the sustainable treatment of these residues.

Boiler ash, flue gas cleaning residues (FGCR) and similar residues from thermal treatment processes (e.g. kiln dust if available in the market) will be accepted and unloaded to one of three new silos located within the process building (refer to area 11 in **Figure 4.1** "Existing Site Layout"). Two silos will be dedicated for FGCR acceptance (approx. 200m^3 each) and one for boiler ash (BA) and other residues (approx. 100m^3). The ash will be delivered in enclosed tankers and are offloaded to the silos pneumatically. The same method is currently used for unloading consumables. Filtration systems on the silos will mitigate against dust emissions during the unloading operation. A new concrete area will be provided for these unloading operations at the northern end of the main process building as shown in drawing **29043-CD-003**, refer to **Appendix 5.2** in **Volume 3**. Rainwater from this area will be contained and, if deemed clean, will be released into the internal water collection system within the main process building, which drains to the spilled water tank on site for re-use in the process.

From the silos, the residues will be transported in enclosed conveyors to the pre-treatment plant and mixed with water in specific proportions in the pre-treatment plant (as described in **Section 4.4.4** above), which has been permitted previously under ABP planning (Ref. PL17.PM0007).

Once mixed, the cement-like product is discharged into 1m^3 flexible intermediate bulk container (FIBC) bags. The bags are then sent to a saltmine in Carrickfergus, Northern Ireland for recovery (Permit No. P0547/16A).

It is anticipated that a maximum of 30,000 tonnes per annum of residues will be accepted on site for treatment in the pre-treatment plant.

Inputs to the storage silos will be residues and compressed air. Outputs will be clean air from the dust filtrations unit on each silo and residues to the pre-treatment plant on site. The design of these silos is considered BAT under the BREF for Emissions from Storage.

4.5.7 Warehouse, Workshop & Office/ERT Building

It is proposed that the existing warehouse and workshop building on site will be re-purposed and the warehousing and workshop functions will be re-located to a new two storey building which will also include additional office accommodation for staff on site, Emergency Response Team (ERT) equipment and staff facilities including changing area, toilets and showers.

The building will be split into three separate areas to accommodate the warehouse, workshop and office/ERT functions. The location and layout of this building is shown on drawings **29043-CD-003** and **29043-CD-401** in **Appendix 5.2** of **Volume 3**.

The warehouse will comprise a goods-in and -out area, a small office for the warehouse technician and racking/storage spaces for spare parts associated with the operation and maintenance of the entire facility. This area is 15m by 17m in plan and 10m high (40.29m OD).

The workshop is dedicated to the mechanical maintenance team and will house welding equipment, grinders, cutting equipment for use on work benches or in a welding booth all located on the ground floor. A mezzanine office area will be provided for the mechanical maintenance team leader and staff. This part of the building will be 10m by 17m in plan and 10m high (40.29m OD).

The existing warehouse and workshop building will be re-purposed to store FIBC bags ready for shipment from the existing residues pre-treatment plant on site, in advance of shipment off site. The existing office area within this building will be re-purposed as a small laboratory area for sample collection, preparation and testing associated with the pre-treatment plant for residues and the incoming aqueous hazardous waste streams.

The proposed office and ERT area will accommodate up to ten additional Indaver staff with a locker room, showers, offices and meeting room for both the Indaver staff and permanent contractors on site.

This two-storey section of the building will be 6.5m by 17m in plan and 10m high (40.29m OD). A plant room will also be provided for the building services and utilities required.

The ERT area, showers/locker area and the plant room will be on the ground floor. A corridor with staircase will provide access to both the mezzanine office area above the mechanical workshop and the meeting room and general office area. Details of the layout of these areas can be seen on drawing **29043-CD-401** in **Appendix 5.2** of **Volume 3** of this EIAR.

Foul effluent will be drained to the existing on-site treatment and percolation system existing on site. Refer to drawing **29043-CD-015** in **Appendix 5.2** for location of same.

As is currently the case under EPA licence requirements, drainage from the roof of this building will be to the main stormwater network on site. Any spills or leaks from the warehouse or workshop will be contained by the concrete floor areas within the building.

4.5.8 New concrete yard area and container/trailer/tanker parking area

This proposed area (approximately 70m x 35m) is to facilitate access and vehicular movements in and out of the bottom ash storage building and for deliveries to the warehouse. The yard area will be of a re-enforced concrete construction.

Part of this concrete area (15m x 35m) will be a dedicated spill control zone for the parking of containers, trailers and tankers associated with aqueous waste deliveries and the transport of residues in containers and pre-treated residues in trailers off-site. The design of the concrete will facilitate double-stacking of shipping containers if required.

As is currently the case under EPA licence requirements, this parking area (15m x 35m) will be constructed so as to control any spillages that may occur. Subject to testing, any liquid falling in this area will be retained until deemed clean. If there is contamination, the water can be transferred to the aqueous waste tank farm on site for recovery or removed for disposal off-site via a collection sump. Clean water will be discharged to the stormwater system on site.

4.5.9 Modular Office Re-construction & Car Park Extension

It is proposed to demolish and re-build an existing single storey modular office building (see **Figure 4.12**) on site with a new permanent single storey office and staff welfare building. This new building will have a slightly increased footprint in place of the old building. The location and layout (47.45m x 12.9m x 4.7m) of this building is shown on drawings **29043-CD-003** and **29043-CD-701**, refer to **Appendix 5.2** of **Volume 3**.

The existing modular building (33m x 12m x 4.7m) was erected for the purpose of housing staff during the construction, commissioning and warranty period of the plant and was made a permanent feature on the site by planning permission in 2014 by the parent strategic infrastructure development (SID) permission for the site 17.PA0026. This included provision for 22 visiting staff to be accommodated in the building.

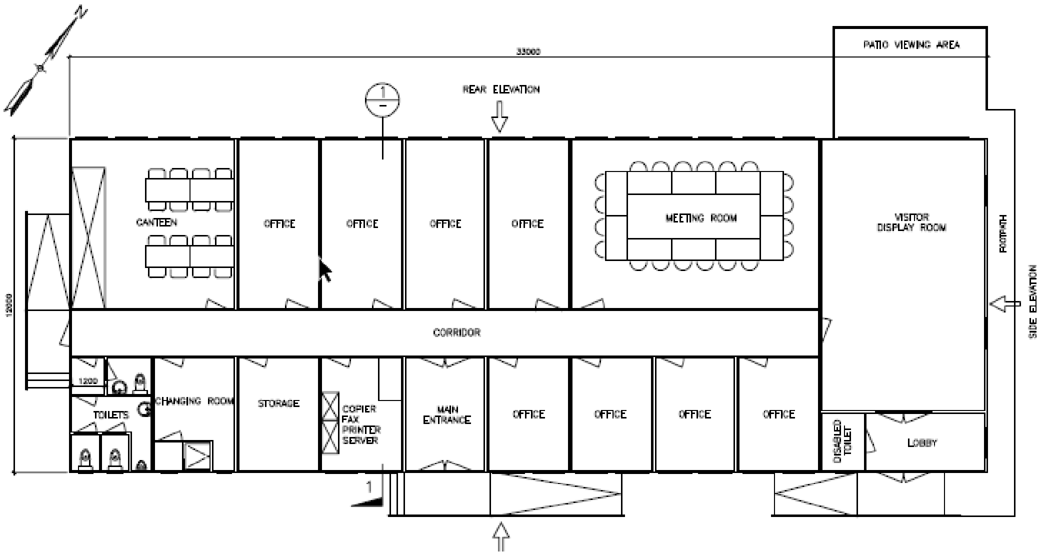


Figure 4.12: Existing office layout

The re-built office will accommodate a total of 23 staff (one additional to that already permitted) and provide a wellness centre, locker room, canteen and meeting facilities for the Indaver staff and permanent contractors on site, refer to **Figure 4.13** below.

Additional car parking spaces are also proposed to accommodate the additional staff and also to facilitate visitors and contractors to the site. Details of the car park extension are presented on drawing **29043-CD-003** (**Appendix 5.2** of **Volume 3**) and is marked as area 18 on **Figure 4.3** above.

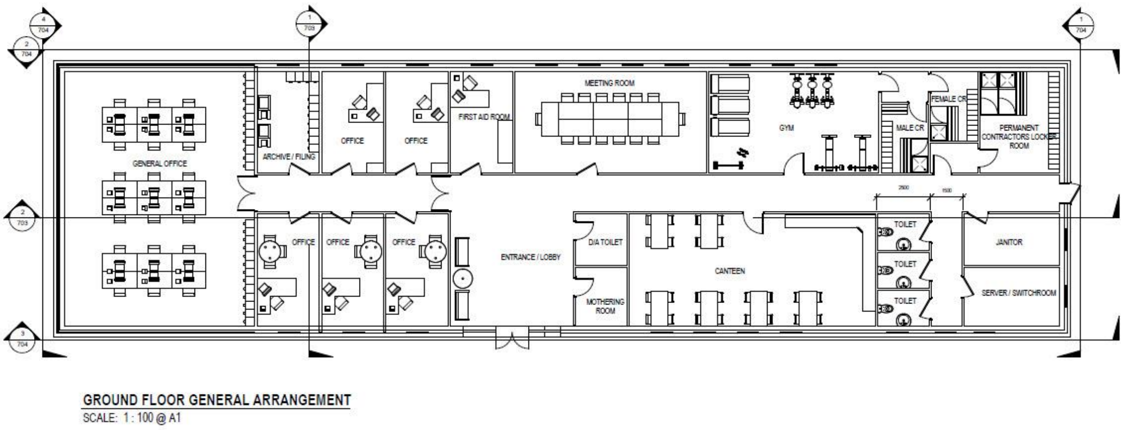


Figure 4.13: Proposed office layout showing 18 people in open plan plus five individual offices

As is currently the case under EPA licence requirements, roof drainage from the office building and paved areas will drain to the existing stormwater drainage system on site. Foul effluent will be drained to a new on-site treatment and percolation system similar to the system already existing on site. Refer to drawing **29043-CD-016** (**Appendix 5.2** of **Volume 3**) for location of same.

As is currently the case under EPA licence requirements, drainage from the extension to the car park will be installed as an extension to the existing car park drainage.

4.5.10 Miscellaneous site upgrades

As part of the project there will be a series of miscellaneous site upgrades to improve the workings of the site in general. The locations of these upgrades are shown on drawing **29043-CD-003** and will consist of the following:

- Provision of a weather canopy to the pre-treatment and residue loading area located on the south-western side of this area. This canopy will consist of a steel and roofing structure approximately 13m x 17m at a height of approximately 12m (42. 5m OD). A separate drawing **29043-CD-801** (**Appendix 5.2** of **Volume 3**) shows this detail. This area will be open sided and used as a weather shield for operatives handling bags of pre-treated residue prior to loading onto curtain-sided vehicles for transport off site.
- Provision of concrete hardstands to the eastern end of the process building for parking lorries.
- Alterations to the hardstands and approach roads to the waste delivery reception hall at the west side of the process building. These changes will improve the circulation of the vehicles and reduce the likelihood of traffic conflicts.

- Provision of a concrete hardstand between the aero condenser structure and the electricity import/export substation. This area will provide for empty trailer parking and loading with pre-treated residues in addition to space for reversing manoeuvres.
- Reconfiguration of the landscaping and berming adjacent to the proposed hydrogen generation building is proposed. This reconfiguration will serve to improve the visual screening characteristics of the landscaping and also serve to reduce the amount of material to be removed from the site during the construction phase.
- Extension of the existing berm at the south-eastern site boundary adjacent to the R152 regional road. The extension will cover an additional 25m and will match the height of the existing berm. This will provide additional screening of the site from the R152. Landscaping will be completed to match that which is already in place.
- Repurposing of the existing temporary trailer park at the southern end of the site (adjacent to the R152) to a dedicated permanent contractors compound is proposed. On completion, this compound will provide welfare facilities and space for contractor facilities during maintenance and construction works in the future. The toilet block will be a permanent feature with a new dedicated treatment plant which will tie into the existing percolation area servicing the gatehouse.

  The compound will be fenced which will also secure it from the main Indaver site. Vehicle access to the compound will be via a paved approach road from the main site entrance. Vehicle access to the Indaver site will be via the existing site security system whilst personnel access will be via a new personnel route through a security turnstile serving the compound.
- Provision will be made for a personnel access route from the process building to the proposed office building, HGU and the contractors compound. This will include the construction of a concrete stairs between the process building level and the office building level, laying of footpaths and the installation of a security turnstile to control access on the site from the contractors compound.

4.6 Stormwater & Firewater Management for the proposed development

4.6.1 Stormwater Management

Runoff during the construction phases will be directed towards temporary soak pits lined with geotextile for filtration purposes prior to its discharge to the stormwater drainage network. This is described in more detail in **Chapter 5 *Construction Activities*** of this EIAR. Details for the operational phase of the proposed development are outlined below.

4.6.1.1 Site Drainage

The stormwater drainage system for the proposed development will collect rainwater from all roofs, hardstands, roads and grassed areas which fall naturally towards hardstand areas. These areas (in addition to the existing developed areas of the site) will amount to approximately 4.9Ha. Approximately 5.1Ha of the site will continue to drain naturally and have not been catered for under the proposed stormwater drainage system.

The stormwater runoff from the new areas will discharge into the existing stormwater system on site. The current system is attenuated at the point of discharge to the watercourse located at the north west corner of the site as described in **Section 4.3.1** above.

Any spills or wash waters generated within the HGU building will be contained and directed to the existing spilled water tank on site.

The proposed stormwater drainage system is outlined in **Figure 4.14** below with the new elements highlighted in green. Full details of the proposed drainage network are included in drawing **29043-CD-015** in **Appendix 5.2** of **Volume 3**.

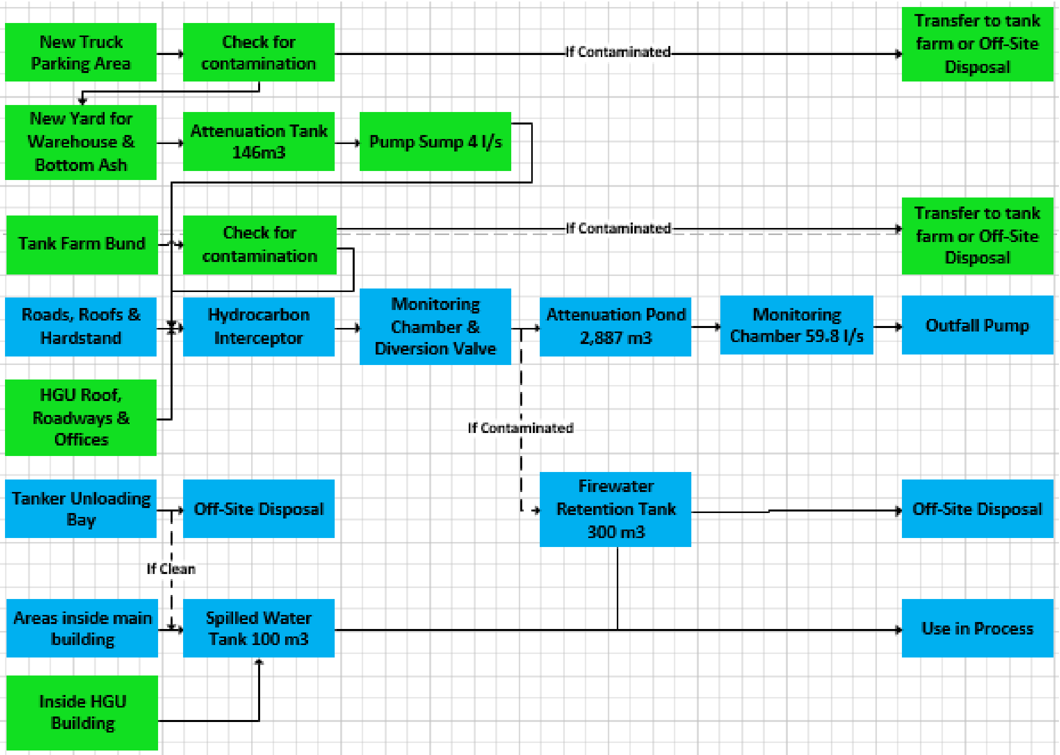


Figure 4.14 Proposed Stormwater Drainage System Flow Diagram.

4.6.1.2 New Concrete Yard Area

The existing stormwater drainage network was evaluated with a view to extend the network to the new concrete yard area. It was determined that due to the existing levels and the need to control the rate of discharge from this area that this was not possible. The design solution is to attenuate the stormwater run-off to a tank with a pumping chamber located under the slab area from where it will be pumped to the nearest existing manhole chamber.

The proposed attenuation tank is a Microstrain stormtech MC4500 type designed for a 30-year return period with a volume of 146m^3. In addition, the proposed system will offer the site additional attenuation volume and the ability to manage any potential for contaminated run-off from the bottom ash storage building and truck parking area.

Two submersible pumps will be utilised in the pumping chamber, a duty pump and a standby pump to ensure continuous operation. The pump will operate at a maximum rate of 4 litres per second. Level control devices fitted in the tank will switch on and off the pump as required.

Design characteristics

The design of the existing network been validated using a Standard Average Annual Rainfall (SAAR) for the region Rainfall = 802mm.

Using this figure combined with a factor for climate change and calculating the impermeable developed area of the site along with landscaped areas that would contribute to run-off, a required attenuation volume is calculated using a site-specific model of maximum rainfall and allowable run-off over a given period of time. The retention capacity required for a 1 in 100-year storm for both the existing and proposed development is calculated in **Tables 4.5** and **4.6** below.

Table 4.5 Current design for stormwater attenuation on-site.

Stormwater Attenuation - Existing	
Current developed Area	2.67 Ha
Contributing Current Landscaped Area	0.84 Ha
Total Current Area:	3.51 Ha
Attenuation storage requirements (including allowance for Climate change)	**1,649 m^3**
Capacity of the existing attenuation pond	**2,887m^3**

The above table demonstrates the spare capacity that exists in the current facility design.

Table 4.6 Design post development for stormwater attenuation on-site.

Stormwater Attenuation – Proposed	
Proposed and current developed Area	3.8 Ha
Proposed and current contributing Landscaped Area	1.02 Ha
Total proposed and current Area	4.82 Ha
Attenuation storage requirements (incl. allowance for climate change)	**2,370 m^3**
Capacity of the existing attenuation pond	2,887 m^3
Capacity of the proposed attenuation tank under concrete yard	146 m^3
Total proposed attenuation capacity	**3,033 m^3**

Based on the above calculations, the existing infrastructure has the capacity to attenuate the additional stormwater run-off.

4.6.2 Fire water management

The greatest potential for fire for the proposed development arises within the tank farm bund.

This bund has been sized to cater for a number of scenarios as follows:

- Tank rupture – the bund volume has been sized to meet the EPA requirements of 110% of the largest tank volume or 25% of the total storage volumes.
- Fire in the bund – the bund volume has been sized to cater for the rupture of the largest tank plus a 150m^3 fire water volume. Excess fire water run-off will be directed to the 300m^3 retention tank as outlined below.

Whilst the risk of fire occurring elsewhere in the process building or other buildings on site is low, contaminated run-off resulting from all other firefighting operations will be contained by collection in the stormwater drainage system and draining to both the contaminated water tank (approx. 300m^3) and by overflow when full to the attenuation pond (approx. 2,887m^3).

This is achieved by the provision of an actuated valve which automatically diverts contaminated firewater to the 300m^3 tank. This water will be stored for removal from site for disposal or for transfer to the tank farm for treatment in the furnace. The volume provided will provide adequate capacity to store both the firefighting water and rainfall that may occur during a fire.

4.6.3 Sanitary Services

Current foul effluent management systems on site consist of effluent discharge via the foul drainage system to the on-site effluent treatment systems which will then pass through percolation areas to ground. It is proposed to extend this system to deal with the proposed development.

Domestic effluent from new toilets, showers, sinks and coffee stations etc. will be dealt with as follows:

- New ERT/office area – to be drained to the existing treatment system and percolation area located on the northern boundary of the site (refer to drawing **29043-CD-003** in **Appendix 5.2** of **Volume 3** for location);
- New Office Re-build - to be drained to the new treatment system and percolation area located to the south west of the proposed office building (refer to drawings **29043-CD-003** & **29043-CD-016** in **Appendix 5.2** of **Volume 3** for details);
- New Contractors toilet facilities - to be drained to the new treatment system and existing percolation area located to the west and the north of the new toilet block respectively (refer to drawing **29043-CD-018** in **Appendix 5.2** of **Volume 3** for details);
- New Tank Farm – not applicable;
- New Bottom Ash storage building – not applicable;
- New Warehouse – not applicable;
- New Workshop – not applicable.

4.6.4 Process Effluent

There is no process effluent generated by the proposed development. Any wash waters or spills generated by materials handling inside buildings of the proposed development will be retained and either collected for treatment in the waste to energy plant or sent off-site.

4.7 Additional site services requirements

The additional utility requirements to support the proposed developments on site are outlined under the individual headings detailed below.

4.7.1 Water

A new supply from the existing de-mineralised water system or process water system on site will be brought to the Hydrogen Generation Unit (HGU) to feed the electrolysis units. An hourly flowrate of 2.2 m^3/hour is required to feed the unit when running at full capacity. The current abstraction rate for the site is approximately 9m^3 per hour. This is not a significant demand based on the groundwater well production volumes that are available which can provide in excess of 300m^3 per day.

Water for domestic use in the warehouse/workshop/office building and in the rebuilt offices on site will be provided from the existing networks that are already in place. The increase in demand will be of the order of 200 litres per hour and is solely related to domestic usage by staff in these areas.

Water requirements are discussed in more detail in **Chapter 16 *Material Assets***.

4.7.2 Electricity

A new cable supplying 10MW_e to the HGU will be provided in underground ducts from the 10kV side of the main transformer compound on site to the HGU. Switchgear and protections will be installed in the electrical room at the HGU on the main incomer. As discussed in Section 4.4.3 the HGU will be powered from electricity generated on-site from the WtE plant process.

Domestic power, lighting and any plant requirements (extraction fans, arc welders etc.) to the other buildings and areas on the site will be provided from the main plant switchrooms at 400V.

All of the electricity requirements for the proposed development will be met by the existing generation capacity on site and are further detailed in **Chapter 16** ***Material Assets***.

4.7.3 Gas

A connection to the natural gas grid via the AGI proposed and the existing distribution gas main in the R152 adjacent to the site will be required for feeding the hydrogen produced by the HGU into the natural gas network.

An application has been made to GNI and discussions are underway in relation to the technical details and requirements for such a connection (refer to **Section 16.5.2.7** of **Chapter 16** ***Material Assets***).

4.7.4 Telecoms

Telecoms will be provided from the existing fibre ring network that exists on site to the new buildings and areas that require such connections. There will be no additional connectivity required for the operational phase but there will be some temporary wireless services sought and provided for the construction phase.

4.8 Commissioning

Following completion of construction and installation of equipment, and before operation of the facility commences, there will be a testing and commissioning phase. This phase will comprise:

- Installation compliance checks;
- Commissioning tests;
- Performance demonstration tests.

4.8.1 Installation Compliance Checks

This will be a process of systematically checking that all systems and equipment have been constructed, assembled, aligned and installed correctly, in accordance with the design specifications and drawings, and that all interconnecting pipe work, cabling and wiring has been installed in compliance with the design specifications and drawings. This phase will also include the Statutory Compliance certification required under the BCMS System.

4.8.2 Commissioning Tests

The function of each item of equipment and each system will be tested and verified, in a systematic manner, as being in accordance with the design and specifications. All the alarm and control systems and instrumentation will be tested to demonstrate that they are functioning correctly. Following these tests, each system will be checked to ensure that it is ready to be commissioned under operating conditions including using real materials, temperatures, pressures and voltages.

4.8.3 Performance Demonstration Tests

The facility's safety and fire prevention systems and the emission monitoring systems will be subject to the same rigorous testing protocols as the other systems in the plant.

In this commissioning phase, the individual items of equipment and systems will be tested under operating conditions using the materials, pressures and voltages to which they will be subjected when in operation.

Once the operation of all equipment and systems have been tested and verified individually, they will be integrated, and the operation of complete systems will be tested.

4.9 Health, Safety and Environmental Aspects

4.9.1 Operational Safety and Environmental Management

Indaver have an integrated Quality, Environmental and Safety & Health (QESH) management system. The Quality, Environmental or the Health & Safety Management Systems for the facility were certified by NSAI to the Quality Standard, ISO 9001:2015, the Environmental Standard ISO 14001:2015 and Occupational Health and Safety Standards OHSAS 1801:2007 in August 2017. All three Standards remain valid until August 2020.Indaver undergoes an annual audit and re-certification process to maintain these ISO certifications.

The objectives and targets for the facility are set out in the Indaver Goals and Plan Book Action (part of Indaver's Environmental Management Programme agreed with the EPA in 2012). Actions are added and closed on an ongoing basis and further details of these are included in the AER for the facility, published by the EPA under licence number W0162-03.

The proposed development, once constructed, will be incorporated into this management system.

4.9.2 Fire Prevention and Emergency Response

During the detailed design phase of the existing plant, hazard and operability (HAZOP) studies were carried out to assess hazards that could arise during both steady and non-steady state operations and identified the necessary mitigation measures required. Based on these studies, a comprehensive set of operating procedures have been drawn up for all aspects of the operation of the plant, to minimise the risk of accident or emergency situations arising.

The same procedure will apply during the detailed design phase of the hydrogen generation unit and tank farm. A HAZOP will be carried out that will determine all required safety measures.

A Hazard Identification exercise has also been carried out for the entire site, covering the risks presented by the existing activities and the new risk presented by the proposed development, specifically the new bulk storage facility at the site. This exercise is included as **Appendix 17.1** to **Chapter 17** ***Major Accidents & Disasters***. The risk reduction and mitigation measures resulting from this exercise are summarised in **Section 17.6.2**.

A comprehensive Site Emergency Plan has been developed for the existing facility (see **Appendix B** of the **Appendix 5.1** ***Construction Environmental Management Plan*** (CEMP) in **Volume 3** of this EIAR). The plan sets out the response measures to be taken by personnel in the event of an emergency.

Measures have been designed to ensure maximum protection for site employees, visitors and people in other premises near the site to limit damage to property and minimise the impact of site operations on the environment. A dedicated Emergency Response Team have been appointed to respond to any emergency which may arise.

The new elements of the proposed development will be incorporated into a revision of the Site Emergency Plan once operational.

4.9.3 Prevention of Accidental Emission or Spillage

All waters produced from wash down etc., and any leaks/spills within the process building are directed to the spill water tank with a capacity of $100m^3$. Water from this tank will be used to supplement process water requirements or will be transported off-site for treatment or disposal to an appropriately permitted or licensed facility. There is no process effluent discharged from the facility.

Bulk tanks containing hazardous materials (ammonia, diesel fuel oil) are double skinned and equipped with interstitial leak detection. The tanks are also fitted with level monitoring and overfill protection. Pipe work from the bulk tanks is located over-ground, over paved areas and undergoes regular visual inspection.

There is a designated bulk tanker unloading area for diesel and ammonia which is graded towards an ACO channel. Prior to unloading a diversion valve on the stormwater drainage system is activated which diverts the drainage from the ACO channel to an underground Retention Forecourt Separator. This ensures that during tanker unloading any spills/leaks are contained within the unloading area and underground separator. Any contained spills of hazardous materials will be treated appropriately.

All other hazardous materials on site are stored in smaller quantities (e.g. 200L drums, IBCs etc.) in individual bunded areas (e.g. spill pallets, trays, chemical storage cabinets) to contain any spills/leaks.

4.9.4 Indaver Environmental Policy

Indaver is committed to its QESH policy that demonstrate concern for people, safety and the environment.

Hazards are managed and risks are mitigated by identifying the major accident scenarios and where applicable, maintaining a major accident prevention policy in accordance with the current European Seveso Directive, (as transposed into Irish and UK legislation). It should be noted that the subject site including the proposed development do not fall within the scope of this Directive.

In addition, the environmental aspects and health and safety hazards associated with our activities are to be identified, action on the identified hazards using the hierarchy of controls to be taken, and a commitment to the protection of the environment and the prevention of pollution from our activities to be ensured.

Before committing capital expenditure or entering into any new business ventures, the impact on the environment is to be considered fully.

4.9.5 Environmental Management Programme

As required by its Industrial Emissions (IE) licence, Indaver prepares an Annual Environmental Report (AER) for submission to the EPA. The AER brings together, in one document, all the individual reports required under the IE licence.

Indaver prepares an annual Environmental Management Programme (EMP), which is formally reviewed at senior management level during the management review. This programme is included in the AER. The programme addresses the requirements of Indaver's IE licence. Targets are set, for between one and five years, for the programme objectives.

At the end of each year the progress against the targets is formally reviewed at senior management level. The programmes are adjusted as required in the light of ongoing experience and advances in knowledge and technology.

Targets and goals in the programmes are set to ensure that resources and systems are put in place to achieve the targets. The success of the programme is measured by the effectiveness of the systems installed, as well as results in meeting targets.

A copy of the AER (which includes the EMP) for 2019 is available on the EPA website[1].

[1] Environmental Protection Agency http://www.epa.ie/licensing/

4.10 Regulatory Control of the Facility

4.10.1 Industrial Emissions Licence

The Indaver site is subject to Industrial Emissions (IE) licensing under licence number W0167-03.

The IE licence requires Indaver to take various actions to meet its environmental obligations, particularly by monitoring emissions and reporting the results to the EPA, the maintenance of the site environmental management programme and the continuation of efforts at waste minimisation and utilisation of clean technology. The existing facility is a highly regulated operation and the EPA licence contains over 200 individual conditions governing all aspects of the operation and control of the facility including opening hours, waste acceptance procedures, acceptable waste types, emissions monitoring and limits on such emissions, emergency response procedures, the keeping of records and reporting requirements. The facility has a very good compliance record and submits annual environmental reports to the EPA each year outlining the overall environmental performance of the facility. The facility has maintained the status of a Recovery Facility (R1) as defined in Annex II of the Waste Framework Directive.

The facility is licensed to carry out the following activities:

Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants
(a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour, and

(b) for hazardous waste with a capacity exceeding 10 tonnes per day.

Full details of the conditions of this licence are available on the EPA website, www.epa.ie. The proposed Site Sustainability Project falls within the same category of licensable activity under IE licensing. Indaver has consulted with the EPA regarding the proposed development. An IE licence review application will be submitted to the Agency if and when planning permission for the proposed development is obtained.

4.10.2 Other existing Licences/consents

The facility also has a number of other existing consents in place, namely:

- Licence to generate electricity from the Commission for Regulation of Utilities (CRU).
- Licence L2890-04 from the EPA for the use of ionising radiation sources on site.

4.10.3 Future Licences/consents

There are several aspects that were considered for any additional licences or consents associated with the proposed development. These are:

- Consents for the HGU unit for generation of hydrogen gas and injection to the natural gas grid from the CRU.
- EPA Licensing requirements for new activities and increased capacity by means of a review application to the EPA of the existing IE Licence W0163-03. Under Schedule 1 of the EPA Act 1992 (as amended) the appropriate activity for H_2 generation is "*5.13 Production of inorganic chemicals, such as (a) gases such as ammonia, chlorine, […], hydrogen, sulphur dioxide […]*". This is mirrored in the IED as Class 4.2 (a).
- Inventory calculations assessment for applicability of the COMAH Regulations.
- SI No. 631 of 2019, Dangerous Substances (Flammable Liquids and Fuels Distribution and Commercial Supply Stores) Regulations 2019 which came into force on April 1st 2020 will apply to the storage of hydrogen on site.

Consultation with the CRU on the consents/licences required for the HGU element of the project is underway. It is clear from this consultation that specific provisions will have to be made to adopt hydrogen into the existing regulatory framework.

The following consents/licences have been discussed in this context and are likely to be applicable once planning permission is received:

- Section 39A to construct a Gas Pipeline;
- Gas Shipping Licence;
- Gas Supply Licence.

All relevant applications will be made at the appropriate time after planning permission is received and the CRU has confirmed the applicable regulatory framework for this element of the project.

An application for a review of the existing IE licence for the facility will also be made to the EPA once planning permission is received.

From initial consultations with the EPA, an additional activity under the IED will be required for the operation of the HGU. This activity is 4.2(a) from Annex I of the IED:

"4.2 Production of inorganic chemicals, such as:
(a) gases, such as ammonia, chlorine or hydrogen chloride, fluorine or hydrogen fluoride, carbon oxides, sulphur compounds, nitrogen oxides, hydrogen, sulphur dioxide, carbonyl chloride;"

Following a detailed assessment of the existing and proposed inventory of substances stored on site under the COMAH Regulations, the proposed development will not require a Notification to the HSA as the site will be sub-threshold for the lower tier requirements of the Regulations. This inventory assessment has been prepared and presented in Appendix 5 of the HAZID Report in **Appendix 17.1** of **EIAR Volume 3** for **Chapter 17 *Major Accidents & Disasters*** of this EIAR.

The storage of up to two tonnes of Hydrogen on site will require a licence from Meath County Council as the licensing authority under SI No. 631 of 2019. The application for a licence must be accompanied by a risk assessment and these Regulations also require that such a storage facility meets certain standards, codes of practice and guidance documents as set out in Schedule 1 of the Regulations. The first steps of such a risk assessment have been set out in **Appendix 17.1 *Hazard Identification & Risk Assessment*** of this EIAR.

4.10.4 Transfrontier Shipment of Waste (TFS)

The transfrontier shipment (TFS) of waste deals with the movement of waste between countries. Transfrontier shipments of waste within, into and out of the EU, for recovery or disposal operations, are governed by Regulation (EC) No. 1013/2006 on shipments of waste which came into effect on the 12 July 2007. Proposals for the export of waste from, and the import of waste into the Republic of Ireland are subject to the provisions of the Waste Management (Shipments of Waste) Regulations 2007, S.I. No. 419, introduced on the 5 July 2007, which give effect to Regulation (EC) No. 1013/2006 under Irish Law. The overall objective of the TFS Regulation is to implement measures for the supervision and control of shipments of waste in order to ensure that the movement, recovery, or disposal of waste, is managed in an environmentally sound manner, for the protection of the environment and human health. Under the Waste Management (Shipments of Waste) Regulations 2007, Dublin City Council is nominated as the competent authority of dispatch in respect of the export of waste, the competent authority of destination in respect of the import of waste, and the competent authority of transit in respect of any waste shipments transiting through the Irish State. Dublin City Council carries out its National TFS functions at the National Transfrontier Shipment Office (NTFSO) in Dublin.

A TFS is already in place for the export of treated boiler ash and flue gas cleaning residues between the existing Indaver facility in Meath and the existing salt mine facility in Carrickfergus, Northern Ireland. A new TFS or modification to the existing TFS will be sought to accommodate the increase in boiler ash and flue gas cleaning residues proposed as part of the proposed development.

A TFS is also in currently place for the export of untreated boiler ash and flue gas cleaning residues between the existing Indaver facility in Meath and the Hattorf and Wintershall Reutilisation Facility, salt mine in Germany. Similarly, a new TFS or modification to the existing TFS will be sought to accommodate the increase in boiler ash and flue gas cleaning residues proposed as part of the Site Sustainability Project.

As noted previously, bottom ash may be exported to outlets in Europe if there is no landfill capacity in Ireland. A TFS will be sought to facilitate the shipment of this waste to Europe if this arises.

4.11 Best Available Techniques (BAT)

BAT is applicable to the proposed development in the context of the BREF’s for Waste Treatment (2018) and the Emissions from Storage (2006). There is no

BREF document on the production of Hydrogen from electrolysis. The BREF for Waste Incineration is also relevant but only in the context of the existing operations on site to which no changes are proposed in the context of the proposed development. The revised BREF for waste incineration has been formally adopted at EU level in December 2019 and the existing facility will have 4 years from that date to implement any additional requirements. This will be formalised in this period as part of a licence review process by the EPA for the existing waste to energy activity on site.

BAT techniques for waste treatment and emissions from storage are applicable to the aqueous waste tank farm, bottom ash storage building and the silos for acceptance of third party residues.

These include set-up and implementation of waste characterisation and pre-acceptance as well as waste acceptance procedures. These are already in place for the aqueous waste treatment as the facility is already accepting aqueous wastes.

Safe and optimised storage will be ensured for an adequate storage capacity. The tank farm is designed to have the capacity to deal with fluctuations in the waste delivery market. Overfill protection will also be provided and the potential for fugitive emissions minimised by venting of over-pressure in the tanks to the secondary air system in the furnace for treatment.

There will be several levels of redundancy installed that will ensure safe operation even if technical issues occur.

The silos for acceptance of third party residues will match all safety measures of the existing silos, including interlocks, overfill protection, dust filters and over-pressure protection.

The bottom ash storage building is designed to avoid any pedestrian and vehicle interference by separating entry doors for pedestrians and vehicles. The building will be able to hold 5,000t of bottom ash which will allow for the storage of approximately 45 days production. The building will also be ventilated to atmosphere via dust filters to avoid any fugitive dust emissions to atmosphere and to ensure a fresh air supply for staff working in the area.

4.12 Provisions for Site Decommissioning

This section discusses the decommissioning of the facility as per the definition given the EPA draft EIAR guidelines (August, 2017) whereby decommissioning is “[t]*he final closing down, and putting into a state of safety of a development, project or process when it has come to the end of its useful life*”.

In the event of decommissioning, measures will be undertaken by Indaver to ensure that there will be no environmental effects from the closed facility. A closure, remediation and aftercare management plan (CRAMP) and an associated financial provision is currently in place as part of a licensing requirement under W0167-03 to provide for decommissioning activities at the site should this arise. As part of the licence review process this closure plan will be updated and submitted for approval to the EPA.

The CRAMP will be expanded to cover the additional activities associated with the proposed development and the financial provision will also be updated to reflect this. Such a plan contains a range of measures to ensure that there will be no environmental effects from the decommissioning activity. The measures will include:

- Cancellation of all waste deliveries to the site,
- All wastes at the facility at time of closure will be incinerated,
- All raw materials, oils, fuels, ash and residues etc. on site at the time of closure will be returned to the supplier, or collected and recycled or disposed of by an authorised waste contractor, as appropriate,
- All process equipment will be decontaminated and decommissioned,
- All equipment from the spare parts warehouse, offices and other facilities will be removed and reused or recycled,
- Cleaning of all underground drainage lines, tanks and stormwater attenuation pond,
- Removal of equipment and facilities from offices, collection of remaining waste materials and decommissioning of wastewater treatment system.

Circa 11,317 tonnes of materials and wash waters will be removed from site during the de-stocking and decontamination phase. This represents 566 No. truckloads of material to be removed from the site over a three month period of the decontamination phase, which is an average of approximately 9 trucks a day.

All of these de-stocking, decontamination and cleaning operations will be carried out in areas that were designed for the unloading, storage and handling of the raw materials and wastes that they contained. Hence the potential for any environmental effects during these operations will be minimised. It will take approximately six months to complete all of the above activities.

The decommissioning measures will have to be implemented to the satisfaction of the EPA and in line with the approved CRAMP submitted to the EPA.

If, after the decommissioning activities described above, no further use can be identified for the site, then Planning Condition No. 27 of PL17.219721 from 2007 must be adhered to. This condition relates to the restoration of the site and would involve the demolition of the main buildings on the site, leaving only the following infrastructure in place for another potential future industrial use:

- Site fencing and entrance gate
- Weighbridges, gatehouse and car park
- 38kV import/export compound (de-energised)
- Firewater storage tank, pumphouse and fire ring main
- Attenuation pond and stormwater monitoring stations
- Roads and stormwater drainage network.

Site restoration activities will include:

- Electrical isolation of all power systems
- Removal of power and signal cables
- Recovery of any remaining internal plant and equipment
- Main process building and equipment demolition
- Ancillary building demolitions
- Recovery and disposal of residual materials from the site.

The same mitigation measures as outlined for the construction phase designed to control noise, dust, traffic and stormwater run-off will be implemented for the decommissioning phase to ensure that the impact on the local community is kept to a minimum during this phase.

Circa 50,000 tonnes of concrete, blockwork, paving, cladding and other building materials will be removed from site during the demolition phase. This represents 2,364 No. truckloads of material to be removed from the site over a five month period. At the peak of activity during this 5 month phase, approximately 29 trucks a day will be used to transport these materials off site. Environmental monitoring will be undertaken for the entire duration of the decommissioning period to ensure that any potential environmental effects from decommissioning activities are minimised.

Key Indaver staff will also be retained on site during this period including site security staff, until all of the decommissioning activities and environmental reporting have been completed.

There will be up to 30 staff and contractors' personnel on site during the complete 11 month period but the average number on site will be less than this. The decommissioning activities will be undertaken within the hours of 08.00 to 18.00 from Monday to Friday.

The decommissioning activities will involve substantially fewer site activities, a substantially smaller workforce and consequently, substantially less truck and car traffic than the construction phase. Consequently, it is expected that the decommissioning will not have a significant impact on the environment or the nearest residential receptors.

4.13 References

COMAH Regulations SI No. 209 of 2015

Indaver Industrial Emissions (IE) Licence No. W0167-03

NSAI Quality Standard, ISO 9001:2015

Environmental Standard ISO 14001:2015

Occupational Health and Safety Standards OHSAS 1801:2007

BREF Reference Document on the Emissions from Storage (2006)

BREF Reference Document on Waste Treatment (2018)

5 Construction Activities

5.1 Introduction

This chapter of the EIAR describes the construction activities and sequencing for the proposed works. It considers how the proposed development will be constructed, including duration, site preparation, services and utility requirements, import and disposal of materials and general construction activities for this type of development.

It is anticipated that, with the proper implementation and management of the construction activities described in this chapter, the construction phase of the development will have no significant or long-term impact.

5.2 Geotechnical Investigation

Original site evaluation and testing of the site was completed as part of the original site construction.

The results of the previous site investigations are described in more detail in **Section 14.2.6** of **Chapter 14** ***Land and Soils*** of this EIAR.

5.3 Duration and Activities

5.3.1 Overview

The works will be carried out in 2 phases.

Phase 1 will consist of the construction of the following:

Phase 1A

- Aqueous waste tank farm and associated works including installation of tanks, gantries, piperacks, pumps, hardstands, etc.
- Tanker unloading area
- Bulk excavation and site preparation for phase 1B
- Miscellaneous site upgrades – including realignment of paved areas local to the reception hall
- Reshaping of berms and landscaping.

Phase 1B

- Bottom ash storage building
- Warehouse, workshop and emergency response team (ERT)/office building
- New concrete yard and parking area
- Development of a permanent Contractors Compound and access to same.

The schedule for the construction and commissioning of the Phase 1 elements is approximately 16 months.

Phase 2 will consist of the construction of the following:

- $10MW_e$ Hydrogen Generation Unit (HGU) including a 10kV electrical supply from the existing installation and an underground gas pipeline to connect to the natural gas grid.
- Demolition of the existing single storey modular office building
- Construction of the new single storey office building.
- Additional car parking.

The schedule for the construction and commissioning of the Phase 2 elements is approximately 12 months.

It is envisaged that the main stages of construction for each phase will be as follows:

- Strip topsoil and vegetation;
- Bulk excavations and general site re-grading, including placing of fill;
- Establish the contractors site compound, including the construction phase power supply, fencing and securing of the site;
- Construction of earth retaining structures, which will happen in tandem with bulk excavations and general site re-grading;
- Establish permanent contractors' compounds and laydown areas;
- Construction of foundations (including piling for the Tank Farm) and substructures;
- Construction of underground tanks and drainage/underground services;
- Construction of ground floor slabs;
- Construction of superstructure elements;
- External and internal completions and finishes of buildings;
- Installation of external plant and equipment;
- Construction of paved roads and parking areas;
- Underground services;
- Surface water drainage system, foul drainage system;
- Connection to existing water and foul services;
- Installation of plant and equipment;
- Fit-out and commissioning buildings and equipment;
- Erection of site fencing;
- Site landscaping;
- Removal of temporary contractor facilities and site hoarding.

5.3.2 Drawings

This chapter presents figures to illustrate the construction activities proposed. A full set of planning drawings accompany the planning application and a summary set of drawings in A3 format included in **Appendix 5.2**, presented in **Volume 3** of this EIAR.

5.4 Site Preparation Works

Site preparation will commence with the establishment of safe access and site haul roads. A perimeter fence will be erected around each of the construction site areas for each phase. Re-grading work will be required. Where feasible, excavated material will be retained on site, for re-use as bulk fill or for landscaping. Otherwise, excavated material will be loaded directly in trucks for export off-site for re-use, recovery or disposal, refer to **Section 16.5.2.9** of **Chapter 16 *Material Assets*** and **Section 5.5** below. There will be no significant stockpiling of excavated material on site. Details on material export requirements and disposal are provided in **Section 5.5** below.

All traffic movements associated with the import and export of materials have been included in the construction traffic impact assessment. Refer to **Chapter 7 *Traffic & Transportation*** of this EIAR for further details. It is anticipated that the bulk excavation will take approximately 6 to 8 weeks in the case of the Phase 1 works. The peak construction traffic flow of 50 HGV's per day will be experienced at this stage of the Phase 1 works. Bulk excavation for Phase 2 will take 4 to 6 weeks and the peak traffic flow will be 40 HGV's per day.

The material to be excavated will comprise overburden and previously excavated materials which have been shaped into landscaped berms. Refer to **Section 14.3** of **Chapter 14 *Land and Soils*** of this EIAR for a description of the soils and geology underlying the site. Rock excavation is not anticipated due to the depth of overburden on the site. Refer to **Chapter 10 *Noise and Vibration*** and **Chapter 8 *Air Quality*** of this EIAR for specific details on construction noise and dust effects and mitigation measures.

Site preparation works will also include the establishment of facilities for the contractors and the construction management team. These will include the following:

- Site offices, site facilities (canteen, toilets, drying rooms, etc.);
- Offices for the construction management team;
- Secure compound for the storage of all on-site machinery and materials;
- Temporary car parking facilities for construction staff (Phase 1 to be located in a segregated section of the existing temporary trailer parking area, Phase 2 to be located in the new permanent Contractors compound);
- Wheel wash facilities, permanent and temporary fencing and site security.

The existing construction laydown area will be used for Phase 1 and the new contractors compound (replacing the existing trailer parking area) will be used for the Phase 2 construction laydown areas and the construction facilities. **Figures 5.1** and **5.2** below show the construction areas in orange and site compounds in blue for phases 1 and 2 respectively.

5.4.1 Main Construction Works

Once site levels have been established by the initial bulk excavation works and construction of the retaining structures, the construction of the individual structures can begin. This will be followed on by the erection of superstructures, building envelopes, floors, services and finishes as appropriate. Where large pieces of plant or equipment are to be installed, these will be coordinated with the main construction works.

Site roads, car parks and site fencing will be completed, and the landscaping will be undertaken, when the main construction and equipment installation is completed, and commissioning is underway.

5.4.2 Construction Methods

The proposed development will be constructed employing best practice in safety and efficiency. The scale of each stage of the works are relatively small and such that all of the construction can be executed using common building methods and materials.

In-situ reinforced concrete will be used to form foundations. In the parts of the site where the ground levels are raised, or where the bearing strata does not have the required geotechnical properties, foundations will be piled. Continuous flight auger (CFA) piling or augered piles 250mm diameter x 12.0m long on a 3.0m grid will be used for the tank farm foundations only. This piling activity will take 3 weeks to complete.

In-situ reinforced concrete will be used to form ground bearing floor slabs, upper floor suspended slabs and earth retaining structures.

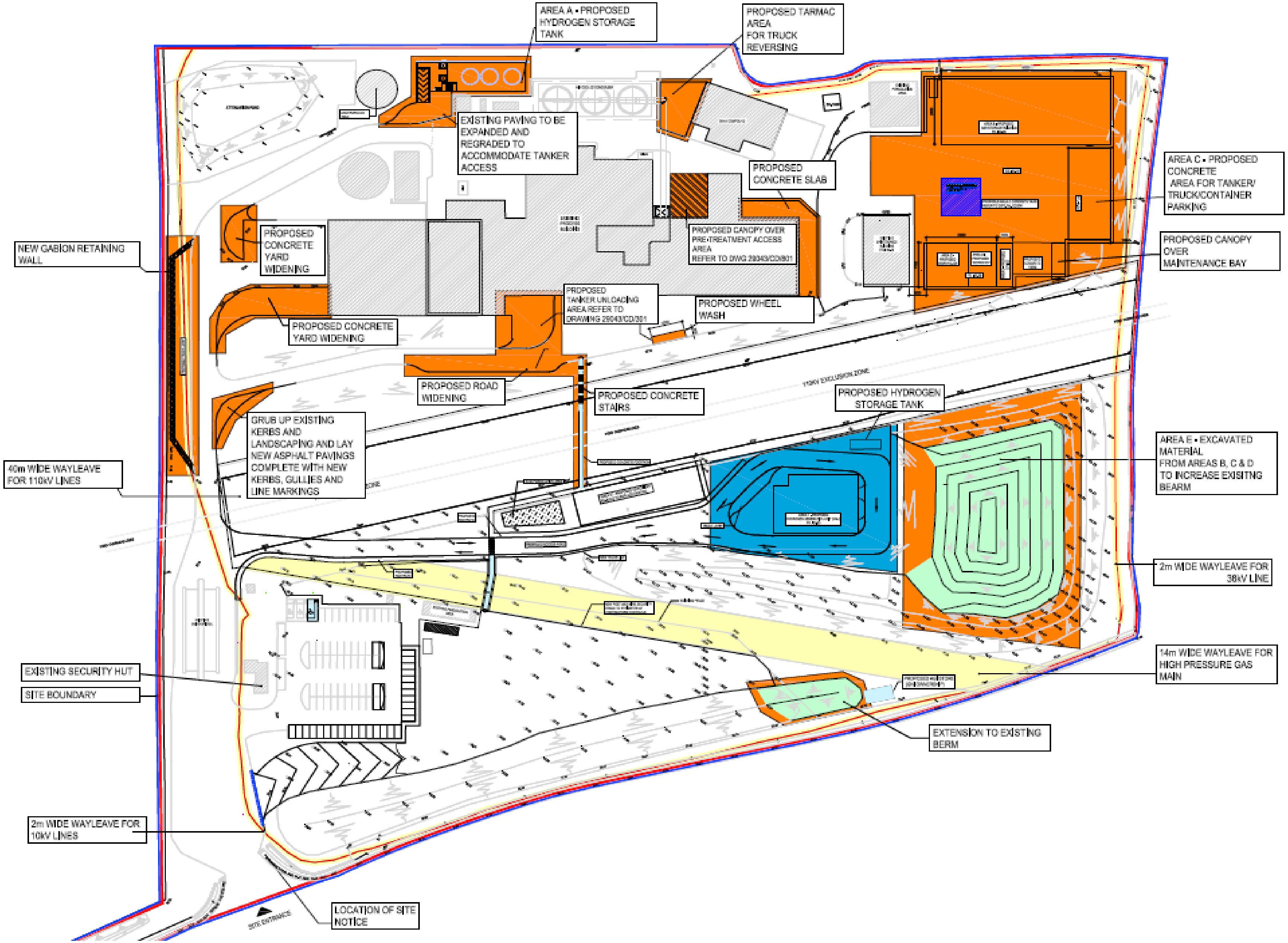


Figure 5.1: Phase 1 construction areas and site compound (highlighted blue). Source Drawing 29043-CD-1101 (refer to Appendix 5.2).

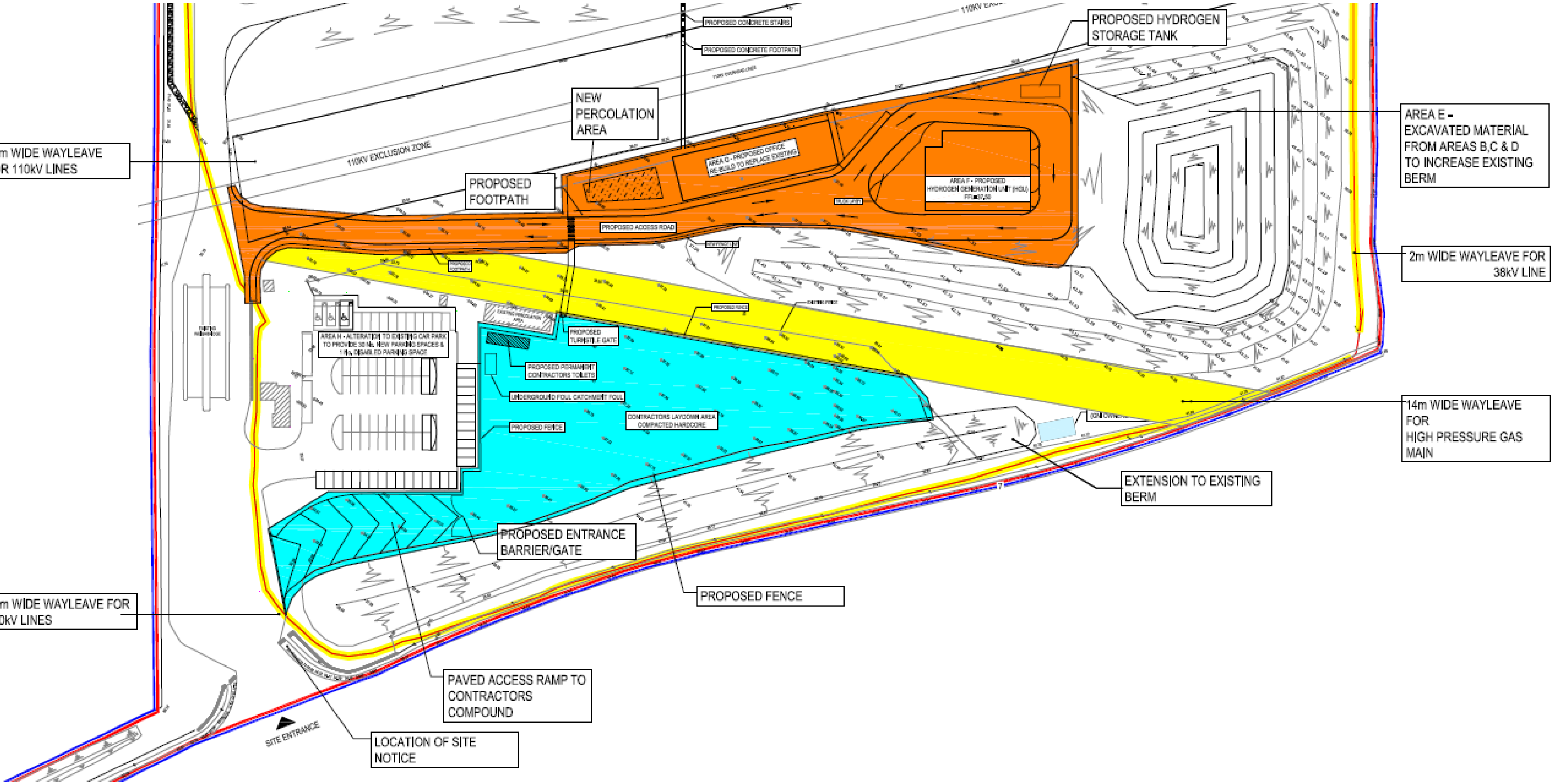


Figure 5.2: Phase 2 construction areas and site compound (highlighted blue). Source Drawing 29043-CD-1102 (refer to Appendix 5.2).

Underground tanks, chambers and process areas will be constructed of in-situ concrete and will be designed as water retaining structures to the relevant codes.

It is likely that all concrete will be brought to site ready-mixed in trucks. The concrete may be placed directly from the trucks, or it may be pumped or be placed by skips hoisted by a crane.

It is envisaged that some of the minor structural elements (e.g. non-load bearing walls) may be constructed in concrete block work.

The superstructures for the buildings will be constructed in structural steel. Steel members will be fabricated off site, in lengths that are safe to transport, and erected on site. Structural steel will also be used to support the process equipment e.g. piperacks, etc., and to provide access platforms.

The buildings will be clad in profiled metal cladding and the roofing will consist of profiled metal cladding or a membrane type system on and metal deck. Depending on the function of the buildings, the cladding and roof will be insulated.

Mobile cranes will be a significant element of the construction plant and it is envisaged that various crane systems will be used for lifting materials in to place.

Typical plant that will be utilised during both phases of the project are listed below:

- 13 tonne excavator;
- 6 tonne excavator;
- 20 tonne excavator;
- 9 tonne dumper;
- Teleporters (2);
- Cherry pickers (4);
- Roller;
- 100 tonne crane;
- CFA-Auger Piling rig (Phase 1 tank farm area only).

Where possible, elements of the construction e.g. steel platforms, tanks, plant and equipment will be assembled off site and delivered on low loaders or similar.

5.5 Material Imports and Exports and Transportation

5.5.1 Material Imports and Transportation

The construction of the proposed development will require considerable movements of materials to and from the site. The selection and specification of construction materials will be informed by local availability of these materials.

Within the necessary constraints of performance, durability and cost, construction materials will be sourced from local suppliers and manufacturers, where possible. Construction materials will be transported from the suppliers via the local road network. Refer to **Chapter 7 *Traffic & Transportation*** of this EIAR for an assessment of the impact of construction traffic.

Approximately 2,300m^3 of engineering fill and crushed stone will be imported onto the site for the construction works.

In order to minimise the environmental effects, materials required from quarries will be sourced from quarries which are located in close proximity to the site where possible and only from quarries listed on the register maintained by the local authority. The environmental effects associated with the registered quarry will have already been assessed by the local authority under Section 261 of the Planning and Development Act 2000, as amended.

All traffic movements associated with the import of materials have been included in the construction traffic impact assessment.

Refer to **Chapter 7 *Traffic & Transportation*** of this EIAR for an assessment of the impact of construction traffic.

In the context of capacity of the market in Ireland for construction materials, the requirements of the construction phase will not be significant. Refer also to **Section 16.5.2.11** of **Chapter 16 *Material Assets***.

5.5.2 Material Exports and Transportation

The construction of the proposed development will require considerable movements of materials to and from the site. Most of the materials leaving the site will consist of soil and materials from the excavation works.

The Contractor will endeavour to re-use as much of the surplus materials and wastes generated during demolition, excavation and construction as feasible within the proposed development boundary subject to further testing to determine if materials meet the specific engineering standards for their proposed end-use. Where possible, excavated materials will be reused on site for backfilling purposes, re-grading and landscaping. However, it is expected that a significant volume of the excavated material will not be suitable for reuse on site.

It is estimated that up to 31,000m^3 of surplus material will be removed from the site. The clean and inert surplus excavated material, which is integral to the construction phase, may be reused as a by-product on other sites subject to Article 27 under the Waste Directive Regulations 2011 and notification to the EPA.

Where a re-use for the material cannot be found, the material may be sent to suitably permitted waste facilities or licensed soil recovery facilities in accordance with relevant waste legislation or disposed at suitable authorised waste facilities. The environmental effects associated with the sending the material to suitably permitted waste facilities, licensed soil recovery facilities or authorised waste facilities will have already been assessed by the relevant consenting authorities.

The environmental impact of the removal of the material from site will be minimised by following the hierarchy of options outlined above. The impact of the traffic movements on the surrounding road network has been assessed in the construction traffic impact assessment in **Chapter 7** ***Traffic & Transportation*** of this EIAR.

It is unlikely that any contaminated material will be encountered (refer to **Section 14.3** of **Chapter 14** ***Land and Soils***) however if it is, it will be disposed of to a suitable authorised waste facility, subject to the appropriate waste acceptance criteria at the receiving facility and in accordance with relevant waste legislation.

Section 16.5.2.9 of **Chapter 16** ***Material Assets***, describes the surplus material management options (re-use, recovery, disposal) and outlines the criteria that the material must meet in order to be disposed of at such facilities.

A small amount of demolition waste (approximately 20 tonnes) from the Phase 2 activity of re-building the office accommodation will also be generated.

All traffic movements associated with the export of materials have been included in the construction traffic impact assessment. Refer to **Chapter 7** ***Traffic & Transportation*** of this EIAR for further details.

A Construction Waste Management Plan (CWMP) is provided in Section 7 of the CEMP in **Appendix 5.1**.

5.6 Services and Utilities Requirements for Construction

5.6.1 Electricity

It is anticipated that the construction work will require a peak load of 120kVA at peak. This load will be met by a combination of spare capacity on site and the provision of a generator at peak periods.

5.6.2 Water Supply

The construction activities that will require water during the construction phase will be relatively small. The initial estimate of demand is approximately 10m^3 per day, primarily based on the demand requirement for the construction workers and the associated support facilities. Water supply will be taken from the existing site system.

5.6.3 Storm Water and Foul Water Disposal

A temporary dedicated holding tank for the temporary storage of construction foul effluent will be installed as part of the contractors compound prior to commencement of the main construction activities. The effluent will be regularly disposed of off-site by tanker by a licensed contractor to an approved licensed facility.

Storm water will be managed carefully during construction. In general, storm water will be infiltrated to ground via silt traps and managed soakaways. The laydown areas will be suitably drained and any areas which will involve the storage of fuel and refuelling will be paved and bunded and hydrocarbon interceptors will be installed to ensure that no spillages will get into the surface water or groundwater. Refer to **Section 14.8.1** of **Chapter 14** ***Land and Soils*** and **15.6** of **Chapter 15** ***Water*** for specific construction mitigation measures.

5.7 Existing Services

The existing services running in the site will be carefully located, identified and suitable working methods will be employed to ensure that these services are protected. Diversion or relocation of services will be undertaken in accordance with the relevant standards and codes of practice.

Some protection measures such as cover slabs may be used for the services which will be left in place. Pipeline protection slabs will be used for works carried out in the vicinity of the gas transmission line.

5.8 Demolition Works

Demolition works proposed on site will be during the Phase 2 construction works where the existing office building will be removed to make way for construction of its replacement. These demolition works will be limited in both time and scale due to the size of the existing building. It is anticipated that these works will be completed within 1 week and that the waste materials (20 tonnes approx.) will be recovered or disposed of using permitted collectors to appropriately licensed or permitted sites. Refer also to **Section 16.5.2.10** of **Chapter 16** ***Material Assets***.

5.9 Site Hygiene

The following are some of the measures that will be taken to ensure that the site and surroundings are maintained to a high standard of cleanliness:

- Daily inspections will be undertaken to monitor tidiness. A regular program of site tidying will be established to ensure a safe and orderly site.
- If necessary, scaffolding will have debris netting attached to prevent materials and equipment being scattered by the wind.
- Food waste will be strictly controlled on all parts of the site.
- Wheel wash facilities will be provided for vehicles exiting the excavation areas of the project site. Wheel wash run off will be stored in an onsite storage tank and will be disposed of by permitted waste haulage company at a permitted or licensed facility.
- In the unlikely event that mud is carried from the project site to the public road, it will be cleaned as required and will not be allowed to accumulate.
- Loaded lorries and skips will be covered if required.

- Surrounding roads used by trucks for access to and egress from the site will be inspected regularly and cleaned, using an approved mechanical road sweeper, when required.
- In the event of any fugitive solid waste escaping the site, it will be collected immediately and removed to storage on site, and subsequently disposed of in the normal manner.

5.10 Employment and Welfare

Through the construction phase there will be some variation in the numbers working on site. It is anticipated that a maximum of 120 construction workers will be employed on site at any one time during Phase 1, with the works being carried out during the daytime only (minor exceptions to this may arise due to weather, type of works etc). The Phase 2 construction works will peak at 100 people.

Temporary office accommodation and other construction facilities will be installed on site for the construction phase. All temporary units will be of a high standard in accordance with statutory regulations, as a minimum.

The co-ordination of people and materials on-site will be one of the key activities throughout the construction phases. The construction traffic management plan will designate traffic routes, timings and parking arrangements.

Typical working hours during the construction phase will be:

Start	Finish	
0700	1900	Monday – Friday
0700	1300	Saturday

Consideration of safety, weather or sub-contractor availability is likely to necessitate working outside normal hours on occasion. Heavy or noisy construction activities will be avoided outside normal hours and the amount of work outside normal hours will be strictly controlled.

Refer to **Chapter 7 *Traffic & Transportation*** of this EIAR for further details on construction traffic.

5.11 Construction Traffic

The impact of the generated traffic on the local road network during the construction of the proposed development is evaluated in **Chapter 7 *Traffic & Transportation*** of this EIAR, and mitigation measures are proposed where necessary.

The appointed contractor will be required to develop a Construction Traffic Management Plan (CTMP) in advance of commencing the works on site. The contents of the plan are outlined in Section 9.3 of the CEMP attached as **Appendix 5.1** to this EIAR. The plan will be implemented at the commencement of the works.

The plan will also implement all relevant mitigation measures identified in this EIAR, together with any additional requirements imposed by conditions attached by An Bord Pleanála decision to grant permission.

In order to ensure compliance by contractors and suppliers, the requirements of the EIAR, and all additional requirements imposed by conditions attached by An Bord Pleanála will be included in all contract tender documents and will be discussed in detail prior to awarding a contract. All traffic movements associated with the import and export of materials have been included in the construction traffic impact assessment. Refer to **Chapter 7 *Traffic & Transportation***, for further details.

The plan will be regularly reviewed and updated in order to take into account the changing patterns of both the existing traffic and the construction traffic, following consultation with Meath County Council.

The routing of any exceptional loads will require liaison with Meath County Council and the Garda Siochána.

The implementation of this plan will be monitored by the Indaver Site Management team during the course of the project and will also be reviewed at the main site meetings.

5.12 Construction Health and Safety

The requirements of the Safety, Health and Welfare at Work Act 2005, the Safety, Health and Welfare at Work (Construction) Regulations, 2013 and other relevant Irish and EU safety legislation will be complied with at all times.

As required by the Safety, Health and Welfare at Work (Construction) Regulations 2013, a Health and Safety Plan will be prepared which will address health and safety issues from the design stages through to the completion of the construction and maintenance phases. This plan will be reviewed as the development progresses. The contents of the Health and Safety Plan will comply with the requirements of the Regulations.

In accordance with the Regulations, a “Project Supervisor Design Process” (PSDP) has been appointed for the initial design phase associated with this planning application. The file from this process will be passed to a newly appointed PSDP for the detailed design phase in advance of the appointment of a main contractor to construct each phase of the proposed development.

A “Project Supervisor Construction Stage” (PSCS) will also be appointed prior to the start of construction on site of each phase.

The Project Supervisor Construction Stage will assemble the Safety File as the project progresses. The safety file will be incorporated into the overall technical record system at the end of project.

Safety on site will be of paramount importance. During the selection of the contractors and subcontractors, their safety records will be investigated. Only contractors with high safety standards will be selected.

Prior to working on site, every individual will receive a full safety briefing and will be provided with all safety equipment relevant to the tasks the individual will be required to perform during employment on site.

Safety briefings will be held regularly and prior to any onerous or special task. ‘Toolbox talks’ will be held to ensure all workers are fully aware of the tasks to be undertaken and the parameters required to ensure the task will be successfully and safely completed.

All visitors will be required to wear appropriate personal protective equipment (PPE) prior to going on to the site and will undergo a safety briefing by a member of the site safety team.

Regular site safety audits will be carried out throughout the construction programme to ensure that the rules and regulations established for the site are complied with, at all times.

At any time that a potentially unsafe practice is observed, the PSCS, Construction Manager or a member of the Indaver contract management team will have the right as well as the responsibility to halt the work in question, until a safe system of working is again put in place.

There will be an Indaver contract management team (comprising Indaver staff) on site for the duration of the construction phase. The team will supervise the construction of the works including monitoring the contractor’s and the PSCS’s performance to ensure that the proposed construction phase mitigation measures are implemented, and that construction effects and nuisance are minimised.

Appropriate site personnel will be trained as first aiders and fire marshals. In addition, appropriate staff will be trained in environmental issues and spill response procedures. Tanks and drums of potentially polluting materials will be stored in secure containers or compounds which will be locked when not in use. Secure valves will be provided on oil and fuel storage facilities. Equipment and vehicles will be locked, have keys removed and be stored in secure compounds.

The contractor will maintain an incident and emergency response action plan which will cover all foreseeable risks, i.e. fire, flood, collapse etc. An Incident Response Plan (IRP) is located in Section 8 of the CEMP in **Appendix 5.1**.

The objective of this Incidence Response Plan is to:

- Ensure the health and safety of workers and visitors along the site.
- Minimise any effects to the environment and ensure protection of the water quality and the aquatic species dependent on it.
- Minimise any effects on properties, services, etc.
- Establish procedures that enable personnel to respond to incidents with an integrated multi-departmental effort (including a link to the existing on-site Emergency Plan) and in a manner that minimises the possibility of loss and reduces the potential for affecting health, property, and the environment.

The primary function of the site security team will be to ensure that no unauthorised entry to site occurs. There will be fencing around the sites to minimise the risk of vandalism and unauthorised access. This process will be made easier by all operatives possessing an ID card. ID Cards will only be issued to operatives that have attended the relevant site safety induction.

5.13 Potential Construction Effects

Potential construction phase effects are addressed in other chapters of this EIAR. For example, the construction phase effects on air quality, climate and noise and vibration are evaluated in **Chapters 8 *Air Quality*, 9 *Climate* and 10 *Noise and Vibration*** of this EIAR respectively. Construction traffic is addressed in **Chapter 7 *Traffic & Transportation*** of this EIAR. There is an evaluation of the construction effects on flora and fauna in **Chapter 11 *Biodiversity*** of this EIAR.

The construction impact on the archaeological, architectural and cultural heritage is addressed in **Chapter 12 *Archaeological, Architectural & Cultural Heritage*** of this EIAR. Visual effects and lighting effects during construction are detailed in **Chapter 13 *Landscape and Visual*** of this EIAR. Potential construction phase effects on soils, geology, hydrogeology are addressed in **Chapter 14 *Land and Soils*** of this EIAR whilst potential construction phase effects on hydrology are addressed in **Chapter 15 *Water.*** The risk of a major accident as a result of construction activities impacting on the existing site has been addressed in **Chapter 17 *Major Accidents & Disasters*** of the EIAR.

The potential cumulative effects arising during the construction phase are also addressed in **Chapters 7 *Traffic & Transportation*, 8 *Air Quality*, 9 *Climate*, 10 *Noise and Vibration*, 11 *Biodiversity*, 12 *Archaeological, Architectural & Cultural Heritage*, 13 *Landscape and Visual*, 14 *Land and Soils*, 15 *Water*, 16 *Material Assets*, 17 *Major Accidents and Disasters* and 18 *Cumulative Effects, Other Effects and Interactions*** of this EIAR.

5.14 Construction Environmental Management Plan

Every effort will be made to ensure that any detrimental environmental effects will be avoided, prevented or reduced during the construction phase of this project. Specific construction phase mitigation measures are described in the individual EIAR chapters.

A ***Construction Environmental Management Plan*** (CEMP) has been prepared prior to construction commencing (Refer to **Appendix 5.1**). The CEMP summarises the overall environmental management strategy that will be adopted and implemented during the construction phase of the proposed development. The purpose of the CEMP is to demonstrate how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to construction works of this nature. The CEMP sets out the mechanism by which environmental protection is to be achieved during the construction phase of the proposed development. Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum.

The CEMP is a working document and will be finalised by the Contractor following appointment and prior to commencing works on site. All of the content provided in the CEMP will be implemented in full by the Contractor and the finalisation of the CEMP by the Contractor will not affect the robustness and adequacy of the information presented in **Appendix 5.1** and relied upon in the EIAR and Natura Impact Statement (NIS). The CEMP, when finalised, will comprise all of the construction mitigation measures, which are set out in this EIAR and NIS.

5.15 Commissioning Phase

Following completion of construction and installation of equipment, and before operation of the facility commences, there will be a testing and commissioning phase. Commissioning is considered in **Chapter 4** ***Description of the Proposed Development***.

5.16 References

British Standard BS 5228 – 1 (2009 +A1 2014) (*Code of practice for noise and vibration control on construction and open sites – Noise).*

British Standard BS3882 (2015) *Specification for Topsoil.*

Construction Industry Research and Information Association, (2015) *Environmental Good Practice on Site*, CIRIA, London.

Construction Industry Research and Information Association, (2001) *Control of Water Pollution from Construction Sites, guidance for consultants and contractors*, CIRIA, London.

Department of Transport (2010) – Traffic Signs Manual

Murnane E., Heap A., Swain A. (2006) *Control of Water Pollution from Linear Construction Projects CIRIA*, London.

National Construction and Demolition Waste Council (2006*), Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects*, NCDWC, Dublin.

National Roads Authority (2014) *Good Practice Guideline for the Treatment of Noise during the planning of National Road Schemes*, NRA, Dublin.

Safety, Health and Welfare at Work (Construction) Regulations 2013

6 Population and Human Health

6.1 Introduction

This chapter evaluates the impacts, if any, which the proposed development will have on population and human health. This chapter has been prepared in accordance with the requirements of the EIA Directive (2014/52/EU).

In accordance with the revised draft EPA Guidance (2017), this chapter has considered the "*existence, activities and health of people*" with respect to "*topics which are manifested in the environment such as employment and housing areas, amenities, extended infrastructure or resource utilisation and associated emissions*".

Aspects, examined in this chapter, primarily relate to direct and indirect effects from the proposed development on local community health and on socio-economic activities. The potential effects on population and human health arising from traffic, visual effects, natural amenity, nuisance, built and natural heritage, air and noise emissions, climate change etc, are dealt with in the specific chapters in this EIAR dedicated to those topics. Refer for example to **Chapters 7 *Traffic and Transportation*, 8 *Air Quality*, 9 *Climate*, 10 *Noise and Vibration*, 11 *Biodiversity*, 12 *Archaeological, Architectural and Cultural Heritage*, 13 *Landscape and Visual*, 14 *Land and Soils*, 15 *Water*, 16 *Material Assets* and 17 *Major Accidents and Disasters.***

Human health effects are primarily considered through an assessment of the environmental pathways by which health can be affected such as air, noise, water or soil. Therefore, the health assessment relies on the assessments in the relevant chapters listed above and draws on the findings as necessary to examine whether the effects arising from any identified impacts may have a health impact and to ensure that the effects which may have a health impact are fully considered.

However, the health assessment also considers health and service improvement. Other aspects, such as changes in traffic flows which are dealt with in **Chapter 7 *Traffic & Transportation***, have also been considered in this chapter with regard to air emissions and potential disruption to the local community.

6.2 Assessment Methodology

6.2.1 Guidance

The recitals to the 1985 (85/337/EEC[1]) and 2011 (2011/92/EU[2]) EIA Directives refer to "*human health*" and include "*Human Beings*" as the corresponding

[1] Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment
[2] Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment Text with EEA relevance

environmental factor. The 2014 EIA Directive (2014/52/EU[3]) changes this factor to "*Population and Human Health*". However, no specific guidance on the meaning of the term Human Health has been issued in the context of Directive 2014/52/EU. In addition, no specific guidance on the assessment of human health in the context of EIA has been issued to date.

6.2.1.1 Environmental Protection Agency

The 2017 draft EPA guidelines on the information to be contained in Environmental Impact Assessment Reports (Section 3.3.6) note that "*while no specific guidance on the meaning of the term Human Health has been issued in the context of Directive 2014/52/EU, the same term was used in the SEA Directive (2001/42/EC)*". The Commission's SEA Implementation Guidance[4] (Section 5.26) states "*The notion of human health should be considered in the context of the other issues mentioned in paragraph (f) and thus environmentally related health issues such as exposure to traffic noise or air pollutants are obvious aspects to study*". (Paragraph (f) (of Annex I of the SEA Directive) lists the environmental factors including soils, water, landscape, air etc.).

The 2017 draft EPA guidelines note that the above health assessment approach is consistent with the approach set out in the 2002 EPA guidelines where health was considered through assessment of the environmental pathways through which it could be affected, such as air, water or soil:

"*The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment*".

The 2017 draft EPA guidelines also note under Section 3.3.6 that in an EIAR, "*the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc. and that "assessment of other health & safety issues are carried out under other EU Directives, as relevant. These may include reports prepared under the Integrated Pollution Prevention and Control, Industrial Emissions, Waste Framework, Landfill, Strategic Environmental Assessment, Seveso III, Floods or Nuclear Safety Directives. In keeping with the requirement of the amended Directive, an EIAR should take account of the results of such assessments without duplicating them*".

[3] Directive 2014/52/EU 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 Text with EEA relevance

[4] European Commission Guidance on the implementation of Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment

6.2.1.2 Department of Housing, Planning and Local Government

These principles are again supported in *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*, August 2018 issued by the Department of Housing, Planning and Local Government (reference page 28):

"consideration of human health effects resulting from the construction and operation of a project should focus on health issues arising in the context of the other environmental factors listed in Article 3 of the Directive/ Section 171A of the Act, namely:

- *Population*
- *Biodiversity, with particular attention to protected species and habitats*
- *Land, soil, water, air and climate*
- *Material assets, cultural heritage and the landscape*
- *Interaction between the above factors."*

6.2.1.3 European Commission

Section 1.3.1 (page 37) of the European Commission guidance (2017) relating to the preparation of the EIAR in reference to "human health" states:

"*Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population*".

6.2.1.4 Institute of Environmental Management and Assessment

The Institute of Environmental Management and Assessment (IEMA) is the largest professional body for environmental practitioners in the United Kingdom and worldwide, with nearly 15,000 members. As such it is an authoritative body on Environmental matters. IEMA issued a discussion document in 2017 *Health in Environmental Impact Assessment - A Primer for a Proportionate Approach* which it describes as a primer for discussion on what a proportionate assessment of the impacts on health should be in EIA and is a useful document when considering what can and should be assessed in the context of this EIAR. Due regard has been had to the general approach advocated in this document when undertaking this assessment.

One of the messages in the IEMA document in terms of assessing health in EIA, is that there should be a greater emphasis on health outcomes, (that is the potential effects on human health), rather than simply the health determinants, (that is the agents or emissions which could have the potential to have health effects).

The IEMA document noted that in EIA, there has previously been a strong focus on just the agents or emission levels (e.g. dust) rather than focusing on the effects of these agents/emission levels on human health. This change in emphasis does not mean a complete change in practice. For example, measurement and modelling of dust levels continues to be an essential part of the health assessment.

The IEMA document notes that:

"*Public health is defined as the science and art of promoting and protecting health and well-being, preventing ill-health and prolonging life through the organised efforts of society and has three domains of practice: health protection, health improvement and improving services*".

The IEMA document suggests that these three domains should be considered in the assessment of human health in EIA. Examples of health protection issues to be considered could include issues such as chemicals, radiation, health hazards, emergency response and infectious diseases whilst health improvement issues could include lifestyles, inequalities, housing, community and employment. Examples of improving services issues could include service planning, equity and efficiencies. This correlates well with Directive 2014/52/EU.

6.2.1.5 World Health Organisation

The World Health Organization (WHO) defined health in its broader sense in its 1948 constitution as "*a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity*". Therefore, whilst the EPA guidance is useful in terms of health protection, for a more holistic assessment as per the IEMA document, it is also worthwhile to look at broader health effects in terms of opportunities for improvement of health and for improvement of access to services. While it is important to do this, it is also important not to attribute every conceivable event as being a health effect. To further rely on the WHO definition, a health effect would be something that would have a material impact on somebody's physical mental and social well-being be that positive or negative.

Therefore, health protection, health improvement and improving services are all considered in this assessment of human health effects. The methodology for assessing health protection is considered further below.

6.2.2 Health Impact Assessment and Environmental Impact Assessment

The IEMA document notes that Health Impact Assessment (HIA) and EIA are separate processes and that whilst a HIA can inform EIA practice in relation to human health, a HIA alone will not necessarily meet the requirements of the EIA Directive in relation to human health.

Further, HIA is not routinely carried out for major infrastructure projects in Ireland and it is typically a non-statutory document that is normally prepared on a voluntary basis by developers overseas, e.g. in the UK.

Guidance for performing HIAs was issued by the Institute of Public Health in Ireland in 2009 and they have outlined that there are considerable difficulties in performing a HIA for a project of this nature. Not least of these is the difficulty of getting baseline health data as it is quite difficult (due to patient confidentiality and other reasons) to accurately determine levels of even relatively common medical conditions in a relatively defined population that might be affected. Qualitative and quantitative baseline health data is a vitally important part of the HIA process. This is because it is first important to determine the baseline health status of the community before it is possible to determine the quantitative impact that a proposal might have on health. In the absence of accurate baseline data, it is very difficult to assess qualitative and quantitative changes that might occur as a result of a project of this nature.

More useful generalised data that might exist for larger areas (such as a city or county) may be used, but these datasets would be at most an estimate of the local baseline and not accurate enough to allow for meaningful interpretation specific to the proposed development. Possible local effects, perhaps due to socioeconomic variations or for other reasons would not be evident using data for larger population areas making the process inaccurate. This difficulty is not unique to the project.

The IEMA document (IEMA, 2017), notes that the WHO provides an overview of health in different types of impact assessment (WHO, 2014) and presents the WHO perspective on the relationship of HIA to other types of impact assessment as follows:

"The health sector, by crafting and promoting HIA, can be regarded as contributing to fragmentation among impact assessments. Given the value of impact assessments from a societal perspective, this is a risk not to be taken lightly ... The need … and justification for separate HIA cannot automatically be derived from the universally accepted significance of health; rather, it should be demonstrated whether and how HIA offers a comparative advantage in terms of societal benefits …

Health issues can, and need to, be included [in impact assessment] irrespective of levels of integration. At the same time, from a civic society perspective, it would be unacceptable for HIA to weaken other impact assessments. A prudent attitude suggests optimizing the coverage of health along all three avenues:

- *better consideration of health in existing impact assessments other than HIA;*
- *dedicated HIA; and*
- *integrated forms of impact assessment."*

It is clear therefore that the WHO does not support a stand-alone HIA unless it can be demonstrated to be of advantage over the assessment of population and human health in the EIAR.

In this case no such advantage exists and indeed given the lack of baseline data, a stand-alone HIA would add very little to the assessment process. It is for these reasons that this assessment of human health is part of this EIAR and that no stand-alone HIA has been prepared for the proposed development.

It is therefore important to note that this assessment on human health is provided as part of the overall EIAR rather than a stand-alone HIA. The HIA is defined as a combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a policy, plan, programme or project on both the health of a population and the distribution of those effects within the population. In contrast, the assessment of human health in the context of EIAR focuses the attention of the assessment on likely significant effects, i.e. on effects that are deemed likely to occur and, if they were to occur, would be expected to be significant (as per the requirements of Directive 2014/52/EU. Conducting a HIA will not necessarily meet the population and human health requirements of the EIA Directive. Therefore, *health protection, health improvement* and *improving services* are all considered in this assessment.

Health protection is considered in this EIAR regarding air quality (**Chapter 8 *Air Quality***), noise (**Chapter 10 *Noise and Vibration***), soils and groundwater (**Chapter 14 *Land and Soils***), water quality (**Chapter 15 *Water***) and potential for accidents (**Chapter 17 *Major Accidents and Disasters***).

Health improvement is considered in **Section 6.6** in this chapter regarding the population, employment, potential receptors, economic activity and heritage and amenity identified in the receiving environment (**Section 6.3**).

Improving services is considered in the context of the activities and services that the proposed development will provide to the at a local and national scale where relevant and the potential direct and indirect effect that will have, refer to **Section 6.7.3**.

The IEMA document suggests that these three domains should be considered in the assessment of human health in EIA. Examples of health protection issues to be considered could include issues such as chemicals, radiation, health hazards, emergency response and infectious diseases whilst health improvement issues could include lifestyles, inequalities, housing, community and employment. Examples of improving services issues could include service planning, equity and efficiencies. This correlates well with Directive 2014/52/EU.

6.2.3 Health Protection

The assessment of human health for the proposed development, in terms of health protection, follows the approach set out in the EPA guidelines and in the European Commission's SEA Implementation Guidance. That is, the assessment on potential effects on human health is guided using **health-based standards**. It is also similar in nature to the US EPA guidance. Human Health protection is considered through the assessment of the environmental factors (pathways) through which health could be affected such as air, noise, water and soils. The US EPA guidance includes a four-step approach which is represented graphically in **Figure 6.1** below.

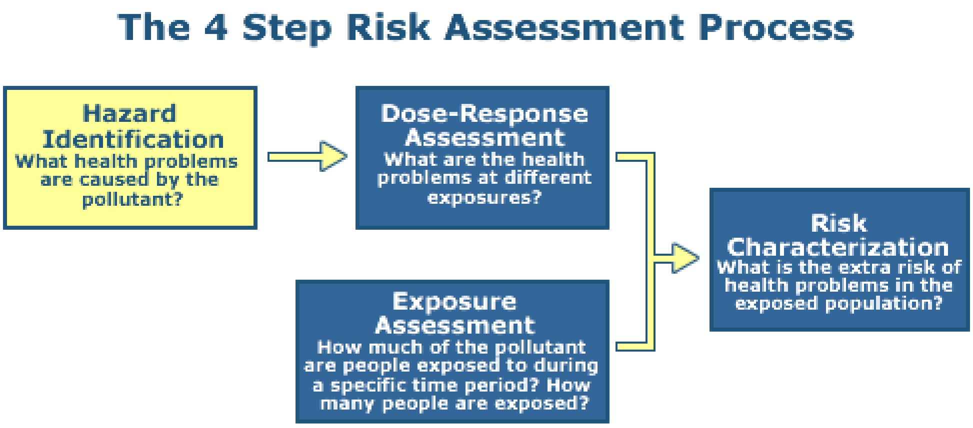


Figure 6.1: Human Risk Assessment. Source US EPA

The potential noise, air, soils and water impacts which could affect human health were identified (Hazard Identification), the scale of these potential impacts (Dose-Response Assessment) and their duration (Exposure Assessment) were assessed and the significance of the potential impact on human health determined (Risk Characterisation).

When using a recognised Health Based Standard such as the one issued by the WHO 2009, the dose-response assessment is actually included in the standard. In other words, the authorities or expert committees which recommended a specific threshold or parameter (i.e. a limit value) in a standard will have inherently taken into account of the health problems at the different exposure levels and thus set the limit value within the standard to prevent these health problems (i.e. significant effects on human health) from occurring.

6.2.4 Standards

The next step in the health-based standards approach is the choice of the most appropriate standard. This section outlines the choices made for this assessment.

6.2.4.1 Air Quality - Appropriate Standards

The Air Quality Standards (aqs) are described in **Section 8.2.1.1** of **Chapter 8 *Air Quality*** but for the convenience of the reader of the salient points are outlined here in **Table 6.1** below.

The starting point in selecting the appropriate standard to apply is Directive 2008/50/EC of the European Parliament and of the Council, as amended by Commission Directive (EU) 2015/1480 on ambient air quality and cleaner air for Europe (CAFE Directive). In Ireland, air quality is monitored by the EPA to ensure that the relevant limit values specified by EU directives (that set out the targets for specific air pollutants) are achieved. Limit values have been specified in the CAFE Directive for the following air pollutants (as described in detail in Table 6.1):

- Sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and oxides of nitrogen (NO_x), particulate matter (PM_{10} and $PM_{2.5}$) and lead;

- Carbon monoxide and benzene;
- Ozone; and
- Arsenic, Cadmium, Nickel and Benzo(a)pyrene.

Table 6.1: Limit values as set out in the CAFE Directive

Pollutant	Limit Value Objective	Averaging Period	Limit Value ug/m^3	Limit Value ppb	Basis of Application of the Limit Value	Limit Value Attainment Date
SO_2	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1 Jan 2005
SO_2	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1 Jan 2005
NO_2	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1 Jan 2010
NO_2	Protection of human health	calendar year	40	21	Annual mean	1 Jan 2010
PM10	Protection of human health	24 hours	50		Not to be exceeded more than 35 times in a calendar year	1 Jan 2005
PM10	Protection of human health	calendar year	40		Annual mean	1 Jan 2005
PM2.5 - Stage 1	Protection of human health	calendar year	25		Annual mean	1 Jan 2015
PM2.5 - Stage 2	Protection of human health	calendar year	20		Annual mean	1 Jan 2020
Lead	Protection of human health	calendar year	0.5		Annual mean	1 Jan 2005
Carbon Monoxide	Protection of human health	8 hours	10,000	8620	Not to be exceeded	1 Jan 2005

Pollutant	Limit Value Objective	Averaging Period	Limit Value ug/m³	Limit Value ppb	Basis of Application of the Limit Value	Limit Value Attainment Date
Benzene	Protection of human health	calendar year	5	1.5	Annual mean	1 Jan 2010

Additionally, it should be noted that provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. These are clearly appropriate and robust standards.

Air quality standards protect the vulnerable including those with respiratory illnesses, the old, very young and infirm. Whilst slightly higher levels of oxides of nitrogen above the limit values may have no effect on the vast majority of the population, elevated levels of pollutants in ambient air may be significant for these vulnerable groups within the population. This assessment has relied on compliance with the limit values in the CAFE Directive to determine likely significant effects on human health. Therefore, adherence to these limit values is considered to represent that there will be no adverse effect on human health due to air quality emissions as **Table 6.1** outlines that the levels set primarily for the protection of human health.

6.2.4.2 Noise and Vibration - Appropriate Standards

As set out in **Chapter 10 *Noise and Vibration***, there is no specific legislation which sets out environmental noise limits that must be achieved. The noise assessment criteria are based on the Guidelines set out by regulatory bodies such as the EPA and the WHO.

Construction Noise Criteria

Construction noise is temporary in nature and usually experienced over a short to medium-term period. This characteristic requires it to be considered differently to other longer-term sources of noise. Construction activities on larger-scale developments of this nature will inevitably result in noise being generated temporarily.

There is no Irish guidance specifically published for the short to medium-term construction work such as that required for the proposed development.

Operational Noise Criteria

In relation to human health specifically, for the operational phase the most applicable guidelines are those issued by the WHO. There are new Guidelines in relation to Environmental Noise issued in October 2018 (WHO, Environmental Noise Guidelines for the European Region, 2018). These deal with specific sources of noise such as Roads, Rail, Aircraft and Wind Turbines. They do not specifically deal with construction noise or industrial noise.

They supersede and supplement previous Guidelines issues by the WHO including the Community Noise Guidelines 1999 (WHO, WHO (1999) Guidelines for Community Noise, 1999) in relation to community effects of noise and subsequent guidance on Night Time noise in Europe 2009.

In their recent guidance (WHO, Environmental Noise Guidelines for the European Region, 2018), the WHO state that large proportions of the European population are exposed to noise levels in excess of 55dB L_{night}.

The WHO guidelines identify some health effects at quite low night time levels and proposed a population Guidance, for roads, of 45dB L_{night} outside residential properties.

6.3 Receiving Environment

This section describes the population of the receiving environment in the context of socio-economic indicators.

6.3.1 National Context

The Labour Force Survey (LFS) is the official source of data for employment and unemployment in Ireland, compiled by the Central Statistics Office. The CSO LFS Quarter 4 (Q4) of 2019, reported that employment totalled 2,361,200 and this showed an annual increase of 3.5% or 79,900 from Q4 2018. When adjusted for seasonal factors, employment increased by 1.3% or 30,500 between Q3 2019 and Q4 2019.

Long term unemployment, which refers to those persons unemployed for one year or more, accounted for 35.0% of total unemployment in Q4 2019.

In Q4 2019, the total number of persons in the labour force was up 2.6% or 61,600 to 2,471,700 from Q4 2018. The number of persons not in the labour force was 1,471,000 and that was up 0.3% or 4,000 from a year earlier.

6.3.2 Population

CSO data from 2011 and 2016 was used in assessing the number of households within the study area. The number of households in the Duleek ED increased from 1,732 in 2011 to 1,943 in 2016 (+12%).

The population of the Duleek ED has also increased from 5,177 in 2011 to 5,565 in 2016 (+7.5%). Information from the 2016 Census shows that the population in Meath has grown by 5.9% between 2011 and 2016 which is well above the National population increase of 3.6% over the same period, refer to **Table 6.2** below.

Table 6.2: Population change from 2011 to 2016. Source CSO.

Population Change 2011 - 2016			
	2011	2016	% Change 2011 - 2016
State	4,588,252	4,757,976	+3.6%
Meath County	184,135	195,044	+5.9%
Duleek ED	5,177	5,565	+7.5%

The age profile of Duleek ED shows the age group with the highest proportion are 0-19 years (35.4% or 1,972 No. persons), higher than both the State and Meath for the same age bracket. Compared to County Meath and the State the proportion of people aged 40-59 years (13.4%) and 60-70 years (6.4%) is much lower and approximately half of that for the State, refer to **Table 6.3**.

Table 6.3: Age profile for State, County Meath and Duleek Electoral Division recorded during the 2016 Census. Source CSO.

Area	**Age 0-19**	**Age 20-39**	**Age 40-59**	**Age 60-79**	**Age 80+**
State	27.50%	27.77%	26.33%	15.28%	3.12%
Meath County	31.7%	25.6%	27.5%	8.2%	2.2%
Duleek ED	35.4%	26.3%	13.4%	6.4%	5.2%

6.3.3 Employment

The 2016 Census data[5] shows that in Duleek ED, of those aged 15 years and over (1,959), 63.4% of the population are ‘At work’, while 7.7% of the population are ‘Unemployed having lost or given up on previous job’. The occupations of the majority of the population at work or unemployed in the Duleek ED (1,394 No. persons) are “Skilled Trades Occupation” (337 No. persons) and “Process, Plant and Machine Operatives” (285 No. persons).

6.3.4 Principal Potential Receptors

As discussed previously, Indaver currently operates a Waste to Energy (WtE) facility (waste incinerator) at the site in Carranstown, Duleek, Co Meath. Refer to **Figures 1.1** to **1.3** of **Chapter 1** ***Introduction*** of this EIAR.

The existing facility has been in operation since August 2011 and is licensed under an Industrial Emissions Licence (No. W0167-03) by the Environmental Protection Agency (EPA).

[5] Central Statistics Office, Census 2016 Sapmap Area: Electoral Division Duleek. Available at: http://census.cso.ie/sapmap2016/Results.aspx?Geog_Type=ED3409&Geog_Code=2AE19629188213A3E055000000000001#SAPMAP_T13_1301

The facility is located 1.8km west of the M1, bound to the south by the R152 regional road and surrounded by greenfield on all other sides.

The principal potential receptors within the environs of the facility include residential homes and industrial premises. Irish Cement Platin is to the immediate north of the site and the rest of the surrounding land is used for industrial, agricultural and residential purposes. Residential development in Carranstown is predominantly ribbon development along the main road (R152). These vary from one off housing to garages and two-storey farmhouses with associated sheds. There are nine private residences located within 200m of the site boundary with one directly adjacent at the north eastern site boundary. The village of Duleek is located approximately 2.7km south west of the site. There are four primary schools located within the general area. These are listed in **Table 6.4**.

Table 6.4: Educational Facilities in the Area. Source MyPlan.ie

School Type	Name	Address	Approx. Distance from existing facility (km)
Primary	Scoil Colm Cille	Mt. Hanover, Duleek, Co. Meath	1
Primary	Donore Primary	Donore, Duleek, Co. Meath	2
Primary	Duleek Girls NS	Duleek, Co. Meath	2.5
Primary	Duleek Boys NS	Duleek, Co. Meath	2.5

6.3.5 Economic Activity

The existing Indaver facility employs a total of 60 No. employees at the plant.

In proximity to the facility, a number of small commercial/industrial units including a petrol station and forecourt shop have been constructed approximately halfway between the facility and Duleek village. Northwards along the R152 from the Indaver facility there are also commercial businesses mostly related to car sales, servicing and testing. There are a number of shops and businesses in the towns of Duleek and Donore with a medium sized commercial Business Park located on the outskirts of Duleek.

Irish Cement Ltd. operate a large quarrying and cement manufacturing facility to the north of the site in the townland of Platin. The plant is a major employer in the area. The Navan Drogheda railway line runs between the plant and the Indaver facility. The output capacity at the Platin facility is in the region of 2.8 million tonnes of cement annually.

A significant portion of the study area is farmland so a number of non-residential buildings outside of the towns are farm sheds and related agri-business. There are numerous small and large farms scattered across the study area.

6.3.6 Heritage and Amenity

Social and community facilities located in the study area include the local football club adjacent to Carranstown Lodge and Duleek pitch and putt course. Bellewstown Golf Club is located approximately 5km to the south-east of the site.

The area is classified under the Meath County Development Plan 2013 - 2019 as *'Rural and Agricultural'*. The closest *'Areas of Visual Quality'* to the facility are the Lower Boyne Valley located about 2km to the north and the River Valleys located about 2km to the south. The area immediately surrounding the facility is not a significant tourist attraction, however Duleek is identified as a settlement with potential to be a tourist base and is considered a secondary tourist attraction in the County Development Plan. The village of Duleek attracts tourists related to River Boyne fishing holidays and the town has heritage connections to the historic Battle of the Boyne.

Duleek is located within *Central Lowlands Landscape Character Area* which is identified by the Meath County Development Plan 2013 - 2019 as being of regional importance, of high landscape value, and as having medium landscape sensitivity. Refer to **Chapter 13** ***Landscape and Visual*** for further details on landscape character. The core area of Duleek town is designated as an Area of Archaeological Interest. The Duleek Heritage Trail has been established because of the high-quality built heritage and historic buildings within Duleek and includes monastic facilities and facilities linked to the Battle of the Boyne.

The village has a number of religious crosses, churches and Abbeys as well as the oldest lime tree in Ireland, historically linked to the Battle of the Boyne.

Further detail on the local cultural heritage, including heritage structures/amenities and natural heritage and visual aspects is presented in **Chapter 12** ***Archaeology, Architectural and Cultural Heritage*** and **Chapter 11** ***Biodiversity*** and **Chapter 13** ***Landscape and Visual*** respectively**.**

6.4 Characteristics of the Proposed Development

6.4.1 Construction Phase

The proposed construction phase is described in detail in **Chapter 5** ***Construction Activities***. Population aspects of relevance to the construction phase of the proposed development include economic and employment opportunities, construction traffic generation, and the potential for nuisances associated with the construction works such as noise and dust emissions.

As described in **Chapter 5**, the proposed development is to be constructed in two phases, with phase one expected to take approximately 16 months to construct and phase two expected to take a further 12 months.

It is envisaged that the peak number of construction personnel on site for phase one will be 120 and during phase two construction personnel are expected to peak at 100 people.

The construction of the proposed development will involve significant capital investment by Indaver. There will also be associated off-site secondary employment and economic activity associated with the supply and fabrication of construction materials and services to the site.

The movement of construction staff to and from the site has the potential to generate additional traffic on local roads in the short-term. The characteristics of the proposed development with regards to traffic has been assessed and is described in further detail in **Chapter 7 *Traffic and Transportation***.

General construction activities including excavation, pilling, as well as the movement of construction vehicles to and from the site, have the potential to give rise to atmospheric emissions, and to generate noise and vibration during the construction phase. The characteristics of the proposed development with regards to air quality and climate, and noise and vibration are assessed and described in further detail in **Chapter 8 *Air Quality*** and **Chapter 10 *Noise and Vibration***, respectively.

6.4.2 Operational phase

The proposed development is described in detail in **Chapter 4 *Description of the Proposed Development***.

The proposed development does not propose any significant changes to the waste to energy (WtE) operating processes at the facility. Although additional tonnage (15,000 tpa) is proposed to be processed at the plant, this is primarily for the treatment of aqueous wastes.

The ongoing operations at the facility will be carried out in compliance with Indaver's IE Licence (W0167-03) issued by the EPA and any additional waste accepted, stored or processed on the site will be done so in accordance with the emission and operational limit requirements set out in this licence and any future required amendments. IE Licence operational limits will also continue to apply to noise emissions from the site.

Population aspects of relevance to the proposed development include economic and employment opportunities, journey patterns, potential for atmospheric emissions, and risk of major accidents and disaster.

The development will take place within the site boundary of the existing Indaver facility and there will be no additional land-use changes outside of this area. The proposed tank farm and ancillary works will serve to improve the efficiency of activities at the facility and provide additional sustainable recovery solutions to the Irish waste market. The hydrogen generation unit (HGU) will utilise energy generated on site which would have otherwise gone to waste.

The hydrogen generated can then be either fed into the natural gas grid or stored on site for fuelling trucks, buses and other vehicles that have been either designed or retrofitted to run on hydrogen fuel cells

6.5 Literature Review

6.5.1 Introduction and Methodology

6.5.1.1 Overview

A literature review was performed to identify potential significant effects on human health.

Whilst there are a number of elements to the proposed development, most of these are inherently unlikely to have significant human health effects. For example, a storage area for bottom ash is proposed but this is for bottom ash which is already produced on site as part of the existing process and will provide the flexibility to export bottom ash to continental Europe for recovery in the event that there are no bottom ash recycling plants developed in the next five to ten years, as described in **Section 4.5.5** of **Chapter 4** and **Section 16.5.3.10** of **Chapter 16**, ***Material Assets***.

To identify potential significant effects on human health, a literature review was conducted. This is not a new facility and the changes in air emissions are minimal and will be related to increase in traffic rather than from the existing facility, therefore a full literature review is unnecessary but has been performed for completeness and it addresses the waste to energy aspects of the proposal regarding human health.

6.5.1.2 Waste to Energy Studies

The introduction of waste incinerators has resulted in numerous studies of the effects of this process on human health.

These have been carried out in either the occupational or community setting. Most of the published studies have looked at incinerators whose emissions of dioxins, particulates and heavy metal were far greater than would be emitted by a modern incinerator such as that operating at Carranstown. Basic scientific principles indicate that the more controlled the emissions are, the lower the level of toxins which are emitted, the less potential for any health effects.

Therefore, the studies that are available, which will be discussed in more detail in the following literature review section, in many ways show a “worse than worst” case scenario for modern incinerators. They can nevertheless be valuable in making an assessment of the possible human health effects whereby if there is little discernible effect with poor controls, we can therefore be scientifically certain there will be still fewer effects with greater controls.

The health outcomes that have been examined in the various published studies include respiratory symptoms and illness, reproductive effects and the development of cancer.

In addition to studies of the possible consequences of non-specific exposure to emissions from waste incinerators, research has also been conducted to determine the presence or effects of exposure to certain substances known to be present in incinerator emissions. In recent years, more attention has also been given to particulate matter such as PM_{10} and $PM_{2.5}$.

6.5.1.3 Review Methodology

A PubMed electronic search was performed on the 4th April 2020 using the key word "incineration" to identify further studies and any more recently published studies. A total of 6,299 articles were identified. When the search was narrowed using the two words "incineration health", 1,352 articles were identified. This could be further reduced if the terms were "waste incineration health" which identified 966 articles. These are all of varying age and relevance.

Using other terms such as incinerator tended to narrow the search further but perhaps might omit relevant articles. A Google search on the same day revealed over 20 million hits for the term "incineration". Even narrowing this by using "waste incineration health" nearly 6,000,000 were found but of course the tool used by the Medical profession is normally PubMed.

It is possible to refine searches in PubMed using a "review" filter and when this was done with the terms "waste incineration health" there were a total of 99 articles. This identifies the articles published in peer reviewed medical journals which attempted to review the available scientific information from other publications.

6.5.2 Literature Review Results

6.5.2.1 HRB report and DEFRA report

Previously, reliance has been on the publication from 2003 by the Health Research Board on *Health and Environmental Effects of Landfilling and Incineration of Waste* and the publication *A review of the environmental and Health effects of Waste Management* was published in May 2004 by the UK Department of the Environment, Food and Rural Affairs (DEFRA).

Both of these publications are now somewhat dated. The studies quoted were largely related to older generation incinerators and prior to EU Directives which set limits on emissions but can be assessed in addition to more recent publications.

The Health Research Board (HRB) report was commissioned in 2003 to review existing data on waste management methods at that time. It presented the available data at that time. In general, it did not make recommendations on the best solutions and in some ways, this is disappointing but that was not its remit. Regarding the human health effects of incineration, it stated:

"*There is some evidence that incinerator emissions may be associated with respiratory morbidity. Acute and chronic respiratory symptoms are associated with incinerator emissions.*

A number of well-designed studies have reported associations between developing certain cancers and living close to incinerator sites. Specific cancers identified include primary liver cancer, laryngeal cancer, soft-tissue sarcoma and lung *cancer. It is hard to separate the influences of other sources of pollutants, and other causes of cancer and, as a result, the evidence for a link between cancer and proximity to an incinerator is not conclusive.*

Further research, using reliable estimates of exposure, over long periods of time, is required to determine whether living near landfill sites or incinerators increases the risk of developing cancer.

Studies of specific environmental agents and specific cancers may prove more definitive in the future."

The current status of this statement and its implications for facilities such as Carranstown will be explored in more detail in this assessment.

The DEFRA report (2004) although covering many of the same studies went further in terms of scientific interpretation and in those terms was probably more helpful in an assessment of the risks or otherwise associated with a technology such as incineration. For example, it stated:

"We looked in detail at studies of incineration facilities and found no consistent or convincing evidence of a link between cancer and incineration. There is little evidence that emissions from incinerators make respiratory problems worse. In most cases the incinerator contributes only a small proportion to local levels of pollutants."

Since the DEFRA report, several important reviews were made. Some of the more important are summarised below.

6.5.2.2 WHO Workshop

The World Health Organisation (WHO) published *Population health and waste management*: *scientific data* and *policy options*. *Report of a WHO workshop*. *Rome, Italy*, in March 2007. Published 2008.

It states:

"Evidence is inadequate to draw conclusions that can be used to determine optimal policy choice on incineration: relatively few good quality studies exist, and they refer to old generation incineration plants-an important distinction, as stack emissions from modern plants are much reduced compared to old generation plants. The adoption of emission abating technology enforced by European Union EU has resulted in a less likely occurrence of measurable health effects on populations resident in the proximity of newer generation incinerators."

And

"Studies pointing to an increase in soft tissue sarcomas (STS) and non-Hodgkin's lymphomas (NHL) support a possible aetiological role of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8 T4CDD). The evidence is inadequate to draw conclusions that can be used to determine optimal policy choices on incineration: relatively few good quality studies exist, and they refer mostly to old generation incineration plants – an important distinction, as stack emissions from modern

plants are much reduced compared to old generation plants. The adoption of emission-abating technology, enforced by the European Union (EU), has resulted in a less likely occurrence of measurable health effects on populations resident in the proximity of new generation incinerators."

6.5.2.3 Porta Review 2009

The Porta review[6] (2009) is a '*Systematic review of epidemiological studies on health effects associated with management of municipal solid waste'*, concentrated on municipal solid wastes (MSW) sites but did include other studies as well. It reported:

"In most cases the overall evidence was inadequate to establish a relationship between a specific waste process and health effects; the evidence from occupational studies was not sufficient to make an overall assessment. For community studies, at least for some processes, there was limited evidence of a causal relationship and a few studies were selected for a quantitative evaluation. In particular, for populations living within two kilometres of landfills there was limited evidence of congenital anomalies and low birth weight with excess risk of 2 percent and 6 percent, respectively. The excess risk tended to be higher when sites dealing with toxic wastes were considered. For populations living within three kilometres of old incinerators, there was limited evidence of an increased risk of cancer, with an estimated excess risk of 3.5 percent. The confidence in the evaluation and in the estimated excess risk tended to be higher for specific cancer forms such as non-Hodgkin's lymphoma and soft tissue sarcoma than for other cancers".

This is broadly in line with previous reviews. Of course, the most important point is that these findings relate to "old" incinerators, 20 years or older. As pointed out in this EIAR, and indeed in the WHO review quoted above, the existing licensed facility already complies with the strictest EU emission standards and the proposed development will also have to comply with the strictest EU emission standards and therefore cannot be compared to the older generation studied.

6.5.2.4 Giusti Review 2009

Giusti et al.[7] (2009) concluded:

"The main conclusion of the overall assessment of the literature is that the evidence of adverse health outcomes for the general population living near landfill sites, incinerators, composting facilities and nuclear installations is usually insufficient and inconclusive."

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[6] Porta, D., Milani, S., Lazzarino, A.I., Peruci, C.A., Forastiere, F. (2009) Systematic review of epidemiological studies on health effects associated with management of solid waste. Environmental Health, 8:60

[7] Giusti, L., 2009 A review of waste management practices and their impact on human health, Waste Management, 29(8):2227-39.

6.5.2.5 Forastiere 2011

Forastiere et al.[8] (2011) performed a Health Impact Assessment of the effects of waste management including incineration in three countries, England, Italy and Slovakia. It is somewhat historical as it looked incinerators operating in 2001. It made some assumptions based on populations living within 3 km of incinerators based on assumed increases in environmental levels of particulate matter and NO_2 which do not occur around modern incinerators. Nevertheless, their conclusions were:

"Past exposures from incinerators were likely to cause a sizeable health impact, especially for cancer, in Italy and England. However, the current impacts of landfilling and incineration can be characterized as moderate when compared to other sources of environmental pollution, e.g. traffic or industrial emissions, which have an importance on public health".

6.5.2.6 Mattiello 2013

The Mattiello[9] *et al*. (2013) review concluded:

"It is confirmed that historically incinerators are an important source of pollution and harm for the health of populations living nearby; however, changes in technology are producing more reassuring results".

6.5.2.7 Sharma 2013

One review which is out of step with the others is an Indian article published in 2013 by Sharma[10]. This concentrated on potential options for dealing with health care waste. It stated:

"Incinerators releases a wide variety of pollutants depending on the composition of the waste, which leads to health deterioration and environmental degradation. The significant pollutants emitted are particulate matter, metals, acid gases, oxides of nitrogen, and sulphur, aside from the release of innumerable substances of unknown toxicity. This process of waste incineration poses a significant threat to public health and the environment. The major impact on health is the higher incidence of cancer and respiratory symptoms; other potential effects are congenital abnormalities, hormonal defects, and increase in sex ratio. The effect on the environmental is in the form of global warming, acidification, photochemical ozone or smog formation, eutrophication, and human and animal toxicity".

It suggested greater use of autoclaves and plasma pyrolysis being a solution for the biological hazards of health care waste. This is simply not consistent with the

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[8] Forastiere (2011) Health Impact Assessment of Waste Management in three Countries, Environmental Health, 10:53.

[9] Mattiello (2013) Health effects associated with the disposal of solid waste in landfills and incinerators in populations living in surrounding areas: a systematic review, International Journal of Public Health, 58(5):725-35.

[10] Sharma (2013) *The impact of incinerators on human health and environment*, Reviews on Environmental Health, 28(1):67-72.

vast majority of published reviews so should be treated with great caution but also as the emphasis of the review was on health care waste, it is much less relevant in the context of the proposed development.

6.5.2.8 De Titto 2019

The article by De Titti and Savino[11] (2019), presents a mini review of the published research focused on understanding environmental and human health impacts nearby waste incineration plants. It is the most recently published of the reviews but broadly shares the conclusions of the others:

"*We found no studies indicating that modern technology waste incineration plants, which comply with the legislation on emissions, are a cancer risk factor or have adverse effects on reproduction or development.*

There are several factors in favour of this affirmation: (a) the emission levels of the plants currently built in the developed countries are several orders of magnitude lower than those of the plants in whose environments epidemiological studies have been carried out and which have found some kind of negative association in terms of health; (b) risk assessment studies indicate that most of the exposure is produced through the diet and not by a direct route; and (c) monitoring dioxin level studies in the population resident in the environment of incineration plants did not reveal increases of these levels when compared with a population living in reference areas."

6.5.2.9 Public Health England

Public Health England is a governmental body in the UK charged with analysing information and making recommendations on issues that may pertain to human health in England. Public Health England made a noteworthy statement in 2015 when Dr Simon Bouffler deputy director of PHE's Centre for Radiation, Chemical and Environmental Hazards stated (Bouffler, 2015):

"that well run and regulated modern municipal waste incinerators are not a significant risk to public health remains valid, and the study is being carried out to extend the evidence base and to provide further information to the public on this subject".

Font et al. in Atmospheric Environment in a separate article published in July 2015[12] stated:

"From our analysis we found no evidence of incinerator emissions in ambient metal concentrations around four UK MWIs [municipal waste incinerators]. The

[11] de Titto E[1], Savino A[2]. (2019) *Environmental and health risks related to waste incineration.* Waste Manag. Res. 2019 Oct; 37(10):976-986. doi: 10.1177/0734242X19859700. Epub 2019 Jul 18.

[12] Font, A., de Hoogh, K., Leal-Sanchez, M., Ashworth, D.C., Brown, R.J.C., Hansell, A.L., Fuller, G.W. (2015) Using metal ratios to detect emissions from municipal waste incinerators in ambient air pollution data. Atmospheric Environment, 113: 177-186

six UK MWIs studied contributed little to ambient PM10 [particulate matter] concentrations"'.

Public Health England funded a study into the health effects of emissions from energy-from-waste plants and was carried out by the Small Area Health Statistics Unit (SAHSU) at Imperial College and the Environmental Research Group at King's College London, looking at data gathered between 2003 and 2010 The paper by Douglas et al.[13] stated that that incinerators emit a 'low level' of air pollutants. Details of the study were published in the Environmental Science & Technology Journal in 2017. *Environ. Sci. Technol.* 2017, 51, 13, 7511-7519.

It stated:

"Overall this study suggests that PM10 exposures related to MWI emissions in Great Britain are extremely low (annual means ranging from 1.00 × 10–5 to 5.53 × 10–2 μg m–3) especially when compared to annual mean background concentrations (typically ranging between 2.00 × 101 and 5.00 × 101 μg m–3 in Europe)".

6.5.2.10 Health Protection Agency UK 2010

The Health Protection Agency (HPA, 2010) is another UK Governmental agency who are responsible for making recommendation on the protection of health.

They issued a report in 2010. They said:

"While it is not possible to rule out adverse health effects from modern well regulated incinerators with complete certainty, any potential damage to health of those living close by is very small if detectable".

It goes on:

"Since any possible health effects are very small, if detectable, studies of Public Health around modern well managed municipal waste incinerators are not recommended".

This latter point is important as an agency as when a reputable and independent as the Health Protection Agency says this it is very reassuring. As already stated, these studies have proceeded anyway to give further evidence again.

6.5.2.11 SAHSU 2018

The UK Small Area Health Statistics Unit (SAHSU) study (Ghosh, 2018)[14] has been published. This was funded by Public Health England amongst others was

[13] Douglas, P., Freni-Sterrantino, A., Leal Sanchez, M., Ashworth, A.C., Ghosh, R.E., Fecht, D., Font, A., Blangiardo, M., Gulliver, J., Toledano, M.B., Elliott, P., de Hoogh, K., Fuller, G.W., Hansell, A. (2017) Estimating particulate exposure from modern municipal waste incinerators in Great Britain. Environmental Science and Technology, 51, 13:7511-7519

[14] Ghosh. (2018). Fetal growth, stillbirth, infant mortality and other birth outcomes near UK municipal waste incinerators; retrospective population based cohort and case-control study. Environment International, https://doi.org/10.1016/j.envint.2018.10.060

one of the largest studies ever published. Of importance is that it studied incinerators operating under modern limits. It was titled *"Fetal growth, stillbirth, infant mortality and other birth outcomes near UK municipal waste incinerators* [MWI]*; retrospective population-based cohort and case-control study".*

Indeed, interestingly in the now normal conflict of interest statements, one of the 14 authors declared Greenpeace membership and another Friends of the Earth membership. This most robust study was therefore entirely independent from the incineration industry. The study was large enough to be able to detect even small changes if such existed.

The result of the study was:

"Analyses included 1,025,064 births and 18,694 infant deaths. There was no excess risk in relation to any of the outcomes investigated during pregnancy or early life of either mean modelled MWI PM10 or proximity to an MWI".

The conclusion was:

"This large national study found no evidence for increased risk of a range of birth outcomes, including birth weight, preterm delivery and infant mortality, in relation to either MWI emissions or living near an MWI operating to the current EU waste incinerator regulations in Great Britain. The study should be generalisable to other MWIs operating to similar regulations and with similar waste streams."

While one might say that this may have been expected given the other studies above, it is the first study that one might say extends to the level of proof that there are no adverse health effects with a modern incinerator.

6.5.3 European Council Directives

The Waste Incineration Directive (WID) introduced in 2000 set stringent operating conditions and sets minimum technical requirements for waste incineration and co-incineration. It consolidated new and existing incineration controls into a single piece of European legislation.

The requirements of the Directive were developed to reflect the ability of incineration plants to more cost effectively achieve high standards of emission control in comparison to the 1980s. Previous waste incineration directives only applied to municipal and hazardous waste. WID updated the requirements of the 1989 municipal waste incineration (MWI) directives (89/429/EEC and 89/369/EEC) and, merged them into the 1994 Hazardous Waste Incineration Directive (94/67/EC), consolidated new and existing incineration controls into a single piece of European legislation (2000/76/EC).

This has now been superseded by the Industrial Emissions (IE) Directive. The Directive specifies air emission limits which must not be exceeded. The basis of the emission limits is to prevent, or limit as far as is practicable, negative effects on the environment and the resulting risks to human health. The proposed development will have to continue to abide by the strictest of criteria under the IE licence (W0167-03) issued by the EPA.

6.5.4 Dioxins

Dioxins and furans will form spontaneously in a combustion process from chlorine atoms, carbon that has not been fully oxidised, and various catalysts in cooling smoke; hence, the process is the same for waste incineration plants, turf fires and tiled stoves alike. Each of the 200 dioxin and furan compounds is of a different degree of toxicity; for that reason, their so-called toxicity units (TUs) are determined and summarized into units of grams per toxicity unit (g TU).

Indeed, the public concern on dioxins was so significant that the Food Safety Authority of Ireland (FSAI) published a report in 2003 (FSAI, 2003) on the potential effect on food if waste incineration of municipal waste was introduced into Ireland. They stated:

" *In relation to the introduction of waste incineration in Ireland, as part of a national waste management strategy, the FSAI considers that such incineration facilities, if properly managed, will not contribute to dioxin levels in the food supply to any significant extent and will not affect food quality or safety*".

The WHO issued a fact sheet on dioxins No. 255 which was updated in October 2016 (WHO, Dioxins and their effects on human health, WHO Fact sheet N°225 , 2016).

This stated:

"Proper incineration of contaminated material is the best available method of preventing and controlling exposure to dioxins. It can also destroy PCB-based waste oils. The incineration process requires high temperatures, over 850°C. For the destruction of large amounts of contaminated material, even higher temperatures - 1000°C or more - are required".

Regarding effects on human health it commented:

"*Short-term exposure of humans to high levels of dioxins may result in skin lesions, such as chloracne and patchy darkening of the skin, and altered liver function. Long-term exposure is linked to impairment of the immune system, the developing nervous system, the endocrine system and reproductive functions.*

Chronic exposure of animals to dioxins has resulted in several types of cancer. TCDD was evaluated by the WHO's International Agency for Research on Cancer (IARC) in 1997 and 2012. Based on animal data and on human epidemiology data, TCDD was classified by IARC as a "known human carcinogen". However, TCDD does not affect genetic material and there is a level of exposure below which cancer risk would be negligible".

"Due to the omnipresence of dioxins, all people have background exposure and a certain level of dioxins in the body, leading to the so-called body burden. Current normal background exposure is not expected to affect human health on average. However, due to the high toxic potential of this class of compounds, efforts need to be undertaken to reduce current background exposure".

Much of the attention in debates in the past about the human health effects of incinerators has concentrated on dioxins and furans.

The dioxin emissions from modern incinerators are up to 1,000 times less than 20 years ago. This can be seen from the situation in Germany, one of the countries in Europe that has studied this area most closely and one where environmental concerns are taken very seriously. Whereas in 1990 one third of all dioxin emissions in Germany came from waste incineration plants, for the year 2000, the figure was less than 1%. It is estimated that in Germany now for example that chimneys and tiled stoves in private households alone discharge approximately twenty times more dioxins into the environment than all the waste incineration plants together (UN, 1999). This is also evident from the fact that in winter airborne dioxin loads are up to five times higher than in summer when heating systems are out of operation, but the incineration plants are still operating.

Most dioxins we are exposed to are in our diet. The major sources are dairy products, as well as some other foods. One however rarely sees this fact highlighted in the press except perhaps after occasional “scares” such as the 2008 Italian one when high levels of Dioxins were found in some agricultural products around Naples. Interesting this was attributed to illegal landfills not incineration.

In addition, there was in 2008 a recall of Irish pork products in relation to elevated dioxins. This was detected through routine monitoring of food. This was traced to contaminated feed which in turn traced back to contaminated oil. There was no evidence of a public health issue.

Because the food we eat is increasingly not from the immediate vicinity in which we live but rather from the broader national and international sources the effect of any source may be dispersed far and wide but equally we may be more vulnerable to high levels coming from all parts of the world rather than our own “back-yard”.

6.5.5 Heavy Metals

Heavy metals, such as lead and mercury, are retained in the filtering devices of waste incineration plants. They are not regarded as carcinogens. Whether or not they are poisonous for human beings will depend on whether they reach their thresholds of effectiveness. In effect, for these to have a human health effect, they must leave the incinerator in the form of emissions and enter the human body either by inhalation or ingestion and theoretically, but rarely in practice, through the skin.

For these substances, too, there has been an impressive decline in emissions from modern incinerators compared with historical measures. Improved controls and reduction in amounts in wastes presenting for treatment explains the marked reduction experience in their emissions.

For example whereas in 1990, emissions in Germany amounted to as much as 57,900 kilograms (kg) of lead and 347 kg of mercury from the incineration of household waste, the respective levels declined to 130.5 kg (equivalent to 0.2% of initial emissions) and 4.5 kg (1.3% of initial emissions) in the year 2001[15]. Thus, lead and mercury emissions from the incineration of household waste are also no longer significant for human exposure to emissions of toxic substances.

[15] http://www.seas.columbia.edu/earth/wtert/sofos/Waste_Incineration_A_Potential_Danger.pdf

6.5.6 Specific Health Issues

6.5.6.1 Respiratory symptoms and illness

Some older studies, described in the 2003 Health Research Board (HRB) report did show that symptoms of respiratory illness, such as chronic cough, wheeze and sinus trouble, were significantly greater in those living near a hazardous waste incinerator than in their control community. It should be noted that these studies predated much stricter environmental controls on the emissions of particulates to which the Indaver facility does and will continue to operate within.

Studies of self-reported symptoms must always be treated with caution as they can be more revealing about peoples' concerns rather than actual health effects. Again, while there have been some of these in the past none were without issues.

As any respiratory symptom that might occur must in turn be related to increase in some airborne contaminant, be it particulate matter or products of combustion such as Sulphur Dioxide or Nitrogen Dioxide. It follows that with the vast reduction of the emission of these in newer incinerators, to levels where there is little or no change in the baseline conditions, these effects will not occur.

In effect the emissions from modern incinerators will not cause coughs or respiratory symptoms.

6.5.6.2 Reproductive effects

Very often when one discusses incineration, concerns are expressed about potential reproductive effects. It is true that in the 1980s studies quoted in the HRB report, there were reported to be an increase in the frequency of twinning in human and cattle populations in an area in central Scotland at increased risk from incinerator emissions.

These findings have not been replicated.

The HRB report also mentions a study of open chemical combustion in the Netherlands in the 1960's was carried out to investigate the incidence of orofacial clefts in the region and to determine any association with the local combustion facility. The authors concluded that these results inferred an association between the incinerator and the increased local incidence of orofacial clefts. Although this increase was probably a true finding, the possibility of other influencing factors, such as alternative sources of exposure, could not be ruled out.

This study is of open chemical burning and bears no relation to modern incineration and so is of no relevance to the existing facility or the proposed development, but again is described here as it is often quoted by persons opposing incineration per se.

A review performed by Ashworth et al (Ashworth, 2014) entitled *Waste incineration and adverse birth and neonatal outcomes: a systematic review* was published in 2014 and is probably the most authoritative ever published.

This concluded:

"*that a comprehensive literature search yielded fourteen studies, encompassing a range of outcomes (including congenital anomalies, birth weight, twinning, stillbirths, sex ratio and infant death), exposure assessment methods and study designs. For congenital anomalies most studies reported no association with proximity to or emissions from waste incinerators and "all anomalies", but weak associations for neural tube and heart defects and stronger associations with facial clefts and urinary tract defects. There is limited evidence for an association between incineration and twinning and no evidence of an association with birth weight, stillbirths or sex ratio, but this may reflect the sparsity of studies exploring these outcomes".*

It went on:

"The current evidence-base is inconclusive and often limited by problems of exposure assessment, possible residual confounding, lack of statistical power with variability in study design and outcomes. However, we identified a number of higher quality studies reporting significant positive relationships with broad groups of congenital anomalies, warranting further investigation.

Future studies should address the identified limitations in order to help improve our understanding of any potential adverse birth outcomes associated with incineration, particularly focussing on broad groups of anomalies, to inform risk assessment and waste policy."

The recently published SASHU study (Ghosh, 2018) confirms no adverse effects with modern incinerators. This studied over 1 million births so is an extremely robust study.

6.5.6.3 Cancer

It is fair to say some studies have reported putative links between incinerators and cancers. However not one of these studies was without problems. In the past incinerators were often sited in urban, industrial and otherwise polluted areas. This introduced major confounders for studying cancers such as deprived populations, urban living, other sources of industrial pollutions, cigarette smoking habits etc.

It is also true that other studies did not support such a link.

The largest study by Elliot (Elliot, 1996) in 1996 examined 72 incinerators. This included essentially all incineration plants, irrespective of age, up to 1987. This was by far the largest and statistically probably the best study ever conducted.

It studied a total of 14 million people. It nevertheless was unable to convincingly demonstrate an excess of cancers in areas within 7.5 km of incinerators once socio-economic confounding was taken into account.

There were reported individual increases for stomach, lung, colorectal and primary liver cancers. This however was thought to be largely due to residual confounding by socio-economic factors. Liver cancer, for example, was the most strongly significant (37% excess risk within 1 km of municipal waste incinerators) but, on review of cancer registration data, this cancer category was reported to be frequently misclassified or misdiagnosed (mainly secondary liver tumours). In a follow up study to investigate the validity of these liver cancer diagnoses, Elliot et al. (2000) attempted to determine the size of any true excess in the vicinity of municipal waste incinerators. In a sample of cases subjected to histological and medical record reviews, only about half were reported to be true primary liver cancer. This resulted in a re-estimation and significant reduction of the calculated excess risk previously reported.

The strong association between deprivation and primary liver cancer was thought to remain an influence on the residual result.

Nevertheless, the overall finding from this very large study was of no increase in cancers in those living close to incinerators.

As a result of this study but also taking into account studies previously published, the UK Department of Health's Committee on Carcinogenicity (COC) published a statement in March 2000 (COC, 2000), evaluating the evidence linking cancer with proximity to municipal solid waste incinerators in the UK.

The Committee specifically examined the results of these studies, and concluded that,

"*Any potential risk of cancer due to residency (for periods in excess of ten years) near to municipal solid waste incinerators was exceedingly low and probably not measurable by the most modern techniques".*[23]

The Committee agreed that the observed excess of all cancers, stomach, lung and colorectal cancers was due to socio-economic confounding and was not associated with emissions from incinerators. The Committee agreed that, at that time, there was no need for any further epidemiological investigations of cancer incidence near municipal solid waste incinerators.

Indeed, the DEFRA report published in 2004 and referred to in the introduction of the Literature Review concluded:

"We looked in detail at studies of incineration facilities and found no consistent or convincing evidence of a link between cancer and incineration. There is little evidence that emissions from incinerators make respiratory problems worse. In most cases the incinerator contributes only a small proportion to local levels of pollutants."

This absence of a measurable effect was evident even with older and undoubtedly dirtier incinerators.

When this is true, we can be as scientifically certain as we can be that there can be no effect with lower emissions from modern facilities regulated to the highest standards.

6.5.7 Repeatedly Quoted Papers

British Society of Ecological Medicine (2006) The health effects of waste incinerators.

This document was published by the British Society of Ecological Medicine (BSEM) in February 2006. This "Society" appear to have little academic standing and we are addressing the report here not because of scientific merit but rather the fact that it has been submitted by objectors in previous applications by Indaver.

Enviros, now known as SKM Enviros, was the company commissioned by the UK government to produce a literature review on health effects of waste management in 2004 commented on the BSEM report. The Enviros report, '*Evaluation of the 4th Report of the British Society for Ecological Medicine: "The Health Effects of Waste Incinerators"*' was published in 2006 and makes the following points about the BSEM report (2006):

"The study makes the common mistake of identifying incinerators as a significant source of emissions of fine particulate matter, dioxins and furans, volatile organic compounds and metals. In fact, incinerators do not make a significant contribution to emissions of these substances. This means that, while the report may make valid comments about the risks to health associated with exposure to these substances, the conclusion should be to consider what needs to be done to deal with the main sources of these emissions.
For example, emissions of PM_{10} from MSW incineration are approximately 100 tonnes per year, compared to 22,000 tonnes per year from electricity generation. Emissions of finer particles (e.g. $PM_{2.5}$ and PM_1) and secondary particles would be expected to be in a similar proportion. If it is right to be concerned about fine particulate matter, then attention needs to be paid to controlling emissions from electricity generation, road transport, agriculture and domestic sources. No discernible benefit would be gained by any policy change relating to waste incineration, because the source is simply too small to be significant."

It concluded:

"The report falls down badly in its understanding of incineration processes. It fails to consider the significance of incineration as a source of the substances of concern. It does not consider the possible significance of the dose of pollutants that could result from incinerators. It does not fairly consider the adverse effects that could be associated with alternatives to incineration. It relies on inaccurate and outdated material. In view of these shortcomings, the report's conclusions with regard to the health effects of incineration are not reliable."

The Health Protection Agency in the UK also reviewed the report and stated:

"*The BSEM report is not a systematic review of the literature and there is no critical analysis of the quality of the included studies. Consequently, the report presents a selective and inaccurate review of the scientific literature. For example the report has not considered important reviews such as the Defra review of environmental and health effects of waste management, the Committee on Carcinogenicity (COC) statement on cancer incidence near municipal solid waste incinerators in Great Britain or the Royal Society critique of the Defra review. In*

addition, several statements regarding health risks are not supported by appropriate scientific references, for example '…increased ischaemic heart disease has been reported in incinerator workers' is taken from a study regarding cement kilns 'They are therefore capable of extremely serious health consequences'.
The authors have also failed to acknowledge the impact of the current legislative changes which minimises the potential for public exposure to emissions. The Waste Incineration Directive for example has strengthened the regulatory regime and provides for strict operating robust monitoring programmes.

There are misleading statements on health issues such as carcinogenicity and it misinterprets the 'precautionary principle'. The precautionary principle should be invoked if there is good reason to believe that harmful effects may occur and the level of scientific uncertainty regarding the consequences or likelihood of the risk is such, that the best available scientific methods to assess the risk with sufficient confidence is not complete, to inform decision making.

As there is a body of evidence strongly indicating that contemporary waste management practices of modern incinerators have at most, a minor effect on human health and the environment, there are no reasons for adopting the 'precautionary principle' to restrict the introduction of new incinerators".

Again, this has been referred to in the above "report" and also by opponents to previous Indaver applications. Again, the Enviros response (2006) is quoted below which adequately deals with this area.

"The BSEM Enviros Response states that "… incinerators will create vast amounts of dioxins, particularly in the ash for periods of 20-30 years…" An incinerator accepting 100,000 tonnes of waste per year over 25 years will result in the production of approximately 25 grams of dioxins and furans in solid residues and approximately 1 gram in emissions to air (expressed as toxic equivalent). For context, sources such as accidental fires, agricultural waste burning, industrial combustion and small-scale waste burning (e.g. on building sites) all give rise to a thousand times more emissions to air.

Information on emissions in residues is harder to obtain, but landfill of household waste results in the production of more than one hundred times as much dioxin as would be contained in the ash from an incinerator. What can we conclude from this? The BSEM concludes that emissions at this level would constitute "tearing up" the Stockholm treaty. A more appropriate conclusion is that the UK should fulfil its responsibilities under the Stockholm treaty by dealing with sources such as those listed above. Enviros is working with the UK Government in this area.

Preventing further development of waste incineration on these grounds risks diverting attention from much more important sources of unintentional persistent organic pollutants and will make no detectable or significant difference to the unintentional production of dioxins and furans."

The same comments are equally applicable to Ireland.

6.6 Likely Significant Effects

6.6.1 Do Nothing Scenario

The "Do Nothing" scenario will involve the facility operating as it currently does without construction related impacts such as noise or dust emissions and additional traffic related emissions. Under this scenario, ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from potential new developments in the surrounding area, changes in road traffic, etc).

In the absence of the proposed development, the existing Indaver facility would operate as it does currently without the additional capacity for additional waste including hazardous aqueous waste from industry, pre-treatment of third-party boiler ash and flue gas cleaning residues and the new hydrogen generation unit.

Under the 'do-nothing' scenario, no additional employment opportunities would be generated, and no subsequent economic benefits would be gained locally, regionally or nationally.

Should the proposed development not proceed, there would be no change in existing traffic movements or journey patterns and the risk of major accidents or disasters occurring on site would remain to be determined based on existing facility operations.

6.6.2 Construction Phase

6.6.2.1 Population

The construction of the proposed development will have a direct effect on population in terms of employment opportunities. As described in **Section 6.4.1.1**, the construction phase will provide additional employment opportunities with up to 120 construction workers on site during the peak.

There will be secondary economic benefit associated with the supply and fabrication of construction materials and services to the site.

Potential indirect effects will be associated with potential temporary disruption to nearby residents and road users; potential indirect effects from air quality due to localised dust generation; and noise from construction activities for example truck movements, excavations and piling.

No local amenities will be significantly affected by the proposed development during construction. The site is removed from the Duleek village where most local amenities are centred.

As discussed in **Section 7.9.2** of **Chapter 7 *Traffic & Transportation***, any additional traffic associated with construction traffic will not have a residual effect as a robust Construction Traffic Management Plan (see Section 9 of the ***Construction Environmental Management Plan*** in **Appendix 5.1** of **Volume 3** in this EIAR) will be put in place for the duration of the works. Therefore, local residents are unlikely to be significantly disrupted regarding traffic.

6.6.2.2 Human Health

The greatest potential for effects on human health during the construction phase of the proposed development is from construction noise and the potential for nuisance dust. These potential effects are outlined in detail in **Chapter 8** ***Air Quality*** and **Chapter 10** ***Noise***. Dust minimisation measures will be implemented for the duration of the construction works to ensure any effects on air quality will not be significant and short-term in duration, as described in **Section 8.8.1** of **Chapter 8**. As described in **Section 10.8.2** of **Chapter 10**, the residual effect of noise will be intermittent and temporary in nature and below the construction noise limits at the nearest noise sensitive properties. Provided the mitigation measures outlined in **Chapters 8** and **10** are adhered to, the effects on the air quality and noise during the construction phase will not be significant on human health.

There is also the potential for traffic related air and noise emissions during the construction phase of the proposed site suitability project. This has been considered in **Chapter 8** ***Air Quality*** and **Chapter 10** ***Noise***.

The change in Daily Traffic Values is not of the magnitude to require an air quality assessment as per the Design Manual for Roads and Bridges (DMRB) screening criteria outlined in **Section 8.5.2** of **Chapter 8**. It can therefore be determined that traffic related air quality impacts during the construction phase are short-term and imperceptible.

Details of the noise assessment for the construction stage traffic flows are outlined in **Section 10.5.5.2** of **Chapter 10**. The change in traffic noise level was calculated between 0 to 0.3dB. A change of this magnitude will not result in any notable change in noise level over existing road traffic noise levels and is considered short-term and imperceptible.

Psychological Impacts Construction Phase

In the planning process, potential adverse effects on psychological health are often mentioned, for example, anxiety and stress experienced by those are worried that there will experience a change in the environment in which they live.

The community will experience annoyance from the temporary effects of the construction phase which in this case is very limited. This is probably the same as for any construction project and will be relatively limited given the location of the site. Annoyance, however, is not in itself a health effect.

6.6.3 Operational Phase

6.6.3.1 Population

The proposed development will have no direct nor indirect significant negative effects on the population of Duleek and surrounding areas in terms of employment, economic activity or amenities.

Projects that have the potential to generate environmental benefits, protect the population from public health dangers as well as support regeneration, reduce unemployment and improve socio-economic circumstance, which can contribute to improving the health and wellbeing of communities.

The proposed development will have a positive effect on the wider economic environment in Ireland by providing additional hazardous waste treatment capacity on the island of Ireland. As described in **Section 2.5.2.1** of ***Chapter 2 Policy and Planning Framework and Need for the Scheme***, in 2018, 76% of hazardous material managed in Ireland was exported to disposal and recovery facilities in Europe. While hazardous waste is currently accepted at Indaver, the increased capacity will provide additional solutions for other operators in terms of waste disposal and facilitate socioeconomic development.

Indirect effects are associated with the additional capacity of the site to accept waste as proposed will result in additional vehicles coming to the site during operation. However, as discussed in **Section 7.9** of **Chapter 7** ***Traffic & Transportation***, the proposed development will have minimal impact on junctions.

6.6.3.2 Human Health

The Waste to Energy process (WtE) would be expected to be the dominant source of air emissions and to a lesser extent, noise emission associated with the facility during operation. It is proposed to increase the annual tonnage of waste accepted from 235,000 to 250,000 tonnes per annum, comprising of up to 15,000 tonnes of additional hazardous wastes. The majority of this increase is intended for the treatment of aqueous wastes which, when evaporated, is converted to water vapour in the flue gas flow. As outlined in **Chapter 8** as the flue gas flow is corrected to standard, dry conditions, so the total flue gas flowrate will not increase.

As discussed in **Section 8.5.3.1** of **Chapter 8** ***Air Quality***, the facility will still be obligated to comply with its licensed emission limit values and maximum flue gas flowrate and thus the increase in waste tonnage proposed will not cause a significant impact to the ambient air quality. Detailed modelling assessments were undertaken as part of the licensing process at the site in 2009 EIS[16] & 2012. Both assessments concluded that the impact on air quality would not be significant.

[16] Available to view from EPA IE Licence portal for W0167-02, http://www.epa.ie/terminalfour/ippc/index.jsp

The modelling assessment was updated in 2019 as part of this EIAR and the results (see **Table 8.6** in **Chapter 8**) indicate that the facility will continue to be in compliance with its licence requirements and no significant impacts to ambient air quality are predicted.

Section 4.6 of **Chapter 4** describes stormwater and firewater management on site. **Chapter 15 *Water***, assessed the potential effects of the proposed development on the water environment and determined that no significant negative effects are predicted on water quality. The assessment considered the existing and proposed site management and infrastructure regarding drainage and wastewater management. It is highly unlikely for waste contaminated water to pollute any receiving waters. Therefore, no adverse effect on human health from water contamination is predicted.

Psychological Impacts Operational Phase

In the operational phase there will be no perceivable difference from outside other than perhaps somewhat increased traffic. No psychological effects are anticipated.

6.7 Cumulative Effects

There are a number of planned or permitted developments in the vicinity of the existing facility which have the potential to cumulatively impact human health. Each project has been reviewed in turn below for the potential cumulative effect on population and human health. Refer also to the cumulative assessment presented in **Chapters 8 *Air Quality*, 10 *Noise and Vibration*, 14 *Land and Soils* & 15 *Water*** for specific details relating to cumulative effects of emissions to air, noise, soils/ground and water.

6.7.1 Irish Cement Ltd (Ref. LB150375) - Cement silo

Should the construction of the planned cement silo at Irish Cement and the proposed development occur concurrently, there is potential for temporary indirect cumulative effects on population and human health due to increased construction traffic and nuisances associated with site activities (dust, noise). However, given the scale of the of the planned development it is unlikely there will be a significant direct or indirect cumulative effect on population during construction. No significant direct or indirect cumulative effects on population or human health are predicted during the operation of the planned and proposed development.

As this planned development will not result in any additional emissions to atmosphere during operation the cumulative effects on population and human health are deemed imperceptible.

6.7.2 Irish Cement Ltd (PL17.PA0050) - Alternative fuels and raw materials

Should the construction of the planned development at Irish Cement and the proposed development occur concurrently, there is potential for temporary indirect effects on population due to increased construction traffic and nuisances associated with site activities (dust, noise). However, given the location of the of the planned development in relation to the Indaver site, it is unlikely there will be a significant cumulative indirect effect on population and human health during construction. No significant direct or indirect cumulative effects are predicted during the operation of the planned and proposed developments.

6.7.3 SSE Generation Ireland Ltd (PL17.303678) - 110kV transmission substation

Should the construction of the planned substation and the proposed development occur concurrently, there is potential for temporary indirect effects on population due to increased construction traffic and nuisances associated with site activities (dust, noise). However, given the scale of the of the planned development, it is unlikely there will be significant indirect cumulative effects on population and human health during construction. No significant direct or indirect cumulative effects are predicted during the operation of the planned and proposed developments.

6.7.4 Highfield Solar Ltd. (PL17.248146) - Solar Farm

Should the construction of the planned substation and the proposed development occur concurrently, there is potential for temporary indirect cumulative effects on population due to increased construction traffic and nuisances associated with site activities (dust, noise). However, cumulative noise or air quality impacts associated with the construction of the proposed development and the planned solar farm development are not envisaged due to the low volume of construction required and the use of materials with a low dust generation potential planned for the solar farm. In addition, given the location of the of the planned development in relation to Indaver, it is unlikely there will be significant indirect cumulative effects on population and human health during construction.

There are no emissions to atmosphere associated with the operational stage of this development. Therefore, no direct or indirect cumulative human health impacts are predicted.

6.7.5 Highfield Solar Ltd. (PL17.303568) - Electrical substation (110kV)

Should the construction of the planned substation and the proposed development occur concurrently, there is potential for temporary indirect effects on population due to increased construction traffic and nuisances associated with site activities (dust, noise). However, given the location of the of the planned development, it is unlikely there will be significant indirect cumulative effects on population during construction.

No significant direct or indirect cumulative effects on population or human health are predicted during the operation of the planned and proposed developments as there will be no emissions from the substation.

Overall, taking all of the projects together in-combination with the proposed development, cumulative population and health effects during the construction phase have been assessed to be imperceptible. Cumulative operational phase effects are also imperceptible.

6.8 Mitigation Measures and Monitoring

6.8.1 Construction Phase

Construction phase mitigation measures relating to those factors under which population and human health effects might occur have been addressed elsewhere in this EIAR, under the environmental factors for traffic and transportation, air quality and noise and vibration. Other than the mitigation measures outlined in **Chapters 7 *Traffic & Transportation***, **8 *Air Quality***, **10 *Noise and Vibration***, **14 *Land and Soils***, **15 *Water*** and **17 *Major Accidents and Disasters*** no further mitigation measures are proposed with respect to population and human health.

6.8.2 Operational Phase

Operational phase mitigation measures relating to those factors under which population and human health effects might occur have been addressed elsewhere in this EIAR, under the environmental factors for traffic and transportation, noise and vibration and major accidents and disasters. Other than the mitigation measures outlined in **Chapters 7 *Traffic & Transportation***, **10 *Noise and Vibration*** and **17 *Major Accidents and Disasters***, no further mitigation measures are proposed with respect to population.

As there will be no significant change in emissions in the operational phase, no further mitigation is proposed regarding human health.

6.9 Residual Effects

6.9.1 Construction Phase

As outlined above, with the mitigation proposed any effects are short term or negligible, so no residual human health impacts are predicted.

Given the nature and duration (temporary) of effects identified which could potentially impact the local population regarding the nuisances associated with the construction phase, the proposed development will not have a significant negative residual effect on the population.

6.9.2 Operational Phase

The impact of the proposed development on noise and air quality is predicted to be imperceptible with respect to the operational phase.

Therefore, no residual significant human health effects are predicted for the operational phase of the proposed development.

Given the nature of the activities associated with the operation of the proposed development and the potential effects identified which may pose a nuisance or risk to the population, it is determined that there will be no significant negative effect on the population.

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7 Traffic & Transportation

7.1 Introduction

This section of the EIAR identifies and evaluates the likely significant effects of the traffic generated by the Site Sustainability Project, both during its construction and operational phases.

Additionally, a specific additional assessment has been undertaken for the transportation of bottom ash to Drogheda Port (for recovery elsewhere in Europe) (as opposed to the current situation whereby bottom ash is sent to landfill).

This section describes the existing traffic situation in the area surrounding the site and provides a description of the local road network. Existing traffic levels are quantified and existing facilities for public transport, cyclists and pedestrians are described.

Brief details of the proposed development are provided, and the trip generation and distribution methodologies are explained. The effect of the generated traffic on the local road network is assessed, and mitigation measures which Indaver intend to include in their development proposals are investigated where necessary.

7.2 Assessment Methodology

The methodology used to carry out the transport assessment can be summarised as follows:

- Step 1 – Assess the existing traffic situation;
- Step 2 – Define the traffic flows underpinning the assessment;
- Step 3 – Define the traffic generation effects of the proposed development;
- Step 4 – Assess the effect of the traffic generated on the local road network;
- Step 5 – Identify mitigation measures to form part of the development proposals; and
- Step 6 – Identify residual effects which remain present after mitigation is considered.

These steps are described in greater detail below.

Step 1 assesses the existing traffic situation:

- Existing traffic operations in the Duleek area have been observed, particularly at junctions; and
- 18-hour traffic counts (06:00-00:00) were undertaken on all relevant roads and junctions on Tuesday October 1st, 2019 and form the basis of subsequent analysis.

Step 2 defines the assessment base case figures:

- The proposed development is to be constructed in two phases, with Phase 1 due to commence construction in 2021 and open in 2022. Phase 2 will then commence construction. An opening year for the proposed development of 2022 is therefore assumed, and consequently the peak construction period is also assumed to occur in 2022 (when Phase 1 will be operational and Phase 2 under construction);
- Background traffic growth rates were obtained from the 'Transport Infrastructure Ireland Project Appraisal Guidelines (2019)' for the Meath area; these growth rates were used to increase 2019 traffic levels to the future years for analysis – a construction/opening year of 2022 (for opening of Phase 1) and future years of 2027 and 2037; and
- In addition to growth of background traffic, which will ensure that other potential developments in the Duleek area are accounted for, specific additional allowances were made for a number of other applications in the locality which have either received planning permission or have been submitted for planning, based on traffic flow information contained in the relevant submitted planning documentation for each development.

Step 3 defines the traffic generation characteristics of the proposed development:

- An appraisal of the traffic generation during the construction phase is undertaken, appraising heavy goods vehicles (HGV) traffic and workforce traffic associated with the proposed development (for both Phase 1 and Phase 2 of construction);
- An appraisal of the traffic generation during the operational phase is also undertaken, split into two categories: HGV traffic generated by the proposed development and car traffic generated by the workers commuting to the site and by visitors to the site (again this is undertaken for Phase 1 and Phase 2 of operation the proposed development); and
- Both the construction and operational phase traffic are distributed onto the road network in accordance with expected origins and destinations.

Step 4 assesses the effect of the traffic generated by the proposed development on the local road network:

- All traffic flows are converted from vehicles to passenger car units (PCUs). A PCU is a common unit used in traffic modelling to ensure that larger vehicles such as HGVs are proportionally represented when compared with general traffic. When converting vehicles to PCU, a factor of 1.0 is used for cars, while a factor of 2.3 is used for HGVs. This ensures that the effect of HGVs on sensitive junctions is correctly examined during the traffic modelling process;
- The traffic surveys undertaken have identified morning and evening peak hours on the local road network (08:15-09:15 and 17:00-18:00 respectively); these form the basis of assessment for the proposed scheme;

- The operational traffic associated with the scheme will generate additional trips to and from the site, with staff working hours commencing before 08:00 and finishing at 16:30, thereby not coinciding with the morning and evening peak periods on the local road network;
- The construction traffic associated with the scheme will generate additional trips to and from the site, with construction working hours commencing at 07:00 and finishing at 19:00 (Monday to Friday);
- Phase 1 of the scheme is expected to conclude construction and become operational in 2022, with Phase 2 to commence construction thereafter; therefore, in 2022 there will be operational traffic associated with Phase 1 and construction traffic associated with Phase 2 present on site;
- The actual numerical and relative percentage increases in traffic on all relevant roads during the morning (AM) and evening (PM) construction peak periods associated with the proposed development (in the 2022 opening year for Phase 1) are assessed and reported;
- The actual numerical and relative percentage increases in traffic on all relevant roads during the morning (AM) and evening (PM) network peaks and the development peak when the proposed development would become operational (opening year of Phase 1 to be 2022) are assessed and reported;
- Subsequent future year scenarios, both 5 and 15-years post-opening (2027 and 2037 respectively) are also included for assessment and reporting;
- The effects on junction capacity at all relevant junctions of the traffic generated during both the construction phase and the operational phases are assessed and reported; and
- The junction capacity assessments were carried out using industry-standard assessment software ARCADY and PICADY (for roundabouts and priority junctions), and LinSig (for signalised junctions).

Step 5 identifies mitigation measures to be included within the development proposals that would serve to reduce the effect of traffic generated by the proposed development.

The sixth and final step is to identify any net residual effects associated with traffic generated by the proposed development, taking into account the mitigation measures considered in Step 5.

7.3 Receiving Environment

7.3.1 General

Duleek is a village in County Meath. It is situated along the convergence of the R150 regional road and a number of local roads, including Abbey Road and Station Road. The village is by-passable to the east by the R152, which is the principal route north to Drogheda and south to Cushenstown. The R150 links the village westwards to the N2. The village is located approximately 7.5km south of Drogheda.

7.3.2 Site Location

The site of the existing Indaver facility is located to the north-east of Duleek village, off the R152 Regional Road linking Drogheda and Duleek. The site has a priority junction with the R152 (with a dedicated right-turning facility) and is located opposite DSG Stores, which also has a priority junction with the R152 opposite the site entrance.

To the north-east, junctions 8 and 9 of the M1 motorway are located approximately 5km from the village (the R152 links the site directly to junction 8 of the M1, which is approximately 2.4km from the site). To the south-west, the R152/R150 junction at New Lanes Cross (the main junction into Duleek Village) is located approximately 1.8km from the site.

Figure 7.1 below shows the site location.

Figure 7.1: Site Location. Source Open Street Map.

7.3.3 Local Road Network

The R152 in the vicinity of the Indaver site is a single-carriageway road with a typical road width of 7m, and at the site entrance the route widens to approximately 10m to include a ghost island right-turning lane (approximately

100m long) and a deceleration lane (approximately 70m long) for traffic turning left into the site, as shown in **Figure 7.2**.

Figure 7.2: Site Entrance [© Google]

A speed limit of 80kph applies on the R152 in the vicinity of the site.

7.3.3.1 Future Transport Proposals

Although the Meath County Development Plan 2020 update is currently at submissions stage, with a draft expected later in 2020, it is an objective of the current Meath County Development Plan (2013 – 2019) to provide a new bypass link to the southwest of the village thus removing the existing R150 from Duleek village centre. The Development Plan (Volume 5) notes that '*Government funds have been allocated towards the route selection and costing and it is anticipated that work should be pursued during the lifetime of the current Meath County Development Plan 2013-2019.'*

The Duleek Local Area Plan (adopted in August 2009, but not updated since) refers to this bypass having a preferred location to the south of the village.

No further information is available at this time regarding the status of the proposed bypass.

7.3.3.2 Relevant Junctions

In addition to the existing Indaver site entrance itself, the principal junction in the immediate site vicinity is the junction of the R152 and R150 (New Lanes Cross) to the south of the site.

To the north, in the context of the transport of bottom ash off-site, traffic leaving the site routing to Drogheda Port is expected to cross the M1 via the R152 and then route north-west and on to Donore Road, and from there to route eastwards and join the R132 in Drogheda and to access the north quays via the junction of the R132 and Shop Street in Drogheda itself – this is the second principal junction in terms of assessment of the scheme and will be assessed for the scenario involving the export of bottom ash from the site. Thus, there are three individual junctions that will be subject to assessment.

Figure 7.3 below illustrates the key junctions of significance which will form the basis of the assessment of the scheme.

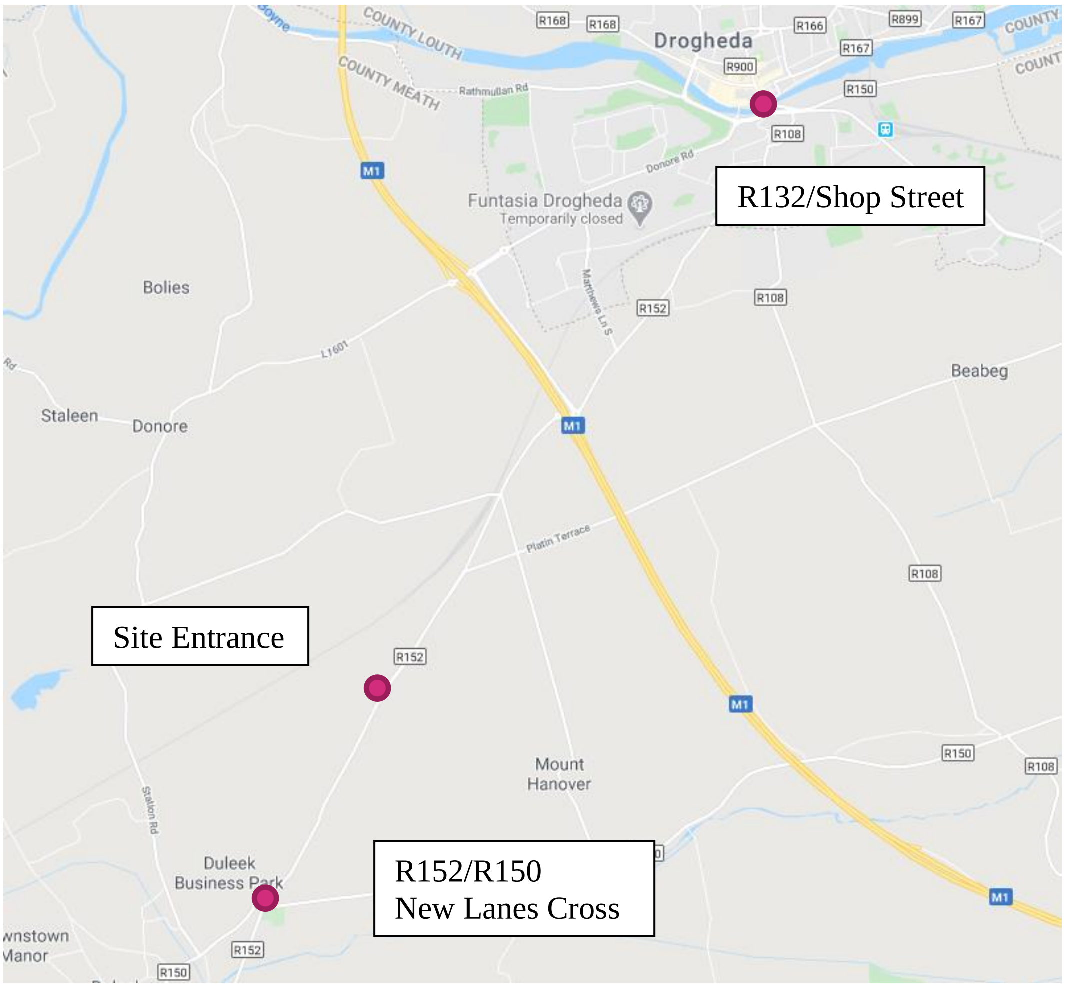

Figure 7.3: Junctions assessed [© Google]

7.3.3.3 Assessment scenarios for analysis

As outlined above, it is proposed to assess the development and the relevant junctions on the local road network under the scenarios indicated in **Table 7.1**. The assessment scenarios for the future year scenarios will evaluate the junctions both with and without the proposed development. Further details of the assessment scenarios are outlined later in this chapter.

Table 7.1: Assessment Scenarios

Junction Name	2019 Base Year	2022 Opening Year**	2027 Opening Year + 5	2037 Opening Year + 15	2022 Opening Year – Bottom Ash Transport
Indaver Site Entrance	✓	✓	✓	✓	
R152/R150 Junction (New Lanes Cross)	✓	✓	✓	✓	
R132/Shop Street Junction					✓

***Note that Phase 1 is assumed to be constructed in 2021/early 2022. Construction of Phase 2 will occur following opening of Phase 1, in 2022. The 2022 Opening Year will therefore include operational traffic associated with Phase 1 of the development and construction traffic associated with Phase 2. This is the most intensive period in terms of combined construction/operational traffic and has been used for assessment.*

7.3.4 Relevant Traffic Data

7.3.4.1 Passenger Car Unit Conversion

For the purpose of this assessment, traffic flows obtained through junction vehicle counts have been converted to 'Passenger Car Units' in accordance with the guidance set out in the Transport Infrastructure Ireland 'Project Appraisal Guidelines' (Unit 5.2), which in turn refers to the Transport for London 'Traffic Modelling Guidelines' for conversion factors.

In order to better reflect the composition of the traffic flow and the numerous vehicle types contained therein, traffic modelling software regularly utilises a common unit, known as a passenger car unit (PCU) in order to convert different types of traffic to a common, single type. Various vehicle classification types are assigned a conversion factor to enable them to be collectively assessed. For example, larger vehicles such as buses, coaches and HGVs have a disproportionately higher effect on a road network than a single passenger car, motorcycle or even bicycle.

Where traffic passes through sensitive locations, such as small villages or problematic junctions, converting larger vehicles to PCUs can ensure that the potential effects associated with traffic flows can be correctly appraised during the traffic modelling process.

Table 7.2 below illustrates the PCU conversion factors adopted for this assessment.

Table 7.2: PCU Conversion Factors (TFL Traffic Modelling Guidelines)

Vehicle Type	PCU Value
Pedal Cycle	0.2
Motor Cycle	0.4
Passenger Car	1.0
Light Goods Vehicle (LGV)	1.0
Medium Goods Vehicle (MGV/OGV 1)	1.5
Heavy Goods Vehicle (HGV/OGV 2)	2.3
Bus/Coach	2.0

7.3.4.2 Traffic Survey Data

Traffic surveys were undertaken in October 2019 at the various junctions and links in the site vicinity have included the above vehicle classifications, which enables the traffic data to be converted from vehicles to PCU based on the above conversion factors.

An 18-hour (06:00-24:00) traffic count was undertaken at all of the junctions listed in **Section 7.3.3.2** above on Tuesday, 1st October 2019, on a typical working day, during school term time. This data represents the 'base' year data which is then used for the assessment of the proposed scheme.

The traffic surveys on the local road network identified a morning peak hour of 08:15-09:15, and an evening peak hour of 17:00-18:00.

Peak periods (used for assessment) associated with the two construction phases of the development will be during 06:00-07:00 in the morning (when construction personnel arrive on site ahead of construction commencing at 07:00) and 19:00-20:00 in the evening (when construction personnel depart the site following conclusion of construction working hours at 19:00).

Peak periods associated with the two operational phases of the development will be during 07:00-08:00 in the morning and 16:00-17:00 in the evening, as operational working hours will commence and finish during these times.

The peak hour link counts on the surrounding road network can be seen in **Table 7.3** below. The locations of the junction counts can be seen in **Figure 7.3.** Note that traffic flows are presented in vehicles (veh).

Table 7.4 shows the peak hour link counts converted to passenger car units (PCU).

Table 7.3: Existing Two-Way Link Flows – Base Year 2019

Junction/Roadway	Construction Peak Periods		Operational Peak Periods		Existing Network Peaks	
	06:00-07:00	19:00-20:00	07:00-08:00	16:00-17:00	08:15-09:15	17:00-18:00
Indaver Site Entrance						
Indaver Site Entrance (internal road)	12	10	32	33	14	11
R152 (north of Indaver entrance)	678	662	1,330	1,292	1,393	1,644
R152 (south of Indaver entrance)	686	664	1,326	1,298	1,393	1,658
R152/R150 Junction (New Lanes Cross)						
R152 (north of New Lanes Cross)	692	759	1,352	1,362	1,407	1,668
R152 (south of New Lanes Cross)	583	326	966	812	796	1,046
R150 (west of New Lanes Cross)	283	579	719	828	934	983
R150 (east of New Lanes Cross)	152	192	293	306	339	375
R132/Shop Street Junction						
R132 (west of Shop Street)	493	1,054	850	1,235	1,158	1,288
R132 (east of Shop Street)	841	1,500	1,268	1,520	1,582	1,664
Barrack Lane (south of R132)	131	93	152	109	137	118
Shop Street (north of R132)	685	995	900	988	1,009	1,050

**All traffic flows in Vehicles (Veh) per hour*

Table 7.4: Existing Two-Way Link Flows – Base Year 2019 (PCU)

Junction/Roadway	Construction Peak Periods		Operational Peak Periods		Existing Network Peaks	
	06:00-07:00	19:00-20:00	07:00-08:00	16:00-17:00	08:15-09:15	17:00-18:00
Indaver Site Entrance						
Indaver Site Entrance (internal road)	12	10	41	43	20	17
R152 (north of Indaver entrance)	721	681	1,439	1,394	1,511	1,701
R152 (south of Indaver entrance)	729	683	1,438	1,405	1,513	1,721
R152/R150 Junction (New Lanes Cross)						
R152 (north of New Lanes Cross)	741	779	1,466	1,469	1,527	1,731
R152 (south of New Lanes Cross)	619	339	1,031	871	855	1,087
R150 (west of New Lanes Cross)	305	591	788	886	1,009	1,009
R150 (east of New Lanes Cross)	159	196	316	324	369	381
R132/Shop Street Junction						
R132 (west of Shop Street)	527	1,077	920	1,300	1,239	1,317
R132 (east of Shop Street)	889	1,519	1,345	1,582	1,659	1,693
Barrack Lane (south of R132)	131	92	151	108	136	117
Shop Street (north of R132)	728	1,014	979	1,051	1,100	1,082

**All traffic flows in Passenger Car Units (PCU) per hour*

A number of distinct time periods have been determined as having the most significant effect by traffic generated by the proposed development. These time periods are as follows:

- Between 06:00-07:00 and 19:00-20:00, when construction personnel will arrive at the site in the morning peak and depart in the evening peak; and

- Between 07:00-08:00 and 16:00-17:00, when new operational staff will arrive at the site in the morning peak and depart in the evening peak. HGV's associated with the construction and operational phases will also be arriving and departing the site during these time periods.

Daily HGV trips to and from the site during the construction and operation stages will typically be distributed throughout the day, whereas personnel associated with construction and operation at the facility will arrive or depart immediately prior to or just after commencement of their working hours. Therefore, the personnel movements to and from the site are more significant in terms of traffic impact.

7.3.5 Assessment Years and assumptions

It is anticipated that the proposed development will be constructed in two distinct phases, with Phase 1 expected to commence construction in early 2021, for a period of approximately 16 months. Following completion of Phase 1, operational traffic associated with the proposed development will be present on site (assumed to be mid-2022). Phase 2 will also commence construction in mid-2022, for a period of approximately 12 months.

Phase 1 is anticipated to be the most intensive construction phase in terms of personnel; however, upon opening of the proposed development in mid-2022 there will be additional operational traffic and construction traffic associated with Phase 2 present on site at the same time. This combined traffic flow is more significant than the construction traffic associated with Phase 1; therefore, this has been used for assessment purposes.

Background traffic levels for 2019 have been forecasted to future years by applying the following growth rates:

- For 2019-2021 – light vehicles increased by 3.5%, heavy vehicles increased by 7.4%;
- For 2019-2022 – light vehicles increased by 5.3%, heavy vehicles increased by 11.4%;
- For 2019-2027 – light vehicles increased by 14.7%, heavy vehicles increased by 33.2%; and
- For 2019-2037 – light vehicles increased by 26.8%, heavy vehicles increased by 68.8%.

These growth rates have been established using the guidelines in the '*TII Project Appraisal Guidelines (2019), Unit 5.5 – Link-Based Traffic Growth Forecasting*', and by utilising the specific growth rates therein for the Meath area.

The guidelines present 'Low Sensitivity', 'Central Growth' and 'High Sensitivity' growth rates for the Meath area.

A 'Central Growth' scenario was therefore assumed for the Meath area in the coming years, and this is considered to allow for all committed and likely future development in the area, notwithstanding the specific allowances made for a number of relevant developments in the site locality.

7.3.6 Site Access Routes

The main access routes to the facility that carry traffic to and from the development are the R152, the R150, the N2 to the south and the M1 motorway to the north as shown on **Figure 7.1** above.

Traffic surveys were undertaken on Tuesday 1st October 2019, at a number of junctions in the site vicinity.

It is also noted that Indaver require operational HGV deliveries to and from the site to avoid routing through Duleek Village, and this requirement will be maintained as part of the proposed development. General car traffic is not subject to this requirement. This requirement will also apply to HGVs during the construction phases.

7.3.6.1 Existing Facility Traffic Flows

The existing facility treats up to 235,000 tonnes per annum of residual household, commercial and industrial non-hazardous and hazardous waste and recovers energy. The existing facility extracts and recovers valuable material (in the form of ferrous and non-ferrous metals) and energy (in the form of 21.5 megawatts of electricity MW_e) resources from residual waste.

The existing facility employs 60 personnel on various shifts, with the majority arriving on site before 08:00 daily, which is outside of the morning network peak period of 08:15-09:15.

The facility accepts waste six days per week between the hours outlined below but the installation runs 24 hours per day and for over 8,000 hours per annum.

- Monday – Friday 07:00 to 18:30 (11.5 hours); and
- Saturday 08:00 to 14:00 (6 hours).

Existing plant operations have been analysed based on data provided by Indaver as recorded at the weighbridge for HGV's entering or leaving the site.

A record of delivery traffic to the facility between September 2018 and September 2019 (i.e. one year) shows that there was a total of 14,756 individual delivery records for trucks accessing the site for the entire year, and on an average weekday there were 57 HGVs accessing the facility.

The arrival profile of HGVs is typically evenly distributed across the typical day, with the following arrival profile:

- 07:00-09:00 – 20.0% of HGVs;
- 09:00-11:00 – 20.8% of HGVs;
- 11:00-13:00 – 21.5% of HGVs;
- 13:00-15:00 – 20.9% of HGVs;

- 15:00-18:00 – 15.6% of HGVs; and
- After 18:00 – 1.2% of HGVs.

Figure 7.4 and **Figure 7.5** illustrate the daily arrival and departure profiles of general traffic and HGV traffic at the existing site, based on the traffic surveys undertaken in October 2019. It is seen that the general traffic profile reflects the morning arrival and afternoon peak periods for staff, whereas the HGV profiles are more dispersed across the typical day.

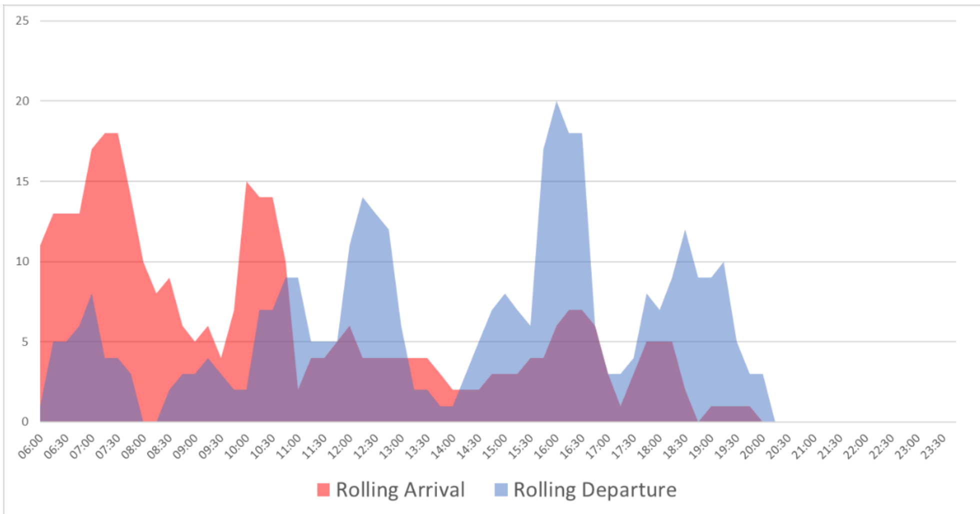

Figure 7.4: Vehicle (General staff traffic) arrival and departure profile on site.

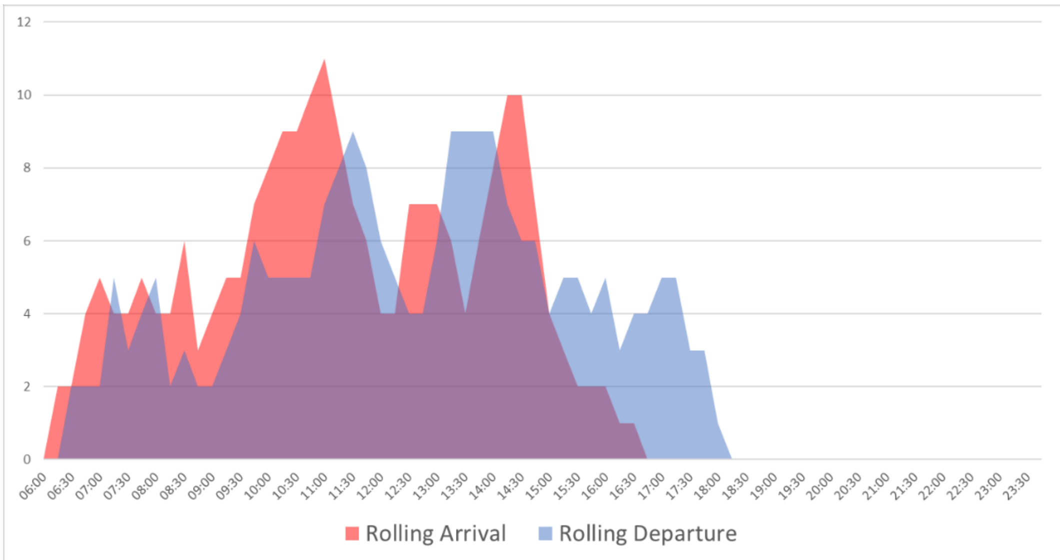

Figure 7.5: HGV arrival and departure profile on site.

7.4 Characteristics of the Proposed Development

As outlined in Chapter 4, the proposed development will consist of the following main elements:

1. Increase in the amount of hazardous waste accepted at the facility for treatment in the waste to energy plant from the current permitted 10,000 tonnes per annum up to a maximum of 25,000 tonnes per annum;
2. This will result in an increase in the annual total waste accepted at the site for treatment in the waste to energy facility from the currently permitted 235,000 tonnes per annum to 250,000 tonnes per annum;
3. Development of an aqueous waste tank farm and unloading area for the storage and processing of aqueous liquid wastes currently accepted at the facility;
4. Development of a 10MW$_e$ hydrogen generation unit for connection to the natural gas transmission/distribution network and for mobile hydrogen transport applications and other potential uses;
5. Development of a bottom ash storage building for the storage of up to 5,000 tonnes of bottom ash which is produced on site;
6. Waste acceptance capacity and infrastructure to accept up to 30,000 tonnes per annum (bringing the site total to 280,000 tpa) of third-party boiler ash and flue gas cleaning residues and other similar residues for treatment in the existing ash pre-treatment facility on site;
7. Development of a warehouse, workshop and emergency response team (ERT)/office building to support existing maintenance activities on the site;
8. Development of a new concrete yard and parking area for up to 10 trucks, tankers or containers on the site;
9. Demolition and re-building of an existing single storey modular office building on site with a slightly increased footprint.; and
10. Other miscellaneous site upgrades.

7.4.1 Construction Phase

7.4.1.1 Construction Programme

As outlined in **Section 7.3.5**, it is anticipated that the proposed development will be constructed in two distinct phases, with Phase 1 (which represents the bulk of the construction works) expected to commence construction in early 2021, for a period of approximately 16 months.

Following completion of Phase 1, operational traffic associated with the proposed development will be present on site (assumed to be mid-2022). Hence, 2022 is assumed to be the 'opening' year for the proposed development.

Phase 2 (construction of the hydrogen generation unit) will also commence construction in mid-2022, for a period of approximately 12 months. Phase 1 of the construction programme is anticipated to be the most intensive construction phase; however, upon opening of Phase 1 of the proposed development in mid-2022 there will be additional operational traffic and construction traffic associated with Phase 2 present on site at the same time.

7.4.1.2 Construction Personnel

As outlined above, construction will take place over two distinct phases.

For each of the phases, there will be an initial ‘peak’ period during which time clearance works and enabling works will occur – during this ‘peak’ period there will be a larger number of HGV traffic to and from the site, and a lower number of construction personnel on site.

Following the completion of the initial ‘peak’ period (for both phases), construction traffic will then adjust to a more typical (referred to as a ‘nominal max’) scenario, comprising less HGV traffic and more construction personnel on site.

Table 7.5: Breakdown of Proposed Development Construction Traffic Generation

Construction Phase/Sub-Phase	Expected Duration	No. Daily HGV’s	No. Daily Personnel	Total Daily Vehs	Daily % HGV	Total Daily PCU
Phase 1 – Peak	Initial 8 weeks	50	30	80	63%	145
Phase 1 – Nominal Max	Remaining 60 weeks (approx.)	20	120	140*	14%	166*
Phase 2 – Peak	Initial 8 weeks	40	30	70	57%	122
Phase 2 – Nominal Max	Remaining 44 weeks (approx.)	20	100	120	17%	146

**Used for assessment*

It can be seen above that the ‘nominal max’ stages of both construction phases will result in higher traffic flows to and from the site (both in terms of vehicles and PCU). Furthermore, it is seen that the ‘nominal max’ traffic associated with the construction of Phase 1 of the scheme is slightly greater than that of Phase 2 (this is due to the fact that there are an additional 20 personnel expected on site during Phase 1 of construction).

As outlined above, during construction of Phase 2, there will be operational traffic to and from the site associated with Phase 1 (which will open in 2022), and therefore the two traffic flows in combination (construction of Phase 2 plus operation of Phase 1) are more significant.

Therefore, the construction of Phase 2 has been used for assessment purposes, and an assessment year of 2022 has been used. However, to ensure a robust assessment, the higher number of construction personnel associated with Phase 1 of construction has been used for assessment (essentially, the assessment of construction traffic is based on the highest number of construction traffic flow to and from the site).

7.4.1.3 Construction Working Hours

Construction will take place on site daily from 07:00-19:00. The following assumptions have also been applied to construction traffic flows to and from the site during the construction of Phase 1:

- For construction personnel, average vehicle occupancy is estimated to be 1.2 persons per car;
- Construction workers will arrive on site before commencement of construction at 07:00 and after conclusion of construction at 19:00;
- Therefore, 100 cars will arrive during the 06:00-07:00 morning peak hour and 100 cars will depart during the 19:00-20:00 evening peak hour; and
- 20% of the daily HGV traffic (i.e. 4 of the total of 20 daily HGV's) will arrive at the site between 06:00-07:00 (in advance of commencement of construction at 07:00) and the same number will depart the site between 19:00-20:00 (following cessation of construction activities on site at 19:00).

Table 7.6: Proposed Development Construction Traffic Generation – Phase 1 Nominal Max

Construction Phase/Sub-Phase	AM Peak Period (06:00-07:00)			PM Peak Period (19:00-20:00)		
	Total Traffic IN	Total Traffic Out	Total Two-Way Traffic	Total Traffic IN	Total Traffic Out	Total Two-Way Traffic
Phase 1 – Nominal Max	100	0	100	0	100	100

**All traffic flows in Vehicles (Veh) per hour. The above values are based on 100 construction personnel arriving on site between 06:00-07:00 and departing the site between 19:00-20:00. Construction HGVs are assumed to begin arriving/departing on site after 07:00 and to finish arriving/departing the site before 19:00.*

Similar arrival and departure flows will apply during Phase 2 of construction.

Table 7.7: Proposed Development Construction Traffic Generation – Phase 2 Nominal Max

Construction Phase/Sub-Phase	AM Peak Period (06:00-07:00)			PM Peak Period (19:00-20:00)		
	Total Traffic IN	Total Traffic Out	Total Two-Way Traffic	Total Traffic IN	Total Traffic Out	Total Two-Way Traffic
Phase 2 – Nominal Max	84	0	84	0	84	84

**All traffic flows in Vehicles (Veh) per hour. Values above have been rounded up for clarity. The above values are based on 84 construction personnel arriving on site between 06:00-07:00 and departing the site between 19:00-20:00. Construction HGVs are assumed to begin arriving/departing on site after 07:00 and to finish arriving/departing the site before 19:00.*

As outlined above, the personnel flows for Phase 1 are slightly higher than those of Phase 2; therefore, the Phase 1 personnel flows have been used for assessment.

Daily HGV traffic flows for the nominal max construction of Phases 1 and 2 are the same.

7.4.2 Operational Traffic Generation

7.4.2.1 Delivery Traffic

The anticipated breakdown of additional vehicles associated with the proposed development is as follows:

- Additional Liquid and Hazardous waste (an additional 15,000 tonnes) – this would equate to 1,764 HGV's per year, which is an average of 35.3 (rounded up to **36**) HGV's per week (based on 50 weeks). These HGV's will arrive full with waste and leave empty;
- Additional residues associated with the treatment of this waste requires an average of **4** HGV's per week to arrive empty and leave full to transport the residual product off site;
- The additional 30,000 tonnes of boiler ash/flue gas cleaning residues generate a total of 27.3 (rounded up to **28**) HGV's per week, arriving full and leaving empty;
- This material which is treated (with the addition of water) has its' overall tonnage increased to 39,000 tonnes as a result, which need to be removed off site. This equates to 32.5 HGV's per week (rounded up to **33**) – these arrive empty and leave full; and
- Additional vehicles refuelling at the Hydrogen plant (assumed to be new traffic), which would equate to a theoretical maximum of **75** HGV's per week.

This therefore represents a total increase of **176** HGVs per week.

Although the facility is open from Monday to Saturday (with Saturday having reduced opening hours), for robustness it has been assumed that all additional development traffic arriving weekly will only be on weekdays (Mon-Fri only).

It is therefore seen above that the typical increase in HGV's to the site is **35** HGV's per day (allowing for some rounding up). This would equate to **70** daily HGV movements to and from the facility.

It is also anticipated that the arrival profiles outlined in **Section 7.3.6.1** would apply to any additional traffic.

For the purpose of analysis, it has been assumed that 20% of the daily HGVs (i.e. a total of 7 out of the 35 daily HGVs, allowing for rounding) arrive and depart in the morning and evening peak periods at the same time as operational staff arrive and depart (07:00-08:00 and 16:00-17:00 respectively).

Distribution profiles associated with the additional traffic is anticipated to be similar to the existing profile at the facility (i.e. traffic approaching from the north and south on the R152 respectively).

Table 7.8: Breakdown of Proposed Development Operational Traffic Generation

Delivery Type	No. Tonnes Annually	No. weekly HGV's	No Daily HGV's (5 days)*	Comments
Phase 1				
Additional Liquid and Hazardous Waste	15,000	36	8	HGV's arrive full and leave empty
Additional residues associated with treatment of Liquid and Hazardous Waste	N/A	4	1	Typical number of HGV's weekly to arrive empty and transport waste off site
Additional Boiler Ash/Flue Gas Cleaning Residues	30,000	28	6	HGV's arrive full and leave empty
Pre-treated Boiler Ash/Waste	39,000	33	7	HGV's arrive empty and leave full
Phase 2				
Hydrogen Plant Refuelling Vehicles	N/A	75	15	
TOTAL		**176**	**35**	

Values have been rounded for clarity.

Table 7.9: Proposed Development Operational HGV Traffic Generation

Development Phase	AM Peak Period (07:00-08:00)			PM Peak Period (16:00-17:00)		
	Total Traffic IN	Total Traffic Out	Total Two-Way Traffic	Total Traffic IN	Total Traffic Out	Total Two-Way Traffic
Phase 1	4	4	8	4	4	8
Phase 2	3	3	6	3	3	6
Total	**7**	**7**	**14**	**7**	**7**	**14**

All flows in vehicles. Values have been rounded for clarity.

7.4.2.2 Personnel

The existing facility employs a total of **60** personnel at present, across various shift times throughout the day. There are also occasional visitors on site, which can be up to 6 additional persons present on site.

The proposed development is expected to result in an additional **20** personnel being employed, in the areas outlined in **Table 7.10**. It is seen in the table that all of the additional personnel will arrive on site before 08:00 and depart just after 16:30.

Table 7.10: Additional daily operational staff associated with each phase

Description	No. People	Start Time	End Time	Phase of Development
Tank Farm	2	07:45	16:30	Phase 1
Bottom Ash	1	07:45	16:30	Phase 1
Logistics	1	07:45	16:30	Phase 1
Office Staff	16	08:00	16:30	Phase 2

**All flows in vehicles. Values have been rounded for clarity.*

Table 7.11: Proposed Development Operational Staff Traffic Generation

Development Phase	AM Peak Period (07:00-08:00)			PM Peak Period (16:00-17:00)		
	Total Traffic IN	Total Traffic Out	Total Two-Way Traffic	Total Traffic IN	Total Traffic Out	Total Two-Way Traffic
Phase 1	4	0	4	0	4	4
Phase 2	16	0	16	0	16	16
Total	**20**	**0**	**20**	**0**	**20**	**20**

**All flows in vehicles. Values have been rounded for clarity.*

The additional traffic associated with the proposed development (both HGVs and personnel) is summarised below in **Table 7.12**. For clarity, the below table is sub-divided into the respective phases.

Table 7.12: Proposed Development Combined Traffic Generation

Development Phase	AM Peak Period (07:00-08:00)			PM Peak Period (16:00-17:00)		
	Total Traffic IN	Total Traffic Out	Total Two-Way Traffic	Total Traffic IN	Total Traffic Out	Total Two-Way Traffic
Phase 1	8	4	12	4	8	12
Phase 2	19	3	22	3	19	22
Phases 1 and 2	27	7	34	7	27	34

**All flows in vehicles. Values have been rounded for clarity.*

7.4.2.3 Combination of Construction and Operational staff

As outlined above, Phase 1 is expected to be constructed and operational in mid-late 2022, with Phase 2 to commence construction thereafter.

Consequently, there will be an overlap at the site of the construction of Phase 2 and the operation of Phase 1. During this time, the following movement patterns are expected to occur over the course of a typical day:

- Construction personnel associated with Phase 2 will arrive on site between 06:00-07:00 ahead of construction commencing at 07:00);
- Construction HGVs associated with Phase 2 will commence arriving/departing the site from 07:00 (with the assumption that 20% of the daily HGV total will arrive and depart between 07:00 and 08:00);
- Operational staff associated with Phase 1 will arrive on site between 07:00 and 08:00;
- Operational HGVs associated with Phase 1 will begin arriving/departing the site between 07:00 and 08:00 (with the assumption that 20% of the daily HGV total associated with Phase 1 will arrive and depart between 07:00 and 08:00);
- Operational staff associated with Phase 1 will depart the site between 16:00-17:00;
- 20% of the daily operational HGVs will arrive and depart the site during 16:00-17:00;
- 20% of the construction HGVs associated with Phase 2 will arrive and depart the site between 16:00-17:00; and
- Construction personnel associated with Phase 2 will depart the site between 19:00-20:00.

7.4.3 Sensitivity Test Scenario – Export of Bottom Ash via Drogheda Port

In addition to the analyses outlined above for the operational traffic associated with the proposed development, a further assessment scenario has been undertaken whereby bottom ash produced by the facility is no longer sent to landfill, and instead is exported to mainland Europe for recovery. This scenario assumes that the export of bottom ash would be via Drogheda Port.

Bottom ash would be stored on site in this scenario periodically throughout the year (likely to be 6-8 times per annum), for a period of two days the material would be transported by truck to Drogheda Port. It has been assumed that a 3,000-tonne capacity ship would be used, which would equate to a total of 150 HGVs (based on a 20-tonne capacity per vehicle).

Over a two-day period, this would then equate to 8 HGVs per hour (i.e. 16 HGV movements) between the site and Drogheda Port (assuming a 10-hour working day).

In this scenario, bottom ash removal to Drogheda Port would occur at the same time as general operations. There would be a minor reduction in the typical daily operational traffic associated with bottom ash disposal to landfill, which would not occur if export was to occur; however, this reduction in operational traffic would be very minor, and so has not been applied to the development operational traffic flows.

Staff arrivals and departures for the export of bottom ash would also remain unchanged from typical operations.

7.5 Cumulative Assessment

A number of planning applications were reviewed from a number of sources including planning lists from Meath County Council and An Bord Pleanála. The purpose of this exercise was to identify planned or proposed projects that have the potential to have a significant cumulative effect on the environment due to the construction and operation of the proposed development in question.

7.5.1 Irish Cement Ltd. (Planning Ref. LB150375)

The development will consist of the installation of a Flue Dust Portland Cement Silo at Kiln 3. The development will include the provision of a silo of circa 40m in height and 12m in diameter, together with filter, access gantries, bucket elevator and truck loading facility all on an application site of circa 0.75 hectares located within Platin Cement Works. Permission was granted in June 2015. The current timeline for construction is unknown.

No detail relating to anticipated traffic movements was available for this project; however, it is stated in the planning report on file that *‘The planning authority would anticipate that during construction works the proposed development will have an imperceptible to slight impact on traffic but at operational stage there will be no impact’.*

Therefore, it is anticipated (based on the information above) that there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

Therefore, no further allowance has been made for this scheme within this chapter.

7.5.2 Irish Cement Ltd. (Planning Ref. PL17.PA0050)

This planning application was for a 10-year permission to facilitate further replacement of fossil fuels and allow for the introduction of alternative raw materials in the manufacturing of cement at Platin Cement Works, Platin, Co. Meath. The proposed development is for the use of an additional 480,000 tonnes per annum of alternative fuels and alternative raw materials. Permission was granted in April 2018. The current timeline for construction is unknown. Nevertheless, the traffic flows associated with this scheme have been obtained from the planning documentation and have been included within this chapter for assessment purposes (it is noted that the majority of estimated construction and operational traffic flow associated with this development is assumed in the relevant planning documentation to be via the M1 and R152 to the north of the proposed development site).

Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

7.5.3 SSE Generation Ireland Ltd. (PL17.303678)

This planning application refers to an air-insulated switchgear 110kVand for a transmission substation (Ref. PL17.303678). The substation application was submitted to An Bord Pleanála as a Strategic Infrastructure development in February 2019 and was granted permission in January 2020.

It is noted that the substation scheme above appears to be an enabling component for a separate planning application for an open cycle gas turbine (OCGT) power plant, which was submitted to Meath County Council and permission granted in July 2019, but was subsequently appealed to An Bord Pleanála, where it was ultimately refused in December 2019. The OCGT plant therefore does not have a grant of planning.

Given the grant of permission received by the 110kV substation there is potential for this scheme to proceed as a standalone project.

Within the associated Environmental Report for the proposed developments (both schemes are presented as one single ‘project’), the construction stage is expected to be 18 months duration. No distinction is provided within the report between the OCGT construction traffic and the substation construction traffic.

Furthermore, the report outlines that the proposed development will require a new priority junction to be constructed on the R152, to the north of the Indaver site, and it is also stated that construction HGV traffic will only access the site from the north (via the M1).

On this basis, with construction likely to be complete before 2022 and construction traffic only permitted to route to and from the M1, no further allowance has been made within this chapter for the proposed substation element of the scheme.

Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

7.5.4 Highfield Solar Ltd. (Planning Refs. PL17.303568 and 17.248146)

These two applications (for a scheme titled ‘Garballagh Lower Solar Farm’) comprise an application for the development of a Solar Farm (17.248146) and a separate application for an electrical substation and associated 110kV and MV infrastructure required (17.303568) to connect the ground-mounted solar PV generation to the electrical transmission system, including underground cabling and all associated ancillary site development work.

Both applications were granted planning permission by An Bord Pleanála (in March 2019 and July 2019, respectively). Construction is underway; however, the estimated opening date is unknown.

It is assumed that this scheme will be constructed before construction commences for the Site Sustainability Project. Operationally, the solar farm will have a negligible impact. Therefore, no further allowance has been made for this scheme within this chapter.

Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the projects above.

Finally, from a traffic perspective, taking the Indaver Site Sustainability Project in in combination with all of the five projects listed above, it is considered that there is no potential for any significant negative direct or indirect cumulative impact to arise given the differences in construction programmes and construction routes and operational traffic flows between the projects.

7.6 Likely Significant Effects

7.6.1 “Do Nothing” Scenario

In the ‘Do Nothing’ scenario, traffic flows to and from the existing facility will remain as they currently are, and consequently there will be no change in the impact of the existing development on the surrounding road network.

7.6.2 2022 Construction/Opening Phase

7.6.2.1 Link Flow Analysis - Phase 2 Construction Personnel

The development traffic associated with construction personnel, as described in **Section 7.4.1** was applied to the local road network during the morning between 06:00-07:00 and in the evening between 19:00-20:00. These time periods are when the construction personnel arrive on site in the morning and depart in the evening, respectively, in the proposed assessment year of 2022.

Table 7.13: 2022 Construction Stage Two-Way Link Flows on surrounding road network

Junction/Arm	AM Peak Period (06:00-07:00)			PM Peak Period (19:00-20:00)		
	Without Dev	With Dev	% Change	Without Dev	With Dev	% Change
Indaver Site Entrance Junction						
Indaver Arm	13	113	100 (+870%)	11	111	100 (+1,009%)
R152 (North)	716	766	50 (+7%)	698	748	50 (+7.2%)
R152 (South)	725	775	50 (+6.9%)	700	750	50 (+7.1%)
R150/R152 New Lanes Cross Junction						
R152 (North)	732	782	50 (+6.8%)	800	850	50 (+6.2%)
R152 (South)	616	641	25 (+4.1%)	344	369	25 (+7.3%)
R150 (West)	299	324	25 (+8.4%)	610	635	25 (+4.1%)
R150 (East)	160	160	0	202	202	0

**All flows in vehicles (two-way flows). Values have been rounded for clarity.*

It can be seen in the above table that the proposed development construction traffic increases the traffic on the local road network by approximately 7-8% in the majority of instances, with the exception being the Indaver entrance where the existing very low traffic flows during the morning and evening peak periods resulting in a proportionately high increase. However, the junction is more than capable of accommodating the additional traffic associated with the construction phase of the proposed development (as described in **Section 7.6.5** below).

Traffic flows on the surrounding road network are also relatively low, reflecting the early morning and later evening peak times for arrival and departure of construction personnel.

7.6.2.2 Link Flow Analysis - Phase 2 Construction HGV Traffic and Phase 1 Operational/HGV Traffic

The development traffic associated with construction HGV traffic, as described in **Section 7.4.1** was applied to the local road network during the morning between 07:00-08:00 and in the evening between 16:00-17:00. These time periods are when it has been assumed that 20% of the daily construction HGVs arrive/depart the site in both the morning and the evening respectively, in the proposed assessment year of 2022.

Furthermore, the development traffic associated with operational staff and operational HGV traffic for Phase 1 of the proposed development have been added to the local road network during the same time periods. As with construction HGV traffic, it has been assumed that 20% of the daily anticipated HGV movements associated with Phase 1 of the development arrive/depart the site in both the morning and evening time periods.

Table 7.14: 2022 Construction/Operational Stage Two-Way Link Flows on surrounding road network

Junction/Arm	AM Peak Period (07:00-08:00)			PM Peak Period (16:00-17:00)		
	Without Dev	With Dev	% Change	Without Dev	With Dev	% Change
Indaver Site Entrance Junction						
Indaver Arm	34	54	20 (+59%)	35	55	20 (+57%)
R152 (North)	1,405	1,413	8 (+0.6%)	1,365	1,373	8 (+0.6%)
R152 (South)	1,401	1,414	13 (+0.9%)	1,371	1,384	13 (+0.9%)
R150/R152 New Lanes Cross Junction						
R152 (North)	1,429	1,441	12 (+0.8%)	1,439	1,451	12 (+0.9%)
R152 (South)	1,020	1,030	10 (+1%)	858	869	11 (+1.3%)
R150 (West)	760	762	2 (+0.3%)	874	875	1 (0.1%)
R150 (East)	310	310	0	323	323	0

**All flows in vehicles (two-way flows). Values have been rounded for clarity.*

It can be seen in the table above that the addition of HGV traffic associated with construction of Phase 2 of the development, plus operational HGVs and vehicles associated with the opening of Phase 1 collectively have a negligible impact on the local road network, with typical increases of 0.3%-1.3%. Again, the exception is the Indaver entrance, where the existing low flows result in a proportionately high increase. Nevertheless, the proposed development will only result in an additional 20 vehicles on the road network during these two assessment hours.

7.6.3 Link Flow Analysis - 2027 Opening Year +5 Scenario

In 2027, the proposed development is fully constructed and operational. Therefore, the development traffic associated with operational staff and operational HGV traffic for Phases 1 and 2 of the proposed development have been added to the local road network during the relevant time periods (07:00-08:00 and 16:00-17:00, respectively). As with the 2022 scenario, it has been assumed that 20% of the daily anticipated HGV movements associated with Phases 1 and 2 of the development arrive/depart the site in both the morning and evening time periods.

Table 7.15: 2027 Construction/Operational Stage Two-Way Link Flows on surrounding road network

Junction/Arm	AM Peak Period (07:00-08:00)			PM Peak Period (16:00-17:00)		
	Without Dev	With Dev	% Change	Without Dev	With Dev	% Change
Indaver Site Entrance Junction						
Indaver Arm	38	72	34 (+89%)	39	73	34 (+87%)
R152 (North)	1,541	1,558	17 (+1.1%)	1,497	1,514	17 (+1.1%)
R152 (South)	1,537	1,554	17 (+1.1%)	1,504	1,521	17 (+1.1%)
R150/R152 New Lanes Cross Junction						
R152 (North)	1,567	1,584	17 (+1.1%)	1,577	1,594	17 (+1.1%)
R152 (South)	1,119	1,127	8 (+0.7%)	941	951	10 (+1.1%)
R150 (West)	833	842	9 (+1.1%)	956	963	7 (+0.7%)
R150 (East)	339	339	0	354	354	0

**All flows in vehicles (two-way flows). Values have been rounded for clarity.*

It can be seen in the table above that the addition operational HGVs and vehicles associated with the full development (both Phases) collectively have a negligible impact on the local road network, with typical increases of approximately 1%. As with previous scenarios, the exception is the Indaver entrance where the existing low flows result in a proportionately high increase. Nevertheless, the proposed development will only result in an additional 34 vehicles on the road network during these two assessment hours.

7.6.4 Link Flow Analysis - 2037 Opening Year +15 Scenario

As with the 2027 scenario the development traffic associated with operational staff and operational HGV traffic for Phases 1 and 2 of the proposed development have been added to the local road network during the relevant time periods in the 2037 assessment year (07:00-08:00 and 16:00-17:00, respectively). As with the 2022 and 2027 scenarios, it has been assumed that 20% of the daily anticipated HGV movements associated with Phases 1 and 2 of the development arrive/depart the site in both the morning and evening time periods.

Table 7.16: 2037 Construction/Operational Stage Two-Way Link Flows on surrounding road network

Junction/Arm	AM Peak Period (07:00-08:00)			PM Peak Period (16:00-17:00)		
	Without Dev	With Dev	% Change	Without Dev	With Dev	% Change
Indaver Site Entrance Junction						
Indaver Arm	44	78	34 (+77%)	45	79	34 (+76%)
R152 (North)	1,723	1,740	17 (+1%)	1,672	1,689	17 (+1%)
R152 (South)	1,719	1,736	17 (+1%)	1,681	1,698	17 (+1%)
R150/R152 New Lanes Cross Junction						
R152 (North)	1,753	1,769	16 (+0.9%)	1,761	1,778	17 (+1%)
R152 (South)	1,249	1,258	9 (+0.7%)	1,052	1,062	10 (+1%)
R150 (West)	932	941	9 (+1%)	1,065	1,072	7 (+1%)
R150 (East)	379	379	0	395	395	0

**All flows in vehicles (two-way flows). Values have been rounded for clarity.*

As with the 2027 assessment year, it can be seen in the table above that the addition operational HGVs and vehicles associated with the full development (both Phases) collectively have a negligible impact on the local road network, with typical increases of approximately 1%. As with previous scenarios, the exception is the Indaver entrance where the existing low flows result in a proportionately high increase. Nevertheless, as with the 2027 assessment year the proposed development will only result in an additional 34 vehicles on the road network during these two assessment hours.

7.6.4.1 Link Flow Analysis – Summary

The above tables demonstrate that the proposed development, once constructed and operational, will have a negligible impact on the local road network, with typical increases in the order of approximately 1% in the majority of locations.

The construction traffic associated with the scheme is seen to have a higher impact on the local road network; however, this is due to the background traffic being lower in the morning and evening assessment hours for construction purposes.

Construction traffic and the impact associated with the construction of the proposed development will be temporary in nature.

Additionally, construction working hours on site will be from 07:00-19:00, coinciding with time periods on the local road network that are outside the existing network peak time periods in the morning and evening.

7.6.5 Junction Assessment

In addition to the link flow analyses above, junction analyses were carried out at the Indaver site entrance/R152 junction and the R152/R150 junction at New Lanes Cross to the south, for the same assessment scenarios outlined above. The assessments were carried out using the PICADY module of the Junctions 9 software package. PICADY is an assessment tool used for analysis of priority-controlled junctions.

The assessment results are summarised in the following sections. The results are presented and discussed in terms of the Ratio of Flow to Capacity (RFC) values for the junction arms (RFC is a measure of how close a junction or an arm of a junction is operating to its theoretical maximum capacity and is expressed as a percentage value) and Mean Maximum Queue.

For all scenarios assessed, traffic flows were converted from vehicles to PCU.

7.6.5.1 2019 Base Year

Indaver Site Entrance Junction

Table 7.17: 2019 Base Year Analysis Results – Indaver Site Entrance – AM Peak Periods

Arm	AM Network (08:15-09:15)		AM (06:00-07:00)		AM (07:00-08:00)	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R152 S/B	41%	<1	29%	<1	46%	<1
R152 N/B	37%	<1	8%	<1	27%	<1
Indaver Arm	1%	<1	<1%	<1	3%	<1

Table 7.18: 2019 Base Year Analysis Results – Indaver Site Entrance – PM Peak Periods

Arm	PM Network (17:00-18:00)		PM (16:00-17:00)		PM (19:00-20:00)	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R152 S/B	35%	<1	32%	<1	14%	<1
R152 N/B	52%	1	39%	<1	21%	<1
Indaver Arm	6%	<1	7%	<1	1%	<1

In 2019, the Indaver site entrance junction has significant reserve capacity throughout the day, and during all relevant time periods. Minimal queuing is seen on all of the arms of the junction, with all arms performing well under all scenarios.

In particular, the junction has significant spare capacity during the relevant time periods for the proposed development traffic (06:00-07:00, 07:00-08:00, 16:00-17:00 and 19:00-20:00).

R152/R150 New Lanes Cross Junction

Table 7.19: 2019 Base Year Analysis Results – R152/R150 New Lanes Cross (AM Peak Periods)

Arm	AM Network (08:15-09:15)		AM (06:00-07:00)		AM (07:00-08:00)	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R150 E/B Left	74%	3	14%	<1	57%	1
R150 E/B St/Right	42%	1	23%	<1	53%	1
R152 N/B	13%	<1	2%	<1	8%	<1
R150 W/B Left	14%	<1	6%	<1	14%	<1
R150 W/B St/Right	36%	1	8%	<1	27%	<1
R152 S/B	61%	2	12%	<1	35%	1

Table 7.20: 2019 Base Year Analysis Results – R152/R150 New Lanes Cross (PM Peak Periods)

Arm	PM Network (17:00-18:00)		PM (16:00-17:00)		PM (19:00-20:00)	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R150 E/B Left	75%	3	57%	1	37%	1
R150 E/B St/Right	28%	<1	24%	<1	16%	<1
R152 N/B	15%	<1	9%	<1	4%	<1
R150 W/B Left	16%	<1	11%	<1	2%	<1
R150 W/B St/Right	57%	1	46%	1	17%	<1
R152 S/B	86%	5	72%	3	34%	1

In 2019, the junction of the R152/R150 at New Lanes Cross performs relatively well throughout most of the day, with the approach arm from Duleek Village on the R150 and the southbound approach on the R152 experiencing the highest capacity results during the morning and evening peak periods on the surrounding road network. However, during the relevant time periods for the proposed development (06:00-07:00, 07:00-08:00, 16:00-17:00 and 19:00-20:00) the junction is operating well and has spare capacity.

7.6.5.2 2022 Construction/Operation Scenario

In 2022, the principal development impacts are outside of the morning and evening network peaks (08:15-09:15 and 17:00-18:00, respectively). Results are therefore presented for the relevant hours (06:00-07:00, 07:00-08:00, 16:00-17:00 and 19:00-20:00) in the tables below.

Indaver Site Entrance Junction

Table 7.21: 2022 Construction/Operational Year Analysis Results – Indaver Site Entrance (AM Peaks - 06:00-07:00 and 07:00-08:00)

Arm	AM (06:00-07:00) Without Development		AM (06:00-07:00) With Development		AM (07:00-08:00) Without Development		AM (07:00-08:00) With Development	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R152 S/B	31%	<1	34%	<1	49%	1	50%	1
R152 N/B	9%	<1	12%	<1	29%	<1	30%	<1
Indaver Arm	<1%	<1	<1%	<1	3%	<1	7%	<1

Table 7.22: 2022 Construction/Operational Year Analysis Results – Indaver Site Entrance (PM Peaks - 16:00-17:00 and 19:00-20:00)

Arm	PM (16:00-17:00) Without Development		PM (16:00-17:00) With Development		PM (19:00-20:00) Without Development		PM (19:00-20:00) With Development	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R152 S/B	34%	<1	34%	<1	15%	<1	15%	<1
R152 N/B	41%	<1	42%	<1	22%	<1	22%	<1
Indaver Arm	7%	<1	12%	<1	1%	<1	12%	<1

In 2022, the Indaver site entrance junction again has significant reserve capacity throughout the day, and during all relevant time periods. Minimal queuing is seen on all of the arms of the junction, with all arms performing well under all scenarios.

The additional arriving construction personnel in the morning (between 06:00-07:00) has a minor impact on the capacity of the junction, increasing the RFC by approximately 3%, but significant spare capacity remains at the junction.

During the 07:00-08:00 morning period, the arrival of operational staff and HGVs associated with Phase 1 of the scheme and construction HGVs associated with Phase 2 of the scheme has a very minor impact on the capacity of the junction, increasing the RFC by between 1-4%, with the largest increase recorded on the Indaver arm of the junction.

In the afternoon period (16:00-17:00), the operational and construction traffic arriving and departing the site result in minor increases in RFC, between 1-5%.

In the evening period (19:00-20:00), the departure of construction personnel from the site is seen to impact the Indaver arm of the junction only, increasing the RFC by approximately 10%.

The junction therefore has ample capacity to accommodate the construction traffic and the operational traffic associated with the proposed development.

R152/R150 New Lanes Cross Junction

Table 7.23: 2022 Construction/Operational Year Analysis Results – R152/R150 New Lanes Cross (AM Peak Periods – 06:00-07:00 and 07:00-08:00)

Arm	AM (06:00-07:00) Without Development		AM (06:00-07:00) With Development		AM (07:00-08:00) Without Development		AM (07:00-08:00) With Development	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R150 E/B Left	15%	<1	18%	<1	62%	2	63%	2
R150 E/B St/Right	25%	<1	25%	<1	60%	2	61%	2
R152 N/B	2%	<1	2%	<1	9%	<1	9%	<1
R150 W/B Left	6%	<1	6%	<1	16%	<1	16%	<1
R150 W/B St/Right	9%	<1	9%	<1	30%	1	30%	1
R152 S/B	12%	<1	12%	<1	38%	1	38%	1

Table 7.24: 2022 Construction/Operational Year Analysis Results – R152/R150 New Lanes Cross (PM Peak Periods – 16:00-17:00 and 19:00-20:00)

Arm	PM (16:00-17:00) Without Development		PM (16:00-17:00) With Development		PM (19:00-20:00) Without Development		PM (19:00-20:00) With Development	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R150 E/B Left	62%	2	62%	2	39%	1	40%	1
R150 E/B St/Right	28%	1	28%	1	17%	<1	18%	<1
R152 N/B	10%	<1	10%	<1	4%	<1	4%	<1
R150 W/B Left	12%	<1	12%	<1	3%	<1	3%	<1
R150 W/B St/Right	50%	1	51%	1	18%	<1	19%	<1
R152 S/B	78%	4	78%	4	36%	1	40%	1

In 2022, the R152/R150 junction at New Lanes Cross has sufficient reserve capacity during all relevant time periods. Minimal queuing is seen on all of the arms of the junction, with all arms performing well under all scenarios.

The additional arriving construction personnel in the morning (between 06:00-07:00) has a minor impact on the capacity of the junction, increasing the RFC by approximately 3%, but significant spare capacity remains at the junction.

During the 07:00-08:00 morning period, the arrival of operational staff and HGVs associated with Phase 1 of the scheme and construction HGVs associated with Phase 2 of the scheme has a very minor impact on the capacity of the junction, increasing the RFC by approximately 1%.

In the afternoon period (16:00-17:00), the operational and construction traffic arriving and departing the site result in minor increases in RFC of a maximum of 1%.

In the evening period (19:00-20:00), the departure of construction personnel from the site is seen to have a minor impact on the junction, increasing RFC values by 1-4%.

The junction therefore has ample capacity to accommodate the construction traffic and the operational traffic associated with the proposed development.

7.6.5.3 2027 Opening Year +5 Scenario

In 2027, as with 2022 the principal development impacts are outside of the morning and evening network peaks (08:15-09:15 and 17:00-18:00, respectively). Additionally, there is no construction traffic present.

Results are presented for the relevant hours (07:00-08:00 and 16:00-17:00) in the tables below.

Indaver Site Entrance Junction

Table 7.25: 2027 Opening Year +5 Analysis Results – Indaver Site Entrance (AM and PM Peaks - 07:00-08:00 and 16:00-17:00)

Arm	AM (07:00-08:00) Without Development		AM (07:00-08:00) With Development		PM (16:00-17:00) Without Development		PM (16:00-17:00) With Development	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R152 S/B	54%	1	55%	1	37%	<1	38%	<1
R152 N/B	32%	<1	33%	<1	45%	<1	46%	<1
Indaver Arm	4%	<1	7%	<1	10%	<1	17%	<1

In 2022, the Indaver site entrance junction again has significant reserve capacity throughout the day, and during all relevant time periods.

Minimal queuing is seen on all of the arms of the junction, with all arms performing well under all scenarios.

During the 07:00-08:00 morning period, the arrival of operational staff and HGVs associated with Phases 1 and 2 of the scheme have a very minor impact on the capacity of the junction, increasing the RFC by between 1-3%, with the highest increase recorded on the Indaver arm.

In the afternoon period (16:00-17:00), the operational and construction traffic arriving and departing the site result in moderate increases in RFC on the R152 (in the order of 1%), and a greater increase on the Indaver arm of 7%.

The junction therefore has ample capacity to accommodate the construction traffic and the operational traffic associated with the proposed development.

R152/R150 New Lanes Cross Junction

Table 7.26: 2027 Opening Year +5 Analysis Results – R152/R150 New Lanes Cross Junction (AM and PM Peaks - 07:00-08:00 and 16:00-17:00)

Arm	AM (07:00-08:00) Without Development		AM (07:00-08:00) With Development		PM (16:00-17:00) Without Development		PM (16:00-17:00) With Development	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R150 E/B Left	73%	3	75%	3	72%	3	73%	3
R150 E/B St/Right	74%	3	75%	3	38%	1	40%	1
R152 N/B	10%	<1	10%	<1	11%	<1	11%	<1
R150 W/B Left	19%	<1	19%	<1	15%	<1	15%	<1
R150 W/B St/Right	37%	1	37%	1	58%	1	59%	2
R152 S/B	42%	1	43%	1	89%	7	90%	8

In 2027, the R152/R150 junction at New Lanes Cross is beginning to approach capacity on the R152 southbound approach to the junction in the evening peak period; however, this is based on the traffic at the junction having increased from 2019-2027 based on the growth factors outlined earlier in this chapter.

Despite this, minor levels of queuing are seen on all of the arms of the junction, and the remaining arms of the junction are seen to perform well and have sufficient residual capacity.

During the 07:00-08:00 morning period, the arrival of operational staff and HGVs associated with Phases 1 and 2 of the scheme has a very minor impact on the capacity of the junction, increasing the RFC by approximately 1-2% and having no impact on queue lengths.

In the afternoon period (16:00-17:00), the operational and construction traffic arriving and departing the site result in minor increases in RFC of a maximum of 1-2%, with a very minor impact on queue lengths.

Despite the junction itself approaching its' theoretical capacity on the R152 southbound approach arm, the proposed development is seen to have an almost negligible impact on the junction performance.

7.6.5.4 2037 Opening Year +15 Scenario

In 2037, as with 2027 the principal development impacts are outside of the morning and evening network peaks (08:15-09:15 and 17:00-18:00, respectively). Results are presented for the relevant hours (07:00-08:00 and 16:00-17:00) in the tables below.

Indaver Site Entrance Junction

Table 7.27: 2037 Opening Year +5 Analysis Results – Indaver Site Entrance (AM and PM Peaks - 07:00-08:00 and 16:00-17:00)

Arm	AM (07:00-08:00) Without Development		AM (07:00-08:00) With Development		PM (16:00-17:00) Without Development		PM (16:00-17:00) With Development	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R152 S/B	61%	1	62%	1	42%	<1	43%	<1
R152 N/B	37%	<1	38%	<1	51%	1	51%	1
Indaver Arm	6%	<1	9%	<1	14%	<1	22%	<1

As with the 2027 scenario, in 2037 the Indaver site entrance junction again has significant reserve capacity throughout the day, and during all relevant time periods. Minimal queuing is seen on all of the arms of the junction, with all arms performing well under all scenarios.

During the 07:00-08:00 morning period, the arrival of operational staff and HGVs associated with Phases 1 and 2 of the scheme have a very minor impact on the capacity of the junction, increasing the RFC by between 1-3%.

In the afternoon period (16:00-17:00), the operational and construction traffic arriving and departing the site result in minor increases in RFC, between 1-8%, with the highest increase seen on the Indaver arm of the junction.

The junction therefore has ample capacity to accommodate the construction traffic and the operational traffic associated with the proposed development.

R152/R150 New Lanes Cross Junction

Table 7.28: 2037 Opening Year +5 Analysis Results – R152/R150 New Lanes Cross Junction (AM and PM Peaks - 07:00-08:00 and 16:00-17:00)

Arm	AM (07:00-08:00) Without Development		AM (07:00-08:00) With Development		PM (16:00-17:00) Without Development		PM (16:00-17:00) With Development	
	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R150 E/B Left	90%	8	92%	9	96%	10	99%	12
R150 E/B St/Right	101%	12	103%	13	73%	2	80%	3
R152 N/B	13%	<1	13%	<1	13%	<1	13%	<1
R150 W/B Left	24%	<1	25%	<1	22%	<1	22%	<1
R150 W/B St/Right	49%	1	50%	1	71%	2	72%	3
R152 S/B	49%	1	50%	1	106%	26	108%	30

By 2037, the R152/R150 junction at New Lanes Cross is experiencing capacity issues on a number of arms, predominantly the entry arm on the R150 from Duleek in the morning and evening and the southbound arm on the R152 in the evening. As with the 2027 scenario, traffic has been factored up to 2037 in line with the relevant growth factors outlined earlier in this chapter.

These results are indicative of a tidal flow pattern from Duleek in the morning towards the M1, and the reverse in the evening. Other arms of the junction are seen to have sufficient residual capacity.

During the 07:00-08:00 morning period, the arrival of operational staff and HGVs associated with Phases 1 and 2 of the scheme have a very minor impact on the capacity of the junction, increasing the RFC by approximately 1-2%.

In the afternoon period (16:00-17:00), the operational and construction traffic arriving and departing the site result in minor increases in RFC of between 1-7%.

Despite the junction itself approaching its' theoretical capacity on a number of arms, the proposed development is seen to have an almost negligible impact on the junction performance.

7.6.5.5 Sensitivity Test – Export of Bottom Ash

As outlined earlier in this chapter, a specific additional sensitivity test was undertaken for a scenario where bottom ash is transported to Drogheda Port to be exported elsewhere in Europe for recovery, as opposed to via landfill in Ireland. In this scenario, approximately once per month the stockpile of bottom ash stored on site would be transported by HGV to Drogheda Port over a two-day period. Traffic flows in this instance would comprise an additional 8 HGV's per hour arriving at the Indaver site and departing the Indaver site, heading north on the R152 and approaching Drogheda Port from the west, turning left at the junction of the R132 and Shop Street in Drogheda.

Export of bottom ash from Drogheda Port would involve the following:

- Bottom ash would be stored on site (the site will have capacity for on-site storage of up to 5,000 tonnes of ash);
- Every month, for a two-day period, bottom ash would be transported from the site to Drogheda Port in covered HGV's;
- These HGV's would commence arrival on site at 07:00 and would work throughout the typical day, finishing at 19:00; and
- These HGV movements would be confined to the local road network between the Indaver site and Drogheda Port.

To evaluate the impact of this, a sensitivity test was carried out at this junction, for an assessment year of 2022, in the morning and evening peak periods on the local road network (08:15-09:15 and 17:00-18:00, respectively).

A LinSig model of the signalised junction was built of the R132 and Shop Street. Signal phasing and staging and timings were obtained from Louth County Council and were cross-referenced against site observations. LinSig is an analytical software package used for the evaluation of signal-controlled junctions.

Traffic growth factors outlined earlier in this chapter were used to increase the traffic flows from 2019 to 2022. Although these growth rates relate to the Meath area, they were also applied to the traffic flows at this junction, which is in Co. Louth, as the Meath growth rates were seen to be slightly higher than the corresponding growth rates for Louth, and therefore were retained for robustness.

Table 7.29: 2022 Opening Year Analysis Results – R132/R167 Shop Street junction, Drogheda – Export of Bottom Ash (AM and PM Peaks - 08:15-09:15 and 17:00-18:00)

Arm	Movement	AM (08:15-09:15) Without Develop.		AM (08:15-09:15) With Develop.		PM (17:00-18:00) Without Develop.		PM (17:00-18:00) With Develop.	
		RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q	RFC (%)	Mean Max Q
R167 S/B	Left	33%	5	33%	5	36%	6	35%	5
R167 S/B	St/Right	62%	10	64%	11	62%	10	63%	11
R132 W/B	Left/St	64%	15	65%	16	57%	13	60%	13
R132 W/B	St/Right	63%	11	65%	11	62%	10	63%	10
R132 E/B	Left/St	59%	7	61%	7	61%	7	64%	8
R132 E/B	St	49%	7	50%	7	53%	8	55%	8
R132 E/B Slip Lane	Left	54%	1	55%	1	59%	3	59%	3

It is seen in the table above that the additional HGV traffic associated with the transport of bottom ash to and from Drogheda Port has a minor impact at the junction in the morning and evening peak periods. RFC values are increased by between 1-3%, and the impact on queuing is seen to be minimal. It must be noted that the above assessment is based on a hypothetical scenario where bottom ash is no longer sent to landfill, and instead is exported.

Furthermore, the additional traffic flow associated with this activity would be temporary only, with the transport of bottom ash to the port taking place over a two-day period approximately once every month.

7.6.5.6 Junction Analysis – Summary

The analysis undertaken for the proposed development is based on the arrival and departure profiles that will be generated by the development, which lie outside of the morning and evening peak periods on the wider road network (08:15-09:15 and 17:00-18:00, respectively).

It can be seen in the above analysis tables that the Indaver site entrance junction has and will continue to have significant residual capacity to accommodate the additional traffic flows associated with the construction and operational phases of the proposed development during the relevant time periods.

The R152/R150 junction at New Lanes Cross to the south will begin to experience some capacity issues by 2027 in the evening (between 16:00-17:00) as a result of forecasted traffic growth; however, the proposed development itself is seen to have a very minor impact on the junction.

By 2037, the capacity issues at this junction have increased (again, due to forecasted traffic growth), with certain arms of the junction over capacity in both the morning and evening peak periods; however, the proposed development is seen to have a very minor impact on the junction.

7.7 Mitigation Measures and Monitoring

7.7.1 Operational Phase

7.7.1.1 Staff Operational Hours

Arrival and departure times for the additional 20 personnel to be employed on site following completion of Phases 1 and 2 of the proposed development will result in all new personnel arriving on site before 08:00 and departing the site before 17:00, thereby avoiding the morning and evening peak periods on the local road network (08:15-09:15 and 17:00-18:00, respectively).

7.7.1.2 HGV Arrival and Departure Profiles

As outlined in **Section 7.3.6.1**, the arrival profile of HGVs to the site is distributed across the working day. This is as a result of specific deliveries to the site being co-ordinated by the Indaver planner, and also a result of the current operators and deliveries to the site settling into an established pattern since the existing facility became operational. It is expected that this will continue for the proposed development.

Furthermore, it is Indaver policy to instruct those companies that use the existing facility to ensure that HGV traffic does not route through Duleek Village, although some localised routing is sometimes necessary for specific cases.

7.7.2 Construction Phase

Construction hours will be from 07:00-19:00. This will result in construction personnel arriving on site before 07:00 and departing after 19:00, thereby avoiding the peak hours on the local road network.

Furthermore, HGV traffic associated with the construction of Phases 1 and 2 will not be permitted to route through Duleek Village.

A Construction Traffic Management Plan (CTMP) will also be in place for the duration of the construction phases of the proposed development (see Section 9 of the ***Construction Environmental Management Plan*** in **Appendix 5.1** of **Volume 3** of this EIAR).

This will be agreed with Meath County Council in advance of commencement of construction, and the overall goal of the CTMP will be to minimise insofar as possible the potential impacts arising from the construction phase of the development on the local road network.

7.8 Cumulative Effects

As outlined in **Section 7.5**, a number of committed projects in the vicinity of the proposed development site have been identified, and the relevant traffic flows have been obtained from the planning documentation and incorporated into the background network traffic where applicable.

The baseline traffic data has also been growthed for future year assessments using a 'Central' growth profile as per the Transport Infrastructure Ireland Project Appraisal Guidelines. Therefore, it is considered that this growthed traffic is sufficient to account for the majority of the committed developments in the vicinity of the site.

7.9 Residual Effects

7.9.1 Operational Phase

The Indaver site entrance junction on the R150 has significant spare capacity at present and will continue to have sufficient capacity into the future to accommodate the proposed development without any residual effects.

The junction of the R152/R150 at New Lanes Cross to the south is heavily-trafficked at present and will begin to experience capacity issues in 2027 and by 2037 the junction will be over-capacity on specific arms and at specific times during the day. However, the proposed development itself will have a minimal impact on this junction.

Furthermore, major upgrade proposals on the local road network (primary the proposed Duleek bypass) will provide significant relief to the junction at New Lanes Cross once constructed. No allowance or reduction in traffic flows have been applied to this assessment to account for major upgrade proposals on the local road network.

7.9.2 Construction Phase

There will be no residual effects associated with the construction of the scheme, as construction traffic to and from the site will be temporary in duration and will be subject to a robust Construction Traffic Management Plan (CTMP), which will ensure that impacts on the local road network during construction are minimised.

The most significant impact associated with the construction stage is that on the Indaver site access junction itself, which has significant capacity and can comfortably accommodate the increased traffic flows.

7.10 References

Transport Infrastructure Ireland (TII) (2019) *Project Appraisal Guidelines, Unit 5.5: Link-Based Traffic Forecasting, Table 5.5.1: National Traffic Growth Forecasts: Annual Growth Factors,* TII, Dublin, Ireland

Transport for London (2010) *Traffic Modelling Guidelines*, Transport for London, UK

8 Air Quality

8.1 Introduction

This chapter presents an assessment of the effects of the proposed Site Sustainability Project, herein referred to as the proposed development, on air quality. There are a number of elements involved in the proposed development which are detailed in full in **Chapter 4 *Description of the Proposed Development***.

8.2 Assessment Methodology

8.2.1 Criteria for Rating of Impacts

8.2.1.1 Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered.

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate EU Directive 2008/50/EC, which has set limit values for NO_2, lead, SO_2, PM_{10}, $PM_{2.5}$, benzene and CO, refer to **Table 8.1**.

Table 8.1: Air Quality Standards Regulations

Pollutant	Regulation	Limit Type	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
		Critical level for protection of vegetation	30 µg/m^3 $NO + NO_2$
Lead	2008/50/EC	Annual limit for protection of human health	0.5 µg/m^3
Sulphur Dioxide (SO_2)	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	350 µg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	125 µg/m^3
		Critical limit for the protection of ecosystems	20 µg/m^3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health	25 µg/m^3
Benzene	2008/50/EC	Annual limit for protection of human health	5 µg/m^3
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	10 mg/m^3 (8.6 ppm)
Dust Deposition	TA Luft	Annual average for nuisance dust	350 mg/(m^{2}*day)

8.2.1.2 Dust Deposition

In terms of dust impacts the concern from a health perspective is focussed on particles of dust which are less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$) and the EU ambient air quality standards outlined in Table 8.1 have set ambient air quality limit values for PM_{10} and $PM_{2.5}$.

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland.

Furthermore, no specific criteria have been stipulated for nuisance dust in respect of this development.

With regard to dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/(m^2*day) averaged over a one year period at any receptors outside the site boundary (**Table 8.1**). Recommendations from the Department of the Environment, Health & Local Government (DEHLG, 2004) apply the Bergerhoff limit of 350 mg/(m^2*day) to the site boundary of quarries. This limit value can also be implemented with regard to dust impacts from construction of the proposed development.

8.2.1.3 Heavy Metals

Ambient air quality guidelines and limits for various heavy metals have been set by the European Union, the WHO and in the TA Luft Guidelines. Council Directive 2004/107/EC has set ambient air quality limit values for Cadmium, Arsenic and Nickel which came into force in 2013. In the absence of statutory standards, ambient air quality guidelines can also be derived from occupational exposure limits (OELs). Short-term and long-term environmental assessment levels (EALs) can be derived by applying appropriate factors to the OEL. Annual average limit values for the heavy metals applicable to this assessment are listed in **Table 8.2**.

Table 8.2: Heavy Metals Ambient Air Quality Standards & Guidelines for the Protection of Human Health

Metal	Short-Term EAL (1-Hr)	Long-Term EAL (Annual)	Regulation
Cd	-	0.005 µg/m^3	WHO(3)
Cd	1.5 µg/m^3	0.005 µg/m^3	EU(1) / EAL(2)
Tl	30 µg/m^3	1.0 µg/m^3	EAL(2)
Sb	150 µg/m^3	5 µg/m^3	EAL(2)
As	15 µg/m^3	0.006 µg/m^3	EU(1) / EAL(2)
Pb	-	0.5 µg/m^3	EU(1)
Cr (except VI)	150 µg/m^3	5.0 µg/m^3	EAL(2)
Cr (VI)	3 µg/m^3	0.1 µg/m^3	EAL(2)
Co	6 µg/m^3	0.2 µg/m^3	EAL(2)

Metal	Short-Term EAL (1-Hr)	Long-Term EAL (Annual)	Regulation
Cu (fumes)	60 $\mu g/m^3$	2.0 $\mu g/m^3$	EAL(2)
Cu (dust & mists)	200 $\mu g/m^3$	10 $\mu g/m^3$	EAL(2)
Mn	1500 $\mu g/m^3$	0.15 $\mu g/m^3$	WHO(3)
Hg	-	1.0 $\mu g/m^3$	WHO(3)
Ni (inorganic)	30 $\mu g/m^3$	0.02 $\mu g/m^3$	EU(1)
V	1.0 $\mu g/m^3$	5.0 $\mu g/m^3$	EAL(2)

(1) Council Directive 2004/107/EC

(2) https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

(3) WHO (2006) Air Quality Guidelines

8.2.2 Construction Phase

The current assessment focuses on identifying the existing baseline levels of PM_{10} and $PM_{2.5}$ in the region of the proposed development by an assessment of EPA monitoring data. Thereafter, the impact of the construction phase of the development on air quality was determined by a qualitative assessment of the nature and scale of dust generating construction activities associated with the proposed development.

An assessment of the construction stage traffic was conducted as per the criteria in **Section 8.2.3.2** below.

8.2.3 Operational Phase

8.2.3.1 Existing Waste to Energy Process

The proposed development does not propose any significant changes to the Waste to Energy (WtE) operating processes at the facility. Although additional tonnage (up to 15,000 tpa) is proposed to be processed at the plant, this is primarily for the treatment of aqueous wastes. There is no change to the licensed parameters under Licence No. W0167-03 and the site will continue to operate within its licence requirements. As a result, the modelling inputs remain unchanged from the maximum operational conditions modelled previously for the original proposal for the Waste to Energy facility and thus, detailed modelling is not required.

This detailed modelling was originally conducted in 2009[1] and was updated in 2012[2] to account for an increased volume flow rate once the plant was operational, which corresponds to the current licensed flow rate. The modelling assessment for emissions from the WtE facility has been updated using the most recent version of the model and with the most up to date meteorological data to ensure current conditions remain in compliance with the ambient air quality limit values and licence requirements.

Modelling was carried out using the EPA approved (EPA, 2010) model AERMOD (version 19191) which is a regulatory model by the USEPA (USEPA, 2019). The air dispersion modelling input data consists of detailed information on the physical environment (including building dimensions and terrain features), design details from all emission points on-site and five full years of meteorological data (Dublin Airport 2014 – 2018). Using this input data, the model predicts ambient ground level concentrations beyond the site boundary for each hour of the modelled meteorological year. The model post-processes the data to identify the location of the maximum ambient ground level concentration in the applicable format for comparison with the relevant limit values. This maximum concentration is then added to the existing background concentration to give the maximum predicted ambient concentration. The maximum ambient concentration is then compared with the relevant ambient air quality standard for the protection of human health to assess the significance of the releases from the site. An overview of the model is outlined in **Appendix 8.1** in **Volume 3** of this EIAR.

8.2.3.2 Road Traffic

The air quality assessment for construction and operational phase road traffic has been carried out following procedures described in the publications by the EPA (EPA, 2015; 2017) and using the methodology outlined in the guidance documents published by the UK DEFRA (UK DEFRA 2016, 2018; UK DETR, 1998). The assessment of air quality was carried out using a phased approach as recommended by the UK DEFRA (UK Highways Agency, 2007). The phased approach recommends that the complexity of an air quality assessment is consistent with the risk of failing to achieve the air quality standards.

The assessment methodology involves air dispersion modelling using the UK DMRB Screening Model (UK Highways Agency, 2007) (Version 1.03c, July 2007), the NO_x to NO_2 Conversion Spreadsheet (UK DEFRA, 2019) (Version 7.1, 2019), and following guidance issued by the Transport Infrastructure Ireland (TII) (2011), UK Highways Agency (2007), UK DEFRA (2016, 2018) and the EPA (2015, 2017).

The TII guidance (2011) states that the assessment must progress to detailed modelling if:

- Concentrations exceed 90% of the air quality limit values when assessed by the screening method; or

[1] Available for inspection under the EPA IE Licence W0167-02, http://www.epa.ie/licensing/
[2] Available for inspection under the EPA IE Licence W0167-03, http://www.epa.ie/licensing/ and SID application http://www.carranstownamendments.ie/.

- Sensitive receptors exist within 50m of a complex road layout (e.g. grade separated junctions, hills etc).

The UK DMRB guidance (UK Highways Agency, 2007), on which the TII guidance was based, states that road links meeting one or more of the following criteria can be defined as being ‘affected’ by a proposed development and should be included in the local air quality assessment:

- Road alignment change of 5 metres or more;
- Daily traffic flow changes by 1,000 AADT or more;
- HGV flows change by 200 vehicles per day or more;
- Daily average speed changes by 10 km/h or more; or
- Peak hour speed changes by 20 km/h or more.

Concentrations of key pollutants are calculated at sensitive receptors that have the potential to be affected by the proposed development. For road links which are deemed to be affected by the proposed development and within 200m of the chosen sensitive receptors inputs to the air dispersion model consist of: road layouts, receptor locations, annual average daily traffic movements (AADT), percentage heavy goods vehicles, annual average traffic speeds and background concentrations. The UK DMRB guidance states that road links at a distance of greater than 200m from a sensitive receptor will not influence pollutant concentrations at the receptor. Using this input data, the model predicts the road traffic contribution to ambient ground level concentrations at the worst-case sensitive receptors using generic meteorological data. The DMRB model uses conservative emission factors, the formulae for which are outlined in the DMRB Volume 11 Section 3 Part 1 – HA 207/07 Annexes B3 and B4.

These worst-case road contributions are then added to the existing background concentrations to give the worst-case predicted ambient concentrations. The worst-case ambient concentrations are then compared with the relevant ambient air quality standards to assess the compliance of the proposed development with these ambient air quality standards. The TII *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (TII, 2011) detail a methodology for determining air quality impact significance criteria for road schemes and this can be applied to any project that causes a change in traffic flows. The degree of impact is determined based on both the absolute and relative impact of the proposed development. The TII significance criteria have been adopted for the proposed development and are detailed in Table A8.2.1 to Table A8.2.3 of **Appendix 8.2** in **Volume 3** of this EIAR. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the annual mean limit values (40 µg/m^3).

However, the criteria have also been applied to the predicted 8-hour CO, annual benzene and annual $PM_{2.5}$ concentrations for the purposes of this assessment.

8.3 Receiving Environment

8.3.1 Meteorological Data

The selection of the appropriate meteorological data has followed the guidance issued by the USEPA (2016). A primary requirement is that the data used should have a data capture of greater than 90% for all parameters. Dublin Airport meteorological station, which is located approximately 30 km south-east of the site, collects data in the correct format and has a data collection of greater than 90%. Long-term hourly observations at Dublin Airport meteorological station provide an indication of the prevailing wind conditions for the region (see **Figure 8.1** and **Appendix 8.3** in **Volume 3** of this EIAR). Results indicate that the prevailing wind direction is from south-westerly to westerly in direction over the period 2014 – 2018 (Met Eireann, 2019). The mean wind speed is approximately 5.3 m/s over the period 2005 - 2018. Calm conditions account for only a small fraction of the time in any one year peaking at 29 hours in 2018 (0.3% of the time). There are also no missing hours over the period 2014 – 2018.

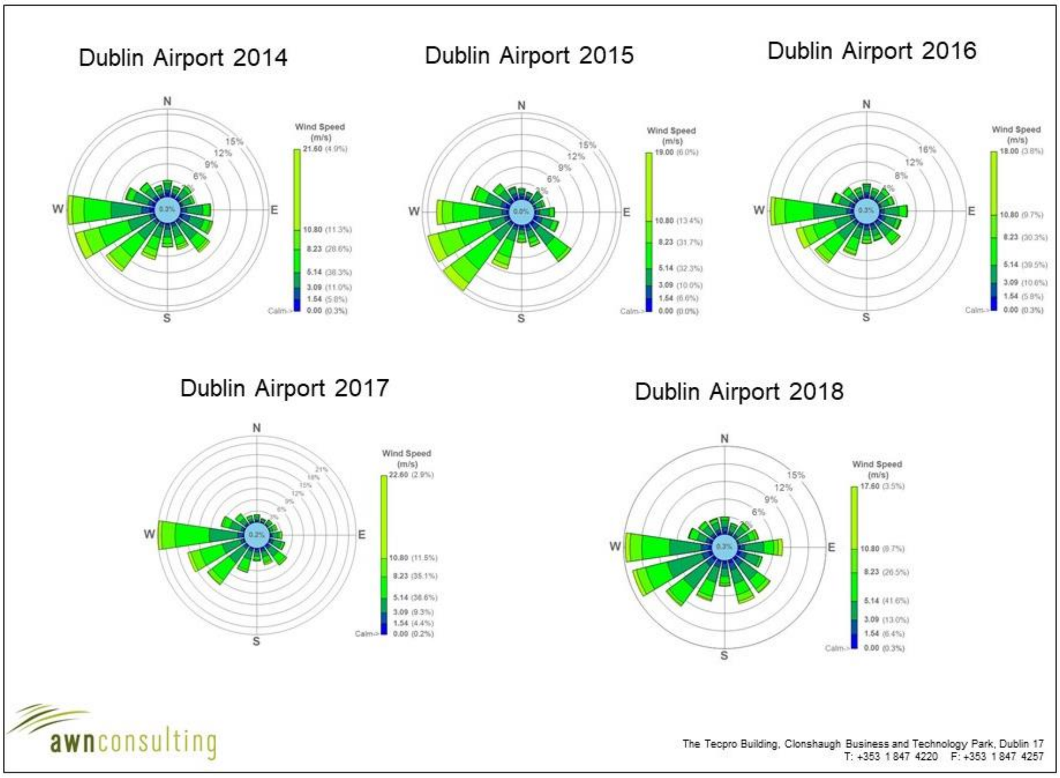

Figure 8.1 Dublin Airport Windroses 2014 – 2018

8.3.2 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality in Ireland is "*Air Quality In Ireland 2018*" (EPA, 2019a). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2019b).

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2019b). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the proposed development site is within Zone D (EPA, 2019b), but is directly on the boundary of Zone C. This has been factored in when estimating the background concentrations. The long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development.

In addition, an extensive baseline monitoring survey was undertaken on site in 2000/2001 and again in 2005 as part of previous assessments. This data has been reviewed as part of assessing the baseline conditions for the current assessment. The monitoring survey found that levels of all pollutants, NO_2, SO_2, PM_{10}/$PM_{2.5}$, HCl, HF, PCDD/PCDFs, PAHs, Hg, Cd, Tl, and heavy metals, were well below the relevant limit values for the protection of human health.

Monitoring of all licensed pollutants is conducted on a continuous, quarterly or biannual basis in line with the requirements of the licence for the facility (Licence No. W0167-03). This ensures that pollutant concentrations remain in compliance with the licence limits and do not add significantly to concentrations in the ambient environment.

8.3.2.1 NO_2

NO_2 monitoring was carried out at two rural Zone D locations in recent years, Emo and Kilkitt and in two urban areas, Enniscorthy and Castlebar (EPA, 2019a). The NO_2 annual average in 2018 for both rural sites, Emo and Kilkitt was 3 µg/m^3; with the results for Castlebar averaging 8 µg/m^3. Long-term average concentrations measured at all locations were significantly lower than the annual average limit value of 40 µg/m^3. The hourly concentration, measured as a 99.8th percentile, was within the limit value of 200 µg/m^3 at all locations over the period 2013 - 2018. The average results over the last five years at a range of Zone D locations suggests an upper average of no more than 11 µg/m^3 as a background concentration. Based on the above information, a conservative estimate of the current background NO_2 concentration, for the region of the development in 2019 is 13 µg/m^3.

Monitoring for NO_X concentrations as carried out at a number of Zone D locations in recent years – Castlebar, Emo, Kilkitt and Enniscorthy. Over the period 2013 – 2018 concentrations ranged from 11 – 25 µg/m^3 for the two urban sites, Castlebar and Enniscorthy, while concentrations for the two rural sites, Emo and Kilkitt ranged from 2 – 6 µg/m^3. Concentrations are below the annual limit value of 30 µg/m^3 set for the protection of ecosystems. Based on the EPA data a conservative estimate of the current background NO_X concentration in the region of the development in 2019 is 25 µg/m^3.

Table 8.3: Trends in Zone D Air Quality - Nitrogen Dioxide (NO_2)

Station	Averaging Period Notes 1, 2	Year					
		2013	2014	2015	2016	2017	2018
Castlebar	Annual Mean NO_2 ($\mu g/m^3$)	11	8	8	9	7	8
	99.8th %ile 1-hr NO_2 ($\mu g/m^3$)	65.7	71.2	-	65.6	59.8	60.2
Kilkitt	Annual Mean NO_2 ($\mu g/m^3$)	4	3	2	3	2	3
	99.8th %ile 1-hr NO_2 ($\mu g/m^3$)	46.3	26.9	-	26.1	17.0	22.3
Emo	Annual Mean NO_2 ($\mu g/m^3$)	4	3	3	4	3	3
	99.8th %ile 1-hr NO_2 ($\mu g/m^3$)	26.8	25.5	-	35.5	27.5	41.6
Enniscorthy	Annual Mean NO_2 ($\mu g/m^3$)	-	13	9	10	-	-
	99.8th %ile 1-hr NO_2 ($\mu g/m^3$)	-	-	-	72.5	-	-

Note 1 Annual average limit value - 40 $\mu g/m^3$ (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 1-hour limit value - 200 $\mu g/m^3$ as a 99.8th%ile, i.e. not to be exceeded >18 times per year (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

8.3.2.2 PM_{10}

Long-term PM_{10} monitoring was carried out at the urban Zone D locations of Castlebar, Enniscorthy and Claremorris in recent years.

The average annual mean concentration measured at Castlebar and Claremorris in 2018 was 11 $\mu g/m^3$ (**Table 8.4**). Long-term PM_{10} measurements carried out at the rural Zone D location in Kilkitt in 2018 gave an average level of 9 $\mu g/m^3$ (EPA, 2019a). The daily limit value, measured as a 90.4th percentile (i.e. it must not be exceeded more than 35 times per year), was within the limit value of 50 $\mu g/m^3$. The average results over the last five years at a range of Zone D locations suggests an upper average of no more than 19 $\mu g/m^3$ as a background concentration.

Based on the above information a conservative estimate of the current background PM_{10} concentration for the region of the development in 2019 is 20 µg/m^3.

Table 8.4: Trends in Zone D Air Quality - PM_{10}

Station	Averaging Period Notes 1, 2	Year					
		2013	2014	2015	2016	2017	2018
Castlebar	Annual Mean PM_{10} (µg/m^3)	15	12	13	12	11	11
	90th %ile 24-hr PM_{10} (µg/m^3)	26.9	20.9	22.2	20.0	19.1	19.9
Kilkitt	Annual Mean PM_{10} (µg/m^3)	11	9	9	8	8	9
	90th %ile 24-hr PM_{10} (µg/m^3)	18.6	15.4	17.7	15.0	14.0	15.3
Claremorris	Annual Mean PM_{10} (µg/m^3)	13	10	10	10	11	12
	90th %ile 24-hr PM_{10} (µg/m^3)	21.0	15.2	16.5	17.4	17.3	19.9
Enniscorthy	Annual Mean PM_{10} (µg/m^3)	-	22	18	17	-	-
	90th %ile 24-hr PM_{10} (µg/m^3)	-	37.3	33.8	32.3	-	-

Note 1 Annual average limit value - 40 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 24-hour limit value - 50 µg/m^3 as a 90.4th%ile, i.e. not to be exceeded >35 times per year (EU Council Directive 1999/30/EC & S.I. No. 180 of 2011).

8.3.2.3 $PM_{2.5}$

The results of $PM_{2.5}$ monitoring at Claremorris for the period 2013 - 2018 indicated an average $PM_{2.5}/PM_{10}$ ratio ranging from 0.50 – 0.62. Based on this information, a conservative ratio of 0.7 was used to generate a current background $PM_{2.5}$ concentration of 14 µg/m^3.

8.3.2.4 Benzene

In terms of benzene, monitoring data for the Zone D location of Shannon Town is available for the period 2011 – 2012 with an average concentration of 0.4 µg/m^3. More recent data for Zone D locations is not available, as an alternative, monitoring in the Zone C location of Kilkenny for the period 2014 – 2018 showed an upper average concentration of no more than 0.2 µg/m^3, which is significantly below the 5 µg/m^3 limit value. Based on this monitoring data a conservative estimate of the current background concentration in the region of the development is 0.2 µg/m^3.

8.3.2.5 Carbon Monoxide

With regard to CO, annual averages at the Zone D, location of Enniscorthy for over the 2014 – 2016 period are low, peaking at 0.6 mg/m^3 (EPA, 2018). More recent data for Zone D locations is not available. Data for the Zone C monitoring station in Portlaoise gave an annual mean concentration of 0.2 mg/m^3 in 2018. Based on this EPA data, a conservative estimate of the current background CO concentration in the region of the development is 0.6 mg/m^3.

8.3.2.6 SO_2

Continuous SO_2 monitoring was carried out at a number of Zone D locations over the period 2013 – 2018. Concentrations ranged from 2 – 4 µg/m^3, with no exceedances of the daily limit value of 125 µg/m^3 for the protection of human health. Long term annual average results suggest an upper limit of 3 µg/m^3 as a background concentration. Based on this EPA data a conservative estimate of the annual mean background SO_2 concentration in the region of the development in 2019 is 4 µg/m^3.

SO_2 concentrations for the representative rural Zone D monitoring station at Kilkitt in 2018 were 5.7 µg/m^3 for the 99.2nd%ile of 24-hour means. The 1-hour limit value for SO_2 (measured as a 99.7th%ile) was 6.4 µg/m^3, which is significantly below the 350 µg/m^3 limit value.

8.3.2.7 Heavy Metals

Monitoring for Cadmium, Arsenic, Lead and Nickle concentrations was conducted at the Zone D locations of Castlebar and Kilkitt over the period 2013 – 2018 (EPA, 2019a). Concentrations of Cadmium ranged from 0.07 – 0.3 ng/m^3 in Castlebar. This is significantly below the limit value of 5 ng/m^3. Concentrations of Arsenic ranged from 0.08 – 0.3 ng/m^3 which is well below the limit value of 6 ng/m^3. Concentrations of lead ranged from 1.5 – 2.95 ng/m^3.

This is well below the limit value of 500 ng/m^3. Concentrations of nickel ranged from 0.13 – 0.8 ng/m^3, which is below the limit value of 20 ng/m^3.

Monitoring for mercury was conducted at the Zone D location of Mace Head over the period 2013 – 2018 (EPA, 2019a). Monitored concentrations ranged from 1.12 – 1.5 ng/m^3 over this period. Annual average concentrations are well below the limit value of 1,000 ng/m^3.

Monitored concentrations of key heavy metals were significantly below the relevant limit values for the protection of human health.

8.4 Characteristics of the Proposed Development

A detailed description of the proposed development is included in **Chapter 4 *Description of the Proposed Development*** of this EIAR. In relation to potential air quality impacts associated with the proposed development, the potential impacts are considered for both the construction and operational phases.

In relation to potential air quality impacts the main elements are listed below:

- Construction dust emissions associated with the construction of additional buildings on site
- Construction and operational phase traffic emissions
- Increase in the amount of hazardous waste accepted at the facility from the currently permitted 10,000 tonnes per annum up to a maximum of 25,000 tonnes per annum. This will result in an increase in the annual tonnage of waste accepted at the site for treatment in the WtE plant from the currently permitted 235,000 tonnes per annum to 250,000 tonnes per annum.

As already noted previously in **Section 8.2.3.1**, the proposed development does not propose any significant changes to the Waste to Energy (WtE) operating processes at the facility. Although additional tonnage (up to 15,000 tpa) is proposed to be processed at the plant, this is primarily for the treatment of aqueous wastes. There is no change to the licensed parameters under Licence No. W0167-03 and the site will continue to operate within its licence requirements.

8.5 Likely Significant Effects

8.5.1 “Do Nothing” Scenario

The “Do Nothing” scenario will involve the facility operating as it currently does without construction dust emissions and additional traffic related emissions. Under this scenario ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from potential new developments in the surrounding area, changes in road traffic, etc).

8.5.2 Construction Phase

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. The proposed development will involve the construction of a number of buildings and hardstanding areas. The construction works can be considered minor in scale and therefore there is the potential for significant dust soiling 25m from the source (TII, 2011) (**Table 8.5**). While construction dust tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. There are a small number of sensitive receptors within 50m of the site boundary (see **Figure 8.2**). In order to minimise dust emissions during construction, a series of mitigation measures have been prepared. Provided the dust minimisation measures outlined in **Section 8.6.2** are adhered to, the effects on the air quality during the construction phase will not be significant.

There is also the potential for traffic related air emissions during the construction phase of the proposed site suitability project. The proposed development will be developed over two construction phases, Phase 1 and Phase 2. During the peak construction period for Phase 1, it is predicted that there will be an additional 186 construction vehicle movements per day. During the peak construction period for Phase 2 (which includes operational traffic for Phase 1), it is predicted that there will be an additional 222 construction vehicle movements per day. The change in AADT values is not of the magnitude to require an air quality assessment as per the DMRB screening criteria outlined in **Section 8.2.3.2**. It can therefore be determined that traffic related air quality impacts during the construction phase are short-term, negative and imperceptible.

Table 8.5: Assessment Criteria for the Impact of Dust from Construction, with Standard Mitigation in Place (TII, 2011)

Source		Potential Distance for Significant Effects (Distance from Source)		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation Effects**
Major	Large construction sites, with high use of haul roads	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites, with limited use of haul roads	25m	10m	10m

Figure 8.2 Location of Dust Sensitive Receptors Within 50m of Site

8.5.3 Operational Phase

8.5.3.1 Waste to Energy Process

The Waste to Energy Process (WtE) would be expected to be the dominant source of air emissions associated with the facility. As part of the proposed development it is proposed to increase the annual tonnage of waste accepted from 235,000 to 250,000 tonnes per annum, comprising of up to 15,000 tonnes of additional hazardous wastes. The majority of this increase is intended for the treatment of aqueous wastes which, when evaporated, is converted to water vapour in the flue gas flow. As the flue gas flow is corrected to standard, dry conditions, the total flue gas flowrate will not increase.

In any event, the facility will still be obligated to comply with its licensed emission limit values and maximum flue gas flowrate and thus the increase in waste tonnage proposed will not cause a significant impact to the ambient air quality. A detailed modelling assessment was undertaken as part of the original application for a Waste to Energy facility at the site in the air quality chapter of the 2009 EIS[3]. This assessment was based on the maximum volume flow rate and maximum emission concentrations and found that the impact on air quality would not be significant (based on continuous operation 8,760 hours per year). A revised assessment was conducted in 2012 based on an increased flow rate once the site was operational, which corresponds to the current licensed flow rate, this

[3] Available to view from EPA IE Licence application W0167-02, http://epa.ie/licensing/

assessment found that there were some insignificant variations in results when compared with the original 2009 assessment.

The full details of the air dispersion modelling input parameters and modelling methodology for this assessment are the same as the Carranstown WtE Facility EIS which was undertaken in 2009. The key changes as part of this assessment are outlined below.

- USEPA dispersion model AERMOD version updated from 07026 to 19191;
- Meteorological data for Dublin Airport updated from 2001 – 2005 to 2014 – 2018;
- Proposed building structures associated with the site suitability project added to the model.

Table 8.6 details the results of the updated modelling assessment and compares the changes with the original 2009 assessment. **Table 8.7** compares the results of the current assessment with the 20122 aboveassessment. The revised assessment shows a very minor variation in results. The facility operating under maximum conditions results in ambient concentration variations ranging from between -<0.01% to -3.6% of the ambient air quality standards when compared with the 2009 results and -<.0.01% to -5.2% of the ambient air quality standards when compared with the 2012 results. The results indicate that the facility will continue to be in compliance with its licence requirements and no significant impacts to ambient air quality are predicted.

Table 8.6: Comparison of Predicted Ambient Ground Level Concentrations Between The 2009 EIS Assessment & The Current Assessment

Compound	Background	Process Contribution (mg/m^3) 2009 Assessment	Process Contribution (mg/m^3) Current Assessment	Variation (mg/m^3)	Predicted Environmental Concentration (mg/m^3)	Limit Value (mg/m^3)	PEC as a % of the Ambient Limit	Variation as a % of the Ambient Limit
NO_2 (1-Hr)	26	27.8	20.65	-7.154	46.65	200	23.3%	-3.58%
NO_2 (Ann)	13	1.1	0.77	-0.330	13.77	40	34.4%	-0.83%
NO_X (Ann)	25	-	1.03	n/a	26.03	30	86.8%	n/a
SO_2 (1-Hr)	6.4	26.4	18.97	-7.428	25.37	350	7.2%	-2.12%
SO_2 (24-Hr)	5.7	2.8	2.08	-0.716	7.78	125	6.2%	-0.57%
PM_{10} (24-Hr)	20	0.25	0.16	-0.087	20.16	50	40.3%	-0.17%
PM_{10} (Ann)	20	0.08	0.0513	-0.029	20.05	40	50.1%	-0.07%
$PM_{2.5}$ (Ann)	14	0.08	0.0513	-0.029	14.05	25	56.2%	-0.11%
CO (8-hr)	600	-	13.91	n/a	613.9	10000	6.1%	n/a
Benzene (Ann)	0.2	0.08	0.05	-0.029	0.25	5	5.0%	-0.57%
HCl (1-hr)	0.01	5.17	3.46	-1.708	3.47	100	3.5%	-1.71%
HF (1-hr)	0.005	0.34	0.23	-0.109	0.236	3	7.9%	-3.64%
Hg (Ann)	0.0015	0.00038	0.00026	0.000	0.0018	1	0.2%	-0.0123%
Cd (Ann)	0.001	0.00039	0.00026	-0.00013	0.0013	0.005	25.1%	-2.67%
As (Ann)	0.001	0.00042	0.00028	-0.00014	0.0013	0.006	21.3%	-2.38%

Table 8.7: Comparison Of Predicted Ambient Ground Level Concentrations Between The 2012 Assessment & The Current Assessment

Compound	Background	Process Contribution (mg/m^3) 2012 Assessment	Process Contribution (mg/m^3) Current Assessment	Variation (mg/m^3)	Predicted Environmental Concentration (mg/m^3)	Limit Value (mg/m^3)	PEC as a % of the Ambient Limit	Variation as a % of the Ambient Limit
NO_2 (1-Hr)	26	31.13	20.65	-10.479	46.65	200	23.3%	-5.24%
NO_2 (Ann)	13	0.93	0.77	-0.165	13.77	40	34.4%	-0.41%
NO_X (Ann)	25	1.25	1.03	-0.220	26.03	30	86.8%	-0.73%
SO_2 (1-Hr)	6.4	29.71	18.97	-10.739	25.37	350	7.2%	-3.07%
SO_2 (24-Hr)	5.7	2.68	2.08	-0.594	7.78	125	6.2%	-0.48%
PM_{10} (24-Hr)	20	0.20	0.16	-0.040	20.16	50	40.3%	-0.08%
PM_{10} (Ann)	20	0.06	0.0513	-0.011	20.05	40	50.1%	-0.03%
$PM_{2.5}$ (Ann)	14	0.06	0.0513	-0.011	14.05	25	56.2%	-0.04%
CO (8-hr)	600	23.48	13.91	-9.578	613.9	10000	6.1%	-0.10%
Benzene (Ann)	0.2	0.06	0.05	-0.011	0.25	5	5.0%	-0.22%
HCl (1-hr)	0.01	5.29	3.46	-1.831	3.47	100	3.5%	-1.83%
HF (1-hr)	0.005	0.35	0.23	-0.122	0.236	3	7.9%	-4.07%
Hg (Ann)	0.0015	0.00032	0.00026	-0.0001	0.0018	1	0.2%	-0.0061%
Cd (Ann)	0.001	0.00032	0.00026	-0.00006	0.0013	0.005	25.1%	-1.21%
As (Ann)	0.001	0.00034	0.00028	-0.00006	0.0013	0.006	21.3%	-1.08%

8.5.3.2 Road Traffic

There is the potential for a number of emissions to the atmosphere during the operational phase of the development. In particular, the traffic-related air emissions may generate quantities of air pollutants such as NO_2, CO, benzene, PM_{10} and $PM_{2.5}$. However, impacts from these emissions have been screened out using the UK DMRB guidance (UK DEFRA, 2018), on which the TII guidance was based. This guidance states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment:

- Road alignment change of 5 metres or more;
- Daily traffic flow changes by 1,000 AADT or more;
- HGV flows change by 200 vehicles per day or more;
- Daily average speed changes by 10 km/h or more; or
- Peak hour speed changes by 20 km/h or more.

During the future operational years in 2027 and 2037, the proposed development will increase traffic levels by a maximum of 76 AADT on the R152 north of the Indaver site. However, it will not increase traffic volume (AADT or HGVs), speeds or change the road alignment by an amount greater than the criteria discussed above. Therefore, none of the road links impacted by the proposed development satisfy the above criteria and an assessment of the impact of traffic emissions on ambient air quality is not necessary. Cumulative traffic data associated with other existing and proposed developments in the vicinity of the Indaver site were also included in the calculations where such information was available. It can therefore be determined that the impact to air quality from traffic emissions during the operational stage is negative, long-term and imperceptible.

8.6 Mitigation Measures and Monitoring

8.6.1 Construction Phase

Construction activities are likely to generate some dust emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction.

The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within 200m of the construction area. The measures to be implemented are outlined below, these will be incorporated into the ***Construction Environmental Management Plan*** **(CEMP)** (see **Appendix 5.1** of **Volume 3**) for the site.

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted, and this speed restriction will be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
- Hoarding or screens shall be erected around works areas to reduce visual impact. This will also have an added benefit of preventing larger particles of dust from travelling off-site and impacting receptors.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

8.6.2 Operational Phase

Impacts to air quality during operation are not significant therefore no mitigation is proposed. The site will continue to operate within the EPA licence conditions set for the plant, which will ensure no significant impacts to air quality occur.

8.7 Cumulative Effects

There are a number of planned or permitted developments in the vicinity of the existing facility which have the potential to cumulatively impact air quality. Each project has been reviewed in turn below for the potential cumulative impact to air quality.

8.7.1 Irish Cement Flue Dust Portland Cement Silo

There is the potential for cumulative dust emissions. However, it is predicted that this development will not result in any additional emissions to atmosphere during operation. The planners report submitted as part of the application details that "*projected pollutant emissions are insignificant*". Therefore, cumulative impacts are deemed imperceptible and there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

8.7.2 Irish Cement fossil fuel replacement and alternative raw materials project

There is the potential for cumulative construction stage dust emissions, however, the EIA Report[4] prepared by Brady Shipman Martin (2017) Section 8.4.1 states that dust soiling effects are predicted within 25m of the works area and PM_{10} effects within 10m. As there are no sensitive receptors within this area and there is sufficient distance between the works areas and the Site Suitability Project area cumulative dust impacts are not predicted.

Section 8.44 of the EIA Report (Brady Shipman Martin, 2017) determined that cumulative operational phase emissions from both the Platin site and the Indaver site were insignificant.

Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

8.7.3 SSE Generation100kV Transmission Substation

There is the potential for cumulative construction dust related impacts as a result of the substation development if the construction phase overlaps with the construction of the site suitability project. However, due to the small scale of the development there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

8.7.4 Garballagh Lower Solar Farm

Cumulative air quality impacts associated with the solar farm development are not envisaged due to the low volume of construction required and the use of materials with a low dust generation potential. There are no emissions to atmosphere associated with the operational stage of this development.

Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

8.7.5 Garballagh Lower Solar Farm - Electrical Substation (110kV)

Cumulative air quality impacts associated with the electrical substation development are not envisaged due to the low volume of construction required. There are no emissions to atmosphere associated with the operational stage of this development.

[4] Available from IE Licence P0030-06, https://www.epa.ie/licensing/

Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

Cumulative air quality impacts during the construction phase have been assessed to be imperceptible. Cumulative operational phase impacts are long-term and insignificant.

8.8 Residual Effects

8.8.1 Construction Phase

Provided the dust minimisation measures outlined in **Section 8.6.1** are implemented construction stage impacts to air quality are predicted to be short-term and not significant.

8.8.2 Operational Phase

The impact of the proposed development on air quality is predicted to be imperceptible with respect to the operational phase.

Therefore, no residual impacts of significance for air quality are predicted for the operational phase of the proposed development.

8.9 References

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9 Climate

9.1 Introduction

This chapter presents an assessment of the likely impacts of the proposed site suitability project on climate. There are a number of elements involved in the proposed development which are detailed in full in **Chapter 4 *Description of the Proposed Development***.

Climate represents long term weather patterns and considers environmental aspects such as climate change resulting from greenhouse gas emissions. Potential emissions of greenhouse gases that can contribute to climate change include carbon dioxide (CO_2) and nitrous oxide (N_2O). This chapter considers the GHG emissions from the facility for the existing "Do Nothing" scenario and the proposed "Do Something" scenario which involves a change in the fuel mix due to the proposed increase in hazardous waste accepted to the facility.

9.2 Assessment Methodology

Due to the changes in waste characteristics as part of the proposed development the potential greenhouse gas (GHG) emissions from the facility have been quantified. Predictions of greenhouse gas emissions from the facility were prepared using the emission factors derived from the European Commission (2001), UK DEFRA (2006), IPCC (2006), using the latest national waste statistics from the EPA (2018) and from information supplied by Indaver.

The waste-to-energy process would be expected to be the dominant source of CO_2 and N_2O emissions from the proposed development. Detailed waste throughput information was obtained from Indaver and this information was used to estimate GHG emissions.

In order to calculate the net contribution to greenhouse gas emissions of the proposed development and its effect on Ireland's annual GHG targets, the total forecasted anthropogenic ('man-made') emissions due to the proposed development have been calculated. In order to quantify the significance of emissions, the calculated GHG emissions as a result of the proposed development have been compared against Ireland's EU 2020 target for GHG emissions (Decision No 406/2009/EC of the European Parliament and Council (2009)). During the incineration of waste at the facility the thermal energy generated can be recovered and converted into electrical output, this can be available to the national grid. In addition, as part of the proposed development it is proposed to build a hydrogen plant which will allow for the electricity generated through the incineration of waste to generate hydrogen during times when the electricity cannot be fed to the grid.

The renewable energy when exported to the National Grid will be used to displace energy currently generated by fossil fuels. In 2018, the primary energy mix within the national generation system was gas (53.9%), coal (10.7%), renewables and waste (24.3%), peat (10.3%), fuel oil (0.8%) and others (SEAI, Energy in Ireland, 2019). The energy mix represents the relative contribution of different types of fuels or means of electricity generation supplying the national electricity distribution system.

Ireland has a binding renewable energy EU target of 16% by 2020. According to SEAI's *Renewable Energy in Ireland (2019 report)*, in 2018 renewable energy supply was 11% of gross final consumption (SEAI, *Renewable Energy in Ireland*, 2019). Looking to 2030, Member States of the EU agreed renewable energy targets of at least 32% by 2030 (European Commission, 2014). Non-ETS emission reduction targets for 2030 have been set at the Member State level. Ireland has a target reduction of 30% compared to 2005 levels (European Parliament & Council, 2018).

Ireland has made good progress towards meeting these renewable electricity targets. The use of renewables in electricity generation in 2018 reduced CO_2 emissions by 4 Mt and avoided €430 million in fossil fuel imports. (SEAI, Energy in Ireland, 2019). The profile of fuel type by 2030 will be significantly different from the current one due to greater penetration of renewable fuels. In order to calculate the emissions displacement, an average grid intensity of 0.37 tonnes CO_2 /MWh (SEAI, 2020) which is similar to that of natural gas which is what would alternatively be used to generate electricity and so allows for comparable results.

The renewable target set in Council Directive 2009/28/EC (Renewable Directive) for 2020 is set at 16% of the total final energy consumption. This target will be made up of contributions from renewable energy in electricity (RES-E), renewable energy in transport (RES-T) and renewable energy for heat and cooling (RES-H). The target for RES-E is 40% of renewables to contribute to gross electricity consumption by 2020. The target for RES-T is that biofuels and the renewable portion of electricity will account for 10% of transport energy by 2020. The RES-H target is that the renewable contribution to heat will reach 12% by 2020. As of 2018, the 11% of the total final energy consumption comes from renewable energy (SEAI, *Renewable Energy in Ireland*, 2019).

9.3 Receiving Environment

9.3.1 Climate Agreements

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the Kyoto Protocol in principle in 1997 and formally in May 2002 (UNFCC, 1997; 1999). For the purposes of the EU burden sharing agreement under Article 4 of the Doha Amendment to the Kyoto Protocol, in December 2012, Ireland agreed to limit the net growth of the six Greenhouse Gases (GHGs) under the Kyoto Protocol to 20% below the 2005 level over the period 2013 to 2020 (UNFCCC, 2012).

In order to meet the ultimate objective of the Convention to prevent dangerous anthropogenic interference in the climate system, cuts of up to 70% in this century are expected to be required (European Commission, 2009). The UNFCCC is continuing detailed negotiations in relation to GHG reductions and in relation to technical issues such as Emission Trading and burden sharing. The most recent Conference of the Parties to the Convention (COP25) was in Madrid, Spain in December 2019. COP21, held in December 2015, was an important milestone in terms of international climate change agreements. The “Paris Agreement” was agreed at COP21 by over 200 nations and has a stated aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries.

Contributions to GHG emissions will be based on Intended Nationally Determined Contributions (INDCs) that will form the foundation for climate action post 2020. Significant progress was also made on elevating adaption onto the same level as action to cut and curb emissions. The EU Effort Sharing Decision 406/2009/EC on GHG emissions (European Commission, 2009), requires Ireland to achieve a 20% reduction, relative to 2005 levels, by 2020 in GHG emissions for sectors of the economy not covered by the EU Emissions Trading Directive (European Council, 2003) (i.e. non-ETS GHG emissions).

In 2014, the EU agreed the “2030 Climate and Energy Policy Framework” (European Council, 2014). The European Council endorsed a binding EU target of at least a 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990. The EU will collectively deliver the target in the most cost-effective manner possible, with the reductions in the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30% by 2030 compared to 2005, respectively. Following on from political agreement, EU Member States legislated for emissions reduction targets at the national level while the renewable target is set at the EU level. As mentioned in **Section 9.2**, Ireland has a target reduction of 30% compared to 2005 levels. An EU level binding target of at least 32% for the share of renewable energy consumed in the EU was agreed for 2030.

In March 2020 the European Commission unveiled its proposal for a legally-binding commitment to reach net-zero greenhouse gas emissions by 2050. While the European Climate Law contains no concrete proposals for an enhanced mid-term target, the proposal suggests the European Commission is looking at a September deadline for finalising its “impact assessed plan” to raise the 2030 target to 50-55%. (European Commission, 2020).

The “Draft National Energy and Climate Plan (NECP) 2021-2030” (Government of Ireland, 2018) was published in December 2018. The NECP was due to be submitted by the government, as a final version, to the EU by the end of 2019. The plan, when finalised, will outline the roadmap for meeting the legal energy and climate obligations including a 30% reduction target in greenhouse gas emissions from the non-ETS sectors including transport, buildings, agriculture and waste management.

9.3.2 Baseline Conditions

The Government has also published the Climate Action Plan 2019 (Government of Ireland, 2019). This Plan is "committed to achieving a net zero carbon energy systems objective for Irish society and in the process, create a resilient, vibrant and sustainable country". This will be led by the Government who will outline a set of policies to achieve the targets of the Plan. In order to meet the EU 2030 targets established for Ireland and the overall aim of decarbonisation by 2050 several plans and policies in the key sectors of electricity, built environment, transport, enterprise, agriculture and waste are outlined within the Climate Action Plan. In addition, the "Draft General Scheme of the Climate Action (Amendment) Bill 2019" was published in January 2020 (Government of Ireland, 2020). This is a key action of the Government's Climate Action Plan 2019 and aims to enshrine in law the approach outlined in the Climate Action Plan.

An important part of the approach to reducing GHG emissions, engrained in the Doha Amendment to the Kyoto Agreement (dated 2012), is that emission reductions should reflect the most economically efficient cost of achieving the set target. As part of this approach, three "flexible mechanisms" facilitate the cost-effective implementation of the Protocol. These mechanisms are Emission Trading (ET), Joint Implementation (JT) and the Clean Development Mechanism (CDM). Emission trading is a mechanism whereby polluting entities are allocated allowances for their emissions which can subsequently be traded with each other. Emitters for whom it is very expensive to effect emission reductions are likely to buy permits from emitters for whom emissions reduction is more cost-effective thus ensuring that a pre-determined environmental outcome will take place where the cost of reduction is lowest. Due to significant economic growth in Ireland since 1990, emissions trading is of benefit to Ireland in meeting its commitments to limit the growth of GHG emissions (EPA, 2019). Both Joint Implementation and the Clean Development Mechanisms allow states to share reduction credits by investing in another territory with the aim of reducing emissions. However, the Clean Development Mechanism differs in that the projects are specific to assisting developing countries that are particularly vulnerable to the adverse effects of climate change to meet the cost of adaptation.

GHGs have different efficiencies in retaining solar energy in the atmosphere and different lifetimes in the atmosphere. In order to compare different GHGs, emissions are calculated on the basis of their Global Warming Potential (GWPs) over a 100-year period, giving a measure of their relative heating effect in the atmosphere. The GWP100 for CO_2 is the basic unit (GWP = 1) whereas CH_4 has a global warming potential equivalent to 28 units of CO_2 and N_2O has a GWP100 of 265. Greenhouse gases other than CO_2 (i.e. methane, nitrous oxide and so-called F-gases) may be converted to CO_2 equivalent using their global warming potentials, providing a CO_2 equivalent or CO_{2eq} value (IPCC, 2013).

Anthropogenic emissions of GHGs in Ireland included in the EU 2020 strategy are given in **Table 9.1** and **Table 9.2** based on data from the EPA. Agriculture is the greatest source of emissions at 33.6% of CO_{2eq} (2020 projection) (EPA, 2019). The next largest share of energy emissions projected for 2020 is from fuel combustion for power generation (19.7% of total emissions) and road transport (21.0%). Waste represents 1.0% of total emissions in 2020 (EPA, 2019).

2013 was the first year where the European Union's Effort Sharing Decision "EU 2020 Strategy" (Decision 406/2009/EC) was assessed for effectiveness in meeting the objectives outlined in the strategy. Ireland had non-ETS sectors emissions of 43.8 Mtonne CO_{2eq} in 2017, when emissions covered by the EU's Emissions Trading Scheme for stationary and aviation operators were removed. Recent data from the EU (EEA, 2019) indicates that Ireland is unlikely to meet the 2020 targets, based on current projections, in terms of GHG emissions and in terms of the renewable energy targets. It also reports a significant gap of -23.5% to the 2030 Effort Sharing target with existing measures (in percentage points of ESD 2005 base-year emissions). The most recent data (EPA, 2019) suggests that based on the "With Additional Measures" scenario, Ireland's non-Emission Trading Scheme emissions will be 6% below 2005 levels in 2020 compared to a target of 20% below 2005 levels in 2020.

Table 9.1 GHG Emissions in Ireland (ktonnes CO_2 equivalent) (2018) Source: EPA (2019) Ireland's Greenhouse Gas Projections 2018 - 2040

Sector	Emissions (ktonnes CO_2 equivalent)
Energy	12,764
Industrial Processes / Commercial / Manufacturing	7,810
Agriculture	20,296
Transport	12,471
Residential	6,639
Waste	712
Total	**61,850.6**

Table 9.2 GHG Emissions (ktonnes CO_2 equivalent) Source: EPA (2019) Ireland's Greenhouse Gas Projections 2018 - 2040

Year	Emissions by National Climate Change Strategy Sectors (ktonnes CO_{2eq})						
	Energy	Residential	Industry & Commercial	Agriculture	Transport	Waste	Total
2013	11,487	6,395	7,631	19.129	11,068	671	57,410
2014	11,272	5,746	7,894	18,901	11,347	853	57,098
2015	11,891	6,041	8,288	19,128	11,813	949	59,212
2016	12,608	6,047	8,528	19,945	12,294	957	61,270

Year	Emissions by National Climate Change Strategy Sectors (ktonnes CO_{2eq})						
	Energy	**Residential**	**Industry & Commercial**	**Agriculture**	**Transport**	**Waste**	**Total**
2017	11,744	5,742	8,879	20,213	12,003	933	60,744
2018	12,764	6,639	7,810	20,296	12,471	712	61,851

9.3.3 IPCC Guidelines for National GHG Inventories

The Intergovernmental Panel on Climate Change (IPCC) has outlined detailed guidelines on compiling national GHG inventories. The guidelines are designed to estimate and report on national inventories of anthropogenic GHG emissions and removals in order to ensure compliance with the Kyoto Protocol.

Anthropogenic refers to GHG emissions and removals that are a direct result of human activities or are a result of natural processes that have been affected by human activities (IPCC, 2006). The quantity of carbon from natural cycles through the earth's atmosphere, waters, soils and biota is much greater than the quantity added by anthropogenic GHG sources. However, the focus of the UNFCCC and the IPCC is on anthropogenic emissions because these emissions have the potential to alter the climate by disrupting the natural balances in carbon's biogeochemical cycle, and by altering the atmosphere's heat-trapping ability. The carbon from biogenic sources such as paper waste and food waste were originally removed from the atmosphere by photosynthesis, and under natural conditions, it would eventually cycle back to the atmosphere as CO_2 due to degradation processes. Thus, these sources of carbon are not considered anthropogenic sources and do not contribute to emission totals considered in the EU 2020 Strategy (IPCC, 2006).

In relation to solid waste disposal sites (SWDSs) including municipal waste landfills, detailed guidelines have been published for the calculation of GHG emissions (IPCC, 2006; USEPA, 2002). The main GHG emission from SWDSs is methane (CH_4). Even though the source of carbon is primarily biogenic, CH_4 would not be emitted were it not for the human activity of landfilling waste, which creates anaerobic conditions conducive to CH_4 formation. Although CO_2 is also produced in substantial amounts from landfills, the primary source of CO_2 is from the decomposition of organic material derived from biomass sources (crops, forests) and which are re-grown on an annual basis. Hence, these CO_2 emissions are not treated as net emissions from waste in the IPCC Methodology (IPCC, 2006).

Similarly, in relation to the proposed development, a large fraction of the carbon in waste combusted (paper, food waste) is derived from biomass raw materials which are replaced by re-growth on an annual basis. Thus, these emissions should not be considered as net anthropogenic CO_2 emissions in the IPCC Methodology (2006).

On the other hand, some carbon in waste is in the form of plastics or other products based on fossil fuel. Combustion of these products, like fossil fuel combustion, releases net CO_2 emissions. Thus, in estimating emissions from waste for the current facility, the desired approach is to separate carbon in the waste to be incinerated into biomass and fossil fuel-based fractions and thereafter to use only the fossil fuel fraction in calculating net carbon emissions (IPCC, 2006; USEPA, 2002). This approach follows the methodology outlined in the IPCC Guidelines For National GHG Inventories (2006). Other relevant gases released from combustion are net GHG emissions including CH_4 and N_2O.

9.4 Characteristics of the Proposed Development

A detailed description of the proposed development is included in **Chapter 4** ***Description of the Proposed Development*** of this EIAR. In relation to potential climate impacts associated with the proposed development, the potential impacts are considered for both the construction and operational phases.

In relation to potential climate impacts the main elements are listed below:

- Construction and operational stage traffic emissions;
- Increase in the amount of hazardous waste accepted at the facility from the currently permitted 10,000 tonnes per annum up to a maximum of 25,000 tonnes per annum;
- It is also proposed to increase the annual total waste accepted at the site for treatment in the waste to energy facility from the currently permitted 235,000 tpa to 250,000 tpa;
- Development of a $10MW_e$ hydrogen generation unit for connection to the natural gas transmission/distribution network and for mobile transport applications.

There is the potential for impacts to climate during both construction and operational activities on site.

9.4.1 Construction Phase

There is the potential for a number of emissions to atmosphere during the construction of the facility. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. However, the Institute of Air Quality Management guidance (IAQM, 2014) states that emissions from site plant and vehicles is unlikely to be a significant source of pollutants and does not require a qualitative assessment.

During the construction phase of the development there is likely to be a minor increase in the number of vehicles required. The proposed development will be developed over two construction phases, Phase 1 and Phase 2. During the peak construction period for Phase 1, it is predicted that there will be an additional 186 construction vehicle movements per day.

During the peak Phase 2 construction period (which includes operational traffic for Phase 1), it is predicted that there will be an additional 222 construction vehicle movements per day. Greenhouse gas emissions during the construction phase will not be significant in the context of Ireland's total GHG emissions.

9.4.2 Operational Phase

The incineration activities at the existing waste-to-energy facility would be expected to be the dominant source of CO_2 and N_2O emissions. Due to the proposed increase in the annual tonnage of material processed through the increase in the tonnage of hazardous waste accepted to the facility, the GHG emissions have the potential to increase. Volume flow rates and emission concentrations will be unchanged and remain in compliance with the licensed limits under Licence No. W0167-03. The composition of wastes received will change due to the proposed increase in hazardous wastes accepted to the facility for processing. Waste throughput information was obtained from Indaver and this information has been used to estimate GHG emissions from the facility. The net GHG contribution from the waste was derived using the procedure recommended by the European Commission (2001), UK DEFRA (2006) and IPCC (2006). See **Section 9.5.3** below for details on this exercise.

The future operation of the hydrogen generation unit (HGU) will have a positive effect to off-set GHG emissions as the existing facility is experiencing high levels of curtailment on the electricity grid (circa 1,000 hours in 2019) and during these times that energy is currently destroyed by diverting the high pressure and temperature steam to the air-cooled condenser on site. By utilising the HGU at these times, the steam can be converted to electricity and used to generate an emission-free fuel, replacing natural gas in the local network, as a transport fuel for vehicles or other purposes. This off-setting exercise is outlined in **Section 9.5.3** below.

9.4.2.1 Road Traffic

There is also the potential for increased traffic volumes to impact climate. During the future operational years in 2027 and 2037, the proposed site suitability project will increase traffic levels by a maximum of 76 AADT on the R152 north of the Indaver site. The change in AADT values is not of the magnitude to require a detailed climate assessment as per the DMRB screening criteria (UK DEFRA, 2018). It can therefore be determined that traffic related CO_2 and N_2O emissions during the operational phase are long-term, negative and imperceptible.

The proposed development will provide additional capacity for up to an additional 15,000 tpa of hazardous waste. This will avoid the need for transport of this waste to mainland Europe for treatment. By providing capacity for the treatment of this hazardous waste within Ireland there is an overall reduction in transport-related GHG emissions due to the reduced distance for travel required. This reduction in transport-related GHG emissions is considered minimal but will result in a long-term, positive, imperceptible impact on climate.

9.4.2.2 Climate Change Adaptation Measures

Effects of climate change on the proposed development must also be considered. The following items have been factored into the assessment:

- Rising sea levels;
- Increased in frequency and intensity of rainfall/storm events;
- The climate action plan will drive further de-carbonisation and carbon taxes likely to increase.

Rising sea levels have been ruled out as the site is sitting at approximately 30m OD at its lowest point and the site is located approximately 10km inland from the sea.

The site is currently not prone to flooding and the FRA prepared outlines this in detail, refer to **Appendix 15.1** ***Flood Risk Assessment*** in **Volume 3** of this EIAR. The increased risk of flooding associated with changing climate factors at the site is not considered to be significant.

The objectives of the climate action plan and aiming to achieve decarbonisation by 2050 will require additional measures to be implemented on a national scale. The proposed hydrogen generation unit (HGU) on site will aid in off-setting emissions which would otherwise be produced by fossil fuels. This will aid in achieving the goal of decarbonisation by 2050 and will reduce the impact on climate change on a national level.

9.5 Likely Significant Effects

9.5.1 "Do Nothing" Scenario

In relation to climate, the "Do Nothing" scenario will involve the facility operating as it currently does with a worst-case maximum annual throughput of 235,000 tonnes of waste consisting of all non-recyclable household and commercial and a maximum of 10,000 tonnes per annum of hazardous waste. The breakdown of waste has been based on the most recent national waste breakdown of residual waste (EPA/RPS, 2018) for the purposes of this assessment (see **Appendix 9.1** in **Volume 3**, Tables A9.1.1 – A9.1.2 of this EIAR).

Table 9.3 details the annual greenhouse gas emission from the site for the "Do Nothing" scenario. Annual GHG emissions from the facility account for 0.17% of Ireland's predicted total GHG emissions in 2018 as detailed in **Table 9.2**. The emissions have been compared with the EU 2020 target for Ireland of 37,942,682 tonnes CO_{2eq} (EC, 2017). The contribution to the total greenhouse gas emissions is 0.28% of the EU 2020 Target for the "Do Nothing" scenario.

According to the EPA's emission projections for 2018-2040, a range of measures will be required to tackle transport emissions. In the absence of biofuels such as hydrogen or an increase in the uptake of battery electric vehicles, transport emissions will continue to grow.

Table 9.3 Greenhouse Gas Emissions At Indaver Ireland's Waste Management Facility, Carranstown, Based On 235,000 Tonnes/Annum (Do Nothing Scenario)

	CO_2	N_2O(2)	CH_4(3)	% Of Ireland's Total 2018 Emissions	% Of Ireland's 2020 Target
Total / Annum (tonnes)(1)	103,487	4.3	32.6	-	-
Total / Annum (tonnes CO_2 Equivalent)(4)	103,487	1152	913	-	-
Total / Annum (tonnes CO_2 Equivalent)	105,552			0.17%	0.28%

(1) Based on average of the UK (2006a, 2006b) and EU (2001) default emission rates

(2) N_2O Emission Factor of 4 kg/TJ taken from Volume 2 Table 2.2 of IPCC Guidelines (2006)

(3) CH_4 Emission Factor of 30 kg/TJ taken from Volume 2 Table 2.2 of IPCC Guidelines (2006)

(4) Conversion of N_2O and CH_4 to carbon equivalents taken from IPCC guidance (2013)

9.5.2 Construction Phase

Impacts to climate during the construction phase are deemed short-term and imperceptible.

9.5.3 Operational Phase

As part of the proposed development it is proposed to increase the annual waste throughput to 250,000 tonnes consisting of all non-recyclable household, commercial and/or industrial waste. For the purpose of this study the maximum annual throughput of 250,000 tonnes was used including 25,000 tonnes of hazardous waste. The breakdown of waste has been based on the most recent national waste breakdown of residual waste (EPA/RPS, 2018) for the purposes of this assessment (see **Appendix 9.1** in **Volume 3**, Tables A9.1.3 – A9.1.4 of this EIAR).

Table 9.4 details the annual greenhouse gas emission from the site for the "Do Something" scenario. Annual GHG emissions from the facility account for 0.19% of Ireland's predicted total GHG emissions in 2018 as detailed in **Table 9.2**. The emissions have also been compared with the EU 2020 target for Ireland of 37,942,682 tonnes CO_{2eq} (EC, 2017). The contribution to the total greenhouse gas emissions is 0.30% of the EU 2020 Target for the "Do Something" scenario. Therefore, the proposed increase in waste throughput will result in a maximum increase of 0.03% of Ireland's EU 2020 target. This is considered a long-term, negative, imperceptible impact on climate.

Table 9.4 Greenhouse Gas Emissions At Indaver Ireland's Waste Management Facility, Carranstown, Based On 250,000 Tonnes/Annum (Do Something Scenario)

	CO_2	N_2O(2)	CH_4(3)	% Of Ireland's Total 2018 Emissions	% Of Ireland's 2020 Target
Total / Annum (tonnes)(1)	113,370	4.8	35.7	-	-
Total / Annum (tonnes CO_2 Equivalent)(4)	113,370	1262	1000	-	-
Total / Annum (tonnes CO_2 Equivalent)	115,631			0.19%	0.30%

(1) Based on average of the UK (2006a, 2006b) and EU (2001) default emission rates

(2) N_2O Emission Factor of 4 kg/TJ taken from Volume 2 Table 2.2 of IPCC Guidelines (2006)

(3) CH_4 Emission Factor of 30 kg/TJ taken from Volume 2 Table 2.2 of IPCC Guidelines (2006)

(4) Conversion of N_2O and CH_4 to carbon equivalents taken from IPCC guidance (2013)

The development of the HGU will result in the generation of approximately 160 tonnes of Hydrogen gas for use as a clean fuel each year. This is generated from 10 GWh of electricity which would otherwise be lost as waste heat to the atmosphere over the air-cooled condenser on site. Hydrogen has a calorific value of 130 MJ/kg which translates into 5.744 GWh of energy based on the HGU running for 1,000 hours per annum and producing 160 tonnes of Hydrogen.

If the equivalent energy (5.744 GWh) was to be supplied by natural gas this would produce 1175.8 tCO_{2eq} per year, based on an emission factor of 204.7 gCO_2/kWh for natural gas (SEAI, 2020). This is equivalent to 0.003% of Ireland's EU 2020 target. Therefore, the proposed HGU is offsetting emissions (albeit by a small amount on a National scale) and has a positive impact on climate.

9.6 Mitigation Measures and Monitoring

9.6.1 Construction Phase

As impacts to climate are imperceptible no mitigation is proposed.

9.6.2 Operational Phase

There are no significant impacts to climate predicted as part of the operational phase of the proposed development therefore no mitigation is proposed.

9.7 Cumulative Effects

There are a number of planned or permitted developments in the vicinity of the existing facility which have the potential to cumulatively impact climate. Each project has been reviewed in turn below for the potential cumulative impact to climate. Proposed projects are in the following sections.

9.7.1 Irish Cement Flue Dust Portland Cement Silo

There are no climate related impacts predicted as part of this development and therefore there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

9.7.2 Irish Cement fossil fuel replacement and alternative raw materials project

This development is predicted to have a positive impact on climate due to the CO_2 savings through the use of alternative fuels relative to fossil fuels. As outlined in the EIA Report (Brady Shipman Martin, 2017) it is estimated that a saving of approximately 314,340 tonnes CO_2 per annum will be achieved as a result of the project. Cumulative impacts are considered neutral.

Impacts to climate are not predicted during the construction phase of this development.

Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

9.7.3 SSE Generation 110kV Transmission Substation

Significant impacts to climate are not predicted as a result of the substation development as there are no direct emissions to atmosphere during operation. Construction vehicles and machinery may give rise to some GHG emissions during construction, however, due to the small scale of the development and the predicted low volume of machinery required GHG emissions are considered imperceptible. The cumulative impact to climate is overall imperceptible and therefore there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

9.7.4 Garballagh Lower Solar Farm

The solar farm development will have a positive impact on climate by reducing the reliance on fossil fuels and increasing the capacity of renewable energy available on the national grid. Cumulative impacts are considered neutral and therefore there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

9.7.5 Solar Farm Electrical Substation (110kV)

The electrical substation development will allow for the renewable electricity generated by the solar farm development to be transported to the national grid. This will have a positive impact on climate by reducing the reliance on fossil fuels and increasing the capacity of renewable energy available on the national grid. Cumulative impacts are considered neutral and therefore there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

9.7.6 Cumulative Effects Summary

Cumulative impacts are considered neutral in terms of climate.

9.8 Residual Effects

9.8.1 Operational Phase

The assessment has shown that the operational phase will not cause a significant impact on climate. Residual emissions from the operational phase will be 0.31% of Ireland's national emissions target in 2020 and thus is not considered to be significant in the context of aggregated national emission sources.

Climate change can cause flooding related impacts as a result of altered weather events. A flood risk assessment prepared for the proposed development found no risk of flooding on site and therefore impacts related to climate change are considered imperceptible.

9.8.2 Construction Phase

Impacts to climate during the construction phase are considered short-term and imperceptible.

9.9 References

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10 Noise and Vibration

10.1 Introduction

This chapter presents an assessment of the likely effects of the proposed Site Sustainability Project on noise and vibration. **Chapter 4 *Description of the Proposed Development*** provides a detailed description of the proposal under consideration here.

10.2 Assessment Methodology

The following methodology is based on the requirements of the EPA document, Draft '*Guidelines on the Information to be Contained in the Environmental Impact Assessment Reports*' (2017) and AWN experience of preparing the noise & vibration chapters for similar developments.

- Compliance noise monitoring data undertaken as part of the facilities annual noise monitoring has been reviewed to summarise the existing noise environment at the nearest noise sensitive locations;
- Additional noise monitoring has been undertaken adjacent to the closest noise sensitive location to supplement the annual noise monitoring results;
- A review of the facilities waste licence operational noise limits has been undertaken to determine the appropriate limit values applicable to the existing facility and any amendments proposed;
- Predictive calculations have been performed to assess the potential impacts associated with the construction and operation of the development at the most sensitive locations surrounding the development site; and
- A schedule of mitigation measures has been proposed to reduce, where necessary, the identified potential impacts relating to noise and vibration from the proposed development.

10.3 Receiving Environment

The Indaver Carranstown Waste to Energy (WtE) facility is located off the R152 Road within the townland of Carranstown, Co. Meath. Lands surrounding the facility are a mix of agricultural farmland, industrial and residential. There are nine residential locations within 200m of the site boundary. The majority of these residences are located to the south west and south east of the site boundary along the R152. Lands to the west of the site are predominantly agricultural farmland with isolated private residences beyond. Lands to the north of the site are a mixture of agricultural farmland and industrial (Platin Cement works and quarry). The closest noise sensitive property being approximately 20m to the south east of the site boundary.

Activities at the Indaver facility are largely contained within the WtE building and ancillary structures with the exception of a small number of external plant items which are positioned along the northern site boundary, away from noise sensitive properties. The facility operates on a 24/7 basis with site traffic permitted to enter the facility between the 07:00 and 18:30hrs Monday to Friday and between 08:00 and 14:00hrs on Saturday.

The noise contribution from the existing site is relatively low. The key activities associated with the existing operations involves site traffic, external plant items to the north of the main building and the main stack.

10.3.1 Noise Emission Limits

The following noise emission limits form part of the facilities existing Industrial Emissions (IE) Licence (W0167-03) as set out in Schedule B.4 of the licence.

Table 10.1: Noise Emission Limits

Daytime dB L_{Aeq} (30 minutes)	Evening dB L_{Aeq} (30 minutes)	Night-time dB L_{Aeq} (30 minutes)
55	50	45

The daytime period is between 07:00 to 19:00hrs, evening period between 19:00 to 23:00hrs and night-time period between 23:00 and 07:00hrs.

Condition 5.4 of the IE licence states that there shall be no clearly audible tonal or impulsive noise from activities on site.

Any amendments to the facilities operation will therefore be required to operate within the limit values set out in the licence. This applies to the proposed development.

10.3.2 Annual Noise Monitoring

A review of the two most recent annual noise monitoring surveys for 2018 and 2019 has been undertaken to establish current noise levels associated with the current facility in operation. The surveys were undertaken by KD Environmental and were surveyed in accordance with the monitoring methodology outlined in the EPA's document *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (2016)* (NG4).

The 2018 survey was undertaken on 27th and 28th August 2018, the 2019 survey was undertaken on 15 and 16th August.

10.3.2.1 Noise Monitoring Locations

Noise monitoring is undertaken on an annual basis at four monitoring positions around the site boundary as part of the facilities IE Licence (W0167-03). These are described in **Table 10.2** below and indicated in **Figure 10.1**.

Table 10.2: Annual Noise Monitoring Locations

Location	Description
AN1-1	South east site boundary bottom of berm. Approximately 18m from nearest property to south east boundary off the R152 Road
AN1-2	Mid southern site boundary. Approximately 80m from nearest properties to southern boundary off the R152 Road
AN1-3	Monitoring position along south western site boundary. Approximately 45m from nearest property to south west boundary off the R152 Road
AN1-4	Monitoring position along north western site boundary. Monitoring location is not in proximity to any noise sensitive locations.

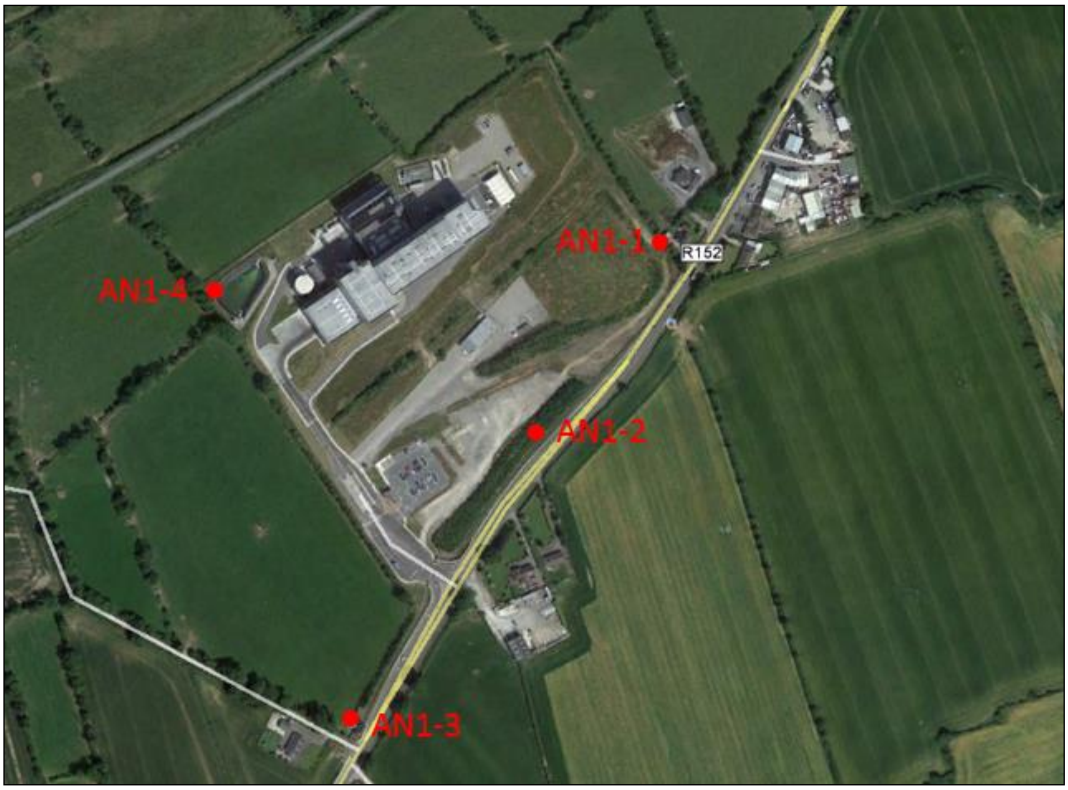

Figure 10.1 Annual Noise Monitoring Survey Locations (Image Source: Google Earth).

10.3.2.2 Noise Monitoring Parameters

The noise survey results are presented in terms of the following three parameters:

- L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

- L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.
- L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise. This parameter is commonly used to describe plant noise emissions where the L_{Aeq} is influenced by other external noise sources.

The “A” suffix denotes the fact that the sound levels have been “A-weighted” in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to 2×10^{-5} Pa.

10.3.2.3 Noise Monitoring Results

The results of the 2019 annual noise survey are summarised in **Table 10.3**.

Table 10.3: Annual Noise Monitoring Results – 2019

Monitoring Point	2018 Noise Monitoring Results			
	Period	$L_{Aeq,30mins}$	$L_{A10,30mins}$	$L_{A90,30mins}$
AN1-1	Daytime	59	62 – 63	48 – 49
	Evening	57	62	43
	Night-time	55	60 – 61	39 – 41
AN1-2	Daytime	63	66	53 – 54
	Evening	55	58	48
	Night-time	51 – 52	54	44 – 45
AN1-3	Daytime	57 – 58	59 – 60	52 – 53
	Evening	54	57	45
	Night-time	52 – 53	56 – 57	43 – 44
AN1-4	Daytime	50 – 52	51 - 53	47 – 48
	Evening	49	50	47
	Night-time	48	50	45 – 47

The results of the 2018 annual noise survey are summarised in **Table 10.4**.

Table 10.4: Annual Noise Monitoring Results - 2018

Monitoring Point	2018 Noise Monitoring Results			
	Period	$L_{Aeq,30mins}$	$L_{A10,30mins}$	$L_{A90,30mins}$
AN1-1	Daytime	55 - 56	58 - 59	46
	Evening	51	56	41
	Night-time	47 - 50	49 - 50	39 -40
AN1-2	Daytime	67 - 68	71 - 72	53 – 55
	Evening	61	65	45
	Night-time	56 - 58	38 - 54	33 – 34
AN1-3	Daytime	61 - 62	65	53 – 54
	Evening	55	59	37
	Night-time	51 - 52	48 - 54	32
AN1-4	Daytime	59 - 52	51 - 52	46 – 47
	Evening	45	46	43
	Night-time	44 - 46	46 - 51	43

The noise monitoring reports note the following with respect to the monitored results:

- Noise levels recorded at AN1-1 to AN1-3 are dominated by road traffic on the R152 Road.
- It is not possible to measure noise levels from the facility in isolation due to the frequent traffic along the R152 Road, particularly during daytime periods.
- Low level plant noise emissions are just audible from the facility during evening and night-time periods when road traffic is less frequent.
- Noise levels recorded at AN1-4 are predominantly within the L_{Aeq} day, evening or night-time limit values. Noise levels at this location are influenced by plant noise and on-site activities.
- The L_{A90} parameter which is recorded over 90% of the monitoring duration is less influenced by intermittent noise such as passing road traffic and hence, presents a better description of continual operations associated with the Indaver facility.
- At all monitoring positions, the L_{A90} value is within the relevant noise limit values set for the facility.
- No tonal or impulsive noise characteristics were detected or measured at the monitoring positions.

In summary, the operation of the Indaver facility does not contribute any significant noise levels to the surrounding environment. During daytime periods, noise from the facility is intermittently audible and is predominately associated with vehicles entering and exiting the site and occasional on-site vehicle movements. The on-site sources are, however, in line with noise characteristics from the surrounding environment, predominately from passing road traffic on the R152. During night-time and evening periods noise from operational plant is faintly audible during traffic lulls.

10.3.3 Supplementary Noise Monitoring

An unattended noise monitoring station was installed along the south-eastern boundary of the Indaver facility at approximate location of AN1-1 in order to gain additional noise monitoring data over day, evening and night-time periods. The survey was undertaken between 11th and 16th October 2019.

The results of the surveys are graphed in **Figure 10.2** for the L_{Aeq} and L_{A90} parameters. The graphed results illustrate the cyclical noise levels measured over day, evening and night-time periods which are dominated by road traffic movements along the R152 and the M1 Motorway beyond.

Given that the process and building service plant at the Indaver facility operates on a continual basis, the L_{A90} parameter measured during the quieter night-time periods are considered to reflect more accurately the specific noise contribution from the facility at this location, once surrounding external sources have reduced.

The monitoring position for this location was extended to first floor height (3.5m above ground) to gain a profile of noise levels at upper floor levels at the nearest noise sensitive location. For security, this monitoring location was secured to the boundary fence between the WtE facility and the adjacent property. Due to its position, an element of leaf rustle influenced the background noise levels from adjacent trees.

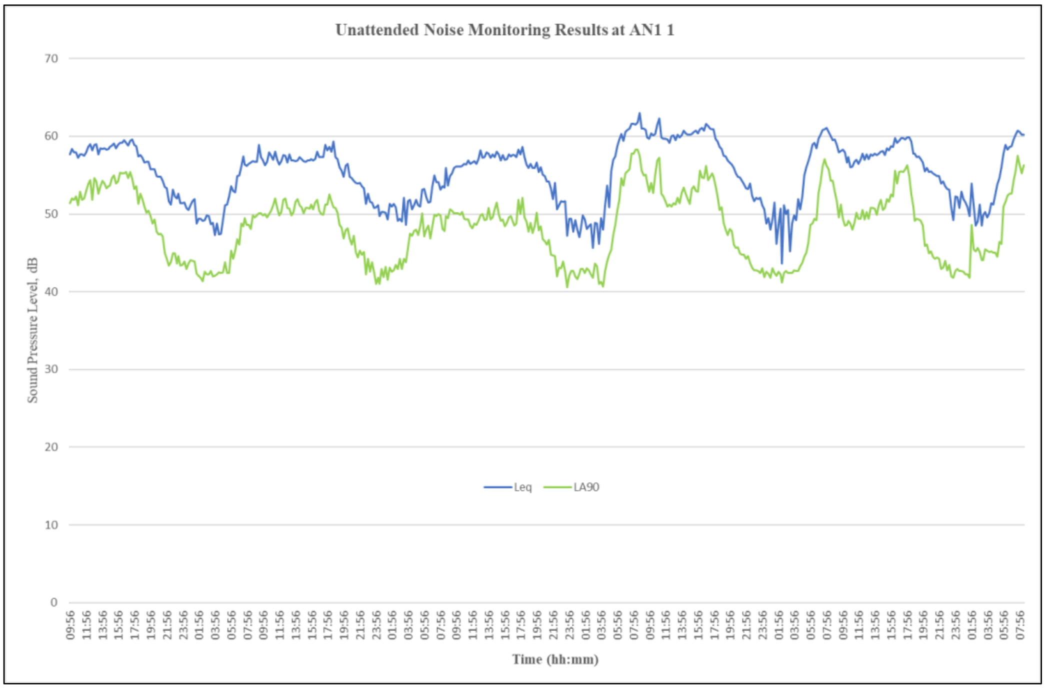

Figure 10.2 Graphed Noise Monitoring Results for AN1-1.

The average noise levels for each day (07:00 to 19:00hrs), evening (19:00 to 23:00hrs) and night-time periods (23:00:07:00) over the 5-day period are summarised in **Table 10.5** below.

Table 10.5: Unattended Noise Monitoring Results AN1-1

Period	Date	Average Measured Noise Levels, per period, dB		
		L_{Aeq}	L_{A10}	L_{AF90}
Daytime	Friday 11/10/2019	59	53	53
	Saturday 12/10/2019	57	50	50
	Sunday 13/03/2019	57	50	50
	Monday 14/10/19	61	54	54
	Tuesday 15/10/19	59	52	52
Evening	Friday 11/10/2019	55	58	47
	Saturday 12/10/2019	55	59	46
	Sunday 13/03/2019	55	58	46
	Monday 14/10/19	55	59	46
	Tuesday 15/10/19	56	59	46
Night-time	Saturday 12/10/2019	51	53	43
	Sunday 13/03/2019	51	54	45
	Monday 14/10/19	54	53	45
	Tuesday 15/10/19	54	54	44
	Tuesday 16/10/19	54	55	45

During daytime periods, average ambient noise levels were measured in the range of 57 and 61dB L_{Aeq}. Average daytime background noise levels were measured in the range of 50 to 54dB L_{A90}. Road traffic was noted to be the dominant source of noise during set up and collection during the daytime period at the monitoring location.

During the evening periods, the average ambient noise levels were measured in the range of 55 to 56dB L_{Aeq}. The average background noise level was measured in the range of 46 to 47dB L_{A90}. Road traffic and low level site activities are expected to be the main contributors to measured noise levels during this period.

During night-time periods, the average ambient noise levels were measured in the range of 51 to 54dB L_{Aeq}. The average background noise levels were measured in the range of 43 to 45dB L_{A90}. Highest ambient and background noise levels during the night-time period are measured between 23:00 and 00:00hrs and the early morning period of 05:30 and 07:00hrs when road traffic flows are higher. During quieter night-time periods, background noise levels are of the order of 41 to 43dB L_{A90}.

The overall results of the unattended noise survey measured noise levels higher than those recorded during the attended surveys at AN1-1.

This was noted to be as a result of some influence from wind generated noise/leaf rustle in adjacent foliage and the height difference between the two locations. Notwithstanding the above, background noise levels are all within the facilities licence limits at this monitoring position.

During night-time periods during traffic lulls and reduction in surrounding extraneous sources typically between 01:00 and 05:00hrs, the background noise level measured at the unattended location is comparable to those measured during the attended annual compliance studies (i.e. between 41 to 43dB L_{A90} as illustrated in **Figure 10.2**)

Operational plant at the WtE facility operates on a continual basis, therefore, in the absence of surrounding traffic and other extraneous sources, the contribution from the WtE facility is best described by the night-time L_{A90} parameter which captures the steady background noise level.

10.3.4 Baseline Summary

The results of the annual compliance noise monitoring surveys in addition to the supplementary noise survey indicate that road traffic dominates the prevailing noise environment at noise sensitive locations surrounding the facility. Activities from the Indaver facility are audible at low level during quieter night-time and evening periods during lulls in surrounding noise sources, predominately road traffic. The range of noise levels measured in terms of the L_{A90} parameter representing the steady background noise levels confirms the facility is operating within its licence limits at present for all periods at all survey locations.

10.4 Characteristics of the Proposed Development

A detailed description of the proposed development is included in **Chapter 4** ***Description of the Proposed Development*** of this EIAR. In relation to potential noise and vibration impacts associated with the proposed development, the potential impacts are considered for both the construction and operational phases.

The construction phase will involve site clearance, demolition of existing structures, excavation, foundations, construction of new structures, connections to on-site utility services and new car parking areas. The various items of construction plant required to undertake these works have the potential to generate high levels of noise at the nearest noise sensitive locations in addition to construction traffic to and from the site. Vibration impacts during this phase will be limited to ground excavation and building foundations.

The primary sources of outward noise in the operational context are deemed to be long term in nature and will involve:

- External equipment used to serve the tank farm area;
- Mechanical and electrical equipment serving new buildings;
- Vehicle movements on site and at parking areas; and
- additional vehicular traffic to and from the site.

The potential noise impacts associated with both phases area assessed in the following sections.

10.5 Likely Significant Effects

10.5.1 Criteria for Rating of Impacts

The significance of noise and vibration impacts has been assessed in accordance with the Environmental Protection Agency (EPA) Draft '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*' (2017) (see **Tables 10.6 to 10.8**). With regard to the quality of the impact, ratings may have positive, neutral or negative applications in line with the definitions included in **Table 10.6**.

Table 10.6: Quality of Potential Effects

Quality of Impact	Definition
Negative	A change which reduces the quality of the environment (e.g. by causing a nuisance).
Neutral	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.
Positive	A change that improves the quality of the environment (e.g. by removing a nuisance).

The significance of an impact on the receiving environment are described in **Table 10.7.**

Table 10.7: Significance of Effects

Significance of Impact on the Receiving Environment	Description of Potential Impact
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters a sensitive aspect of the environment.

The duration of impacts as described in the EPA Guidelines are listed in **Table 10.8**.

Table 10.8: Duration of Effects

Duration of Impact	Definition
Momentary	Effects lasting from seconds to minutes
Brief	Effects lasting less than a day
Temporary	Effects lasting one year or less
Short-term	Effects lasting one to seven years
Medium-term	Effects lasting seven to fifteen years
Long-term	Effects lasting fifteen to sixty years
Permanent	Effects lasting over sixty years
Reversible	Effects that can be undone, for example through remediation or restoration

As these guidelines do not quantify the impacts in decibel terms further reference has been made to the '***Guidelines for Environmental Noise Impact Assessment***'[1] produced by the Institute of Acoustics/Institute of Environmental Management and Assessment Working Party and the Design Manual for Roads and Bridges (DMRB)[2] as discussed in the following sections.

1 IEMA Guidelines for Environmental Noise Impact Assessment 2014
2 Design Manual for Roads and Bridges (DMRB), LA111 *Noise and Vibration*, Rev 0, Nov 2019.

10.5.2 Relevant Guidance

10.5.2.1 Construction Phase

Noise Criteria

Construction works on-site are not licensed under the facilities noise licence limits as these relate to ongoing continual sources. The EPA's document NG4 (2016) notes that construction related issues are typically covered in other guidance documents and best practice standards. Section 11 of NG4 notes "*There are numerous standards and guidance documents that may be of use in the assessment of noise in situations that do not fall under the remit of the Agency*".

For construction noise, the document recommends the use of BS 5228-1: 2009 +A1: 2014 *Code of practice for noise and vibration control on construction and open sites*. In this instance, appropriate criteria relating to permissible construction noise levels are taken from Part 1 – Noise of the British Standard.

This document suggests an absolute construction noise limit depending on the receiving environment. The documents states:

"Noise from construction and demolition sites should not exceed the level at which conversations in the nearest building would be difficult with windows shut [...]. *Noise levels between 07:00 and 19:00hrs, outside the nearest window of the occupied room closest to the site boundary should not exceed:*

70dB in rural, suburban and urban areas away from main road traffic and industrial noise;

75dB in urban areas near main roads in heavy industrial areas".

Given the suburban location of the facility, a limit value of 70dB $L_{Aeq,T}$ for construction is considered to be reasonable.

This limit value is also in compliance with those set by Transport Infrastructure Ireland (TII) for construction projects. Their 2004 document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* recommends the following construction noise limit values.

Table 10.9: Recommended Construction Noise Limits (TII 2014)

Days and Times	L_{Aeq}	L_{Asmax}
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60*	65*
Saturdays 08:00 to 16:30hrs	65	75
Sundays & Bank Holidays 08:00 to 16:30hrs	60*	65*

Note * Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the local authority.

Construction Traffic

In order to assist with interpretation of construction traffic noise, **Table 10.10** offers guidance as to the likely impact associated with changes in traffic noise levels. For construction traffic, due to the short-term period over which this impact occurs, the magnitude of impacts is assessed against the 'short term' period as described in the DMRB. The corresponding significance of impact presented in the '*EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EIAR), Draft, August 2017 is included in **Table 10.10** for consistency in wording and terminology for the assessment of impact significance.

Table 10.10: Likely impact associated with change in traffic noise level during the Short-Term Period

Change in Sound Level (dB L_{A10})	Magnitude of Impact (Short Term)	Impact Guidelines on the Information to be contained in EIAR (EPA)
0.1 – 0.9	Negligible	Imperceptible - Not Significant
1 – 2.9	Minor	Slight
3 – 4.9	Moderate	Moderate
5+	Major	Significant - Very Significant

Vibration Criteria

Vibration standards come in two varieties: those dealing with human comfort, and those dealing with cosmetic or structural damage to buildings. For the surface construction works proposed here, vibration is expressed in terms of Peak Particle Velocity (PPV) in mm/s.

Building Response Criteria

British Standard 7385-2 (1993) *Evaluation and measurement for vibration in buildings*, gives guidance regarding acceptable vibration in order to avoid damage to buildings. British Standard BS 5228-2 (2009) reproduces these guidance values.

These standards differentiate between transient and continuous vibration. Surface construction activities are transient because they occur for a limited period of time at a given location. Risk of cosmetic damage to residential buildings starts at a PPV of 15mm/s at 4Hz. Below 12.5 mm/s PPV, the risk of damage tends to be zero. Important buildings that are difficult to repair might require special consideration on a case by case basis, but buildings of historical importance should not (unless it they are structurally unsound) be assumed to be more sensitive. If a building is in a very unstable state, then it will tend to be more vulnerable to the possibility of damage arising from vibration or any other groundborne disturbance.

Table 10.11 summarises the vibration levels below which there is no risk of damage to buildings. These limits apply to vibration frequencies below 15Hz where the most conservative limits are required. For protected or potentially vulnerable buildings, the recommended construction vibration limit is reduced by 50%.

Table 10.11 – Transient Vibration Impact Criteria for Buildings (conservative criteria below which there is no risk of cosmetic damage).

Category of Building	**Threshold of potential significant effect (Peak Particle Velocity - PPV - at building foundation) for Transient Vibration**
Structurally sound and non-protected buildings	12 mm/s
Protected and / or potentially vulnerable buildings	6 mm/s

Human Perception

Humans are sensitive to vibration stimuli, and perception of vibration at high magnitudes may cause concern. Vibration typically becomes perceptible at around 0.15 to 0.3 mm/s and may become disturbing or annoying at higher magnitudes. During surface construction works (e.g. piling) the vibration limits set within **Table 10.11** would be perceptible to building occupants and would have the potential to cause subjective effects.

However, higher levels of vibration are typically tolerated for single events or events of short-term duration, particularly during construction projects and when the origin of vibration is known. For example, piling can typically be tolerated at vibration levels up to 2.5mm/s during the daytime and the evening if those affected are aware of the time-frame and origin of the vibration, and if they have been informed about the limit values relating to the structural integrity of neighbouring properties.

10.5.2.2 Operational Phase

Noise

As noted in **Section 10.3.1**, the existing facility is licensed under an Industrial Emissions Licence which includes the relevant noise emission limits, as presented in **Table 10.1**.

The '*Guidelines for Environmental Noise Impact Assessment*' produced by the Institute of Environmental Management and Assessment (IEMA) (2014) have been referenced in order to categorise the potential effect of changes in the ambient noise levels during the operational phases of the proposed development.

The guidelines state that for any assessment, the potential significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise. Due to varying factors which effect human response to environmental noise (prevailing environment, noise characteristics, time periods, duration and level etc.) assigning a subjective response must take account of these factors.

The scale adopted in this assessment is shown in **Table 10.12** below and is based on an example scale within the IEMA guidelines. The corresponding significance of impact presented in the Draft '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*' (EPA, 2017) is also presented.

Table 10.12: Noise Impact Scale – Operational Noise Sources

Noise Level Change dB(A)	**Subjective Response**	**Long Term Impact Classification (IEMA, 2014)**	**Impact Guidelines on the Information to be contained in EIAR's (EPA)**
≥ 0	No change	Negligible	Imperceptible
≥ 0 and < 3	Barely perceptible		Not Significant
≥ 3 and < 5	Noticeable	Minor	Slight - Moderate
≥ 5 and < 10	Up to a doubling of loudness	Moderate	Moderate - Significant
≥10	More than a doubling of loudness	Major	Significant - Profound

The significance table reflects the key benchmarks that relate to human perception of sound. A change of 3dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10dB(A) 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.

It is considered that the ratings specified in the above table provide a good indication as to the likely significance of changes on noise levels in this case and have been used to assess the impact of operational noise.

Road Traffic Noise Assessment Criteria

Given that traffic from the development uses public roads outside the facility boundary, it is appropriate to consider the increase in traffic noise level that arises as a result of vehicular movements, is associated with the proposed development.

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, **Table 10.13** offers guidance as to the likely impact associated with any particular change in traffic noise level, in accordance with the DMRB, LA111 2019 document.

Table 10.13 : Likely impact associated with change in traffic noise level during the Long-Term Operational Phase

Change in Sound Level (dB A)	DMRB Magnitude of Impact	Impact Guidelines on the Information to be contained in EIAR (EPA)
0	No Impact	Imperceptible
0.1 – 2.9	Negligible	Not Significant
3 – 4.9	Minor	Slight - moderate
5 – 9.9	Moderate	Moderate – Significant
10+	Major	Very Significant - Profound

Vibration

There are no operational vibration limits set within the existing licence. There are no expected sources of vibration associated with the existing or the proposed operations, given the type of activity associated with the development and the distances to the nearest sensitive buildings. In this instance, operational vibration limits are not deemed necessary.

10.5.3 "Do Nothing" Scenario

In the absence of the proposed development proceeding, the noise and vibration environment in its current form is expected to remain nominally unchanged. The results of the noise surveys undertaken would remain similar under a Do-Nothing scenario and hence the Do-Nothing Impact of the proposed development is long term, neutral.

There are a number of additional developments proposed within the area however, which have the potential to alter the existing noise environment including developments within the Irish Cement Ltd adjacent facility and other proposed electrical power developments in the surrounding area. The noise environment resulting from these proposed developments have the potential to introduce new sources to the surrounding environment. For these potential future developments, they will be subject to individual noise and vibration impact assessments and will be required to satisfy all planning conditions relating to noise and vibration control. Further comment relating to potential changes in the noise environment is discussed in **Section 10.7** Cumulative Effects.

10.5.4 Operational Phase

Once operational, the potential noise sources associated with the proposed development will be from:

- Mechanical and electrical equipment;
- vehicle movements / activities on site, and;
- additional vehicular traffic to and from the site.

In order to assess the potential impacts from this phase, a 3D noise model of the facility was developed to include for the proposed development, using information provided by the design team including site drawings and topographical information.

The model was developed using a proprietary noise calculation package Brüel & Kjær Type *Predictor.* This is an acoustic modelling package for computing noise levels in the vicinity of different types of noise sources. The calculation standard used in the model for fixed plant and industrial type sources is *ISO 9613-2:1996 Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.*

The model takes account of the various factors affecting the propagation of sound in accordance with the standard, including:

- the magnitude of the noise source in terms of sound power;
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver;
- attenuation due to atmospheric absorption, and;
- meteorological effects such as wind gradient, temperature gradient and humidity.

Each of the main sources is discussed in turn in the following sections.

10.5.4.1 Mechanical and Electrical Equipment

Tanker Unloading Area

The proposed tanker unloading area is located adjacent to the east of the existing process building and will include an unloading pump. In line with equipment noise limit values applied at the site, the maximum allowable noise level associated with each pump item is 82dB at 1m.

The operational hours of this area are between 07:00 and 18:30hrs Monday to Friday. This source has been included in the model and is assumed to operate continually over the daytime period.

Tank Farm

The proposed tank farm is located along the north-western boundary of the site. This area will include a feeding centrifugal pump, a circulation pump and a mechanical agitator. In line with equipment noise limit values applied at the site, the maximum allowable noise level associated with each pump item is 82dB at 1m.

The operational hours of this area are 24hrs/day, 7 days a week, however the operational periods of the equipment listed above will be intermittent depending on required use. In order to include for a robust assessment, however, all sources are calculated to operate continually over day, evening and night-time periods.

Bottom Ash Storage Building

The proposed ash storage building is located along the north-eastern boundary of the site. Activities are predominately fully enclosed within the building (e.g. front loader within building). External noise sources include an extract fan located to the south west of the building to remove dust and moisture through a filter which will also be located at ground level external to the building. In line with equipment noise limit values applied at the site, the maximum allowable noise level associated with the fan is 82dB at 1m.

The operational hours of this building will be 24hrs/day, 7 days a week. The extract fan is modelled therefore to operate on a continual 24/7 basis.

Hydrogen Building

The proposed hydrogen building is located south of the existing process building and the 110kV exclusion zone. This area includes a compressor building which will house the compressor units internally. Operational noise levels from the compressors will be required to comply with the maximum noise level of 82dB at 1m from the unit. This activity will operate intermittently but a worst case operation of 24hrs/day, 7 days a week has been assumed and hence has been modelled on this basis.

Additional sources from this area include venting of oxygen and hydrogen to the atmosphere from the two vents. This activity is undertaken at atmospheric pressure (i.e. no overpressure venting). Noise levels associated with this activity will be negligible and hence are not included in the model

Above Ground Installation Store

An above ground installation (AGI) is located along the south eastern site boundary. This will include pressure regulation equipment and a metering station. There is no mechanical equipment associated with this installation, potential sources of noise relate to the pressure control area, however this is not expected to generate audible levels of noise beyond the AGI store area. In the absence of any operational noise level data from this potential source, a worst-case operational noise levels of 70dB at 1m from the unit has been modelled assuming a high frequency spectrum. This source is modelled on a continual 24/7 basis to account for its potential operation during day, evening or night-time periods. Operational noise levels from this area will, however, not be continual. This is a worst-case scenario, as noise from this area of the site is expected to be negligible.

10.5.4.2 Vehicle Movements on Site

The tanker unloading area, tank farm, bottom ash storage building and tank/truck/container area in the proposed concrete yard will involve manoeuvring of vehicles into and out of these areas, unloading of tankers/ HGV’s.

For the purpose of assessing noise from on-site vehicle activities, the following has been included in the noise model:

- 2 No. HGV's being unloaded at the tanker unloading area with a sound pressure value of 72dB at 10m using source data from BS5228 Part 1 Ref Table C4.15 'Fuel Tanker Pumping'. The calculations assume that each source operates for 50% of the daytime period and 20% of the evening period.
- 2 No. HGV's per hour accessing / egressing the bottom ash storage building and the hydrogen building with a sound pressure value of 78dB at 10m using source data from BS5228 Part 1 Ref Table C4.1 'Articulated Truck – Maximum drive by'.
- Tanker vehicles driving within the site (16 No. additional per day) with a sound pressure value of 76dB at 10m using source data from BS5228 Part 1 Ref Table C4.15 'Fuel Tanker Lorry – Maximum drive by'.

10.5.4.3 Modelled Results

Noise levels have been modelled at a total of 5 No. off-site noise sensitive locations surrounding the development site, representing the closest noise sensitive locations to the proposed facility. These locations are illustrated in **Figure 10.3**.

Figure 10.3: Noise Modelled Locations.

Table 10.14 presents the calculated noise levels at each of the assessment locations taking account of the operational noise sources associated with the proposed development and assumptions outlined in the previous sections. Results are calculated for the daytime (07:00 to 19:00hrs), evening (19:00 to 23:00hrs) and night-time period (23:00 to 07:00hrs).

Table 10.14: Modelled Operational Noise Levels – New Sources

Modelled Location	Calculated Noise Level, dB $L_{Aeq,T}$		
	Daytime	Evening	Night-time
NSL-1	29	27	27
NSL-2	24	22	22
NSL-3	30	27	26
NSL-4	31	24	23
NSL-5	26	25	25

During the daytime period, calculated noise levels are between 24and 31dB L_{Aeq}. During evening periods noise, calculated noise levels are between 22 and 27dB L_{Aeq}. During night-time periods noise, calculated noise levels are between 23 and 27dB L_{Aeq}.

Noise sources associated with the proposed development are significantly screened from the nearest noise sensitive locations by the site perimeter berms and on-site buildings resulting in low noise levels external to the site.

The specific noise levels noted above relate to sources associated with the new development only. The combined noise levels associated with the existing facility in addition to any new noise sources associated with the proposed development must comply with the facilities noise emission limits.

In order to assess the cumulative noise from both, noise levels measured as part of compliance surveys and additional monitoring has been reviewed. The background measured noise level (L_{A90} parameter), representing as close as possible the steady background operational noise from the facility, has been added to the predicted noise level associated with the proposed development in order to determine the cumulative noise from the facility. **Tables 10.15** to **10.17** present the assessment for day, evening and night-time periods respectively.

Table 10.15: Combined Noise Levels – Daytime

Assessment Location	Nearest Baseline location	Baseline L_{A90} Daytime	Predicted Noise Level dB (Proposed Development)	Cumulative Noise Level, dB(A)	Within daytime limit value? (55dB L_{Aeq})
NSL1	AN1-4	46	29	46	Yes
NSL2	AN1-1	50	24	50	Yes
NSL3	AN1-2	53	30	53	Yes
NSL4	AN1-2	53	31	53	Yes
NSL5	AN1-1	50	26	50	Yes

Table 10.16: Combined Noise Levels – Evening

Assessment Loc.	Nearest Baseline location	Baseline L_{A90} Evening -	New sources Predicted Level dB (Proposed Development)	Cumulative Noise Level dB(A)	Within evening limit value? (50dB L_{Aeq})
NSL1	AN1-4	43	27	43	Yes
NSL2	AN1-1	46	22	46	Yes
NSL3	AN1-2	45	27	45	Yes
NSL4	AN1-2	45	24	45	Yes
NSL5	AN1-1	46	25	46	Yes

Table 10.17: Combined Noise Levels – Night-time

Assessment Loc.	Nearest Baseline location	Baseline Night-time - L_{A90}	New sources Predicted Level dB (Proposed Development)	Cumulative Noise Level dB(A)	Within night-time limit value? (45dB L_{Aeq})
NSL1	AN1-4	43	27	43	Yes
NSL2	AN1-1	45[3]	22	45	Yes
NSL3	AN1-2	34	26	35	Yes
NSL4	AN1-2	34	23	34	Yes
NSL5	AN1-1	45	25	45	Yes

The result of the assessment outlined in **Tables 10.15** to **10.17** confirms that cumulative noise levels associated with existing and proposed operational noise sources are within the noise emission limits for the facility during day, evening and night-time periods.

The baseline noise levels included in the assessment tables above include noise sources from the existing facility combined with surrounding noise sources and hence reflect a worst-case assessment.

[3] The higher background level of 45dB L_{A90} measured over the full night-time period at the supplementary unattended noise monitoring position has been used. This is a worst-case assessment as it includes contribution from road traffic flows during early morning periods.

10.5.4.4 Additional Traffic Along Surrounding Road Network

Chapter 7 *Traffic and Transportation* details the operational phase traffic impacts on the surrounding road network.

Traffic associated with operational Phases 1 and 2 combined (i.e. post construction works) are calculated for the future years of 2027 (Opening year + 5) and design year of 2037 (Operational year + 15).

The assessment has concluded that the proposed development will result in an additional 35 Heavy Vehicle (HGV) trips and 40 Light Vehicle (LV's) trips, which will be spread throughout the day. This equates to a daily total of 70 HGV two-way movements and 80 Light Vehicle movements to and from the site.

Tables 10.18 and **10.19** present the calculated change in noise levels associated with additional traffic along the local road network for the operational years of 2027 and 2037. The traffic flows used in the assessment are the Annual Average Daily Traffic (AADT) flows for two-way traffic, divided into both light and heavy vehicles.

Table 10.18: Change in Traffic Noise Level, Operational Phase 2027

Junction R152/R150	**2027 Opening Year +5**				**Increase in noise level, dB**
	Without Development		**With Development (Phase 1 and Phase 2 Operational)**		
	AADT (Two-Way Flows)		**AADT (Two-Way flows)**		
Arm	**LV**	**HV**	**LV**	**HV**	
R152 (North)	16,439	1,883	16,479	1,918	+0.1
R152 (South)	9,334	1,140	9,354	1,169	+0.1
R150 (West)	11,126	1,076	11,146	1,082	0
R150 (East)	4,223	394	4,223	394	0
Junction Indaver/R152	**Without Development**		**With Development**		**Increase in noise level, dB**
	AADT (Two-Way Flows)		**AADT (Two-Way Flows)**		
Arm	**LV**	**HV**	**LV**	**HV**	
R152 (North)	15,772	1,821	15,812	1,857	+0.1
R152 (South)	15,789	1,878	15,829	1,912	+0.1

Table 10.19: Change in Traffic Noise Level, Operational Phase 2037

Junction R152/R150	**2037 Opening Year +15**				**Increase in noise level, dB**
	Without Development		**With Development (Phase 1 and Phase 2 Operational)**		
	AADT (Two-Way Flows)		**AADT (Two-Way flows)**		
Arm	**LV**	**HV**	**LV**	**HV**	
R152 (North)	18,173	2,361	18,213	2,395	+0.1
R152 (South)	10,319	1,439	10,339	1,467	+0.1
R150 (West)	12,300	1,337	12,320	1,344	0
R150 (East)	4,668	495	4,668	495	0
Junction Indaver/R152	**Without Development**		**With Development**		Increase in noise level, dB
	AADT (Two-Way Flows)		**AADT (Two-Way Flows)**		
Arm	**LV**	**HV**	**LV**	**HV**	
R152 (North)	17,435	2,282	17,475	2,318	0
R152 (South)	17,454	2,354	17,494	2,388	0

The change in traffic noise level during both assessment years is calculated between 0 to 0.1dB. A change of this magnitude will not result in any notable change in noise level over existing road traffic noise levels. A change in noise levels of this magnitude is neutral, long-term, imperceptible to not significant.

10.5.5 Construction Phase

10.5.5.1 Construction Noise

Construction works associated with the proposed development will involve excavation works, construction of buildings, structures, parking areas, etc., and landscaping/berm reshaping. Due to the nature of the activities required to clear parts of the site and construct the various elements, there is potential for generation of high levels of noise within the site.

Phase 1 Works

Phase 1 is expected to be under construction in 2021 and will become operational in 2022. The schedule for the construction and commissioning of this phase is approximately 16 months.

This phase will involve bulk excavation works, construction of the tank farm, tanker unloading area, bottom ash warehouse, warehouse & workshops, new parking areas, permanent contractors compound, miscellaneous site circulation improvements consisting of realignment of paved areas local to the reception hall, reshaping of berms and landscaping.

Phase 2 Works

Phase 2 will be under construction in 2022 and opened in 2023. This involves construction of the hydrogen generation building, demolition of existing modular office building and construction of new office building, new access road to both areas and additional car parking. A construction site compound will be located within the south-west of the site.

The schedule for the construction and commissioning of the phase 2 elements is approximately 12 months.

Typical working hours during the construction phase will be:

Start	Finish	
0700	1900	Monday – Friday
0700	1300	Saturday

Consideration of safety, weather or sub-contractor availability is likely to necessitate working outside normal hours on occasion. Heavy or noisy construction activities will, however, be avoided outside normal hours.

Construction Noise Calculations

Given the construction will encompass a range of different activities on a day to day and week to week basis, it is not possible to calculate with a high degree of accuracy the specific levels of noise associated with each phase. It is possible, however, to determine a range of potential worst-case scenarios which represent the key construction phases.

Indicative noise levels associated with construction activities may be calculated in accordance with the methodology set out in *BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise*. This standard sets out sound power levels for plant items normally encountered on construction sites, which in turn enables the prediction of noise levels at selected locations. Using the typical noise levels for construction plant items, construction noise levels at specific distances have been calculated for the main construction activities associated with the project.

The impact at nearby noise sensitive buildings will depend upon a number of variables, the most notable of which are:

- the amount of noise generated by plant and equipment being used at any one time 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;
- the attenuation due to ground absorption or barrier screening effects; and
- reflections of noise due to the presence of hard vertical faces such as walls.

The nearest noise sensitive locations to the proposed development are located south east of the development works (NSL 2 – **Figure 10.2**), at approximately

30m from works associated with the berm reshaping. The remaining work areas are at a minimum distance of approximately 90m from properties along this boundary. Closest properties to the west are located between 250m and 500m from the closest working areas.

Table 10.20 presents the calculated noise levels associated with berm reshaping works at the closest noise sensitive locations to this activity. No screening has been included in calculations relating to berm realignment works. The calculations assume that plant items are operating for 66%[4] of the time.

Table 10.20: Calculated Noise Level associated with Berm Realignment Works

Item of Plant (BS5228 Ref)	L_{Aeq} at 10m	No of plant items	Calculated Noise Level, dB at 30m
Tracked excavator (C4.17)	71	3	64
Dump Truck (C4.4)	76	1	65
Combined Noise Level			68

The calculated noise level associated with this activity at the closest property to this works is within the construction noise limit of 70dB L_{Aeq} during daytime periods.

Table 10.21 presents the calculated noise levels associated with remaining construction activities at the closest noise sensitive locations to construction works. A conservative screening correction of 5dB is included in calculations for construction works to account for site boundary berms.

4 This estimate assumes that the plant will operate a full 8-hour shift over the proposed 12 hour working period which equates to a 66% operating time over a daytime period or 40 minutes over a 1-hour period. The dynamic nature of construction sites is such that this is deemed to be a conservative estimate.

Table 10.21: Calculated Noise Level associated with Construction Works

Item of Plant (BS5228 Ref)	L_{Aeq} at 10m	No of plant items	Calculated Noise Level, dB at 90m	Calculated Noise Level, dB at 200m
Tracked excavator (C4.17)	71	3	50	43
Dump Truck (C4.4)	76	1	50	43
Telescopic Handler (C2.35)	71	2	48	41
Scissor Lift (C4.60)	70	4	50	43
Roller (C2.37)	79	1	53	46
Mobile Crane (C2.28)	67	1	41	34
Crawler Mounted Rig (C3.22)	80	1	54	47
Combined Noise Level			59	52

The calculated noise level associated with this activity at the closest properties to this works are well within the construction noise limit of 70dB L_{Aeq} during daytime periods. The combined noise level assumes all items of plant are operating simultaneously at the same distance which is a highly worst-case scenario.

Notwithstanding the above, any construction activities undertaken on the site will be required to operate within the recommended noise criteria set out in **Table 10.9** during all activities.

10.5.5.2 Construction Traffic

Chapter 7 *Traffic & Transport* details the construction phase traffic impacts on the surrounding road network. Construction traffic during Phases 1 and 2 will have 'Peak' construction stages, and 'Nominal Max' construction stages. The 'Peak' stages will occur during the initial weeks during earthworks and excavation which will generate the highest number of HGV's. During the remaining phases, HGV traffic volumes will be reduced, however a higher overall volume of traffic flows will occur due to staff vehicles and other light vehicles accessing the site, this will therefore result in the 'Nominal Max' traffic flows.

From a noise impact assessment view, flows associated with the 'Peak' flows result in highest potential impacts due to the increased HGV volumes.

During the 'peak' construction of Phase 1 (2021), an additional 43 staff vehicle trips (86 vehicle movements) and 50 HGV's (100 HGV movements) per day are predicted.

During the 'peak' construction of Phase 2 (2022) an additional 43 staff vehicles (86 vehicle movements) and 40 HGV's (80 HGV movements) per day are predicted.

The resultant noise impacts associated with the 'Peak' construction traffic scenarios are therefore assessed for the following years:

- 2021 Construction Year (Phase 1 construction);
- 2022 Opening Year (Phase 1 operational, Phase 2 under construction)

Table 10.22: Change in Traffic Noise Level, Construction Phase 1

Junction R152/R150	Phase 1 Construction Peak Flows - 2021				Increase in noise level, dB
	Without Development		With Development (Phase 1 Construction Works)		
	AADT (Two-Way Flows)		AADT (Two-Way flows)		
Arm	**LV**	**HV**	**LV**	**HV**	
R152 (North)	14,868	1,537	14,911	1,602	+0.1
R152 (South)	8,436	924	8,457	989	+0.2
R150 (West)	10,056	886	10,078	886	0
R150 (East)	3,814	321	3,814	321	0
Junction Indaver/R152	**Without Development**		**With Development (Phase 1 Construction Works)**		**Increase in noise level, dB**
	AADT (Two-Way Flows)		**AADT (Two-Way Flows)**		
Arm	**LV**	**HV**	**LV**	**HV**	
R152 (North)	14,265	1,487	14,308	1,522	+0.1
R152 (South)	14,281	1,533	14,324	1,598	+0.2

Table 10.23: Change in Traffic Noise Level, Construction Phase 2

Junction R152/R150	Phase 2 Construction Peak Flows - 2022				Increase in noise level, dB
	Without Development		With Development (Phase 2 Construction Works)		
	AADT (Two-Way Flows)		AADT (Two-Way flows)		
Arm	**LV**	**HV**	**LV**	**HV**	
R152 (North)	15,088	1,590	15,139	1,668	+0.2
R152 (South)	8,567	957	8,593	1,033	+0.3
R150 (West)	10,212	915	10,237	917	0
R150 (East)	3,876	332	3,876	332	0
Junction Indaver/R152	**Without Development**		**With Development (Phase 2 Construction Works)**		**Increase in noise level, dB**
	AADT (Two-Way Flows)		**AADT (Two-Way Flows)**		
Arm	**LV**	**HV**	**LV**	**HV**	
R152 (North)	14,476	1,538	14,527	1,580	+0.1
R152 (South)	14,491	1,585	14,542	1,663	+0.2

The change in traffic noise level during both assessment years is calculated between 0 to 0.3dB. A change of this magnitude will not result in any notable change in noise level over existing road traffic noise levels. A change in noise levels of this magnitude is neutral, short-term, imperceptible to not significant.

10.5.5.3 Construction Vibration

Potential for vibration impacts during the construction phase programme will be limited given the minimal level of intrusive works required as part of the construction phases. In the parts of the site where the ground levels are raised, or where the bearing strata does not have the required geotechnical properties, foundations will be piled. Continuous Flight Auger (CFA) piling or augured piles will be used for the tank farm foundations only. This will occur for a period of approximately 3 weeks.

The use of augured piling generates the lowest levels of vibration whilst the use of impact driven piles generate the highest. For the purposes of this assessment the expected vibration levels during piling have been determined through reference to published empirical data. The British Standard BS 5228 – Part 2: Vibration, publishes the measured magnitude of vibration of rotary bored piling using a 600mm pile diameter for bored piling into soft ground over rock, (Table D.6, Ref. No. 106):

- 0.54mm/s at a distance of 5m, for auguring;
- 0.22mm/s at a distance of 5m, for twisting in casing;
- 0.42mm/s at a distance of 5m, for spinning off, and;
- 0.43mm/s at a distance of 5m, for boring with rock auger.

Considering the low vibration levels that are experienced at very close distances to the piling rigs during augured piling, vibration levels at the nearest off-site buildings will not pose any significance in terms of cosmetic or structural damage. In addition, the range of vibration levels are below a level which would cause any disturbance to occupants of the nearest off-site sensitive buildings.

Notwithstanding the above, any construction activities undertaken on the site will be required to operate below the recommended vibration criteria set out in **Table 10.11** during all activities.

Considering the magnitude of vibration associated with the proposed site works, vibration levels at the nearest buildings are not expected to pose any significance in terms of building damage or human perception. The likely vibration impacts during the construction phase are deemed to be of neutral effect and of short term, imperceptible significance.

10.6 Mitigation Measures and Monitoring

10.6.1 Operational Phase

10.6.1.1 On-site Noise Sources

The results of the assessment have confirmed that once noise emission levels associated with the new plant items do not exceed the equipment noise limit applied at the site, discussed in **Section 10.5.4**, the facilities noise emission limit values will not be exceeded. The following best practice measures will be applied to the proposed development to ensure noise levels are controlled to the surrounding environment and to comply with the facilities IE licensed noise emission limits:

- Roller shutter doors within the Bottom Ash Storage building will be maintained closed at all times, except for access/egress during activities; and
- Vehicles parked at the truck parking bay will be required to switch engines off when parked on site.

In addition to the measures outlined above, the following best practice measures which form the basis of ongoing noise management at the site will be applied to the proposed development to ensure operational plant noise levels are kept to a minimum:

- All new items of external plant will be limited to a sound pressure noise level of 82dB at 1m;
- Plant will be sited as far away from noise-sensitive locations as is practicable;
- External plant items (pump, motors, fans) will be switched off when not required, particularly during night-time periods;
- The use of acoustic attenuators/ enclosures etc., will be employed to any items of external plant in order to ensure this limit value is complied with;
- Duct mounted attenuators will be installed on the atmosphere side of all air moving plant, where required;
- Splitter attenuators will be installed providing free ventilation to internal plant areas, where required, and;
- Anti-vibration mounts will be installed on all reciprocating plant, where required.

10.6.1.2 Additional Vehicles on Public Roads

The noise effect assessment outlined above has demonstrated that mitigation measures are not required.

10.6.1.3 Monitoring

The facility is licensed by the EPA under an Industrial Emissions (IE) licence. As part of the IE licence, annual noise monitoring is undertaken at the nearest noise sensitive locations to compare against the operational Emission Limit Values (ELV's).

Monitoring results will be submitted to the EPA for review and will also be included within the facilities Annual Environmental Report (AER) issued to the EPA.

10.6.2 Construction Phase

The impact assessment has determined that construction activities can comply with the construction noise and vibration criteria included in **Section 10.5.2.1** at the closest noise sensitive locations.

Notwithstanding this, best practice control measures from BS5228-Parts 1 and 2 are included. BS5228 offers detailed guidance on the control of noise and vibration from demolition and construction activities that will be complied with during the construction phase. Various mitigation measures should be considered and applied during the construction phase and specific examples of such measures are:

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise;
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract;
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers;
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use;
- Any plant, such as generators or pumps that is required to operate outside of normal permitted working hours will be surrounded by an acoustic enclosure or portable screen.

BS 5228 -1:2009+A1 2014 includes guidance on several aspects of construction site practices, which include, but are not limited to selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise monitoring.

The ***Construction Environmental Management Plan*** (**CEMP**) prepared as part of this EIAR (see **Appendix 5.1** in **Volume 3**), summarises the overall environmental management strategy that will be adopted and implemented during the construction phase of the proposed development.

The CEMP is a working document and will be finalised by the Contractor following appointment and prior to commencing works on site. For the control of noise, the contractor will be required to conduct construction noise predictions prior to works taking place and put in place the most appropriate noise control measures depending on the level of noise reduction required at any one location.

Further comment is offered on these items in the following paragraphs, however specific control measures will be chosen depending on the works involved and the noise reduction required.

10.6.2.1 Selection of Quiet Plant

The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item of plant will be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action will be to identify whether or not said item can be replaced with a quieter alternative.

For static plant such as compressors and generators used at work areas such as construction compounds etc., the units will be supplied with manufacturers' proprietary acoustic enclosures where possible.

10.6.2.2 General Comments on Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant, or the application of improved sound reduction methods in consultation with the supplier or the best practice use of equipment and materials handling to reduce noise.

- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant will be switched off when not in use and not left idling;
- For piling plant, steady continuous noise such as that generated by diesel engines, it is possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover;
- For all materials handling, the contractor will ensure that best practice site noise control measures are implemented including ensuring that materials are not dropped from excessive heights and drop chutes/dump trucks are lined with resilient materials, where relevant;
- Where compressors, generators and pumps are located in areas in close proximity to noise sensitive properties/ areas and have potential to exceed noise criterion, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation;
- Resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises

can be controlled by fixing resilient materials in between the surfaces in contact;

- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

10.6.2.3 Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen, its mass, and its position relative to both the source and receiver.

In addition, careful planning of the site layout will also be considered. The placement of temporary site buildings such as offices and stores between the site and sensitive locations can provide a good level of noise screening during the phasing of works.

10.6.2.4 Hours of Work

Construction noise impacts will be controlled through strict working hours. Construction activity will take place during daytime hours Monday to Friday and Saturdays. It may be necessary to work outside of these hours for example for the consideration of safety, weather or sub- contractor availability.

Consideration will be given to the scheduling of activities in a manner that reflects the location of the site and the nature of neighbouring properties. Each potentially noisy event/activity will be considered on its individual merits and scheduled according to its noise level, proximity to sensitive locations and possible options for noise control.

10.6.2.5 Liaison with the Public

Clear forms of communication will be established between the contractor and noise sensitive areas in proximity so that residents or building occupants are aware of the likely duration of activities likely to generate higher noise or vibration.

10.6.2.6 Monitoring

During the construction phase of the proposed project, spot check noise monitoring will be undertaken at the nearest sensitive locations to ensure construction noise limits set in **Table 10.9** are not exceeded. Refer to Section 11.4 of the **CEMP (Appendix 5.1)** relating to construction monitoring).

Noise monitoring will be conducted in accordance with the International Standard ISO 1996: *Acoustics – Description, measurement and assessment of environmental noise* Part 1 (2016) and Part 2 (2017).

10.7 Cumulative Effects

10.7.1 Proposed Development and Existing Facility

The cumulative effects of the proposed development in terms of noise and vibration take account of the existing environment coupled with the proposed developments at the WtE facility.

The existing environment as measured, takes account of existing sources of noise in the surrounding environment (i.e. operational activities associated with the existing WtE, adjacent industrial facilities i.e. Platin Cement works and road traffic).

Assuming no change to the existing noise environment (i.e. no increase or decrease in the prevailing noise environment occurs as a result of other developments in the area), the following cumulative effects are calculated at the noise sensitive locations measured during the baseline survey.

Table 10.24 Calculated Cumulative Noise Levels at Baseline Survey Locations

Location	Calculated Operational Noise Level, dB $L_{Aeq,T}$	Measured Existing Noise Levels, dB $L_{A90,T}$	Cumulative Noise Level, dB $L_{Aeq,T}$	Increase, dB	Impact Classification
	Daytime				
NSL1	29	46	46	0	Imperceptible
NSL2	24	50	50	0	
NSL3	30	53	53	0	
NSL4	31	53	53	0	
NSL5	26	50	50	0	
Location	**Evening**			**Increase, dB**	
NSL1	27	43	43	0	Imperceptible
NSL2	22	46	46	0	
NSL3	27	45	45	0	
NSL4	24	45	45	0	
NSL5	25	46	46	0	
Location	**Night-time**			**Increase, dB**	
NSL1	27	43	43	0	Imperceptible
NSL2	22	45	45	0	
NSL3	26	34	36	+1	Not Significant
NSL4	23	34	36	0	Imperceptible
NSL5	25	45	45	0	

The results of the cumulative assessment indicate the operation of the proposed development will not add to the prevailing noise environment during day or evening periods.

During night-time periods, there is potential for noise levels to be increased by up to 1dB(A) at noise sensitive properties to the south-west of the facility. The combined noise level at this location is, however well below the night-time noise emission limit value of 45dB.

10.7.2 Developments in Surrounding Area

In addition to the operation of the proposed development, there are a number of additional projects proposed in the vicinity of WtE facility. A full list of projects which have been considered as part of this EIAR for cumulative effects are listed in **Chapter 18** ***Cumulative Effects, Other Effects and Interactions***.

On review of the projects listed for cumulative impacts, none of these proposed developments are close enough or include any significant noise sources to result in a cumulative noise impact to noise sensitive locations.

The relevant projects reviewed are summarised below:

10.7.2.1 Irish Cement Limited – Planning Reference LB150375 & PL17 .PA0050

These planned developments relates to a dust silo and application for replacement of fossil fuels with alternative fuels respectively. Both proposals have a negligible noise impact on the surrounding noise environment. In addition any amendments to on-site operations within the Platin cement works IE licence are required to operate within the relevant noise emission limit values.

Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the projects above.

10.7.2.2 SSE Generation Ireland Ltd. Planning Ref : PL17.303678 .

Proposal for 110kV transmission substation at Carranstown and Caulstown, Platin, Duleek, Co. Meath. The environmental report for this development concludes there are no potential significant noise sources identified with respect to the substation, and therefore no operational noise impacts are predicted. On the basis of the assessment presented, the cumulative impact of this development coupled with the proposed development under consideration here is therefore negligible.

Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

10.7.2.3 Highfield Solar Ltd. Planning Reference: PL17 .303568 and PL17.248146.

Garballagh Lower Solar Farm, Co. Meath. This development is over 4km from the Caranstown WtE facility and will not result in any cumulative noise impact to the surrounding environment.

Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the projects above.

The predicted noise effects associated with the proposed development at the Caranstown WtE facility are therefore well below those in the existing noise environment and hence will be imperceptible in terms of noise to its surrounding environment.

10.7.2.4 Cumulative Effects Summary

On review of the projects discussed above, given their distance to the WtE facility and /or the low predicted noise levels associated with each, the cumulative effect of all projects operating simultaneously will result in a negligible change in the prevailing noise environment. The cumulative noise impact is determined to be not significant.

10.8 Residual Effects

10.8.1 Operational Phase

The assessment has concluded that cumulative operational noise levels associated with the existing and proposed development can continue to operate within the facilities IE licence noise emission limits. The overall effect is imperceptible to not significant when added to the prevailing noise environment.

10.8.2 Construction Phase

During the construction phase of the project, there is potential for a temporary increase in noise levels during site preparation and building construction. Traffic transporting material to and from the site in addition to plant equipment used for developing the proposed buildings and structures are the main potential noise sources during this phase.

Whilst increased noise levels will be experienced during this phase, these will be intermittent and temporary in nature and are below the construction noise limits at the nearest noise sensitive properties.

The application of binding noise limits (**Table 10.11**) and hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum.

In summary, the construction phase of the development will be of short term, minor to moderate negative impact.

During the construction phase, no significant source of vibration is expected. Any vibration impacts during this phase will be well below the limit values set out in **Table 9.6** and will not lead to perceptible level of vibration at the nearest sensitive locations to the site.

10.9 References

EPA (2002) Guidelines on the Information to be contained in Environmental Impact Statements

EPA (2003) Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)

EPA (2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports

EPA Advice Notes for Preparing Environmental Impact Statements, (Draft, September 2015);

EPA (2016) Guidance Noise for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)

BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1 – Noise.

BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2 – Vibration.

BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration;

BS 8233: 2014: Guidance on Sound Insulation and Noise Reduction for Buildings

Institute of Environmental Management and Assessment (IEMA) (2014) Guidelines for Environmental Noise Impact Assessment

Design Manual for Roads and Bridges (DMRB), LA111 *Noise and Vibration*, Rev 0, Nov 2019.

ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.

ISO 9613-2: 1996: Acoustics – Attenuation of sound during propagation outdoors.

Transport Infrastructure Ireland (2004) Guidelines for the Treatment of Noise and Vibration in National Road Schemes.

11 Biodiversity

11.1 Introduction

This chapter of the EIAR provides an assessment of the likely effects of the proposed Site Sustainability Project, herein referred to as the proposed development on terrestrial and aquatic biodiversity in the receiving environment. Full details of the proposed development can be found in **Chapter 4** ***Description of Proposed Development***.

This chapter of the EIAR describes the existing flora and fauna within and in the vicinity of the existing Indaver facility, the proposed work sites and the surrounding area. This chapter reviews the likely significant effects and proposes measures for the mitigation of these effects, where appropriate.

The potential impacts on biodiversity in this Chapter should be read in conjunction with the other chapters of the EIAR including **Chapter 4** ***Description of the Proposed Development***, **Chapter 5** ***Construction Activities***, **Chapter 8** ***Air Quality***, **Chapter 9** ***Climate***, **Chapter 10** ***Noise and Vibration***, **Chapter 14** ***Land and Soils***, **Chapter 15** ***Water***, **Chapter 17** ***Major Accidents and Disasters*** and **Appendix 5.1** ***Construction & Environmental Management Plan (CEMP)***.

11.2 Assessment Methodology

11.2.1 Introduction

This appraisal is based on surveys of the entire Indaver site and surrounding area and a review of desktop data. Ecological surveys were carried out on the 30th of September 2019 and 22nd April 2020. A flora and fauna report was prepared previously for the site in February 2019 by the onsite Environmental Specialist. Reports prepared for previous planning applications at the Indaver site were also consulted during the preparation of this chapter of the EIAR.

11.2.2 Relevant Legislation Designated Sites.

Flora and fauna in Ireland are protected at a national level by the Wildlife Acts, 1976 to 2000 and the European Communities (Birds and Natural Habitats) Regulations 2011. They are also protected at a European level by the EU Habitats Directive (92/43/EEC) and the EU Birds Directive (79/409/EEC) amended in 2009 as the Directive 2009/147/EC.

Under this legislation, sites of nature conservation importance are then designated in order to legally protect faunal and floral species and important/vulnerable habitats. The relevant categories of designation are as follows:

- Special Areas of Conservation (SAC) are designated under the European Communities (Birds and Natural Habitats) Regulations 2011 to comply with the EU Habitats Directive (92/43/EEC);

- Special Protection Areas (SPAs) and designated under the EU Birds Directive (79/409/EEC) amended in 2009 as the Directive 2009/147/EC; and
- Proposed Natural Heritage Areas (pNHA) are listed under the Wildlife (Amendment) Act, 2000. They have limited legal protection under Local Authority Development Plans.

11.2.3 Desktop Review

A desktop study was carried out to collate the available information on the local ecological environment. The purpose of the desktop study was to identify features of ecological value occurring within the development site and those occurring in close proximity to it. A desktop review also allows the key ecological issues to be identified early in the appraisal process and facilitates the planning of surveys. Sources of information utilised for this report include the following:

- National Parks & Wildlife Service (NPWS) - www.npws.ie;
- Environmental Protection Agency (EPA) – www.epa.ie;
- National Biodiversity Data Centre – www.biodiversityireland.ie;
- County Meath Biodiversity Action Plan (Draft) 2015-2020;
- Bat Conservation Ireland - http://www.batconservationireland.org;
- Birdwatch Ireland - http://www.birdwatchireland.ie/;
- British Trust for Ornithology (BTO)-www.BTO.ie;
- *Best Practice Guidance for Habitat Survey and Mapping* (Heritage Council, 2011);
- *Guidance on integrating climate changes and biodiversity into environmental impact assessment* (EU Commission, 2013);
- *Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority* (2009);
- National Biodiversity Action Plan 2017-2021;
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August, 2018);
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (Draft August 2017);
- Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU) European Union, 2017.

11.2.4 Guidance

This Chapter of the EIAR follows the Environmental Protection Agency's Draft *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2017). It also takes account of the draft *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment* (Department of Environment, Community and Local Government, July 2012), Chartered Institute of Ecology and Environmental Management *Guidelines on Ecological Impact Assessment in the UK and Ireland, 2nd edition* (CIEEM 2016) and Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, Version 1.1 (CIEEM, 2018). Reference was also made to the following key legislation and documents where relevant:

European

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (The Habitats Directive);
- Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (codified version of Directive 79/409/EEC as amended) (The Birds Directive);
- Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (The Water Framework Directive);
- Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life (The Fish Directive (consolidated)).

Republic of Ireland

- The Wildlife Act 1976 as amended by the Wildlife Act 1976 (Protection of Wild Animals) Regulations, 1980, the Wildlife (Amendment) Act 2000, the Wildlife (Amendment) Act 2010, European Communities (Wildlife Act, 1976) (Amendment) Regulations 2017. (The Wildlife Act);
- European Communities (Conservation of Wild Birds) Regulations 1985 (S.I. 291/1985) as amended by S.I. 31/1995;
- European Communities (Natural Habitats) Regulations, S.I. 94/1997 as amended by S.I. 233/1998 & S.I. 378/2005 (The Habitats Regulations);
- Fisheries (Consolidation) Act, 1959 (as amended), hereafter referred to as the Fisheries Act;
- European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011);
- The Flora (Protection) Order, 1999 (S.I. No. 94/1999).

11.2.5 Surveys Overview

Surveys were carried out at the site in September 2019 and April 2020. The likelihood of additional ecological impacts occurring, which have not been identified in this EIAR, is considered remote. The following surveys were carried out.

- Habitats were mapped according to the classification scheme outlined in the Heritage Council publication *A Guide to Habitats in Ireland (Fossitt, 2000)* and following the guidelines contained in *Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011).* Habitats were cross referenced with Habitats Directive Annex 1 habitats.
- The site was surveyed for invasive species and rare floral species.
- All bird species recorded during habitat surveys were recorded.
- A general mammal survey was carried out in conjunction with the habitat survey.
- All aquatic habitats were visually assessed.

This report was prepared by Carl Dixon MSc. (Ecological Monitoring), Sorcha Sheehy PhD (Ecology) and Ian McDermott MSc. (Ecological Monitoring). Carl Dixon MSc (Ecology) is a senior ecologist who has over 20 years' experience in ecological and water quality assessments with particular expertise in freshwater ecology. He also has experience in mammal surveys, invasive species surveys and ecological supervision of large-scale projects. Projects in recent years include the Indaver Waste to Energy Facility Ringaskiddy, Shannon LNG Project, supervision of the Fermoy Flood Relief Scheme, Skibbereen Flood Relief Scheme, Upgrade of Mallow Waste Water Treatment Plant (WWTP) Scheme, Douglas Flood Relief Scheme, Great Island Gas Pipeline etc.

Ian McDermott MSc (Ecology) is an experienced ecologist with particular expertise in surveying for invasive species, mammal and bird surveys. He carries out ongoing water quality surveys for a range of projects including quarries, WWTPs etc. Likewise, he has carried out ecological surveys for a range of projects including industrial developments, pipelines, quarries, agricultural units etc.

Sorcha Sheehy PhD (ecology/ornithology) is an experienced ecological consultant with over ten years' experience. She has worked on Screening/NIS's for a range of small and large-scale projects with particular expertise in assessing impacts on birds. Recent projects include bird risk assessments for Dublin and Cork Airports, Waste to Energy Facility Ringaskiddy and Water Storage Schemes for Irish Water.

11.3 Receiving Environment

11.3.1 General Landscape

The site is located adjacent to the R152 road which runs along the southern boundary of the site and connects Duleek and Drogheda. Duleek is located approximately 2.7km to the south and the larger town of Drogheda is located approximately 4.5km to the northeast. Approximately 260m north of the facility boundary is the large Platin Irish Cement facility which is a dominant feature in the local landscape.

The north, east and west the facility is surrounded by intensively managed agricultural land. A mix of arable and pastoral farming is the dominant activity and the fields are generally large within a flat to gently undulating landscape. Internal agricultural boundaries are largely absent due to the consolidation of small fields into large units. Hedges are generally of moderate to high quality and mature native trees have a scattered distribution along the external boundaries of fields.

11.3.2 Designated Conservation Areas

11.3.2.1 European (Natura 2000) Sites

Special Areas of Conservation (SACs) and candidate SACs are protected under the Habitats Directive 92/43/EEC and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Special Protection Areas (SPAs) are protected under the Birds Directive 2009/147/EC and European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Collectively, these sites are referred to as Natura 2000 or European sites.

In accordance with the European Commission Methodological Guidance (EC2001), a list of Natura 2000 Sites that can be potentially affected by the proposed project has been complied. All candidate SAC's (cSAC) and SPAs sites within a 15km radius of the proposed development have been identified, **Table 11.1** relevant Natura 2000 sites are shown in **Figure 11.1 and Figure 11.2**. It is noted that use of a 15km radius was chosen as a precautionary measure, as impacts at this distance from the proposed development are highly unlikely in the absence of significant aqueous emissions.

Table 11.1. Designated sites and location relative to the proposed development area.

Site	Code	Distance at the closest point (distance downstream) (approx.)
Special Area of Conservation (SAC)		
River Boyne And River Blackwater	002299	Located 3.2km north- northwest (not hydrologically connected)
Boyne Coast and Estuary	001957	Located 7.2km northeast (not hydrologically connected)
Special Protection Area (SPA)		
River Boyne and River Blackwater	004232	Located 3.4km north- northwest (not hydrologically connected)
Boyne Estuary	004080	Located 6.1km northeast (not hydrologically connected)
River Nanny Estuary and Shore	004158	Located 8.1km east (11.3km downstream)

The site is potentially hydrologically connected to one of the Natura 2000 sites listed in **Table 11.1**, i.e. River Nanny Estuary and Shore SPA. The site lies within the Nanny River Catchment and the River Nanny, is located about 2km to the south of the site (Refer to **Figure 1.2** of **Chapter 1** ***Introduction*** and **Figure 14.1** of **Chapter 14** ***Land and Soils***, both of which show the Indaver site and surrounds including the River Nanny to the south). Surface water runoff from the site currently passes through a class 1 interceptor and attenuation pond before discharging to a seasonal ditch which drains to the Cruicerath stream c.130m to the west of the site, which in turn discharges to the River Nanny. It is noted that the Cruicerath Stream was dry during a site survey in April 2020 and thus this stream is seasonal and will not support permanent fish populations.

The River Nanny Estuary and Shore SPA comprises the estuary of the River Nanny and sections of the shoreline to the north and south of the estuary (c.3km in length). The estuarine channel, which extends inland for almost 2km, is narrow and well sheltered. Sediments are muddy in character and edged by saltmarsh and freshwater marsh/wet grassland. The shoreline, which is approximately 500m in width to the low tide mark, comprises beach and intertidal habitats. It is a well-exposed shore, with coarse sand sediments. The well-developed beaches, which are backed in places by clay cliffs, provide high tide roosts for the birds. The village of Laytown occurs in the northern side of the River Nanny estuary. The River Nanny Estuary and Shore SPA is an important east coast site, with nationally important populations of Golden Plover, Oystercatcher, Ringed Plover, Knot, Sanderling and Herring Gull. The population of Knot and Sanderling are of particular note as they represent 4% and 3.8% of the respective all-Ireland totals. A range of other waterfowl species also occur, including Light-bellied Brent Goose, as well as *Larus* gulls. The site is of importance as a roosting area for these bird species and also provides feeding habitat.

The River Boyne and River Blackwater SAC and River Boyne and River Blackwater SPA are located approximately 3.2km and 3.4km north-northwest of the proposed development site respectively. Although not hydrologically connected to the proposed development site, consideration was given to the potential presence of qualifying species for these sites namely Otter and

Kingfisher which could potentially forage within the existing pond within the Indaver site.

The Boyne Estuary SPA moderately-sized coastal site is situated west of Drogheda on the border of Counties Louth and Meath. The site comprises most of the estuary of the Boyne River, a substantial river which drains a large catchment. Apart from one section which is over 1 km wide, its width is mostly less than 500 m. The river channel, which is navigable and dredged, is defined by training walls, these being breached in places. Intertidal flats occur along the sides of the channelled river. This SPA is of considerable ornithological importance for wintering waterfowl, with Black-tailed Godwit occurring in internationally important numbers and nine other species having populations of national importance. Of particular significance is that three species that regularly occur, Golden Plover, Bar-tailed Godwit and Little Tern are listed on Annex I of the E.U. Birds Directive. Part of the Boyne Estuary SPA is a Wildfowl Sanctuary.

The Boyne Coast and Estuary SAC is a coastal site which includes most of the tidal sections of the River Boyne, intertidal sand- and mudflats, saltmarshes, marginal grassland, and the stretch of coast from Bettystown to Termonfeckin that includes the Mornington and Baltray sand dune systems. The site is of considerable conservation interest as a coastal complex that supports good examples of eight habitats that are listed on Annex I of the E.U. Habitats Directive, including one which is listed with priority status, and for the important bird populations that it supports.

Potential impacts on designated Natura 2000 sites (SAC/cSAC/SPA) are specifically addressed in a Natura Impact Statement (NIS) which has been submitted as part of this application. The NIS notes the following: *"*It has been objectively concluded by Dixon Brosnan Environmental Consultants, following an examination, analysis and evaluation of the relevant information, including in particular the nature of the predicted impacts from the proposed development and with the implementation of the mitigation measures proposed, that the proposed development does not pose a risk of adversely affecting (either directly or indirectly) the integrity any European site, either alone or in combination with other plans or projects, and there is no reasonable scientific doubt in relation to this conclusion"

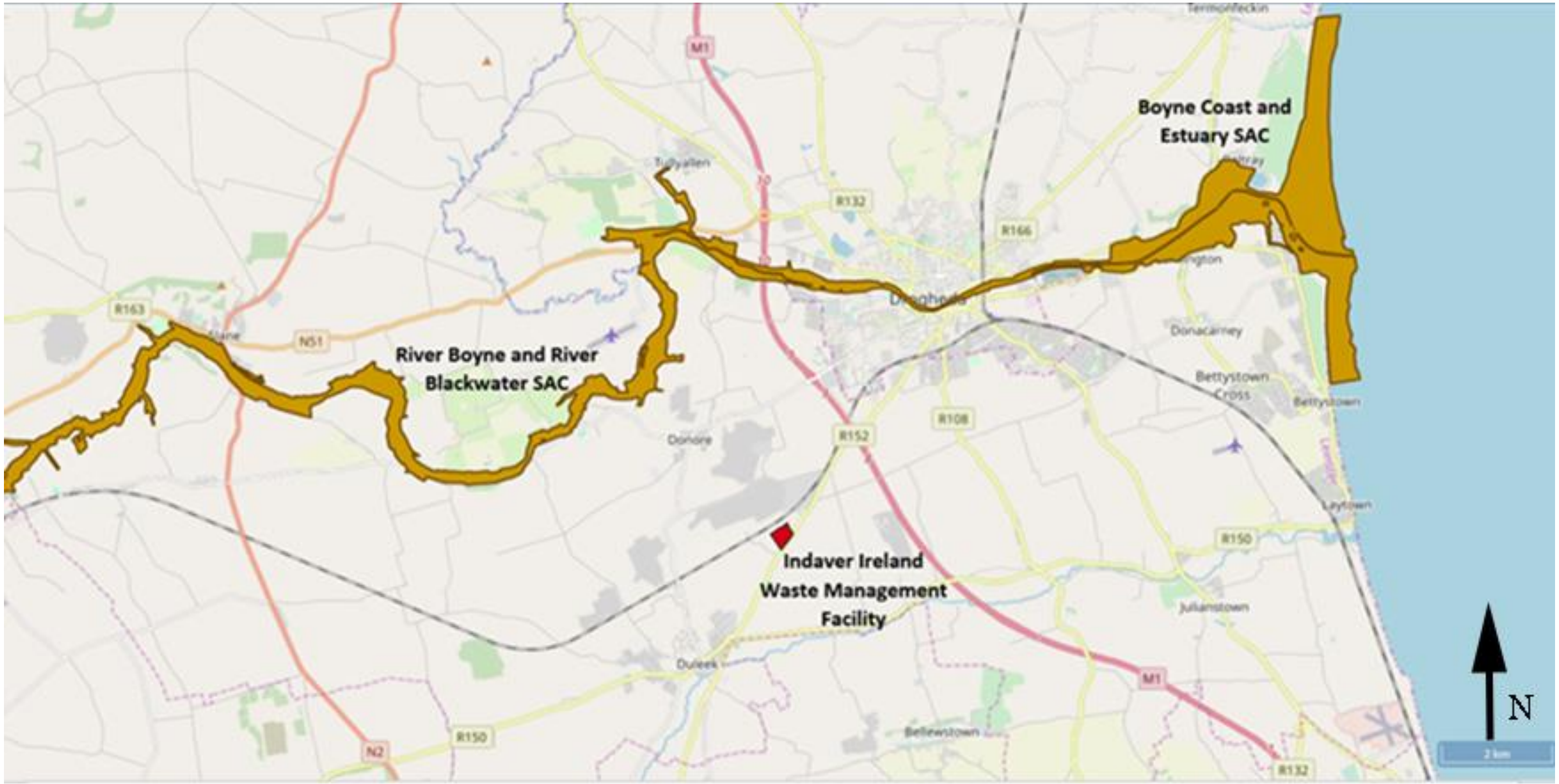

Figure 11.1: Natura 2000 Sites (SACs) in relation to the Indaver Waste Management Facility at Carranstown, Co. Meath. Not to scale. (Source EPA maps 2020)

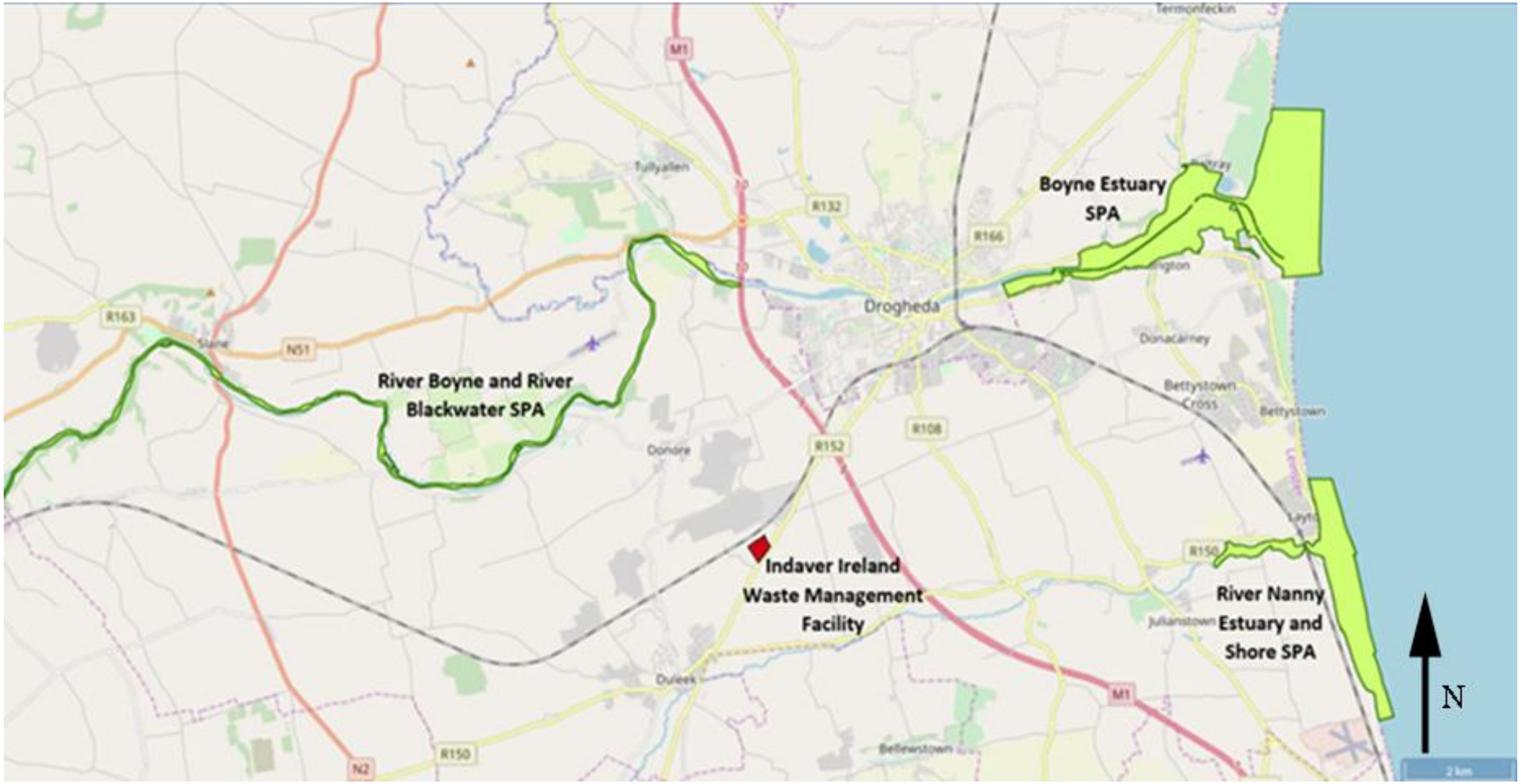

Figure 11.2: Natura 2000 Sites (SPAs)in relation to the Indaver Waste Management Facility at Carranstown, Co. Meath. Not to scale. (Source EPA Maps 2020).

11.3.2.2 Nationally Protected Sites

Natural Heritage Areas (NHAs/pNHAs) are national designations under the Wildlife Act 1976, as amended. A Natural Heritage Area (NHA) is designated for its wildlife value and receives statutory protection. A list of proposed NHAs (pNHAs) was published on a non-statutory basis in 1995, but these have not since been statutorily proposed or designated.

The following proposed NHAs, as shown in **Figure 11.3**, are located in the vicinity of the proposed development:

- Duleek Commons (Site Code: 001578) located approximately 2.0 km southwest
- Dowth Wetland (Site Code: 001861) located approximately 3.6 km northwest
- Boynes River Islands (Site Code: 001682) located approximately 4.4 km north
- Thomastown Bog (Site Code: 001593) located approximately 5.3 km southwest
- King William’s Glen (Site Code: 001804) located approximately 5.6 km northwest
- Rossnaree Riverbank (Site Code: 001589) located approximately 6.1 km west-northwest
- Cromwell's Bush Fen (Site Code: 001576) located approximately 6.7 km southeast
- Crewbane Marsh (Site Code: 000553) located approximately 6.8 km west-northwest
- Laytown Dunes/Nanny Estuary (Site Code: 000554) located approximately 6.9 km east
- Boyne Coast and Estuary (Site Code: 001578) located approximately 7.1 km northeast
- Balrath Woods (Site Code: 001579) located approximately 7.9 km southwest
- Boyne Woods (Site Code: 001592) located approximately 9.6 km west-northwest.

With the exception of a hydrological connection to the Laytown Dunes/Nanny Estuary (Site Code: 000554), there are no other conservation sites with biological connectivity to the subject site that could potentially be affected by the proposed project.

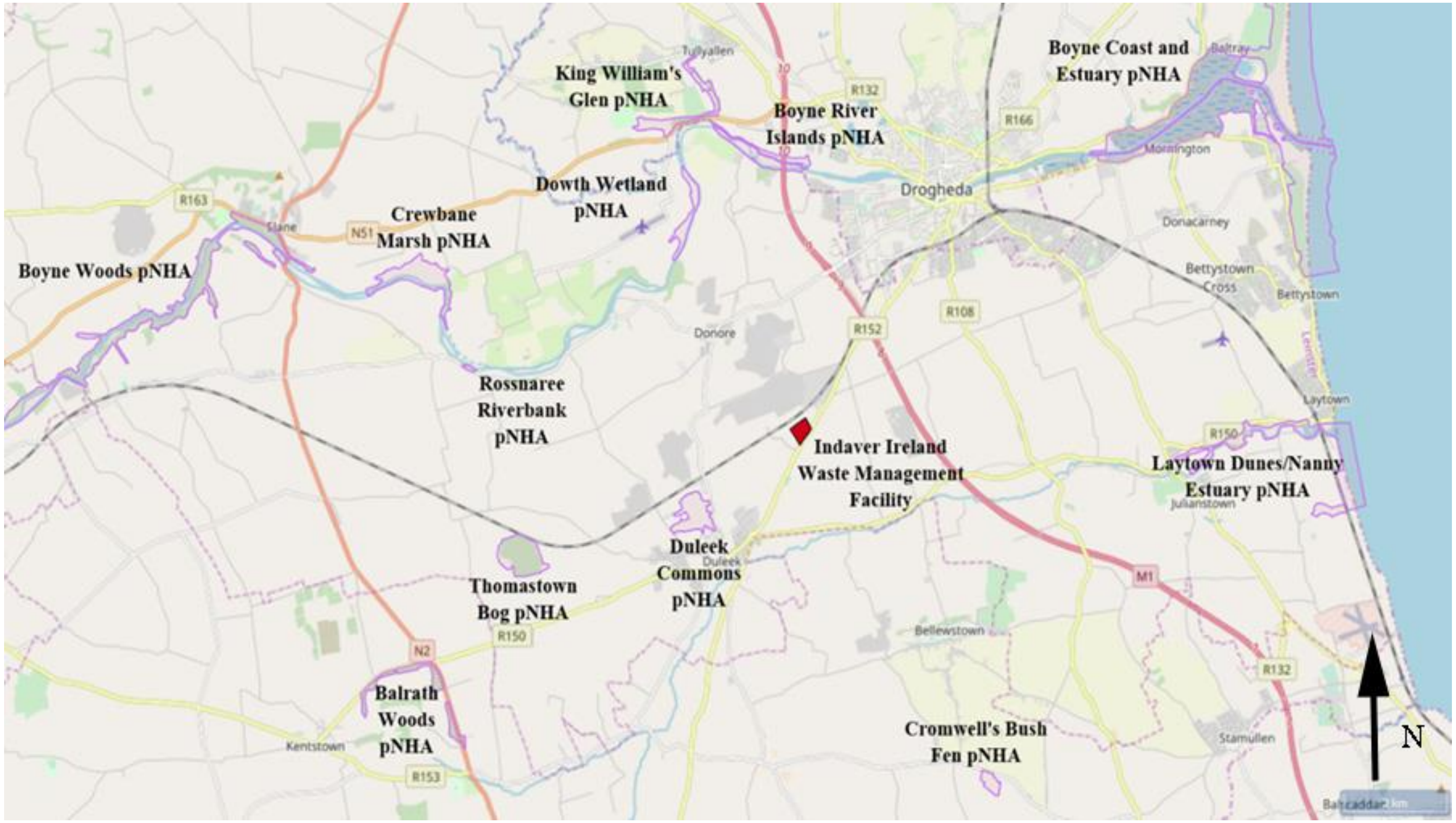

Figure 11.3: Proposed Natural Heritage Areas (pNHAs) in relation to the Indaver Waste Management Facility at Carranstown, Co. Meath. Not to scale. (Source EPA Maps 2020)

11.3.2.3 Important Bird Areas – Nanny estuary and shoreline

Important Bird and Biodiversity Areas (IBAs) are sites selected as important for bird conservation because they regularly hold significant populations of one or more globally or regionally threatened, endemic or congregator bird species or highly representative bird assemblages. The European IBA programme aims to identify, monitor and protect key sites for birds all over the continent. It aims to ensure that the conservation value of IBAs in Europe (now numbering more than 5,000 sites or about 40% of all IBAs identified globally to date) is maintained, and where possible enhanced. The programme aims to guide the implementation of national conservation strategies, through the promotion and development of national protected-area programmes. Through their designation they aim to form a network of sites ensuring that migratory species find suitable breeding, stop-over and wintering places along their respective flyways.

The function of the Important Bird Area (IBA) Programme is to identify, protect and manage a network of sites that are important for the long-term viability of naturally occurring bird populations, across the geographical range of those bird species for which a site-based approach is appropriate. The Indaver site is potentially hydrologically connected to an IBA site via the River Nanny, i.e. the Nanny estuary and shoreline IBA (Site Code: IE118).

The Nanny estuary and shoreline IBA site qualifies for designation due to the population of Red Knot under the following IBA Criteria (2000):

- B2 - The site is one of the most important in the country for a species with an unfavourable conservation status in Europe and for which the site-protection approach is thought to be appropriate.

Table 11.2: Summary of the Nanny estuary and shoreline IBA trigger species.

Species	Current IUCN Red List Category	Season	Year(s) of estimate	Population estimate	IBA Criteria Triggered
Red Knot (*Calidris canutus*)	NT	Winter	1996	800 individuals	B2

11.4 Habitats

Site surveys were carried out on the 30th of September 2019 and 22th of April 2020. Habitat mapping was carried out in line with the methodology outlined in the Heritage Council Publication, Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011). The terrestrial and aquatic habitats within or adjacent to the proposed development site was classified using the classification scheme outlined in the Heritage council publication *A Guide to Habitats in Ireland* (Fossitt, 2000) and cross referenced with Annex 1 Habitats where required. The survey results are representative of the habitats within the application site and include the dominant and characteristic species of flora.

No rare plant species were recorded within the works area during the site survey and given the modified nature of the habitats within the proposed development area are highly unlikely to occur.

A current overview of habitats recorded within the site is shown in **Figure 11.4** and the habitats recorded on site are described below. Their ecological value is detailed in **Table 11.3.** The ecological value of habitats has been defined using the classification scheme outlined in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority, 2009) which is included in **Appendix 11.1**, **Volume 3** of this EIAR. It should be noted that the value of a habitat is site specific and will be partially related to the amount of that habitat in the surrounding landscape. Habitats that are considered to be good examples of Annex I and Priority habitats are classed as being of International or National Importance. Semi-natural habitats with high biodiversity in a county context and that are vulnerable, are considered to be of County Importance. Habitats that are semi-natural, or locally important for wildlife, are considered to be of Local Importance (higher value) and sites containing small areas of semi-natural habitat or which maintain connectivity between habitats are considered to be of Local Importance (lower value).

11.4.1 Habitat survey – proposed works area

Habitats within the proposed works area are generally of low ecological value at a local level i.e. amenity grassland (GA2), buildings and artificial surfaces (BL3), ornamental/non-native shrub (WS3), spoil and bare ground (ED2) and recolonising bare ground (ED3). A narrow band of planted immature woodland (WS2) / (Mixed) broadleaved woodland (WD1) will also be impacted by the proposed development.

The northern half of the site is dominated by man-made structures with large areas of hardstanding also present (Buildings and artificial surfaces (BL3)). Amenity grassland (GA2) is also common. These grassland habitats are maintained as short swards and are generally species poor. However, the composition and relative abundance of species varies throughout the site. The overall Indaver facility was originally developed on agricultural fields used for arable crops or intensive pasture. As a result, a number of species derived from these habitats still exist within the proposed works area. Additionally, smaller areas which are less intensively managed are more diverse with species typical of dry meadows and grassy verges (GS2) habitat becoming established.

Species recorded within the grassland habitats include White Clover (*Trifolium repens*), Daisy *(Bellis perennis*), Yorkshire-fog (*Holcus lanatus*), Broad Dock (*Rumex obtusifolius*), Creeping Buttercup (*Ranunculus repens*), Ragwort (*Senecio jacobaea*), Thistles (*Cirsium arvense & C. vulgare*), Silverweed (*Potentilla anserine*), Dandelion (*Taraxacum spp*.), Nettle (*Urtica dioica*), Cock's-foot (*Dactylis glomerata*). Bush Vetch (*Vicia sepium*), Ribwort Plantain (*Plantago lanceolate*), Creeping Cinquefoil (*Potentilla reptans*), Greater Plantain (*Plantago major*), Meadow Buttercup (*Ranunculus acris*), Hard Rush (*Juncus inflexus*) and False Oat-grass (*Arrhenatherum elatius*).

The southern half of the site is dominated by disturbed areas that are used for staff parking, contractor parking and laydown areas (buildings and artificial surfaces (BL3)). These areas are largely unvegetated because they are regularly driven over and weed species are controlled by herbicides.

A large berm in the southeast corner of the site which is to be increased as part of the proposed development has been colonised by a range of ruderals and is classified as recolonising bare ground (ED3). Smaller areas of this habitat have a scattered distribution within the facility. Species noted within the recolonising bare ground (ED3) habitat include; Willowherbs (*Epilobium spp*.), Black Medick (*Medicago lupulina*), Sow-thistle (*Sonchus asper & S. arvensis*), Common Poppy (*Papaver rhoeas*), Common Vetch (*Vicia sativa ssp*.), Creeping Buttercup (*Ranunculus repens*), Thistles (*Cirsium arvense & C. vulgare*), Coltsfoot (*Tussilago farfara*), Red Bartsia (*Odontites vernus*), Selfheal (*Prunella vulgaris*), Creeping Cinquefoil (*Potentilla reptans*), Orache (*Atriplex spp*.), Herb-robert (*Geranium robertianum*), Scarlet Pimpernel (*Anagallis arvensis*), Greater Plantain (*Plantago major*), Butterfly Bush/Buddleja (*Buddleja davidii*), Sun Spurge (*Euphorbia helioscopia*), Speedwell (*Veronica spp*.), Knotgrass (*Polygonum aviculare*), Ragwort (*Senecio jacobaea*), Fleabane (*Conyza spp*.), Groundsel (*Senecio vulgaris*), Cut-leaved Crane's-bill (*Geranium dissectum*), Redshank (*Persicaria maculosa*), Ox-eye Daisy (*Leucanthemum vulgare*) and Daisy (*Bellis perennis*).

As part of the proposed development the screening berm along the southern boundary of the site is to be extended. This will impact on a small portion of a planted band of woodland (immature woodland (WS2) / (mixed) broadleaved woodland (WD1)) growing on the berm. This band of woodland while fragmented from similar habitats within the site and surrounding landscape is of a slightly higher ecological value. Two other woodland bands growing on top of man-made berms within the site were also recorded but will not be affected. Species recorded within these woodlands include; Small leaved lime (*Tilia cordata*), Alder (*Alnus glutinosa*), Silver birch (*Betula pendula*), Hazel (*Corylus avellane*), Hawthorn (*Crataegus monogyna*), Scots pine (*Pinus Sylvestris*), English Oak (*Quercus robur*), Wild cherry (*Prunus avium*), Double flowered wild cherry (*Prunus avium 'Plena'*), Sessile oak (*Quercus petraea*), Ash (*Fraxinus excelsior*) and Rowan (*Sorbus aucuparia*).

11.4.2 Habitat survey – habitats of note outside the proposed development area

Located in the northwest corner of the site is an attenuation pond (Other artificial lakes and ponds habitat (FL8)) that will not to be impacted by the proposed development. This pond, although generally lacking cover or marginal vegetation, is known to hold a population of Smooth Newt (*Lissotriton vulgaris)*, a species protected under the Wildlife Act 1976, as amended.

Situated just east of the proposed berm extension is an area of grassland that has been seeded with a wildflower mix. This area of grassland has similarities to the dry meadows and grassy verge (GS2) habitat. It is dominated by grasses with a high proportion of tussocky grasses noted e.g. Cock’s-foot (*Dactylis glomerata*).

The broadleaved herb component is characterised by a range of species such as Common Knapweed (*Centaurea nigra*), Clovers (*Trifolium spp*.), Birds-foot-trefoil (*Lotus spp*.) and Ribwort Plantain (*Plantago lanceolate*). Other species noted include Cornflower (*Centaurea cyanus*) and Marjoram (*Origanum vulgare*).

There are sections of well-developed mature hedgerow (WL1) habitats, with some smaller sections of recently planted augmented hedgerows within the facility boundary.

Overall, the species composition is similar throughout with spinose species dominating. A section of treeline (WL2) consisting of mature Ash (Fraxinus excelsior) forms the northwest boundary of the facility. Species noted within the hedgerow habitats include; Hawthorn (*Crataegus monogyna*), Gorse (*Ulex europaeus*), Elder (*Sambucus nigra*), Ash (*Fraxinus excelsior*), Hazel (*Corylus avellana*), Blackthorn (*Prunus spinosa*), Bramble (*Rubus fruticosus agg.)*, Dog-rose (*Rosa canina*), Ivy (*Hedera helix*) and Guelder rose (*Viburnum opulus*).

Drainage ditches (FW4) are associated with some of the hedgerows, primarily concentrated in the northern and western sections of the facility. These piped/buried ditches as well as the open ditches discussed in **Section 11.3.3.1** are illustrated in **Figure 11.5**. These drainage ditches are artificial in origin and have been excavated to enhance drainage and control the flow of water within the site. The north and western ditches have a covering of stone while the internal drainage ditch remains exposed. It is noted that the ditches on site are largely seasonal and dry out during dry periods.

Table 11.3. Habitat types affected within the works areas and their relative ecological value

Habitats	Comments	Ecological value (NRA guidelines)
Buildings and artificial surfaces (BL3)	This is a highly modified habitat with low species diversity and little value for wildlife.	Local importance (Lower value)
Amenity grassland (improved) (GA2)	This is a highly modified habitat with limited value for local wildlife.	Local importance (Lower value)
Ornamental/non-native shrub (WS3)	This category is used for areas that are dominated by ornamental and non-native shrubs.	Local importance (Lower value)
Recolonising bare ground (ED3)	This is a highly modified habitat with low species diversity and limited value for wildlife. However, if left unmanaged recolonising bare ground can be important for wildlife and may support a diverse flora.	Local importance (Lower value)
Spoil and bare ground (ED2)	This is a highly modified habitat with low species diversity and little value for wildlife.	Local importance (Lower value)
Immature woodland (WS2) / (Mixed) broadleaved woodland (WD1)	The woodland habitats on site are generally of low diversity with an underdeveloped ground flora and shrub layer. However, woodland can provide important habitats for local wildlife such as birds, insects, mammals including bats.	Local importance (Higher value)

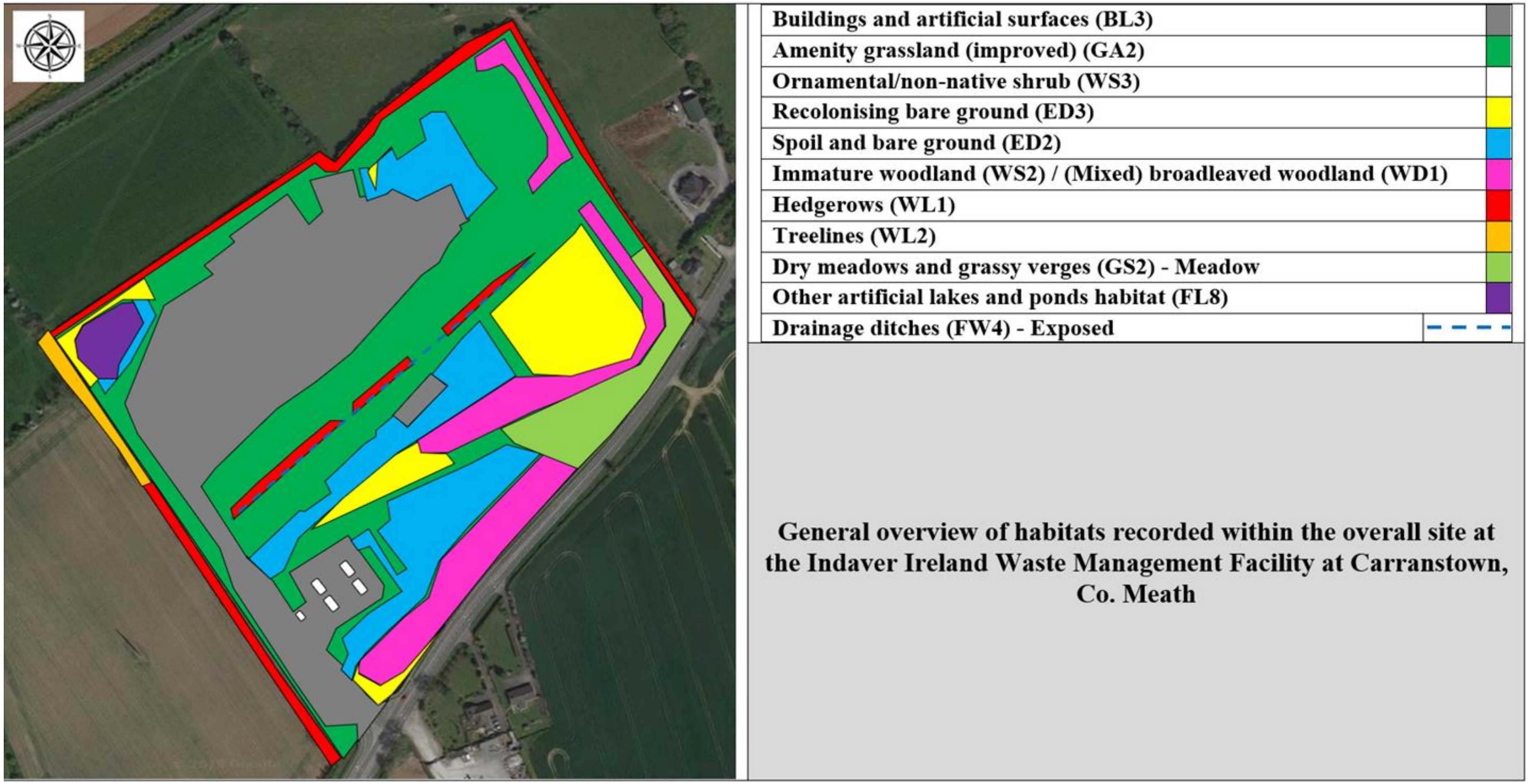

Figure 11.4: General overview of habitats on site (Source Bing Maps. Not to scale).

Figure 11.5. Location of drainage ditches within the site boundary and location of Cruicerath Stream.

11.4.3 Flora

The site of the development lies within Ordnance Survey National Grid 10km square O07. The National Parks and Wildlife Service (NPWS) rare plant database does not list the presence of any protected plant species within O07 (NBDC 21/04/20). In addition, no rare, threatened or legally protected plant species, as listed in the Irish Red Data Book (Curtis & McGough, 1988), were found within the proposed development area.

The National Biodiversity Data Centre (NBDC) online database provides data on the distribution of mammals, birds, and invertebrates within 10km grid squares. Some 363 flowering plants are listed by the NBDC as present in the grid square O07 (NBDC 21/04/20). Of these species listed, only one is listed as a threatened species, namely Marsh Cress (*Rorippa islandica*) which is listed as vulnerable. Marsh Cress is an annual or short-lived perennial herb found in open, muddy habitats such as lake, pond and pool margins, ditch banks, depressions in pasture, in turloughs and rarely on rocks by rivers. There are also records from waste ground and tips. This species was not recorded during site surveys.

No rare species were recorded during the site survey, nor are they expected to occur given that the habitats within the works areas are relatively common.

11.4.4 Invasive species

Non-native plants are defined as those plants which have been introduced outside of their native range by humans and their activities, either purposefully or accidentally. Invasive non-native species are so-called as they typically display one or more of the following characteristics or features: (1) prolific reproduction through seed dispersal and/or re-growth from plant fragments; (2) rapid growth patterns; and, (3) resistance to standard weed control methods.

Where a non-native species displays invasive qualities and is not managed it can potentially: (1) out compete native vegetation, affecting plant community structure and habitat for wildlife; (2) cause damage to infrastructure including road carriageways, footpaths, walls and foundations; and, (3) have an adverse effect on landscape quality. The NBDC lists a number of both aquatic and terrestrial high impact invasive species which have been recorded within grid square O07 (**Table 11.4**). It should be noted that this data relates to the entire 10km^2 area and these species will not necessarily occur within the proposed development site.

Table 11.4: NBDC list of high impact invasive species (Source NBDC 21/04/20).

Common Name	Latin Name
Flora	
Japanese Knotweed	*Fallopia japonica*
Cherry Laurel	*Prunus laurocerasus*
Giant Hogweed	*Heracleum mantegazzianum*
Giant Rhubarb	*Gunnera tinctorial*
Indian Balsam	*Impatiens glandulifera*
Rhododendron	*Rhododendron ponticum*
Canadian Waterweed	*Elodea canadensis*
Terrestrial Mammal	
American Mink	*Mustela vison*
Brown Rat	*Rattus norvegicus*
Eastern Grey Squirrel	*Sciurus carolinensis*
House Mouse	*Mus musculus*
Flatworm (Turbellaria)	
New Zealand flatworm	*Arthurdendyus triangulates*

Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 make it an offence to plant, disperse, allow dispersal or cause the spread of certain species e.g. Japanese knotweed and Rhododendron, keep the plant in possession for purpose of sale, breeding, reproduction, propagation, distribution, introduction or release, keep anything from which the plant can be reproduced or propagated from the species, without a granted licence and keep any vector material for the purposes of breeding, distribution, introduction or release. Regulation 49 deals with the '*Prohibition on introduction and dispersal*' while Regulation 50 deals with the '*Prohibition on dealing with and keeping certain species*'. Regulation 50 has yet to be brought into Irish law. Regulation 74 is a transitional provision in relation to Regulation 49 and 50.

The Wildlife (Amendment) Act 2000 states that anyone who plants or otherwise causes to grow in a wild state in any place in the State any species of (exotic) flora, or the flowers, roots, seeds or spores of (exotic) flora shall be guilty of an offence. There is a statutory obligation under S.I. 477 of 2011 of the European Communities (Birds and Natural Habitats) Regulations 2011 to address invasive species in Ireland.

No high-risk invasive species were recorded during the site surveys. However, the non-native invasive species Butterfly Bush/Buddleja (*Buddleja davidii*) was recorded within the overall site but outside the proposed works area. Butterfly Bush/Buddleja is classified as an Amber Threat species by Invasive Species Ireland which under the right ecological conditions may have a negative impact on native species or habitats. Butterfly Bush is also included in the NRA *Guidelines on the Management of Noxious Weeds and Non-native Species on National Roads* (NRA, 2010) as this species has been shown to have an adverse impact on landscape quality, native biodiversity or infrastructure; and is likely to be encountered during road schemes.

Buddleja or butterfly bush is native to temperate central and south-western China, brought to Europe in the nineteenth century for use as a garden shrub owing to its profusion of flowers which tend to attract a considerable diversity of butterflies.

Buddleja is a medium to large perennial shrub that grows up to 5m tall. It is a very fast-growing species which can reach 2m in its first year, producing flowers and setting seed. It has long arching branches with lilac/purple (sometimes white) flowers, which occur in dense pyramidal shaped panicles during the period June to September. These produce large quantities of nectar. The opposite leaves are lance shaped, deep green above and white-tomentose below.

The seeds produced are very small and numerous with up to 3 million produced per plant. Seeds show lengthy dormancy, remaining in the seed bank for several years. Seeds are adapted for wind dispersal and to a lesser extent dispersal by water. Seeds can be distributed over long distances using wind currents. Additional dispersal can be facilitated by the air currents generated by cars and trains. Stem cuttings can also regenerate new plants and these can be dispersed via waterways. It colonises bare ground very rapidly and can quickly form mono-typic stands. These shrubs also alter the nitrogen and phosphorous amounts in the soil, giving it an advantage that displaces native species, particularly in riparian areas.

Spreading rapidly by windburn seed, butterfly bush displaces native vegetation in disturbed, open areas. It tolerates very poor soils and is capable of growing on walls, rock outcrops or sub-soil. Buddleja can cause structural damage when plants get a foothold in walls, pavements, chimneys etc. Listed and historic buildings can be particularly under threat from the species.

11.5 Fauna

11.5.1 Bats

In Ireland, nine species of bat are currently known to be resident with the residency of the tenth recorded species yet to be proven.

These are classified into two Families: the Rhinolophidae (Horseshoe bats) and the Vespertilionidae (Common bats). The lesser horseshoe bat *Rhinolophus hipposideros* is the only representative of the former Family in Ireland. All the other Irish bat species are of the latter Family and these include three pipistrelle species: common *Pipistrellus pipistrellus*, soprano *P. pygmaeus* and Nathusius' *P. nathusii*, four *Myotids*: Natterer's *Myotis nattereri*, Daubenton's *M. daubentonii*, whiskered *M. mystacinus*, Brandt's *M. brandtii*, the brown long-eared *Plecotus auritus* and Leisler's *Nyctalus leisleri* bats.

Whiskered and Natterer's bats are listed as 'Threatened in Ireland', while the other species are listed as 'Internationally Important' in the Irish Red Data Book 2: Vertebrates (Whilde, 1993). The population status of both Whiskered and Natterer's bats was considered 'indeterminate' because of the small numbers known of each, a few hundred and approximately a thousand respectively. Ireland is considered to be an international stronghold for Leisler's bat, whose global status is described as being at 'low risk, near threatened' (LR; nt) by the IUCN (Hutson, *et al.*, 2001).

Near threatened status is applied to those taxa that are close to being listed as vulnerable (facing a high risk of extinction in the wild in the medium-term future on the basis of a range of criteria defined by the IUCN). The Irish population of the Lesser Horseshoe Bat is estimated at 14,000 individuals and is considered of International Importance because it has declined dramatically and become extinct in many other parts of Europe. Data collected shows that the species increased significantly between from the early 1990's to present.

A review of existing bat records within a 10km radius of the study site (sourced from Bat Conservation Ireland's (BCI) National Bat Records Database via the NBDC) indicates that seven of the nine Irish bat species have been listed in **Table 11.5** have been recorded within O07. It is noted that Nathusius's Pipistrelle have not been included within this database, but they could potentially occur in this general area.The closest record for Nathusius's Pipistrelle is approximately 13km northwest of the site (BCI 13/08/2012). Lesser horseshoe bat (*Rhinolophus hipposideros*) is the only species of bat listed on Annex II of the Habitats Directive (Directive 92/43/EEC) and does not occur in the east of the country.

Table 11.5: Presence of Irish bat species within grid squares O07 (Source BCI via NBDC 21/04/20).

Common name	Scientific name	Presence
Lesser Noctule	*Nyctalus leisleri*	Present
Pipistrelle	*Pipistrellus pipistrellus sensu lato*	Present
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Present
Daubenton's Bat	*Myotis daubentoniid*	Present

Common name	Scientific name	Presence
Natterer's Bat	*Myotis nattereri*	Present
Brown Long-eared Bat	*Plecotus auratus*	Present
Whiskered Bat	*Myotis mystacinus*	Present
Lesser Horseshoe	*Rhinolophus hipposideros*	Absent
Nathusius's Pipistrelle	*Pipistrellus nathusii*	Absent

All bat species are protected under the Wildlife Acts (1976 & 2000) which make it an offence to wilfully interfere with or destroy the breeding or resting place of all species; however, the Acts permit limited exemptions for certain kinds of development. All species of bats in Ireland are listed in Schedule 5 of the 1976 Act and are therefore subject to the provisions of Section 23 which make it an offence to:

- Intentionally kill, injure or take a bat
- Possess or control any live or dead specimen or anything derived from a bat
- Wilfully interfere with any structure or place used for breeding or resting by a bat
- Wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose.

All bats are listed on Annex IV of the EU Habitats Directive. The domestic legislation that implements this Directive gives strict protection to individual bats and their breeding and resting places. It should also be noted that any works interfering with bats and especially their roosts, including for instance, the installation of lighting in the vicinity of the latter, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by NPWS. The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 *"Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences"* issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007.

Furthermore, on 21st September 2011, the Irish Government published the European Communities (Birds and Natural Habitats) Regulations 2011 which include the protection of the Irish bat fauna and further outline derogation licensing requirements. **Table 11.6** summarises the protection given to bats by national and international legislation and conventions.

Evidence of bat activity associated with potential roost sites includes bat droppings, urine staining, feeding remains and dead/alive bats. Indicators that potential roost locations and access points are likely to be inactive include the presence of cobwebs and general detritus within the apertures. Bats generally make use of large mature trees that contain natural holes, cracks/splits in major limbs, loose bark, hollows/cavities, dense epicormic growth (bats may roost within it) and bird and bat boxes. The importance of trees to bats varies with species, season and foraging behaviour.

Evidence indicating bat presence, includes dark stains running below holes or cracks, bat droppings, odours, or scratch marks.

Table 11.6 Legislative protection for bats in Ireland

Legislation/Convention	Relevance to Irish bats
Irish Wildlife Act (1976) & Irish Wildlife (Amendment) Act 2000.	It is an offence to wilfully interfere with or destroy the breeding or resting place of bats, (with some exemptions for certain kinds of construction development). Provides for the creation of NHAs.
EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Directive 92/43/EEC), commonly known as the 'Habitats Directive	Lists all the vesper bats in Annex IV as in need of strict protection and also encourages Member States to conserve landscape features such as river corridors, field boundaries, ponds and woodlands. It also requests that Member States establish a system to monitor the incidental capture and killing of the animals listed in Annex IV. The lesser horseshoe bat is further listed in Annex II of the EU Habitats Directive The level of protection offered to lesser horseshoe bats effectively means that areas important for this species are designated as Special Areas of Conservation.
The Convention on the Conservation of European Wildlife and Natural Habitats, commonly known as the 'Berne Convention'.	It obliges states to protect and conserve animals and their habitats, especially those listed as endangered or vulnerable. Also obliges parties to promote national policies for the conservation of wild fauna and natural habitats
The Convention on the Conservation of Migratory Species of Wild Animals, commonly known as the 'Bonn Convention'.	This led to the European Bats Agreement (EUROBATS), which lists a wide range of objectives, including promoting research programmes relating to the conservation and management of bats, promoting bat conservation and public awareness of bats, and identifying and protecting important feeding areas of bats from damage and disturbance.

Bats also often use features such as hedgerows, treelines, woodland edges and waterways as commuting pathways between roosts and foraging areas. Sheltering vegetation, such as treelines and woodland, not only acts as cover from potential predators and the weather, but also provides structure for acoustic orientation and navigation. Sheltered areas also allow insects to gather and therefore support bat foraging.

As part of the original application for the development of the existing facility, bat surveys were conducted in 2008. The surveys identified that bats utilised the overall site for feeding, commuting and roosting. Mitigation measures in the form of bat boxes and supervised felling of trees were recommended to minimise the impact to bat species as a result of the original development.

In order to mitigate against the potential loss of bat foraging/roosting sites identified for bat species, six bat boxes were erected at the site in 2008. The main function of bat boxes is to provide alternative safe roosting sites for groups of bats where natural sites become unavailable. Details of the Bat Box scheme were forwarded to Bat Conservation Ireland to be included in their database for monitoring purposes.

Unpublished reports by Bat Eco Services show that the 2012 results indicated evidence of usage (bat droppings) in four boxes but with no bats present. Results in 2015 again indicated evidence of low usage (bat droppings) in four boxes but with no bats present.

The linear features around the periphery of the site have the potential to link roost sites to foraging areas and facilitate the dispersal of bats into the wider landscape. These linear boundary habitats will be unaffected by the proposed development. It is noted that there are large areas of pasture with high quality hedgerows and treelines in the surrounding area and outside the site boundary, which provide much higher quality potential feeding habitat.

Overall is has been concluded that the proposed development area is of low to negligible value for bats. The grassland areas and planted woodland within the site are considered of low value to local bat populations and the proposed development is unlikely to result in adverse impacts through habitat loss. Overall there may be a minor negative impact on the local bat populations foraging within the overall site.

Bats which use the Indaver site, albeit in small numbers, are currently habituated to existing noise and activity levels and given no significant changes in the management of the facility will occur, bats are likely to continue to use the site during and post construction.

11.5.2 Otter

Otters, along with their breeding and resting places are protected under the provisions of the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act, 2000. Otters have additional protection because of their inclusion in Annex II and Annex IV of the Habitats Direct which is transposed into Irish law in the European Communities (Natural Habitats) Regulations (S.I 94 of 1997), as amended. Otters are also listed as requiring strict protection in Appendix II of the Berne Convention on the Conservation of European Wildlife and Natural Habitats and are included in the Convention on International Trade of Endangered species (CITES).

Although rare in parts of Europe they are widely distributed in the Irish countryside in both marine and freshwater habitats. Otters are solitary and nocturnal and as such are rarely seen. Thus, surveys for otters rely on detecting signs of their presence. These include spraints (faeces), anal gland secretions, paths, slides, footprints and remains of prey items. Spraints are of particular value as they are used as territorial markers and are often found on prominent locations such as grass tussocks, stream junctions and under bridges. In addition, they are relatively straightforward to identify.

Otters occasionally dig out their own burrows but generally they make use of existing cavities as resting placing or for breeding sites. Suitable locations include eroded riverbanks, under trees along rivers, under fallen trees, within rock piles or in dry drainage pipes or culverts etc. If ground conditions are suitable the holt may consist of a complex tunnel and chamber system.

Otters often lie out above ground especially within reed beds where depressions in the vegetation called "couches" are formed. (NRA, 2005b). Generally, holts or resting areas can be located by detecting signs such as spraints or tracks.

In contrast natal holts which are used by breeding females can be extremely difficult to locate. They are often located a considerable distance from any aquatic habitats and otters may also use habitats adjoining small streams with minimal or no fish populations. In addition, natal holts are usually carefully hidden and without obvious sprainting sites. Otters do not have a well-defined breeding season.

It is noted that Otters are largely nocturnal, particularly in areas subject to high levels of disturbance as evidenced by the presence of Otters in the centre of Cork and Limerick City. Thus, they are able to adapt to increased noise and activity levels; however, breeding holts are generally located in areas where disturbance is lower.

Otter is a Qualifying Interest (QI) for the River Boyne and River Blackwater SAC located 3.2 km northwest of the proposed development site. A review of existing records showed that Otter or signs of Otter have been recorded on 17 occasions within grid square O07, the most recent being in September 2018 (NBDC 21/04/20). Otter has been recorded within and is known to occur within the River Nanny, which is located approximately 2km south of the site.

No evidence of Otter was recorded during site surveys. The closest watercourse is the Cruicerath Stream which is located approximately 130m from the Indaver site boundary. The Cruicerath Stream is hydrologically connected to the Indaver site and ultimately discharges to the River Nanny. A survey of this stream in April 2020 indicated that it was dry with no running water recorded from its source to its discharge point. Therefore, this watercourse does not support permanent fish populations which provide a source of prey for Otters. It has been concluded therefore that this stream is of negligible value for Otter.

Otter could potentially forage on Common Frog and Smooth Newt in pond habitat (located within the existing attenuation pond) within the site boundary. It is noted that the existing facility and surrounding landscape are already subject to high levels of disturbance from traffic and human activity and species currently utilising the site will be habituated to ongoing disturbance factors in these circumstances.

The proposed construction activities will result in an increase in noise and disturbance, however it will be of negligible significance in the context of Otter's largely nocturnal habits, ability to move away from short-term disturbance and the negligible significance of increased noise and disturbance in the context of existing noise levels at the Indaver facility.

11.5.3 Other terrestrial mammals

Thirteen other species of terrestrial mammal have been recorded within grid square O07. Seven of which are protected under the Irish Wildlife Act; namely Hedgehog, Red Deer, Badger, Irish Stoat, Irish Hare, Red Squirrel and Pine Marten. Signs of Fox were noted within the overall site and likewise live sightings of Rabbits were recorded.

11.5.3.1 Badger (*Meles meles*)

Badger (*Meles meles*) and their setts are protected under the provisions of the Wildlife Act 1976, as amended, and it is an offence to intentionally, knowingly or unknowingly kill or injure a protected species, or to wilfully interfere with or destroy the breeding site or resting place of a protected wild animal. Badger setts are formed by a complex group of interlinked tunnels, and therefore works in proximity to setts can potentially cause damage a protected species.

Badgers are known to occur within the wider landscape (NBDC). Field signs are characteristic and sometimes quite obvious and include tufts of hair caught on barbed wire fences, conspicuous Badger paths, footprints, small excavated pits or latrines in which droppings are deposited, scratch marks on trees, and snuffle holes, which are small scrapes where Badgers have searched for insects and plant tubers. No signs of Badger, were recorded during site surveys.

11.5.3.2 Red Deer *(Cervus nippon)*

Red Deer *(Cervus nippon)* are the largest land mammal found on the island of Ireland. Populations of red deer are found in the west, northwest, east and southwest regions of Ireland, with smaller populations found scattered throughout Northern Ireland and certain parts of the midlands.

The closest records of the species are from approximately 1.5km north of the facility, within agricultural fields (NBDC records). It is noted that deer (species not identified) have been observed in fields in proximity to the facility by Indaver staff. There are no habitats of significant value for deer species within the proposed development site and no signs of deer were recorded during the site surveys.

11.5.3.3 Irish hare (Lepus timidus hibernicus)

Irish Hare (*Lepus timidus hibernicus*) is one of three lagomorphs found on the Island of Ireland and the only native lagomorph. It is listed on Appendix III of the Berne Convention, Annex V(a) of the EC Habitats Directive (92/43/EEC) and as an internationally important species in the Irish Red Data Book.

The Irish Hare is adaptable and lives in a wide variety of habitats. It typically reaches its highest densities on farmland, particularly where there is a mix of grassland and arable fields along with hedgerows and other cover.

Instead of making use of burrows for protection, hares make shelters known as forms. Forms are usually situated in longer vegetation in which hares make allows using their front legs and head.

A hare form was noted within an area of tall vegetation on top of an existing berm on site. It is noted as of 2018, the site is now home to a stable population of Irish hares (per comms. onsite Environmental Specialist).

Hare populations can respond rapidly to habitat changes. The development of primarily areas of short sward amenity grassland and areas of recolonising bare ground and hard stand will have little to no effect on hare populations within the site. The presence of a meadow and larger areas of grassland under a low intensity management regime provides favourable conditions for the species within the overall site.

11.5.3.4 Hedgehog (*Erinaceus europaeus*),

Hedgehog (*Erinaceus europaeus*), also listed on Appendix III of the Berne Convention can be found throughout Ireland, with male hedgehogs having an annual range of around 56 hectares. A number of factors are thought to influence the distribution of hedgehogs in a habitat, with nest sites, food availability and the presence of predators believed to be major contributory factors. Generally, hedgehogs prefer edge habitat and pasture but in recent years have begun to colonize urban areas. Due to the habitats recorded within the proposed development site and surrounding landscape, hedgehog is likely to occur.

11.5.3.5 Irish Stoat (*Mustela erminea hibernica*)

Irish Stoat (*Mustela erminea hibernica*) is one of the species protected under regulations (Protection of Wild Animals) in 1980 which enabled Ireland to comply with the provisions of the Bern Convention of European Wildlife and Natural Habitats, which was ratified by Ireland in April 1982. Irish stoats occur in most habitats with sufficient cover, including urban areas. It is likely that stoat will occur within the proposed development site given the presence of prey species.

11.5.3.6 Red Squirrel (*Sciurus vulgaris*)

Red Squirrel (*Sciurus vulgaris*) also listed on Appendix III of the Berne Convention can be found throughout Ireland. Red Squirrels feed mainly on tree seeds, although they can utilise fungi, fruit and buds as they become available in the woodland. They are found in all types of habitat but typically are in higher densities in mature mixed broadleaved forests. They can also survive in monoculture coniferous woodland. Red Squirrel is known to occur in the wider area (NBDC records), however it is unlikely that Red Squirrel will occur within the proposed development site. It is noted that the stands of immature woodland within the site may provide limited suitable habitat for this species once mature.

11.5.3.7 Pine Marten (*Martes martes*)

Pine Marten (*Martes martes*) also listed Annex V of the EU Habitats Directive 1992 and Appendix III of the Bern Convention 1979, are habitat specialists, requiring forest or scrub habitat to exist in an area. They are adept at climbing trees as they have powerful non-retractable claws. The species is primarily active at night and individuals live in territories that can vary in size from 50 hectares to 400 hectares.

Numerous records of Pine Marten have been recorded within 4km of the facility (NBDC). However, this species is unlikely to occur within the proposed development site.

11.5.4 Reptiles and Amphibians

Amphibians

According to records held by the NBDC, Common Frog (*Rana temporaria)* and Smooth Newt (*Lissotriton vulgaris*) were recorded within grid square O07.

Common Frog is listed in Annex V of the EU Habitats Directive and is protected under the Wildlife Acts. The species was not recorded during the site survey. This species has been recorded on occasion from an onsite attenuation pond which will not be impacted as part of the proposed development.

Smooth Newt is the only member of the Urodela (the tailed amphibians) found in Ireland. While commonly encountered near water bodies, adult newts are actually terrestrial, only returning to water bodies to breed. They tend to prefer habitats that offer protection from desiccation, such as long grass, woodland and scrubland. Newts will over-winter in refugia such as woodpiles and rotting logs, which offer them some protection from the elements.

In 2018 a Newt survey was carried out jointly by Hibernica Ecology Ltd and Triturus Environmental Consulting at the attenuation pond / fire water retention pond within the Indaver facility. The survey was conducted to determine the significance and viability of the newt population present and to determine newt-friendly management measures for the excessive duckweed (*Lemna sp*.) which is currently covering the pond surface. The newt survey identified a strong population of juvenile newts (efts) principally associated with the presence of pondweed (*Potamogeton berchtoldii*) and concentrated at the southern portion of the pond, i.e. towards the outfall. No adult newts were recorded during the survey; however, the presence of efts confirms successful breeding within the site in 2018. The very warm, dry summer period experienced that year is likely to have triggered adults to leave the pond early to seek more suitable habitat and thus they would have been unrecorded during the survey. It is noted that the attenuation pond is outside the proposed works areas and the habitats to be affected by this proposed development are of minimal value to Smooth Newts.

Reptiles

Common Lizard (*Zootoca vivipara*) been recorded within grid square O07 (NBDC records), Common Lizard is protected under the Wildlife Act. is Ireland's only native terrestrial reptile and is so protected under the Wildlife Act. Unlike the vast majority of reptiles, it has been found that the Common Lizard often frequents damp habitats, as the humidity has a beneficial effect on growth rate and activity. The species is tolerant, to a degree, of habitat disturbance (it may even use artificial habitats, e.g. railway embankments, hedgerows, and gardens. Due to the habitats recorded within or in proximity to the proposed development site it is possible that Common lizard could occur, however no habitats of significant value for this species will be affected.

11.5.5 Birds

The National Biodiversity Centre online data base lists 118 species of bird recorded within grid square O07. Of these species, a number are listed under Annex I of the Birds Directive and are Red Listed Birds of Conservation Concern in Ireland (Colhoun & Cummins, 2013) (**Table 11.7**).

Table 11.7: Bird species listed under Annex I of the Birds Directive and/or classified as Red Listed Birds of Conservation Concern in Ireland recorded within grid square O07 (NBDC records 21/04/20).

Species	Birds Directive Annex	BOCCI
	I	Red List
Barn Owl		X
Bar-tailed Godwit	X	
Black-headed Gull		X
Common Goldeneye		X
Kingfisher	X	
Pochard		X
Quail		X
Redshank		X
Common Tern	X	
Corn Crake	X	X
Eurasian Curlew		X
Eurasian Wigeon		X
Eurasian Woodcock		X
European Golden Plover	X	X
Grey Partridge		X
Grey Wagtail		X
Hen Harrier	X	
Herring Gull		X
Little Egret	X	
Meadow pipit		X
Merlin	X	
Northern Lapwing		X
Northern Pintail		X
Northern Shoveler		X
Peregrine Falcon	X	
Tufted Duck		X
Whooper Swan	X	
Yellowhammer		X

A general bird survey was carried out in conjunction with habitat survey in September 2019 and a breeding bird survey was carried out in April 2020 which focused on habitats outside the site boundary. During the survey, all birds seen or heard within the development site were recorded. Signs of birds were also noted e.g. nests. The majority of birds utilising the proposed works areas are common in the local landscape.

Birds species listed in Annex I of the Birds Directive are considered a conservation priority. Certain bird species are listed by BirdWatch Ireland as Birds of Conservation Concern in Ireland (BOCCI).

These are bird species suffering declines in population size. BirdWatch Ireland and the Royal Society for the Protection of Birds have identified and classified these species by the rate of decline into Red and Amber lists. Red List bird species are of high conservation concern and the Amber List species are of medium conservation. Green listed species are regularly occurring bird species whose conservation status is currently considered favourable. Birds species listed in Annex I of the Birds Directive (2009/147/EC) are considered a conservation priority. Species recorded within the site are shown in **Table 11.8**.

Kingfisher is a Special Conservation Interest (SCI) for the River Boyne and River Blackwater SPA, which is located 3.4 km northwest of the proposed development site. Kingfisher could potentially use the attenuation pond within the facility.

Wading birds which are SCI species for the River Nanny Estuary and Shores SPA may forage inland on terrestrial habitats. Golden Plover were recorded foraging on arable fields at the Knockharley Landfill Site which is located approximately 9.5km west-southwest of the Indaver site and some 16.5km inland of the River Nanny and Estuary Shores SPA (Greenstar 2008). However, no wading birds were recorded on or near the Indaver site during the September 2019 or April 2020 surveys or in any previous surveys carried out at the site. Furthermore, there is no suitable habitat for wading birds within the proposed development site. If wading birds were to use agricultural lands in the vicinity of the proposed development site, these birds would already be habituated to the noise and disturbance of the existing Indaver facility and therefore should continue to use these fields during and after construction of the proposed development.

Table 11.8: Bird Species recorded during site surveys.

Species		Birds Directive Annex			BOCCI	
		I	II	III	Red List	Amber List
Carduelis carduelis	Goldfinch					
Larus fuscus	Lesser black-backed Gull					X
Erithacus rubecula	Robin					X
Larus argentatus	Herring Gull				X	
Turdus merula	Blackbird					
Prunella modularis	Dunnock					
Troglodytes troglodytes	Wren					
Pyrrhula pyrrhula	Bullfinch					
Corvus frugilegus	Rook					
Corvus monedula	Jackdaw					
Pica pica	Magpie					
Delichon urbicum	House Martin					X
Columba palumbus	Woodpigeon		X	X		
Fringilla coelebs	Chaffinch					
Corvus cornix	Hooded Crow					
Parus caeruleus	Blue Tit					
Motacilla cinerea	Grey Wagtail				X	
Motacilla alba yarrellii	Pied Wagtail					
Buteo buteo	Buzzard					
Parus major	Great Tit					
Columba livia f. domestica	Feral Pigeon					
Larus canus	Common gull					X
Hirundo rustica	Swallow					X
Sturnus vulgaris	Starling					X
Regulus regulus	Goldcrest					X
Anthus pratensis	Meadow Pipit					
Emberiza citrinella	Yellow hammer				X	

Symbol	Description
I	Annex 1: species and sub-species are particularly threatened. Member States must designate Special Protection Areas (SPAs) for their survival and all migratory bird species.

Species		Birds Directive Annex			BOCCI	
		I	II	III	Red List	Amber List
II	Annex 2: bird species can be hunted. However, the hunting periods are limited and hunting is forbidden when birds are at their most vulnerable: during their return migration to nesting areas, reproduction and the raising of their chicks.					
III	Annex 3: overall, activities that directly threaten birds, such as their deliberate killing, capture or trade, or the destruction of their nests, are banned. With certain restrictions, Member States can allow some of these activities for species listed here.					

Overall, the proposed development site is of local value for terrestrial bird species that are relatively common in the Irish countryside. The data in **Table 11.8** includes birds recorded within the overall Indaver site, proposed development area and agricultural land in proximity to the site. In general, the mixture of arable and pastoral lands adjoining the site are of highest value for birds due to the presence of moderate to high quality hedgerows. There are areas of grassland planted trees within the overall site boundary which are of some value for common bird species, and it is noted that the value of woodland for birds will improve as it matures. However, the habitats within the proposed development area are highly modified and are generally of low value for birds.

Three red list species were recorded namely Herring Gull, Yellowhammer and Grey Wagtail. Yellowhammer was recorded within arable land outside the site boundary and there are no habitats of value for this species within the proposed development area. Grey Wagtail is generally associated with aquatic habitats and may utilise the attenuation pond onsite, however there are no habitats suitable for this species within the proposed development site.

Herring Gull, which is also listed as a SCI for the River Nanny Estuary and Shores SPA, was recorded during the bird surveys. However this species, which commonly uses inland sites, was not recorded in significant numbers.

Seven amber listed species were noted namely Lesser Black-backed Gull, Robin, House Martin, Common Gull, Swallow, Starling and Goldcrest.

These are all relatively common constituents of the general countryside bird community and no habitats of significant value for these species will be affected by the proposed development.

There is a rookery within several ash trees along the R152 regional road road close to the site entrance and a second rookery located to the south west of the site. Chaffinch, Blackbird and Robin were also recorded as definite breeding species during the site survey in April 2020. However, these species were recorded as breeding within hedgerow habitat outside the site boundary. The proposed development area consists of modified habitat and recently planted woodland and is considered of low to negligible value for breeding birds.

Kingfishers have been recorded on 18 occasions within the 10km grid square O07 (NPWS 22/04/20) and they are known to occur within the River Nanny main channel (Irish Birding 2016). No kingfishers were recorded during site surveys within or in proximity to the Indaver site.

The closest watercourse is the Cruicerath Stream which is located approximately 130m from the Indaver site boundary. This is hydrologically connected to the Indaver site and ultimately discharges to the River Nanny. A survey of this stream in April 2020 indicated that this watercourse was dry with no running water recorded from its source to its discharge point. Therefore, this watercourse does not support permanent fish populations which provide a source of prey for kingfisher. Whilst the pond within the site may provide feeding habitat for this species, this is improbable given the absence of significant hydrological pathways or commuting routes linking the Indaver site to the River Nanny. Taking a worst-case scenario, any use of the attenuation pond on site would be sporadic and this pond is unlikely to be a critical resource for this species.

Overall, the study area is of a local value for a range of terrestrial bird species that are relatively common in the Irish countryside and the proposed development area is not of significant value for birds. There may be a short-term impact on feeding patterns during construction but the long-term impact is predicted to be imperceptible.

11.5.6 Other species listed by NBDC as present within grid square O07

Table 11.9 below lists other species recorded within grid square O07, along with any species considered under threat and provided with legal protection. It is noted that Large Red-Tailed Bumble Bee, which is considered threatened, has been recorded onsite by the in-house Environmental Specialist. However, no habitats of significant value for this species will be affected.

Table 11.9: Other species listed by NBDC as present within grid square O07 (Source NBDC 21/04/20)

Species Group	Named species
Alga	None protected
Bony fish (Actinopterygii)	European Eel - Threatened Species: OSPAR Convention & Threatened Species: Critically Endangered
Conifer	None protected.
Crustacean	None protected.
Fern	None protected.
Flatworm (Turbellaria)	None protected.
Fungus	None protected.
Harvestman (Opiliones)	None protected.
Horsetail	None protected.
Beetle (Coleoptera)	*Hydraena rufipes* - Threatened Species: Endangered. *Gyrinus urinator* & *Ochthebius (Ochthebius) marinus* - Threatened Species: Near threatened. *Hygrotus (Coelambus) novemlineatus* & *Laccophilus hyalinus* - Threatened Species: Vulnerable
Butterflies	Wall - Threatened Species: Endangered. Small Heath - Threatened Species: Near threatened.

Species Group	**Named species**
	It is noted that the Small Heath Butterfly has been recorded onsite by the in-house Environmental Specialist. No habitats of high value for this species will be affected.
Caddis fly (Trichoptera)	None protected.
Dragonfly (Odonata)	None protected
Flea (Siphonaptera)	None protected.
Earwig (Dermaptera)	None protected.
Hymenopteran	*Halictus (Seladonia) tumulorum*, Gipsy Cuckoo Bee, Moss Carder-bee & Large Red-Tailed Bumble Bee - Threatened Species: Near threatened. *Andrena (Melandrena) nigroaenea*, *Lasioglossum (Evylaeus) rufitarse*, & Field Cuckoo Bee - Threatened Species: Vulnerable.
Lacewing (Neuroptera)	None protected.
Louse (Phthiraptera)	None protected.
Mayfly (Ephemeroptera)	*Ephemerella notata* & *Labiobaetis atrebatinus* - Threatened Species: Endangered. *Kageronia fuscogrisea* - Threatened Species: Near threatened. *Procloeon bifidum* - Threatened Species: Vulnerable.
Moths	None protected.
Orthopteran	None protected.
Hemiptera	None protected.
True fly (Diptera)	None protected.
Lichen	None protected.
Liverwort	Cliff Scalewort - Threatened Species: Near threatened
Millipede	None protected.
Mollusc	Desmoulin's Whorl Snail - Protected Species: EU Habitats Directive Annex II & Protected Species: Wildlife Acts - Threatened Species: Endangered. Moss Chrysalis Snail, Smooth Ramshorn & Lesser Bulin - Threatened Species: Endangered. Common Whorl Snail, Striated Whorl Snail & Prickly Snail - Threatened Species: Near threatened. Marsh Whorl Snail, Point Snail, Tree Snail, Blind Snail, *Sphaerium nucleus* & English Chrysalis Snail - Threatened Species: Vulnerable.
Moss	River Bristle-moss, Rose-moss, Wulfsberg's Tamarisk-moss & Showy Feather-moss - Threatened Species: Near threatened. Tufted Thread-moss - Threatened Species: Vulnerable.
Slime Mould	None protected

11.6 Characteristics of the Proposed Development

The proposed development consists of the following main elements:

- Increase in the amount of hazardous waste accepted at the facility for treatment in the waste to energy plant from the current permitted 10,000 tonnes per annum (tpa) up to a maximum of 25,000 tpa;
- It is also proposed to increase the annual total waste accepted at the site for treatment in the waste to energy facility from the currently permitted 235,000 tpa to 250,000 tpa;
- Development of an aqueous waste tank farm and unloading area for the storage and processing of aqueous liquid wastes currently accepted at the facility;
- Development of a 10MW_e hydrogen generation unit for connection to the natural gas transmission/distribution network and for mobile hydrogen transport applications and other potential uses;
- Development of a bottom ash storage building for the storage of up to 5,000 tonnes of bottom ash which is currently produced on site;
- Additional waste acceptance capacity and infrastructure to accept up to 30,000 tpa (bringing the site total to 280,000 tpa) of third party boiler ash and flue gas cleaning residues and other similar residues for treatment in the existing ash pre-treatment facility on site;
- Development of a warehouse, workshop and emergency response team (ERT)/office building to support existing maintenance activities on the site;
- Development of a new concrete yard and parking area for up to 10 trucks, tankers or containers on the site;
- Demolition and re-building of an existing single storey modular office building on site with a slightly increased footprint.; and
- Other miscellaneous site upgrades.

The development is described in detail in **Chapter 4 *Description of Proposed Development*** of this EIAR.

11.7 Likely Significant Effects

Annex III of the amended Directive 2104/52/EU requires that the EIAR should assess:

a) The magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected)

b) The nature of the impact

c) The transboundary nature of the impact

d) The intensity and complexity of the impact

e) The probability of the impact

f) The expected onset, duration, frequency and reversibility of the impact

g) The cumulation of the impact with the impacts of other existing and/or approved projects and

h) The possibility of effectively reducing the impact.

The potential impacts of the proposed development on terrestrial and aquatic biodiversity include:

- Impacts on Habitats
- Impacts from non-native invasive species
- Predicted impacts on water quality and aquatic ecology during construction
- Predicted impacts on water quality and aquatic ecology during operation
- Predicted Impacts on fauna during operation - Air
- Potential impacts on protected mammals – bats and otter during construction and operation
- Potential impacts on birds during construction and operation
- Potential impacts on other fauna during construction and operation.

11.7.1 Impact Appraisal

When describing changes/activities and impacts on ecosystem structure and function, important elements to consider include positive/negative, extent, magnitude, duration, frequency and timing, and reversibility (IEEM, 2018).

Section 3.7 of the *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'*, (EPA 2017) provides standard definitions which have been used to classify the effects in respect of ecology. This classification scheme is outlined below in **Table 11.10.**

Table 11.10. EPA Impact Classification

Impact Characteristic	Term	Description
Quality	Positive	A change which improves the quality of the environment.
	Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative	A change which reduces the quality of the environment.
	Imperceptible	An effect capable of measurement but without significant consequences.
	Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging trends.

Impact Characteristic	Term	Description
Significance	Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
	Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound	An effect which obliterates sensitive characteristics.
Duration and Frequency	Momentary Effects	Effects lasting from seconds to minutes.
	Brief Effects	Effects lasting less than a day.
	Temporary Effects	Effects lasting less than a year.
	Short-term	Effects lasting one to seven years.
	Medium-term	Effects lasting seven to fifteen years.
	Long-term	Effects lasting fifteen to sixty years.
	Permanent	Effects lasting over sixty years.
	Reversible Effects	Effects that can be undone.
	Frequency	Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
	Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost.
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic	Where the resultant effect is of greater significance than the sum of its constituents.
	'Worst Case'	The effects arising from a development in the case where mitigation measures substantially fail.

11.7.2 "Do Nothing" Scenario

Most of the habitats to be affected have been significantly modified from their natural state by human activity. Formally disturbed areas and areas that have been left unmanaged are being recolonised by vegetation. The general pattern of succession from recolonising bare ground to patches of grassland to woodland would be expected to continue. In the absence of development, it is expected that the proposed works areas would largely remain under the same management regimes. No significant changes to the boundary habitats are likely to occur.

11.7.3 Predicted Impacts on Habitats

Impacts on terrestrial habitats are generally restricted to the direct removal of habitats and possible impacts from the spread of invasive species. Based on the criteria outlined by EPA, 2017, as described above, the predicted impacts are detailed in **Table 11.11.**

Table 11.11. Impacts on Habitats

Habitat	Description/ Habitats Directive Annex I Status	Potential Impact
Buildings and artificial surfaces (BL3)	Local importance (Lower value)	Low value habitat of negligible ecological value. Neutral, Not significant, Long term impact
Amenity grassland (improved) (GA2)	Local importance (Lower value)	Loss of small areas of low value habitat. Negative, Not Significant, Long term impact
Ornamental/non-native shrub (WS3)	Local importance (Lower value)	Loss of small areas of low value habitat. Negative, Not Significant, Long term impact
Recolonising bare ground (ED3)	Local importance (Lower value)	Loss of small areas of low value habitat. Negative, Not Significant, Long term impact
Spoil and bare ground (ED2)	Local importance (Lower value)	Loss of small areas of low value habitat. Negative, Not Significant, Long term impact
Immature woodland (WS2) / (Mixed) broadleaved woodland (WD1)	Local importance (Higher value)	The planted woodland habitats on site are generally of low diversity with an under developed ground flora and shrub layer Negative, Not Significant, Long term impact.

As detailed above no significant direct loss of habitat will occur as a result of the proposed development. Construction activities are likely to generate some dust emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. As noted in **Chapter 8 *Air Quality*** of this EIAR, following implementation of standard dust minimisation measures construction stage impacts to air quality are predicted to be short-term and not significant.

Given that there are no sensitive or high value habitats within the site or in proximity to it, any impacts from dust generation will be short-term and imperceptible.

11.7.4 Impacts from non-native invasive species

No high-risk invasive species were recorded during the recent site survey. However, the non-native invasive species Butterfly Bush/Buddleja (*Buddleja davidii*) was recorded within the overall site but outside the proposed works area. As the proposed development will not result in the spread of this species outside of its current distribution and given the relatively low potential impact associated with this species, no impact from the spread of invasive species will occur.

11.7.5 Predicted impacts on water quality and aquatic ecology during construction

Surface water emissions associated with the construction phase of the proposed development could impact on aquatic habitats via increased silt levels in surface water run-off and inadvertent spillages of chemicals such as hydrocarbons from fuel and hydraulic fluid. This is only likely to occur where works take place in proximity to seasonal drainage ditches within the site boundary.

Inadvertent spillages of hydrocarbon and/or other chemical substances during construction could introduce toxic chemicals into the aquatic environment via direct means, surface water run-off or groundwater contamination. Some hydrocarbons exhibit an affinity for sediments and thus become entrapped in deposits from which they are only released by vigorous erosion or turbulence. Oil products may contain various highly toxic substances, such as benzene, toluene, naphthenic acids and xylene which are to some extent soluble in water; these penetrate into the fish and can have a direct toxic effect. The lighter oil fractions (including kerosene, petrol, benzene, toluene and xylene) are much more toxic to fish than the heavy fractions (heavy paraffins and tars). In the case of turbulent waters, the oil becomes dispersed as droplets into the water. In such cases, the gills of fish can become mechanically contaminated and their respiratory capacity reduced.

If of sufficient severity, aquatic invertebrates may be smothered by excessive deposits of silt from suspended solids. In areas of stony substrate, silt deposits may result in a change in the macro-invertebrate species composition, favouring less diverse assemblages and impacting on sensitive species. Cement can also affect fish, plant life and macroinvertebrates by altering pH levels of the water. Aquatic plant communities may also be affected by increased siltation. Submerged plants may be stunted and photosynthesis may be reduced.

Potentially, impacts could arise from any inadvertent spills of hydrocarbons or other chemicals during construction. High levels of suspended solids in surface water run-off could potentially have localised impacts on aquatic ecology. It is noted that such impacts are easily prevented by standard mitigation measures, which will be implemented during construction, and which are set out in detail in **Chapter 5 *Construction Activities*** of this EIAR and in the CEMP.

The risk of potential impacts on water quality is low as the drainage ditches within the site boundary are seasonal and will not have running water during dry periods. The closest watercourse is the Cruicerath Stream which is located approximately 130m from the Indaver site boundary and which is hydrologically connected to the Indaver site and ultimately discharges to the River Nanny. A survey of this stream in April 2020 indicated that this watercourse was dry with no running water recorded from its source to its discharge point and therefore it will not support permanent fish populations. Therefore, no habitats of high sensitivity to pollutants or of high conservation value occur in close proximity to the proposed development site.

The Cruicerath Stream joins the River Nanny approximately 2km downstream of the Indaver site. The River Nanny holds a small stock of wild trout and is stocked annually with Brown Trout. It also gets a small run of Sea Trout (Eastern Regional Fisheries Board). One site was electro-fished on the River Nanny as part of the WFD surveillance monitoring programme of rivers 2012. The survey site was located upstream of a bridge in Julianstown, approximately 4km north of Athboy, Co. Meath. A total of eight fish species were recorded in the River Nanny (Julianstown) site. Minnow was the most abundant species followed by Stone Loach, European Eel, Brown Trout, Flounder, Atlantic Salmon, Sea Trout and Three-spined Stickleback (Kelly *et al*, 2013). Atlantic Salmon are listed on Annex II of the Habitats Directive and European Eel are considered endangered. Therefore, the ecological value of the River Nanny is classified as County Importance.

Given the short term nature of construction works, the existing surface water management systems, the implementation of standard mitigation measures (refer to **Section 11.8** below), the limited and seasonal flow in drainage ditches and the Cruicerath Stream and the dilution provided in the River Nanny located approximately 2km south, any indirect impacts on water quality and aquatic ecology will be localised, short term and not significant during construction works and imperceptible in the long term.

There is a hydrological link between the proposed development site and the River Nanny Estuary and Shore SPA and Laytown Dunes/Nanny Estuary pNHA. However, given the low risk of significant effects on water quality, the distance involved and the dilution provided in the estuarine environment the effects on water quality and aquatic ecology will be imperceptible.

11.7.6 Predicted impacts on water quality and aquatic ecology during operation

The main hydrological feature in the vicinity of the site is the River Nanny, which is located approximately 2km to the south of the proposed development site. Surface water runoff from the site currently passes through a class 1 interceptor and attenuation pond before discharging to a semi-dry ditch which drains to the seasonal Cruicerath stream c.130m to the west of the site, which in turn leads to the River Nanny. Details on drainage at the site are provided in **Chapter 4** ***Description of the Proposed Development*** and **Chapter 15** ***Water.***

As detailed in these chapters, following attenuation, the existing surface water system has sufficient capacity to adequately deal with any surface water arising from the expanded site during operation. Detailed design protection controls are already in place to deal with sanitary services, prevention of potential accidents and spillages, unloading of aqueous liquid wastes, management of firewater and transport of bottom ash and flue gas residues. These controls have been factored into the design of the proposed development with BAT techniques utilised where relevant to ensure that significant impacts on water quality are prevented. Based on the above it has been concluded that the impact on local water quality and water quality in downstream receptors will be imperceptible during operation.

It is noted this site is currently operational and systems are already in place and functioning effectively in preventing any significant impacts on water quality from occurring. In the absence of any significant impact on water quality the effect on aquatic ecology during operation will be imperceptible.

11.7.7 Effects on Fauna during operation - Air

A full assessment of the potential impacts of the proposed development on air quality, including detailed modelling, is included in **Chapter 8 *Air*** of this EIAR.

It concluded that the Waste to Energy Process (WtE) would be expected to be the dominant source of air emissions associated with the facility. As part of the proposed development it is proposed to increase the annual tonnage of waste accepted from 235,000 to 250,000 tonnes per annum, comprising of up to 15,000 tonnes of additional hazardous wastes. The majority of this increase is intended for the treatment of aqueous wastes which, when evaporated, is converted to water vapour in the flue gas flow. As the flue gas flow is corrected to standard, dry conditions, the total flue gas flowrate will not increase.

In any event, the facility will still be obligated to comply with its licensed emission limit values and maximum flue gas flowrate and thus the increase in waste tonnage proposed will not cause a significant impact to the ambient air quality. A detailed modelling assessment was undertaken as part of earlier applications at the site in the air quality chapters of the 2009 & 2012 EISs. These assessments were based on the maximum volume flow rate and maximum emission concentrations and found that the impact on air quality would not be significant (based on continuous operation 8,760 hours per year).

Based on the up to date modelling the results indicate that the facility will continue to be in compliance with its licence requirements and no significant impacts to ambient air quality are predicted.

Based on the above it has been concluded that in the absence of any significant impacts on air quality, the effect on fauna via direct toxicological impacts or via bioaccumulation will be imperceptible.

11.7.8 Effects on protected mammals including bat species and otter

The habitats on the site are not rare, threatened nor do they require any special protection under existing or pending legislation.

No significant loss of habitat for mammal species is predicted. Although the habitats to be directly affected may form part of the territories of various mammal species, such as Irish Hare which occurs within the overall site, they do not provide critical resources for these species. Overall, the proposed development is predicted to have a slight, short-term impact on mammal populations. The long-term impact is predicted to be not significant to imperceptible.

No potential bat roosting sites were identified within the work areas. The native hedgerow along the external boundaries will be retained. Whilst the loss of small areas of grassland and a small area of immature woodland will reduce the net potential feeding area available for bats, there will be no significant loss of the more important feeding habitat along external boundaries and of linear routes which may provide commuting routes within the wider landscape. It is also noted that currently the facility is developing areas of semi-natural grassland habitat within the site boundary, which is likely to be of value for feeding bats. No significant changes in lighting levels are proposed. The impact will be localised and will not significantly impact on overall bat populations as there will no significant loss of critical resources for bats. Overall the impact on feeding habitat for bats is predicted to be permanent and not significant.

Whilst increased noise and disturbance is predicted to occur during construction and to a lesser degree during operation, the impact on local mammal populations is predicted to be slight in the short-term and imperceptible in the long-term. It is noted that the existing facility and surrounding landscape are already subject to high levels of disturbance from traffic and human activity and species currently utilising the site are expected to be habituated to ongoing disturbance factors in these circumstances.

Otter could potentially forage on Common Frog and Smooth Newt in pond habitat within the site boundary. The proposed works will result in an increase in noise and disturbance, however it will be of limited significance in the context of Otter's largely nocturnal habits, ability to move away from short-term disturbance and the negligible significance of increased noise and disturbance in the context of the levels already generated by the existing Indaver facility. The impact on Otter, if they utilise the site, would be not significant in the short term and imperceptible in the long term.

11.7.9 Effects on birds during construction and operation

The majority of terrestrial bird species recorded within the development site during the bird survey are typical of the types of habitats recorded within the study area and are generally common. There will be a minor net loss of semi-natural habitats within the proposed development area (e.g. woodland). It is noted that the hedgerow and treeline habitats along the site boundary, will be preserved as part of the proposed development.

Some displacement of feeding birds may occur during construction due to increased noise and disturbance.

Disturbance can cause sensitive species to deviate from their normal, preferred behaviour, resulting in stress, increased energy expenditure and, in some cases, species mortality. Birds living in the urban & suburban environment are largely habituated to increased levels of human disturbance. However, disturbance is still an important factor that can cause birds to abandon nest sites and breeding attempts and take on less food. However, this will be short-term in duration. The impact is therefore predicted to be a short-term, not significant impact.

In general, the habitats within the development area and in proximity to it are utilised for feeding by a range of common bird species, however the habitats to be affected are of significantly are generally of lower-value than large areas of habitat in the surrounding countryside.

The presence of gulls within the site and surrounding landscape is largely due to their opportunistic behaviour. Although not an issue within the Indaver Facility, scavenging is an increasingly important feeding strategy for gulls. However, while gulls were recorded foraging in the vicinity, no gulls were noted nesting within the proposed development site.

No wading birds were recorded on or near the Indaver site during site surveys for the current or previous applications and no valuable habitat for these species was recorded within the site boundary. While wading birds could potentially forage in agricultural lands in the vicinity of the proposed development site, these birds would already be habituated to noise and disturbance at the existing facility. Therefore they would continue to use these fields during and after construction of the proposed development.

Whilst the pond within the site may provide feeding habitat for Kingfisher, this is improbable given the absence of significant hydrological pathways or commuting routes linking the Indaver site to the River Nanny. Taking a worst-case scenario, any use of the pond on site would be sporadic and this pond is very unlikely to be a critical resource for this species. This pond is located outside the works area and will not be impacted by the proposed development.

It is noted that the existing facility and area in proximity to the proposed development are subject to high levels of disturbance and that any birds which utilise this area will have habitualised to high levels of daytime disturbance. Whilst works could potentially disrupt feeding patterns, given the availability of similar and better quality habitat in the surrounding area and the ability of birds to move away from disturbance, the impact on the feeding behaviour of these species is predicted to be not significant.

During the operational phase, the levels of activity will stabilise and birds in the surrounding landscape will be expected to habitualise to any increased noise and disturbance levels which will be within current Industrial Emissions Directive (IED) limits. The impact on terrestrial birds, in habitats adjoining the proposed development site is therefore predicted to be permanent and imperceptible to not significant during operation.

The Indaver site is hydrologically connected to the River Nanny Estuary SPA and Shore SPA and Laytown Dunes/Nanny Estuary (Site Code: 000554). Surface water on and in the vicinity of the proposed development site ultimately drains to the River Nanny.

It is noted that due to the dilution provided in the estuarine and marine environment, the naturally fluctuating levels of silt and robust nature of these habitats, impacts during construction are only likely to arise from extremely severe levels of siltation which will not occur. It is also noted that any chemical spills during construction would be minor in the context of the dilution provided in the riverine/estuarine/marine environment.

During operation stormwater management systems have been designed to ensure that there are no significant effects on surface or ground water quality. The impact on surface water quality and on prey availability for birds will be imperceptible during construction and operation.

11.7.10 Effects on other fauna during construction and operation

A number of protected mammal species which are protected under the Irish Wildlife Act 1976, as amended, occur or could potentially occur within the overall site and surrounding area. No habitats of significant value with regard to amphibians (including the existing pond) or reptiles will be affected by the proposed works. One Large Red-Tailed Bumble Bee, which is considered threatened, has been recorded onsite by the in-house Environmental Specialist. However, no habitats of significant value for this species will be affected. The effect on these species will be not significant in the short term and imperceptible in the long term.

11.8 Mitigation Measures and Monitoring

The likely success of the proposed mitigation measures listed below is high, either in their current form or as they will be supplemented on-site to achieve the desired result. The mitigation measures have been drawn up in line with current best practice and include an avoidance of sensitive habitats at the design stage and mitigation measures will function effectively in preventing significant ecological impacts. The following mitigation measures will be implemented:

A construction environmental management plan (CEMP) has been prepared (Refer to **Appendix 5.1** in **Volume 3** of this EIAR). The CEMP contains the construction mitigation measures, which are set out in this EIAR.

11.8.1 Protection of habitats during construction

- There will be a defined working area which will be fenced off to prevent inadvertent damage to adjoining habitats.
- To prevent incidental damage by machinery or by the deposition of spoil during site works, any habitats earmarked for retention nearby will be securely fenced or sign posted early in the construction phase. These will be clearly visible to machine operators.
- Habitats that are damaged and disturbed will be left to regenerate naturally or will be rehabilitated and landscaped, as appropriate, once construction is complete. Disturbed areas will be seeded or planted using appropriate native grass or species native to the areas where necessary.
- Any woodland habitat disturbed during construction will be replanted using a suitable mix of native species.
- Tree root systems can be damaged during site clearance and groundworks. No materials will be stored within the root protection area of semi-mature trees.

Materials, especially soil and stones, can prevent air and water circulating to the roots. Retention of the existing woodland areas will provide natural screening and help to maintain biodiversity.

11.8.2 Protection of Water Quality and surface water management during construction

Detailed mitigation and monitoring measures in relation to water quality and preventing effects on aquatic habitats, in particular when working adjacent to or in the vicinity of ditches or streams are specified in **Section 15.6.1** of **Chapter 15 *Water*** and in **Section 14.7.1** of **Chapter 14 *Land and Soils.***

The surface water discharge will continue to be monitored prior to discharge and if an out of specification reading is detected all contaminated runoff will be contained within the storage tank system. No change from the current situation is required.

A Construction Environmental Management Plan (CEMP) is included as **Appendix 5.1**. It will be maintained by the Contractor for the duration of the construction phase. The CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures.

The employment of good construction management practices will minimise the risk of pollution of storm water run-off, and any deterioration in the quality or quantity of surface water. In particular, the measures detailed in **Section 15.6.1** of **Chapter 15 *Water*** and in **Section 14.7.1** of **Chapter 14 *Land and Soils*** will be implemented when working adjacent to or in the vicinity of ditches or streams to prevent uncontrolled runoff from the site into the watercourses. In particular, the contractor will maintain an incident and emergency response action plan which will cover all foreseeable risks, i.e. fire, flood, collapse etc. An Incident Response Plan (IRP) is located in Section 8 of the CEMP in **Appendix 5.1.**

11.8.3 Noise and Vibration during construction

Mitigation measures in relation to noise and vibration are addressed in **Chapter 10 *Noise and Vibration*** of this EIAR.

11.8.4 General Ecology Protection

The Wildlife Act 1976, as amended, provides that it is an offence to cut, grub, burn or destroy any vegetation on uncultivated land, or any such growing in any hedge or ditch from the 1st of March to the 31st of August. Exemptions include the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure is intended to be provided. Nonetheless, it is recommended that vegetation be removed outside of the breeding season.

Retention of the native treelines, hedgerows and woodland along the site boundaries will reduce the loss of breeding and nesting habitat for birds. NRA guidelines on the protection of trees and hedges prior to and during construction should be followed (NRA, 2006b).

11.8.5 Operational stage

No specific mitigation measures are required for biodiversity at operational stage.

11.9 Cumulative Effects

Chapter 18 *Cumulative Effects, Other Effects and Interactions*, lists a number of planned projects that may potentially have a cumulative impact on the environment. Each project has been reviewed in turn below for the potential cumulative impacts on biodiversity.

11.9.1 Irish Cement Ltd (Ref. LB150375) - Cement silo

The development will consist of the installation of a Flue Dust Portland Cement Silo. This application relates to an activity for which an Industrial Emissions Licence applies under the Environmental Protection Acts 1992 as amended. (IE Licence Register Number P0030). In the absence of significant emissions to air or water no significant cumulative impact on biodiversity has been identified. Therefore, there is no potential for significant negative direct nor indirect cumulative effects on biodiversity.

11.9.2 Irish Cement Ltd (PL17.PA0050) - Alternative fuels and raw materials

10-year permission to facilitate further replacement of fossil fuels and allow for the introduction of alternative raw materials in the manufacturing of cement at Platin Cement Works, Platin, Co. Meath. In the absence of significant emissions to air or water no significant cumulative impact on biodiversity has been identified. Therefore, there is no potential for significant negative direct nor indirect cumulative effects on biodiversity as a result of the proposed and planned development.

11.9.3 SSE Generation Ireland Ltd (PL17.303678) - 110kV transmission substation

Section 6.4.1 of the EIAR[1] (2019) prepared for the SID application stated that '*There will be no discharges to ground or groundwater during the operational phase of the Substation as none of the substation infrastructure will pose a risk to land and soils during the operational phase*.' Therefore, there is no potential for significant negative direct nor indirect cumulative effects on biodiversity as a result of the proposed and planned development.

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[1] Available from: http://caulstown-platin-substation.com/downloads/environmental/substation-environmental-report.pdf

11.9.4 Highfield Solar Ltd. (PL17.248146) - Solar Farm

Applicant applied to Meath CC for solar farm on 2 sites (Site 1 and Site 2) and a 110kV substation. Meath CC granted permission (conditional) under Ref. LB160898 on 10/02/17. In the absence of significant emissions to air or water no significant cumulative impact on biodiversity has been identified.

Therefore, there is no potential for significant negative direct nor indirect cumulative effects on biodiversity as a result of the proposed and planned development

11.9.5 Highfield Solar Ltd. (PL17.303568) - Electrical substation (110kV)

Proposed electrical substation and associated 110kV and MV infrastructure required to connect ground mounted solar PV generation to the electrical transmission system, underground cabling and all associated ancillary site development work. SID application.

In the absence of significant emissions to air or water no significant cumulative impact on ecology has been identified. Therefore, there is no potential for significant negative direct nor indirect cumulative effects on biodiversity as a result of the proposed and planned development.

11.9.6 Conclusion

It has been concluded that should the construction of any of the developments mentioned above occur concurrently, the potential cumulative effects will not be significant, given the distances involved, the implementation of standard construction environmental measures, the limited risk of significant effects, the dilution provided in the nearby watercourses and the distance from Natura 2000 sites. In the absence of significant emissions to water or air during operation or impacts from noise, no significant cumulative impacts on biodiversity during operation have been identified.

When the predicted effects of the proposed development at Indaver are considered cumulatively with each planned project and cumulatively with all planned projects as a whole, it is concluded that there are no significant negative cumulative effects predicted on biodiversity.

11.10 Residual Effects

The proposed development will have effects on habitats that are primarily low value. No adverse effect on designated sites or their conservation objectives will occur. No particular difficulties in the effective implementation of the prescribed environmental mitigation measures have been identified.

The EPA document *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA 2017) provides a standard scheme for classifying effects as detailed in **Table 11.10**. Based on this classification scheme the residual effects of the proposed development are classified below in **Table 11.12**.

Table 11.12 Residual effects

Impact	**Residual effect**
Impacts on Habitats	The habitats to be directly affected consist primarily of modified habitats of limited ecological value and are classified as Local importance (Lower value). The exception is a small area of planted woodland which was classified as Local importance (Higher value). The impact on these habitats will be long term and not significant. The ecological effect from dust generation during construction will be short term and imperceptible.
Impacts from non-native invasive species	The only invasive species recorded was Buddleia and this species was recorded outside the proposed development site. There will be no ecological effect from invasive species.
Predicted impacts on water quality and aquatic ecology during construction	No watercourses of high sensitivity to pollutants or high conservation value occur in close proximity to the development site. Significant dilution will occur in aquatic habitats downstream of the construction activity in relation to possible inadvertent minor spills of hydrocarbons or other chemicals. There is a hydrological link between the site and the River Nanny Estuary and Shore SPA and Laytown Dunes/Nanny Estuary pNHA however given the low risk of significant effects on water quality, the distance involved and the dilution provided in the estuarine environment the impacts on water quality will be imperceptible and the effect on aquatic ecology will be imperceptible. ***Chapter 15 Water*** of this EIAR concluded that during construction, with the implementation of mitigation measures there will be no significant residual effect on hydrology, drainage characteristics of the site or water quality during construction. Any indirect impacts on water quality and aquatic ecology will be localised, short term and not significant during construction works and imperceptible in the long term.
Predicted impacts on water quality and aquatic ecology during operation	Following attenuation, the existing surface water system has sufficient capacity to adequately deal with any surface water arising from the expanded site during operation. Detailed controls have already been provided to deal with sanitary services, prevention of potential accidents and spillages, unloading o aqueous liquid wastes, management of firewater and transport of bottom ash and flue gas residues. These measures have been factored into the design of the project with BAT techniques utilised where relevant to ensure that significant impacts on water quality are minimized.

Impact	Residual effect
	In respect of operational impacts, ***Chapter 15 Water*** of this EIAR concluded that the proposed development is predicted to have an overall neutral long-term impact on water and hydrology with the study area. Therefore no mitigation measures are required and as such there will be no significant residual effect on hydrology, drainage characteristics of the site or water quality during operation. Based on the above it has been concluded that the impact on local water quality, water quality in downstream receptors and aquatic ecology will be imperceptible during operation.
Predicted Impacts on Fauna during operation - Air	Based on up to date modelling results indicate that the facility will continue to be in compliance with its licence requirements and no significant impacts to ambient air quality are predicted. Based on the above it has been concluded that in the absences of any significant impacts on air quality the effect on fauna via direct toxicological impacts or via bioaccumulation will be imperceptible.
Potential impacts on protected mammals – bats and otter	The impact on bats will be localised and will not significantly impact on overall bat populations as there will no significant loss of critical resources for bats. Overall, the impact on feeding habitat for bats is predicted to be permanent and not significant. Otter could forage on Common Frog and Smooth Newt in pond habitat within the Indaver site boundary. The proposed works will result in an increase in noise and disturbance, however it will be of limited significance in the context of Otters' largely nocturnal habits, ability to move away from short-term disturbance and the negligible significance of increased noise and disturbance in the context of the levels already generated by the existing Indaver facility. The impact on Otter, if they utilise the site, would be not significant in the short term and imperceptible in the long term.
Potential impacts on birds during construction and operation	It is noted that the existing facility and area in proximity to the proposed development, are subject to high levels of disturbance and that, to a degree, any birds which utilise this area will have habituated to high levels of daytime disturbance. Whilst works could potentially disrupt feeding patterns, given the availability of similar habitat in the surrounding area and the ability of birds to move away from disturbance, the impact on the feeding behaviour of these species would be not significant during construction. Whilst the pond within the site may provide feeding habitat for kingfisher, this is improbable given the absence of significant hydrological pathways or commuting routes linking the Indaver site to the River Nanny. Taking a worst-case scenario, any use of the pond on site would be sporadic and this pond is very unlikely to be a critical resource for this species. No impact on this pond will

Impact	Residual effect
	occur. Any impact on this species would be not significant during construction and imperceptible during operation. During the operational phase, the levels of activity will stabilise and birds in the surrounding landscape will be expected to habituate to any increased noise and disturbance levels. The impact on terrestrial birds, in habitats adjoining the proposed development site is therefore predicted to be permanent and imperceptible during operation. During operation, the existing stormwater management systems have been designed to ensure that there are no significant effects on surface or ground water quality. The impact on surface water quality and on prey availability for birds feeding in aquatic or estuarine habitats downstream of the facility will be imperceptible during construction and operation.
Potential impacts on other fauna during construction and operation	Mammal species which are protected under the Irish Wildlife Act 1976, as amended, occur or could potentially occur within the proposed development site. No habitats of significant value with regard to amphibians (including the existing pond) or reptiles will be affected by the proposed works. The work areas are only likely to support common invertebrate species. The effect on these species will be not significant in the short term and imperceptible in the long term.

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12 Archaeology, Architectural and Cultural Heritage

12.1 Introduction

This chapter of the EIAR assesses the potential for archaeological, architectural and cultural heritage effects from the construction and operation of the proposed Site Sustainability Project, herein referred to as the proposed development, as detailed in **Chapter 4** ***Description of the Proposed Development*** and **Chapter 5** ***Construction Activities*** of this EIAR and shown on **Figures 12.1-12.6.**

This chapter initially sets out the methodology followed (**Section 12.2**), describes the receiving environment (**Section 12.3**), and summarises the main characteristics of the proposed development which are of relevance for archaeological, architectural and cultural heritage (**Section 12.4**). The likely significant effects of the proposed development on archaeological, architectural and cultural heritage are described (**Section 12.5**), measures are proposed to mitigate likely significant effects (**Section 12.6**), and cumulative effects (**Section 12.7**) and residual effects (**Section 12.8)** are described. The chapter concludes with a reference section (**Section 12.9**).

Some terms used in this report are explained hereunder.

12.1.1 Archaeological Heritage

Archaeological heritage can be described as the study of past human societies through their material remains and artefactual assemblages. The Valetta Treaty (or the European Convention on the Protection of the Archaeological Heritage, 1992) defines archaeological heritage as “all remains and objects and any other traces of humankind from past times” this includes “structures, constructions, groups of buildings, developed sites, moveable objects, monuments of other kinds as well as their context, whether situated on land or under water”.

12.1.2 Architectural Heritage

Architectural heritage is defined in the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 as structures and buildings together with their settings and attendant grounds, fixtures and fittings, groups of such structures and buildings, and sites, which are of architectural, historic, archaeological, artistic, cultural, scientific, social or technical interest.

12.1.3 Cultural Heritage

Cultural Heritage is an expression of the ways of living developed by a community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions and values.

Cultural Heritage is often expressed as either Intangible or Tangible Cultural Heritage (ICOMOS, 2002). Environmental Protection Agency Guidelines (2003), define cultural heritage as including archaeological heritage, architecture, history, landscape and garden design, folklore and tradition, geological features, language and dialect, religion, settlements, inland waterways (rivers), and place names.

12.1.4 Study Area

In order to undertake a comprehensive assessment of the archaeological, architectural and cultural heritage environment, a study area within approximately 1.5km radius of the proposed development site including the proposed development site was examined (**Figure 12.1; Section 12.3.1**).

12.2 Assessment Methodology

12.2.1 General

The methodology used to complete this chapter of the EIAR comprised the following:

- A review of the relevant legislation and guidelines;
- A desktop assessment of the proposed development site and study area;
- A walkover survey of the proposed development site;
- An evaluation of the likely significant effects of the proposed development on the archaeological, architectural and cultural heritage of the proposed development site and study area; and
- Proposed mitigation measures to be undertaken to prevent or reduce any potential effects on the archaeological, architectural and cultural heritage.

12.2.2 Guidance and Legislation

In Ireland, the primary means of protecting archaeology, architectural and cultural heritage assets are the National Monument (Amendments) Acts 1930 to 2004, the Heritage Act 1995, the relevant provisions of the National Cultural Institutions Act 1997, the Architectural Heritage (National Inventory) and Historic Monuments (Misc. Provisions) Act 1999 and the Local Government (Planning and Development) Act 2000, as amended. Policies for both the archaeological and architectural heritage are set out in a series of specific published guidelines. This chapter is prepared having regard to the following guidelines:

- Guidelines on the information to be contained in Environmental Effect Statements, 2002 (Environmental Protection Agency) and Draft Revised Guidelines, 2017;
- Advice Notes on Current Practice in the Preparation of Environmental Effect Statements, 2003 (Environmental Protection Agency) and Draft Revised Advice Notes, 2015;

- Guidelines on the information to be contained in Environmental Effect Statements, 2003, EPA;
- Advice Notes on Current Practice (in preparation of Environmental Effect Statements), 2003, EPA;
- Framework & Principles for the Protection of the Archaeological Heritage, 1999 (Department of Arts, Heritage, Gaeltacht & the Islands);
- Policy & Guidelines on Archaeological Excavation, 1999 (Department of Arts, Heritage, Gaeltacht & the Islands);
- Architectural Heritage Protection, Guidelines for Planning Authorities, 2004. (Department of the Environment, Heritage and Local Government); and
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning and Local Government, 2018).

Comprehensive guidelines on the treatment of the archaeological and architectural heritage during the planning and design of national road schemes were published by the National Roads Authority in 2005. These were also used as a guide in the compilation of this EIAR.

- Guidelines for the assessment of Archaeological Heritage Effects of National Road Schemes, 2005a (NRA).
- Guidelines for the assessment of Architectural Heritage Effects of National Road Schemes, 2005b (NRA).

12.2.3 Desktop Assessment

The desktop study provided an archaeological, architectural and cultural heritage overview of the proposed development site and study area and used the following sources.

12.2.3.1 Record of Monuments and Places (RMP)

This RMP was established under Section 12 (1) of the National Monuments (Amendment) Act 1994.

It lists all monuments and places believed to be of archaeological importance in the County. The numbering system consists of two parts: the first part is the county code (ME for Meath) followed by the Ordnance Survey map number (six-inch to the mile scale); the second part is the number of a circle surrounding the site on the RMP map, e.g. ME027-109 refers to circle 109 on OS sheet 027 for County Meath. The circle is intended to show the recorded monument or place and is sometimes referred to as the Zone of Archaeological Potential or Zone of Notification; the circle does not define the exact extent of the monument or place.

The diameter of the circle can vary depending on the size and shape of the site but it averages out at approximately 180m. The RMP for County Meath was published in 1996.

There are no RMP sites within the proposed development site. There are a number of RMP sites within the study area. Refer to **Section 12.3** below for further details.

12.2.3.2 Sites and Monuments Record (SMR) Database of the Archaeological Survey of Ireland at the National Monuments Service (NMS)

The purpose of the Archaeological Survey of Ireland (ASI) is to compile a base-line inventory of the known archaeological monuments in the State. The archive and database resulting from the survey are continually updated. Archaeological sites which are added to the database are proposed to be included in the next published edition of the RMP and will then be afforded its protection. Sites previously listed in the RMP which, following investigation, are now considered to be of no archaeological potential are de-listed from the database and generally described as redundant records. This database, complete with maps is now available for consultation via the NMS website at www.archaeology.ie.

There are no SMR sites within the proposed development site. There are a number of SMR sites within the study area. Refer to **Section 12.3** below for further details.

12.2.3.3 Archaeological Inventory

The inventories for each county are follow-ons by the ASI to the RMPs. They give a written description of each archaeological site in the county. The Archaeological Inventory of County Meath (Moore, M.J., 1987) was published in 1987.

12.2.3.4 Files of the NMS, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs (DAHRRGA)

The National Monuments Service (NMS) was consulted to retrieve information on lists of RMP sites that have been afforded added protection such as;

- National Monuments in the ownership or guardianship of the state – None in the study area;
- Monuments subject to Preservation Orders and Temporary Preservation Orders – None in the study area; and
- Monuments listed in the Register of Historic Monuments – None in the study area.

12.2.3.5 The National Museum of Ireland Archives

These files were consulted for townlands within the study area. The topographical files contain the reports, including correspondence, present location and occasionally, illustrations of archaeological material recovered throughout the country.

There are a number of stray finds within the study area. Refer to **Section 12.3** below for further details.

12.2.3.6 County Development Plan for Meath (2013-2019)

The Meath County Development Plan (CDP) (2013-2019) outlines Meath County Council's objectives with regard to the preservation of the archaeological, architectural and cultural heritage of the County. The Council recognises that the archaeological heritage of an area '*..includes monuments, sites, and objects whether situated on land or under water. In this respect, Meath has a significant archaeological heritage, which includes the UNESCO World Heritage Site of Brú na Bóinne…Through policies contained in this Development Plan, they seek to ensure the effective protection, conservation and enhancement of archaeological sites, monuments and their settings'.*

The CDP outlines the Council's objectives regarding the protection of the archaeological heritage, including the protection of monuments listed in the SMR and RMP, by preservation in situ, or at a minimum preservation by record. It aims to protect important archaeological landscapes from inappropriate development and will encourage the appropriate maintenance of the county's archaeological heritage in accordance with conservation principles and best practice guidelines.

Development in the immediate vicinity of a recorded monument will be sensitively sited and designed to ensure it does not detract from a monument and, where upstanding remains exist, a visual impact assessment may be required.

The guidance of the National Museum of Ireland (NMI) will be sought in the event that an archaeological object is discovered while the NMS will be contacted in the event of the discovery of an unrecorded archaeological site. The RMP will be made available to the public in the Planning Office and a link will be maintained on the Meath website to maintain access to the on-line edition of same.

The rich and varied architectural heritage of the County is protected through the inclusion of buildings in the Record of Protected Structures (RPS), as required in the Planning and Development Act 2000 (Part IV).

It is an objective of Meath County Council to '*protect all structures (or, where appropriate, parts of structures) within the county which are of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest and which are included in the Record of Protected Structures*

The objectives of the Council for the RPS include:

- The identification of structures for protection according to criteria set out in Architectural Heritage Protection – Guidelines for Planning Authorities (2004, 2011), as well as the extension of the RPS to form a comprehensive schedule for the County;
- The protection of structures and parts of structures, listed in the RPS, as well as their curtilage and attendant grounds;

- Ensuring that development proposals for protected structures are appropriate and of high quality;
- Ensuring best conservation practises are promoted; and
- Ensuring high quality architectural design of new development relating to or effecting on structures and their settings included in the RPS.

The National Inventory of Architectural Heritage (NIAH) for County Meath lists items of architectural importance in the County. The structures identified as being of international and national importance are included on the RPS. Other structures of regional importance were considered for inclusion in the Record. Meath County Council recognises the important contribution that all historic structures, including those not on the record, make to County Meath's heritage. The Council will seek to enhance all historic structures, features and landscapes not included in the RPS as well as non-structural elements such as designed gardens, garden features, masonry walls, railings, follies, gates, bridges and street furniture. This includes industrial heritage sites and structures. It is acknowledged in the CDP that the county '*contains significant stretches of both operational and derelict waterways, railway structures, mills, lime kilns and milestones'*.

The CDP recognises the importance of historic designed landscapes which consist of private gardens, public parks, and the gardens and landscapes associated with country houses and demesnes. The NIAH have identified approximately 300 such sites in County Meath.

The importance of vernacular architecture as the expression of the culture of a community built with local materials by local people is recognised. It is a policy of Meath County Council to '*encourage the retention, sympathetic maintenance, and appropriate re-use of the vernacular heritage of Meath, in both the towns and rural areas of the County, including the retention of the original fabric, such as windows, renders, shop fronts, gates, yards, boundary walls and other significant features where possible*'. The Council will encourage the appropriate re-use of traditional farm buildings in preference to their replacement.

There are no protected structures within the proposed development site or within the 1.5km Study Area.

12.2.3.7 National Architectural Inventory of Architectural Heritage

The National Inventory of Architecture in Ireland (NIAH) was set up under the Convention for the Protection of the Architectural Heritage of Europe or the Granada Convention of 1985.

It was established on a statutory basis under Section 2 of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999.

The work of the NIAH involves identifying and recording the architectural heritage of Ireland, from 1700 to the present day, in a systematic and consistent manner.

It is divided into two parts; The Building Survey and Historic Garden Survey (www.buildingsofireland.ie). The main function of both is to identify and evaluate the State's architectural heritage in a uniform and consistent manner, so as to aid to its protection and conservation. The NIAH carried out a survey of the buildings of County Meath in 2004 with the exception of Navan Town which was published in 2003.

Under Section 53 of the Planning and Development Act 2000, as amended, all structures considered of regional, national or international importance within the survey are recommended for inclusion in the RPS by the Minister for Arts Heritage and the Gaeltacht. If this is not adopted by the local authority, the reasons must be communicated to the Department. The Building and Historic Garden Survey for County Meath is available online.

There are no buildings included in the Inventory within the proposed development site or within the 1.5km Study Area.

12.2.3.8 Database of Irish Excavation Reports

This website[1] provides a database of summary accounts of archaeological excavations and investigations undertaken in Ireland between 1970 and 2020. Until 2010, these accounts were also published in book form. The database was queried for any investigations undertaken in the proposed development site and Study Area.

A number of archaeological investigations were undertaken within the Indaver site and in the surrounding area. Archaeological monitoring was carried out on a 15m wide corridor for a new gas pipeline from the south of Drogheda to the outskirts of Navan. Part of this pipeline extended through the proposed development site and no archaeological finds or features were identified (Clinton, 1999). Other archaeological investigations undertaken within the Indaver site and in the surrounding area are detailed in **Section 12.3** below and reproduced in full in **Appendix 12.2** of **Volume 3** in this EIAR.

12.2.3.9 Site-specific publications

All available published information on the study area was consulted. This included historical journals, local history publications etc., all of which are listed in **Section 12.9**.

12.2.3.10 Previous Archaeological Assessments

Previous archaeological assessments undertaken within the proposed development site include the following;

2006 – EIS to assess the potential for cultural heritage effects from the construction of the waste to energy facility at Indaver Meath.

[1] Access at www.excavations.ie

The EIS, comprising a desktop study and field inspection of the 25 acre site, did not identify evidence of archaeological activity within the proposed development site but did identify the potential for uncovering subsurface archaeological finds or features during construction (Archaeological Development Services Ltd. 2006). This EIS (2006) was submitted under EPA IE licence application W0167-02 and available from the EPA IE licence database[2].

2009 - Following on from the EIS and in compliance with Condition 10 of the grant of planning (Planning Ref. SA/60050), archaeological monitoring of topsoil stripping was undertaken over a period of five months from September 2008 to February 2009 (Leahy, 2009). A total of five features of archaeological potential were identified; two isolated pits and a cluster of three pits. Three of the features were archaeological and charcoal from these features was submitted for dating. The results of dating indicated that the features were late Neolithic and Middle Bronze Age (*ibid.*). In conclusion, the author noted '*All archaeological features on this site have been fully resolved and the remainder of the site was devoid of any archaeological remains. It is therefore deemed that no further onsite archaeological work is necessary in relation to this development'*. However, '*should the areas under the high voltage power line, over the gas main or under the berms ever be the subject of further development, involving subsurface disturbance, it is recommended that these works be carried out under archaeological supervision'*.

2012 – EIS[3] to assess the potential cultural heritage effects (if any) of proposed amendments to the Indaver Meath facility (ABP Pl. Ref No. PL17.PA0026). The proposed amendments did not result in any additional areas of the site being disturbed. Construction activity was associated with the pre-treatment plant which was built adjacent to the main process building on previously disturbed ground. The EIS concluded that the proposed amendments would not impact on the archaeological and cultural heritage environment (White Young Green, 2012). The report also concluded that any future topsoil stripping of any undisturbed areas at the site should be monitored by a suitably qualified archaeologist as required by Condition 10 of the original grant of planning in 2008 (Planning Ref. SA/60050).

12.2.3.11 Cartographic Sources

The following maps were consulted:

- The Down Survey Parish and Barony maps (1654-1659) (**Figure 12.2; Section 12.3.5;**
- Ordnance Survey 6-inch maps: the two editions of the 6-inch to one mile scale maps were consulted, the first edition published in 1841-1842, the second edition published in 1909 onto which the RMP was superimposed in 1996. The 25-inch to one mile scale map, from which the second edition 6-inch map was derived in 1909 was also consulted. Refer to **Figures 12.3 and 12.4; Section 12.3.6.**

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[2] EPA Industrial Emissions Licence W0167-02, available to view from: http://www.epa.ie/terminalfour/ippc/index.jsp
[3] EIS available to view from http://www.carranstownamendments.ie

12.2.3.12 Aerial Photographs

Ordnance Survey of Ireland online aerial photographs (dated 1995, 2000, 2005-2012 and 2017) from GeoHive[4] (OSI) and Google maps online aerial photographs are available for viewing (www.google.ie). **Refer to Figures 12.5 and 12.6; Section 12.3.6**. These were examined to identify any previously unrecorded features of archaeological/cultural heritage significance that may only be visible from the air. No archaeological features were apparent on the photographs.

12.2.3.13 Consultation

Consultation was held with Loreto Guinan, Heritage Officer with Meath County Council on the 27th of February 2020.

12.2.3.14 Site Inspection

The primary purpose of a site inspection is to assess the physical environment in which the proposed development will take place and identify any possible features of cultural heritage significance which have not been previously recorded. Current land use, local topography and environmental conditions are assessed to gain an overall picture of the area. An inspection of the proposed development site was carried out on the 7th of October 2019 (**Refer to Plates 1- 13; Appendix 12.1**, **Volume 3** of this EIAR**)**.

The proposed development site comprises an established industrial facility which includes upstanding buildings, hard surface yards, carparking and internal road network. The proposed development will comprise the addition of structures, car parking and upgrades to allow for its expansion. A contractor's compound and facilities will also be established on the site. The majority of proposed works are on previously developed land i.e. the ground has previously been disturbed. The remaining works proposed are on Indaver land which has not been previously developed i.e. undisturbed land.

These proposed works and areas of the site to be developed are described in detail in **Chapters 4 *Description of the Proposed Development*** and **5 *Construction Activities*** of EIAR.

12.2.4 Impact Assessment Methodology

Impacts of the proposed development are assessed in accordance with EPA *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (EPA Draft 2017).

[4] GeoHive, available at: http://map.geohive.ie/mapviewer.html

12.3 Receiving Environment

12.3.1 Introduction

The proposed development site lies within the existing Indaver waste to energy site which received planning permission in 2007 (Pl. Ref. 17.219721) with construction of the facility completed in 2011, refer to **Figure 4.1** in **Chapter 4**. The Indaver facility is located along the R152 approximately 2.7km northeast of the Historic Town of Duleek (CO027-038) in County Meath and 4.5km to the southwest of the Historic Town of Drogheda (which straddles both counties Meath and Louth). The site is in the townland of Carranstown, in the parish of Duleek of barony of Lower Duleek.

The nearest extant settlement to the proposed development site is the Historic Town of Duleek (ME027-038), located 2.5km to the southwest on the banks of the River Nanny. The name Duleek is derived from the old Irish word for stone church, 'Damliac' and it is thought that the earliest stone church in Ireland was established here by St. Patrick (Bradley, 1985). Important archaeological sites within the village include the remains of a round tower (ME027-038009), two high crosses (ME027-038004 and ME027-038005), St. Cianán's parish church (ME027-038013) built *c.* 1816 and developed on the site of the early church (ME027-038003).

The following overview is a chronological account of the archaeological, architectural and cultural heritage of the study area.

There are no recorded archaeological monuments listed in the RMP for Co Meath or in the SMR database of the ASI within the proposed development site. The closest known recorded monuments to the proposed development site are a ringfort (ME027-109) in Carranstown, an embanked enclosure (ME027-078) in Carranstown/Caulstown and an enclosure (ME027-078001) and a redundant record (ME027-079) in Caulstown situated between 150m and 210m to the southeast. Sites previously listed in the RMP which, following investigation, are now considered to be of no archaeological potential are de-listed from the database and generally described as redundant records. In total, there are 17 recorded archaeological sites included in the RMP and SMR database within the 1.5km study area (**Figure 12.1 and Table 12.1 below)**.

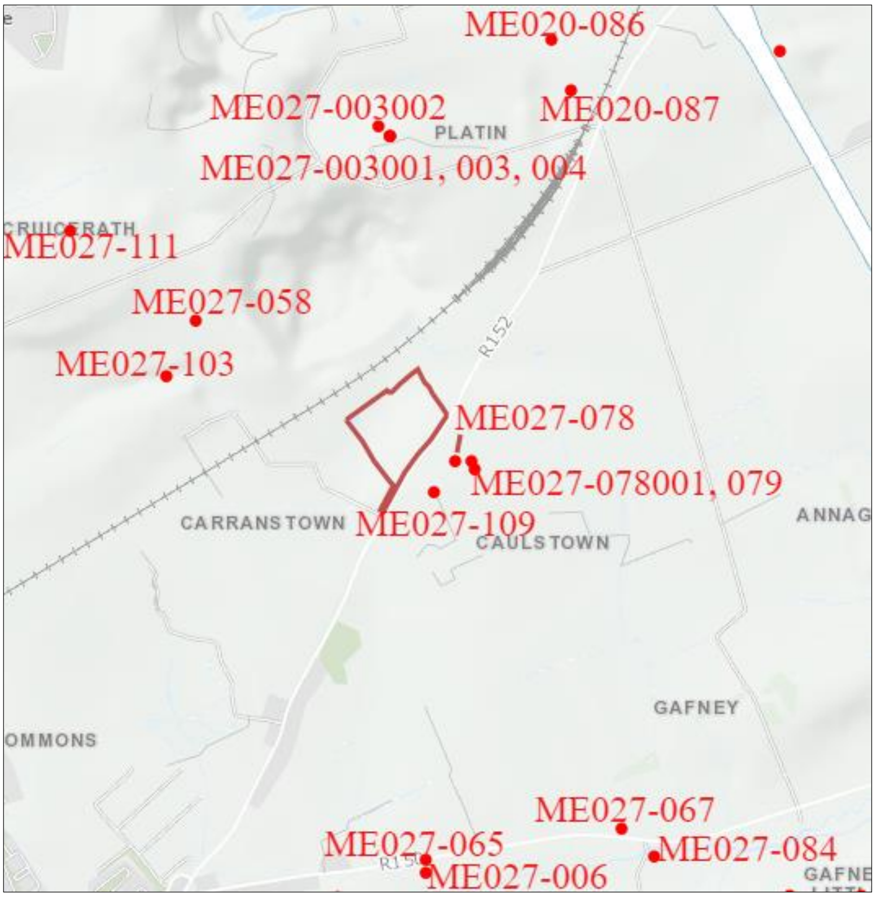

Figure 12.1: Extract from OS map showing existing Indaver site boundary (where proposed development will be located) in red with RMP detail within the 1.5km Study Area www.archaeology.ie

Table 12.1: Archaeological sites included in the RMP and SMR database within a 1.5km radius of the proposed development site

RMP	Site Type	Townland	Distance
ME020-086	Enclosure	Platin	1.4km to NE
ME020-087	Enclosure	Platin	1.3km to NE
ME027-003001	Church	Platin	1km to N
ME027-003002	Castle unclassified	Platin	1km to N
ME027-003003	Cross	Platin	1km to N
ME027-003004	Cross	Platin	1km to N
ME027-006	Souterrain	Bellewstown	1.5km to SW
ME027-058	Fulacht fia	Carranstown	745m to NW
ME027-065	Enclosure	Bellewstown	1.4km to SW
ME027-067	Enclosure	Bellewstown	1.6km to S
ME027-078	Embanked enclosure	Carranstown/ Caulstown	130m to SE
ME027-078001	Enclosure	Caulstown	180m to SE

RMP	Site Type	Townland	Distance
ME027-079	Redundant Record	Carranstown/ Caulstown	210m to SE
ME027-084	Burial Ground	Bellewstown	1.6km to SE
ME027-103	Fulacht fia	Carranstown	750m to NW
ME027-109	Ringfort	Carranstown	135m to S
ME027-111	Ringfort	Cruicerath	1.4km to NW

The archaeological timescale can be divided into two major periods, each with a number of sub-sections:

1. **The prehistoric period:** Mesolithic - (*circa* 7000 to 4000 BC); Neolithic - (*circa* 4000 to 2400 BC); Bronze Age (*circa* 2400 to 500 BC) – Iron Age (*circa* 500 BC to AD 400)
2. **The medieval period:** Early medieval 5th – 12th century; high medieval 12th century – *circa* 1400; late medieval *circa* 1400 – 16th century.

12.3.2 Mesolithic and Neolithic

The earliest evidence for human colonisation and settlement in Ireland can be dated to 7000 BC, the Mesolithic Period. The people of this era were hunter-gatherers, entirely dependent on what food could be obtained through hunting and gathering, amongst other things, edible plants and shellfish. The transition of these early settlers from hunter/gatherers to a farming way of life in the Neolithic Period brought about more permanent settlements and a more complex and structured social hierarchy. There are no known archaeological sites dating to the Mesolithic Period within the Study Area. The general lack of sites does not, however, mean that such early settlement and occupation were unknown to the region.

Within the proposed development five features were identified during archaeological monitoring in 2008-2009, three of which were archaeological and were fully resolved through excavation. Charcoal samples dated one pit to the beginning of the Late Neolithic period, the second pit to the Late Neolithic and the third pit to the Middle Bronze Age (Leahy, 2009 and **Appendix 12.2**). One of the excavated features produced lithic material and the Neolithic date from this feature may allow the other lithic artefacts, recovered from the topsoil, to also be assigned to this period (*ibid*). It was concluded that despite the lack of diagnostic artefacts the material is indicative of activity in the area in either the Neolithic or Bronze Ages (*ibid*).

Archaeological monitoring and excavations undertaken at a proposed westward extension of Platin Quarry to the north of the proposed development site has revealed a number of archaeological features over the years. In 2004, four charcoal spreads and a curvilinear feature were excavated and produced prehistoric pottery and worked flint. The curvilinear ditch contained bone, pottery, flint and a possible amber bead within its fills (O’Carroll, 2004 and **Appendix 12.2**).

In 2001, a roughly rectangular Neolithic house (8m N-S x 6m) was excavated in the townland of Platin c. 1.2km to the northeast of the proposed development site (Moore, 2001). While outside the Study Area, excavations at Platin Promontory Fort (ME020-014), c. 2km to the northeast have established human activity on the summit from the Early Neolithic to the Middle Bronze Age (Seaver, 2000).

The UNESCO World Heritage Site of Brú na Bóinne which means the ‘palace’ or the ‘mansion’ of the Boyne is situated approximately 5km to the northwest of the proposed development site. This prehistoric landscape within the bend of the River Boyne is dominated by three large passage tombs; Newgrange, Knowth and Dowth which date to the Neolithic Period. In 2018, a programme of aerial reconnaissance was carried out by the NMS over the World Heritage Site. The near-drought conditions of that summer provided clarity of detail on the known monuments and uncovered numerous additional archaeological sites, many of which have been classified as enclosures, defined by banks and ditches. The survey has transformed the overall archaeological appreciation of this Neolithic ritual landscape on the Newgrange floodplain (Condit. T. and Keegan, M. et al. 2018).

12.3.3 Bronze Age and Iron Age

The Irish Bronze Age is characterised by the introduction of metallurgy to the Island of Ireland. The earliest recorded archaeological sites in the study area date to the Bronze Age in the form of two fulachtai fia, (ME027-058 and ME027-103), both in Carranstown. Fulachtai fia, which have been interpreted as cooking places, bathing places or steam baths are the most common type of prehistoric site in the country. The two fulachtai fia in Carranstown were identified during pre-development testing and were excavated in advance of a western extension of Platin Quarry, located just 300m to the northwest of the Indaver facility in 2003 (Dehaene, 2002, 2003 and **Appendix 12.2**). Two of the excavated pit features within the proposed development site contained burnt and heat shattered stone, the type that is usually associated with fulachtai fia. The excavator concluded that while the pits were isolated and did not contain associated features or mounds of burnt stone, it may be that they represent the employment of this technology on a very limited basis with each pit functioning as a trough but on a very small scale (Leahy, 2009). The pits within the proposed development site, according to the excavator, most probably represent the remains of activity related to the fulachtai fia excavated in Platin Quarry (*ibid*). Hence the pits within the proposed development site ‘*are aspects and evidence of the wider use of the landscape outside the more easily recognised sites that result from more intensive activity*’ (*ibid*.).

Archaeological testing was undertaken as part of a request for further information from Meath County Council for a proposed substation and power plant across the R152 to the south of the proposed development site in March 2019. The testing was undertaken to the immediate east of an embanked enclosure (ME027-078) and three localised spreads of heat-fractured stone were identified (McCarthy, M. 2019). To the north of the proposed development site in Carranstown, fourteen archaeological features (12 large post-holes and 2 pits) were identified.

The post-holes were arranged in a sub-circular shape and produced a large assemblage of prehistoric pottery (293 sherds) of possible Bronze Age date and a small assemblage of worked flint artefacts (Stirland, 2017 and **Appendix 12.2**).

Stray finds have been found in the townlands of Cruicerath to the northwest and Newtown to the west. A bronze pin (NMI reg. 1933:580) was found in a quarry at Cruicerath and a battle axe and hammer (NMI reg. L1934:7-8) were found near White Rock in Newtown. In Bellewstown, to the southwest of the proposed development site, a small/miniature cast bronze palstave/axe (Length 8.7cm; Width across the blade 3.08cm; Height 2.18cm at stop ridge) was found on Bellewstown Hill (NMI 2018:195).

Outside the Study Area, excavations at Platin Promontory Fort (ME020-014), have established human activity on the summit dating to the Early and Middle Bronze Age (Seaver, 2000).

12.3.4 Early Medieval Period

This period in Ireland is characterised by the influx and influence of Christianity, which had become widely established by the 6th century AD. Monasteries became a focal point for the lay communities of this period who were spread throughout the countryside in settlements such as ringforts/raths, crannogs and simple huts. In Duleek, c. 2.5km to the southwest, the stone church of St. Cianán (ME027-038003) was established within a large ecclesiastical enclosure (ME027-038019). Tirechan's Life of St. Patrick and the Annals of Ulster for the year AD724 make reference to a stone church in Duleek (Edwards, 1990). The present-day concentric street patterns of Duleek town follow the original circular shape of the ecclesiastical enclosure (dims. c. 325m N-S; 380m E-W) that was such a distinctive feature of the early monastic sites. According to Swan (1983) the ecclesiastical enclosure '*has become fossilised in the street system'*.

Recorded archaeological sites dating to this period within the Study Area include two ringforts (ME027-109 and ME027-111) in Carranstown and Cruicerath respectively, and a souterrain (ME027-006) in Bellewstown. Ringforts (also known by the names rath, lios, cathair or caiseal/cashel) are defended farmsteads and are the most characteristic monument of the Early Medieval Period. Their main phase of construction and occupation dates from the beginning of the 7th century AD to the end of the 9th century. They are generally circular or oval in plan, defined by an earthen bank with an external ditch or fosse. Larger ringforts with double defences (bi-vallate) and triple defences (tri-vallate) are generally interpreted as higher status sites and these can be particularly associated with specialised craft working. The sub-surface remains of circular dwelling houses and associated outbuildings are frequently revealed within ringforts during excavation. Some ringforts have associated souterrains (underground chambers connected by narrow creepways) as defensive features which may have also been used for storage. Others have associated corn-drying kilns and sometimes external structures.

The most common site type in the area with six examples, is the enclosure, with two in Platin (ME020-086 and ME020-087), two in Bellewstown (ME027-065 and ME027-067), one (ME027-078) in Carranstown/Caulstown and one (ME027-078001) in Caulstown.

The term enclosure is applied to archaeological sites, which cannot be definitively classified. Very often these enclosures are ringforts or cashels, which fall beyond the accepted size range for these monuments (i.e. less than 20 m or more than 60 m in diameter). Sometimes they can be of indeterminate shape and may date to as early as the Bronze Age or as recently as the last century, when they were used as animal shelters.

There is no above ground evidence for the ringfort in Carranstown, which is evident as a cropmark visible on aerial images (Digital map 2018). The site is described on the ASI database as a circular area (int. diam. c. 45m; ext. diam. c. 52m) that is defined by a single fosse feature (Wth. *c.* 3-4m) with a wide entrance gap (Wth. *c.* 8m). The ringfort is located *c.* 140m to the southwest of an embanked enclosure (ME027-078) which was identified by a LiDAR survey in 2018. It is described on the ASI database as a large circular enclosure (int. diam. c. 120m; ext. diam. c. 200m) defined by a broad bank feature (Wth. C. 30-40m). According to the ASI database, a gradiometry survey also carried out in 2018, identified a probable enclosure (ME027-078001) inside the perimeter of this larger embanked enclosure. The ringfort in Cruicerath consists of a circular enclosure (diam. 35m) defined by a single fosse feature. The levelled site was identified as a cropmark from an aerial survey conducted by Bluesky International during the drought conditions of June 2018 (ASI Database).

12.3.5 High Medieval and Late Medieval Periods

There is one recorded site dating to this period within the Study Area, an unclassified castle (ME027-003002) in the townland of Platin. The majority of castles in Ireland can be broadly classified into two groups; the early castles of the late twelfth and thirteenth centuries and the tower houses of the fifteenth to seventeenth centuries. The castle in Platin is no longer extant and cannot be classified to a precise timeframe. According to the Civil Survey (1656-8) Nicholas Darcy of Platen owned over 600 acres including a castle (Moore, 1987). The castle was replaced by a three-storey, nine-bay fronted red brick house in *c.* 1700, which was demolished in *c.* 1950 (Bence-Jones, 1988). The house is variously named ‘Platin House’ on the OS 1st edition map (1841-42) and ‘Platin Hall’ on the later 2nd edition OS map (1909). Lewis (1837) describes the house as the seat of R. Reeves and a ‘spacious mansion situated in a richly planted demesne’. Platen House is depicted on the Down Survey Parish Map (1654-1659) to the north of Carranstown townland which is spelt ‘Curranstonne’ and the town of ‘Droghedagh’ depicted to the northeast (**Figure 12.2)**

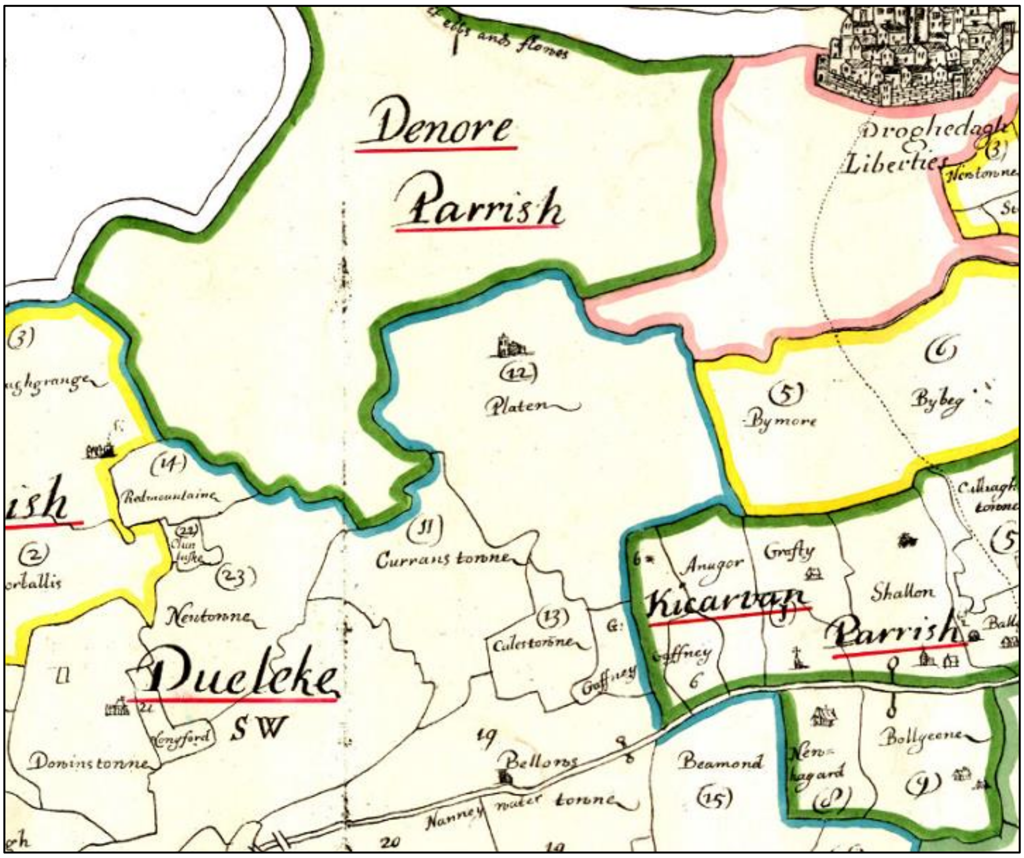

Figure 12.2: Extract from Down Survey Parish and Barony map (1654-1659)

The Battle of the Boyne between the Williamite forces of Protestant King William III and Jacobite forces of Catholic King James II was fought across the River Boyne approximately 5km to the north of the proposed development site. The site of the battle (ME020-025001) is shown on the ASI database as being on the bend of the River Boyne close to Oldbridge Obelisk and extending over the townlands of Ardagh, Glebe (Slane Upper Barony), Oldbridge, Rathmullan and Sheephouse. The Williamite encampment (LH024-009) was situated in the townland of Tullyallen in County Louth to the north of the river, while the Jacobite encampment was on Donore Hill near Donore Church to the south of the river. All of the fighting took place on the south side of the river where approximately 1,500 soldiers were killed and the battle ended in victory for King William (www.battleoftheboyne.ie). The Williamites again defeated the Jocobites at the decisive battle of Aughrim in county Galway a year later, finally bringing the war to an end with the signing of the treaty of Limerick.

In 2003, the westward extension of Platin Quarry to the north of the proposed development site, produced ten features which in turn produced approximately 530 sherds of medieval pottery, dating to the 13th/14th centuries. Initial analysis of the site show similarities with other medieval rural settlement sites (Dehaene, 2003 and **Appendix 12.2**). In 2017 three archaeological features were identified in the townland of Carranstown to the north of the proposed development site. A narrow shallow linear area (20m in length) was excavated and a large assemblage of medieval pottery (147 sherds) ranging in date from the 12th and 13th centuries (Stirland, 2017 and **Appendix 12.2**).

12.3.6 Post Medieval Period

The church at Platin (ME027-003001), dating to the 16th century, lies *c.* 30m to the south of the former Platin Hall country house and probably functioned as an estate or private chapel. There is a limestone cross (ME027-003003), decorated with foliage and figure sculpture and dating to c. 1480-1500, cemented into the east window of the church. A second disc-headed cross (ME027-003004) also in the church dates to the 17th century (King, 1984). There is one burial ground (ME027-084) in the Study Area in Bellewstown. According to the ASI database there is a tradition that it marks the resting place of two Cromwellian soldiers who occupied Bellewstown Castle (ME027-083), during the siege of Drogheda in 1649. The burial site is marked by two stones in the middle of a field some 500m to the northeast of the castle. According to the ASI database, historical records show that Bellewstown Castle was occupied by Cromwellian troops.

The proposed development site was previously a green field site in agricultural land. Cartographic sources indicate the site of the Indaver complex and the surrounding landscape was under agricultural use since the mid-19th century.

The 1841-42 6-inch OS map, (**Figure 12.3**) and the 25-inch map of 1897-1904 (**Figure 12.4**) (from which the second edition of the 6-inch map was derived) show the proposed development site as reasonably sized, rectangular fields in a rural environment.

The 1st edition Ordnance Survey (OS) map of 1842 (**Figure 12.3**) depicts the proposed development site as consisting of two large rectangular-shaped fields and the southern end of a third field. There are no structures depicted in these fields. The only change to the proposed development on the later 2nd edition OS map of 1906 is the insertion of a field boundary running north to south through the southernmost field. As with the earlier OS map edition, there are no structures depicted within the proposed development site **(Figure 12.4).** The most obvious change to the surrounding area is the development of the Oldcastle Branch of the Great Northern Railway Ireland which runs east to west a short distance (*c.* 110m) to the north of the proposed development site.

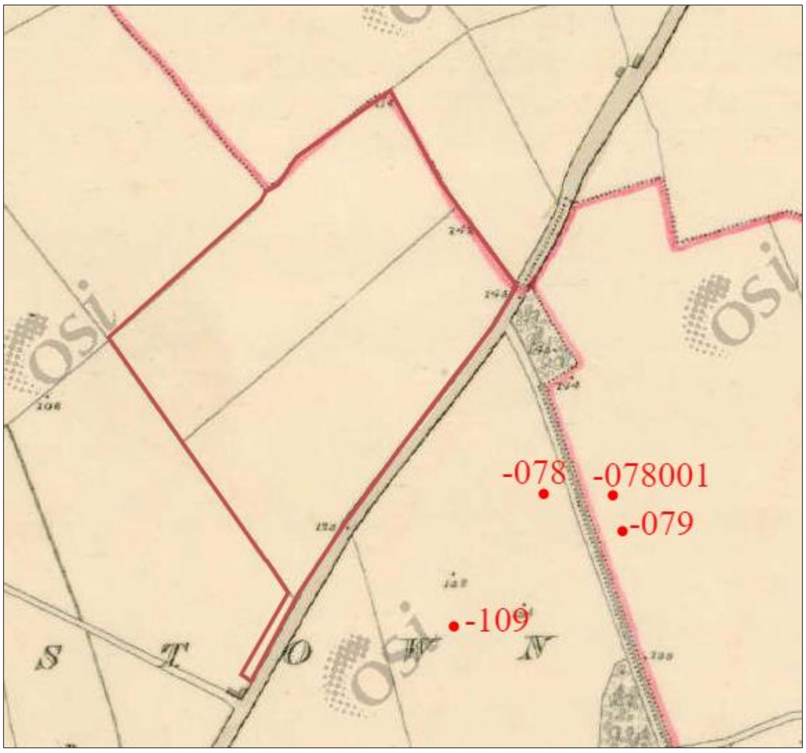

Figure12.3: Extract from 6-inch OS map (1841-42) showing Indaver site boundary where proposed development will be located outlined in red with RMP detail (to be pre-fixed with ME027) www.archaeology.ie

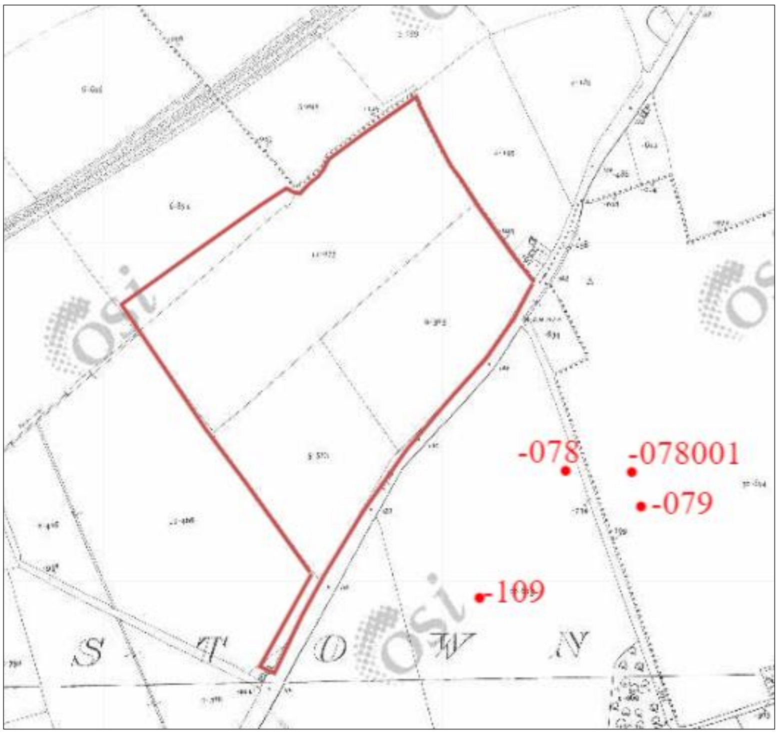

Figure 12.4: Extract from 25-inch OS map (1909) showing Indaver site boundary where proposed development will be located outlined in red, with RMP detail (to be prefixed with ME027) www.archaeology.ie

The proposed development site is depicted as greenfield in 1995 and 2000 while the majority of the site is stripped of topsoil and under development in 2005-2012 (**Figure 12.5)**. The latest aerial photograph (2017) depicts the current Indaver facility (**Figure 12.6**).

Figure 12.5: Extract from OS aerial photograph (2005-2012) www.geohive.ie

Figure 12.6: Extract from OS aerial photograph (c. 2017) www.geohive.ie

The Meath County Development Plan (2013-2019) does not list any protected structures within the proposed development site or within the 1.5km Study Area. Similarly, there are no structures listed in the NIAH within the proposed development site or within the 1.5km Study Area. The nearest protected structures to the proposed development lie within the Historic Town of Duleek (ME027-038) located 2.5km to the southwest. There are no architectural conservation areas (ACAs) in the Study Area or larger environs. The closest ACA's to the proposed development site would be those around Slane village and Slane Castle Demesne, c. 10km to the northwest.

The Historic Town of Duleek (ME027-038) contains thirteen Protected Structures listed in Appendix 8 of the Meath County Development Plan (2013 - 2019). The structures include churches such as St. Kienan's Church of Ireland (RPS 206) dating to 1816 and St. Cianan's Roman Catholic Church (RPS 213) dating to 1812, some early houses such as Duleek Country House (RPS 203) dating to 1750 and Connell's House (RPS 208) dating to 1690, the Old Nanny Bridge (RPS 216) dating to 1587, and a wayside cross (RPS 202) dating to 1690, erected by Dame Jenet Dowdall to commemorate her two husbands.

12.4 Characteristics of the Proposed Development

The proposed development site comprises an established industrial facility which includes upstanding buildings, hard surface yards, carparking and an internal road network. The proposed development will comprise of main development elements and miscellaneous site upgrades to allow for its expansion. These development elements are numbered Areas 1-18 on **Figure 4.4** in **Chapter 4.** For full details on the proposed development and construction activities refer to **Chapters 4** and **5** of this EIAR.

An inspection of the proposed development site was carried out on the 7th of October 2019, refer to **Plates 1-13; Appendix 12.1** and the following observations were made;

12.4.1 Main Development Areas

12.4.1.1 Bottom Ash Storage Building Area 1(B)

This is a grassed landscaped/bermed area. It lies to the east of an existing percolation area and to the west of an established berm (**Plate 1**). Archaeological monitoring was undertaken in most of this area, except under the berm during ground reduction in 2008-2009 and no finds or features of archaeological significance were revealed (Leahy, 2009).

12.4.1.2 Concrete yard area and Tanker/Truck Container Parking Area 2 (C)

This area is partially a hard surface tarmac area and partially bermed/landscaped. It lies adjacent to the west of an established berm (**Plate 2**).

Archaeological monitoring was undertaken in most of this area, except under the berm, during ground reduction in 2008-2009 and no finds or features of archaeological significance were revealed (Leahy, 2009).

12.4.1.3 Warehouse, Workshop and ERT Building Areas 4 and 5 (D)

This is hard surface area of chip and tar and hardcore material. It lies adjacent to the east of the existing maintenance building and to the north and west of an established berm (**Plate 3**). Archaeological monitoring was undertaken here during ground reduction in 2008-2009 and no finds or features of archaeological significance were revealed (Leahy, 2009).

12.4.1.4 Proposed Tank Farm Area 8 (A)

This is a grassed landscaped area adjacent to the west of an existing Air Cooled Condenser (**Plate 4**) and **Figure 4.4** in **Chapter 4**. Archaeological monitoring was undertaken here during ground reduction in 2008-2009 and no finds or features of archaeological significance were revealed (Leahy, 2009).

12.4.1.5 Existing Berm (Area E)

The berm lies to the east of a large hard surface area of chip and tar Area 15 (F). It is landscaped and colonised by established vegetation (**Plate 5**).

12.4.1.6 Office Rebuild Area 14 (G) and Proposed Hydrogen Generation Unit Area 15(F)

This is a large hard surface area of chip and tar with a modular office building standing in one section. An established berm lies to the east and south, while a fenced off exclusion area under overhead powerlines lies to the north (**Plates 6 and 7**). Archaeological monitoring was undertaken here during ground reduction in 2008-2009 and a single archaeological feature (pit) was identified. The feature was fully resolved by archaeological excavation and a charcoal sample taken produced a Late Neolithic date. No other finds or features of archaeological significance were revealed (Leahy, 2009).

12.4.1.7 Alteration to existing carpark Area 18 (H)

This is an established hard surface carpark area (**Plate 8**). Archaeological monitoring was undertaken here during ground reduction in 2008-2009 and no finds or features of archaeological significance were revealed (Leahy, 2009).

12.4.2 Miscellaneous site upgrades

Ancillary development works include the following;

- Area 3 – Canopy Maintenance Bay
- Area 6 – Cast Concrete hardstand
- Area 7 – Tarmac area for truck reversing

- Area 9 – Tanker unloading area (**Plate 9**)
- Area 10 – Road widening
- Area 11 – Concrete yard widening
- Area 12 – Truck Layby (**Plate 10**)
- Area 13 – Concrete Footpath and Stairs (**Plate 11**)
- Area 16 – Access Road
- Area 17 – Contractors laydown area: This will be located to the east of the established carpark and south of the fenced off line of the underground gas main. This is a mixture of hard surface and landscaped area currently in use as an overflow truck park (**Plates 12 and 13**).

Archaeological monitoring was undertaken in all of these areas with the exception of Area 13 during ground reduction in 2008-2009 and no finds or features of archaeological significance were revealed (Leahy, 2009). Area 13 lies under the high voltage power line that runs roughly east to west across the centre of the site. With the exception of two crossing points, this area was not stripped of topsoil.

12.5 Likely Significant Effects

The likely significant effects of the proposed development on the archaeological, architectural and cultural heritage landscape are assessed with reference to the Draft EPA Guidance[5] (2017, p.50) *Description of Effects*.

The proposed development works will require ground disturbance and preparation works. This construction work would have a significant effect on any potential archaeological material that may survive below the ground surface.

12.5.1 Archaeology

Archaeological monitoring of topsoil stripping was undertaken within the proposed development site over a period of five months from September 2008 to February 2009 (Leahy, 2009). Three archaeological features were identified and were fully resolved by archaeological excavation. At that time, the author noted that the remainder of the site was devoid of any archaeological remains and no further onsite archaeological work was necessary. The report outlined three areas which would require archaeological supervision if disturbed by future development as follows;

- Area of ground under the high voltage power line
- Area of ground over the gas main
- Area of ground under the berms

Limited sections of two of these areas will be impacted by the proposed development as follows;

[5] Available here: https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf

12.5.1.1 Area of ground under the high voltage power line

It is proposed to construct a concrete footpath and stairs under the overhead powerline to provide a personnel access route from the process building to the proposed office building, hydrogen generation building and the contractors compound (refer to Area 13 in **Figure 4.4**, **Chapter 4**). The footpath and stairs is one of a series of miscellaneous site upgrades to improve the general workings of the site.

Construction of this footpath will require the removal of topsoil which would impact on any potential subsurface archaeological remains. During archaeological monitoring in 2008-2009 a single archaeological feature (pit) was identified *c.* 15m to the south of this proposed footpath. The pit feature was fully resolved by archaeological excavation and a charcoal sample taken produced a Late Neolithic date. No other finds or features of archaeological significance were revealed in the surrounding area.

Given the limited area of ground to be disturbed (path measurements approximately 50m in length x 2m in width), the impact of construction of the footpath is assessed as slight.

12.5.1.2 Area of ground under the berms

It is proposed to construct a bottom ash storage building and a large concrete yard at the northeast of the development site. The building (Area 1) will be 60m by 25m in plan and the concrete yard (Area 2) will be 35m by 55m in plan.

The majority of ground in the area of the proposed building and yard was archaeologically monitored during topsoil stripping in 2009 and no finds or features of archaeological significance were revealed (Leahy, 2009). The closest archaeological feature identified at that time to the berm was a pit situated over 200m to the southwest. Construction works will require the excavation of the berm and the removal of topsoil underneath. This excavation would impact on any potential subsurface archaeological remains. Given that no archaeological finds or features were found in proximity of the berm in 2009, the overall impact is assessed as slight.

The majority of the proposed development lies within the footprint of ground which has already been archaeologically resolved. Therefore, no likely significant effects on the archaeological environment are foreseen in Areas 3-12 and in Areas 14-18 which comprise the majority of the development elements. Two areas of the proposed development; under the overhead power line (Area 13) in roughly the centre of the site and under the berm (Areas 1 and 2) at the northeast of the site may impact on previously unknown archaeological finds or features. Where extensive earthmoving is involved there is always the possibility that hitherto unknown subsurface archaeological material will be uncovered.

The physical impact of the current Indaver facility on the World Heritage Site of Brú na Bóinne was considered in the 2006 EIS. The EIS concluded '*The facility is a minimum of 3km from the river valley and approximately 5km from the boundary of the World Heritage Site, sufficiently distant so as to render any* *archaeological impacts not significant*'. Similarly, the UNESCO-ICOMOS monitoring mission which reported on the Indaver site in 2004, '*found no grounds for believing that the construction of the proposed incinerator itself would have a direct impact on the outstanding universal value of the World heritage site*' (UNESCO-ICOMOS, 2004).

12.5.2 Architecture

The Meath County Development Plan (2013-2019) and the NIAH do not list any protected structures or features of architectural merit within the proposed development site or within the 1.5km study area. Therefore, no significant effects on the architectural environment are predicted.

12.5.3 Visual Effects

The 2006 EIS submitted for the initial construction of the Indaver facility addressed the following impacts on the World Heritage Site of Brú Na Boinne;

Visual Effects: The assessment concluded '*the mass of Redmountain will mask the development from almost all of the core area of the World Heritage Site. The stack however will be visible from Dowth but not from Newgrange or Knowth. Therefore, while there will be some visual impact on the World Heritage Site this impact will be minimum particularly when compared to the nearby cement factory*'. The UNESCO-ICOMOS (2004) concurred with this conclusion stating that '*while the construction of the incinerator stack will be a visual intrusion, the mission considers that it would have a minimum impact on the world Heritage site compared with the existing cement factory nearby*'. The proposed development does not include any structures at the height of the stack (79m) already present on the site.

Section 13.5.3 of **Chapter 13 *Landscape and Visual*** of this EIAR assessed the potential impacts of the proposed development on views from Brú na Bóinne. The three Protected Views and Prospects listed in Meath County Development Plan from the three main passage tombs of Dowth (View 88), Newgrange (View 87) and Knowth (View 59) were assessed. The report concluded that the relatively small scale of the built elements that comprise the proposed development will have no perceptible visual impact on views from the World Heritage Site.

Vapours from the stack: Potential impacts on the unique winter solstice event at Newgrange Passage tomb were considered in the 2006 EIS. This is when the rising sun on a number of days around December 21st shines directly into the burial chamber within the tomb. The 2006 EIS stated '*examination of the cartographic evidence shows that the development will be sited some considerable distance, c.3km to the east of the point on the Newgrange horizon, where the sun rises on the 22nd. As far as the events at Newgrange are concerned the entire development will be completely masked by Redmountain ridge'*.

A report entitled '*Assessment Of Air Quality Impact Of Carranstown Waste Management Facility At Brú Na Boinne*' was completed by AWN in March 2004.

A summary of the findings of this report were presented in Appendix 16.2 of the 2006 EIS and concluded that the impact of air emissions from the Indaver facility on the Brú na Bóinne site would be insignificant.

Chapter 8 *Air Quality* of this EIAR assessing Air Quality confirms that the '*increase in waste tonnage proposed will not cause a significant impact to the ambient air quality'*. Therefore there is no significant change in the emissions from the initial Indaver development as modelled in 2009/2012 (as per the current IE licence W0167-03) and the current proposed development.

The 2006 EIS assessed the visual impact of the development of the Indaver facility of the site of the Battle of the Boyne. The site of the Battle (ME020-025001) is shown on the ASI database as being on the bend of the River Boyne close to Oldbridge Obelisk and extending over the townlands of Ardagh, Glebe (Slane Upper Barony), Oldbridge, Rathmullan and Sheephouse. The EIS concluded that although the stack would be seen from some of these extended areas of the battlefield, the impact will not be significant.

In addition, the UNESCO ICOMOS mission report[6] (2004) concluded that the construction of the incinerator '*would not appear to preclude any possible interpretation of the course of the Battle*'.

Finally, impacts on the ecclesiastical centre of Duleek, situated *c.* 2.5km to the west of the proposed development, were addressed. The EIS (2006) concluded that the construction of the Indaver facility will not impact on the village and its archaeological heritage.

12.5.4 'Do-Nothing' Effects

If development does not proceed the existing landscape will remain in its current condition with potential archaeological finds or features beneath areas of previously unstripped ground under the berm at the northeast in Areas 1 and 2 and under the overhead power line in Area 13.

12.5.5 Construction Phase

All of the development areas 3-12 and areas 14-18 lie within the footprint of ground which has already been archaeologically resolved. Therefore, no significant effects on the archaeological, architectural and cultural heritage environment are foreseen during the construction phase for the majority of the development.

It is possible that hitherto unknown archaeological finds or features may be present under the overhead power line in Area 13 and under the berm in Areas 1 and 2. The potential impact of construction works in these areas has been assessed as slight given that no archaeological finds or features were found in proximity to Areas 1 and 2 and given the limited area of ground to be disturbed in Area 13.

[6] Available from: http://whc.unesco.org/archive/2004/mis-659-2004.pdf

12.5.6 Operational Phase

No significant archaeological, architectural or cultural heritage effects are predicted during the operational phase of the proposed development.

12.6 Mitigation Measures and Monitoring

There will be no impact on the archaeological, architectural and cultural heritage environment for the bulk of the development on the site in areas 3-12 and 14-18. Hence, no archaeological mitigation measures are required for these development areas.

During construction archaeological monitoring will be carried out on areas of ground disturbance under the berm in Areas 1 and 2 and under the overhead powerline in Area 13. In the event of archaeological material being uncovered such material will be preserved *in situ*, where possible or preserved by record. Preservation *in situ* will require the relocation of the element of the development beyond the area of archaeological sensitivity.

Preservation by record will require the excavation of the archaeological material and such material will be fully resolved to professional standards of archaeological practice (*Policy Guidelines on Archaeological Excavation*[7] – Department of Arts, Heritage, Gaeltacht and the Islands, 1999). This work will be funded by the developer.

Mitigation measures are not required for the operational stage.

12.7 Cumulative Effects

Chapter 18 *Cumulative Effects, Other Effects and Interactions* of this EIAR considers the likely significant effects that may arise during construction and operation of the proposed development.

No significant cumulative effects on the archaeological, architectural or cultural heritage are predicted as the majority of the proposed development lies within the footprint of ground which has already been archaeologically resolved and has been subjected to extensive ground reduction and subsequent development. The overall impact of ground works on the small remaining areas of unstripped ground under the overhead power line Area 13 and under the berms in Areas 1 and 2 has been assessed as slight.

Chapter 18 *Cumulative Effects, Other Effects and Interactions* of this EIAR also considers whether any of the proposed and/or recently approved schemes in the local area have a potential to exacerbate (i.e. alter the significance of) effects associated with the proposed development. Proposed and/or recently approved projects include the following;

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[7] Department of Arts, Heritage, Gaeltacht and the Islands (1999) Policy Guidelines on Archaeological Excavation, https://www.archaeology.ie/sites/default/files/media/publications/excavation-policy-and-guidelines.pdf

- Irish Cement Limited (Planning Ref: LB150375) - Cement Silo;
- Irish Cement Limited (Planning Ref: PL17 .PA0050) - Alternative fuels and raw materials;
- SSE Generation Ireland Ltd. (Planning Ref: PL17.303678) - 110kV transmission substation;
- Highfield Solar Ltd., (Planning Ref: PL17.248146) - Solar farm;
- Highfield Solar Ltd., (Planning Ref: PL17 .303568) - Electrical substation (110kV).

When the predicted impact of the proposed development at Indaver is combined with each of the approved projects individually, no significant negative direct nor indirect cumulative effects are predicted on the overall archaeological landscape.

Construction work for the proposed and/or recently approved projects will require some degree of ground works which may impact on hitherto unknown subsurface archaeological finds or features. The combination of these various projects may have a cumulative effect on the archaeological landscape in the vicinity of the Indaver development site and in the wider area.

The more extensive the area of ground to be disturbed, the greater the risk of negatively impacting on potential subsurface archaeological finds or features. If such features are preserved by record they will be permanently removed from the archaeological landscape.

12.8 Residual Effects

The bulk of the current development proposal lies within the footprint of ground which has already been archaeologically resolved, thereby negating the presence of any further archaeological finds or features on the majority of the site. There will be no likely significant residual effects on the archaeological and cultural heritage environment on the majority of the development site.

It is possible that archaeological finds or features may be present under the overhead power line Area 13 and under the berms in Areas 1 and 2. In the event of archaeological material being uncovered in these areas, such material will be preserved *in situ*, where possible or preserved by record.

The Meath County Development Plan (2013-2019) and National Inventory of Architectural Heritage (NIAH) do not list any protected structures or features of architectural merit within the proposed development site. There will be no likely significant residual effects on the architectural heritage associated with the proposed development.

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13 Landscape and Visual

13.1 Introduction

Mitchell + Associates was engaged by Indaver to prepare a Landscape and Visual Impact Assessment (LVIA) Chapter for the EIAR for the proposed development at Carranstown.

This Chapter summarises the impact of the proposed development on the landscape character and visual amenity of the site and on the contiguous area and the site environs. It describes the landscape character of the subject site and its hinterland, together with the visibility of the site from significant viewpoints in the locality. It includes an outline of the methodology utilised to assess the impacts and descriptions of the receiving environment (baseline) and of the impacts of the development. Mitigation measures introduced to ameliorate or offset impacts are outlined and considered in **Section 13.6** and the resultant predicted (residual) impacts are assessed.

This section should be read with reference to the selection of photomontages produced by Arc Digital, which are presented in **Appendix 13.1** of **Volume 3** of the EIAR.

13.2 Assessment Methodology

13.2.1 General

The assessment takes account of the existing landscape's capacity to accommodate the proposed development and assesses the landscape and visual impacts upon existing roads and public spaces within the broader environs of the site.

13.2.2 Guidance

The standard evaluation methodology used in the preparation of the Landscape and Visual Impact Assessment (LVIA) for Environmental Impact Assessment (EIA) is utilised. The evaluation methodology is therefore based on the following:

- 'Guidelines on the information to be contained in Environmental Impact Statements' - Environmental Protection Agency (EPA) 2002.
- 'Advice Notes on Current Practice in the preparation of Environmental Impact Statements' - Environmental Protection Agency (EPA), September 2003.
- 'Guidelines for Landscape and Visual Impact Assessment', prepared by the Landscape Institute and the Institute of Environmental Assessment, published by Routledge, 3rd Edition 2013.
- Reference is also made to the DRAFT 'Revised guidelines on the information to be contained in Environmental Impact Statements' - Environmental Protection Agency (EPA), September 2015 and to the DRAFT 'Guidelines on

the information to be contained in Environmental Impact Assessment Reports' - Environmental Protection Agency (EPA), August 2017.

13.2.3 Study Methodology

This Landscape and Visual Impact Assessment involved:

- Visiting the site and preparing a photographic record of the main landscape features including landscape elements, features and characteristics;
- Undertaking a desk study of the subject site and its environs in relation to its local and broader landscape significance using the photographic record, studying aerial photography and Ordnance Survey mapping;
- Establishing and describing the receiving environment in terms of the existing landscape and its visual amenity;
- Assessing the nature, scale and quality of the proposed development through examination of the design team's drawings, illustrations and descriptions of the proposed scheme;
- Assessing potential viewpoints, selecting those (from the public realm) which are considered most important and most representative in terms of visual impact; and
- Assessing the landscape and visual impact of the proposed development with reference to the photomontages contained in **Appendix 13.1** of this assessment.

13.2.4 Study Area and Selection of Views

The existing site and the proposed development may theoretically be visible from a range of populous and sensitive locations near the site and from further afield, and from a range of locations between these and the site. However, topography and existing vegetation often intervene and the visibility created by weather conditions, coupled with distance also tend to reduce such potential visibility.

In the context of the scale of proposed development, relative to the existing facility or indeed to the neighbouring Irish Cement works, Platin site (which is located 350 metres north of the subject site), a broad reconnoitre around the subject site was undertaken. This focussed particularly on visibility from roads, public places and sensitive historic sites and was also carried out to check on the accuracy and currency of the selected views for previous assessments carried out for developments on the subject site. Earlier assessments have included more viewpoints, however most of these yielded very slight or imperceptible impacts only, because they were either too distant or existing topography and/or vegetation intervened. Four of these viewpoints were established as potentially the most sensitive in previous viewpoint selections for assessments of this site. These four views are considered potentially relevant to the current proposals and most likely to be of significance (i.e. Views 1-4 incl.). A fifth viewpoint (View 5) is located on the public road (R152), across from the entrance to the nearest residential property, just east of the site. It was included following discussions between the applicant and the property owner/occupant concerning potential visual impact upon the neighbouring property.

The potential impacts of the proposed development on important views from sensitive sites such as Brú na Bóinne, its prehistoric site complexes of Dowth, Newgrange and Knowth and other Protected Views and Prospects within the environs of the proposed development site, is discussed in detail in **Sections 13.3.4** 'Cultural Heritage Context' and **13.3.5** 'Views and Prospects' and explains how the proposed development will not perceptibly impact on such views from distance. Please also refer to **Chapter 12** ***Archaeology***, ***Architectural and Cultural Heritage***, which also addresses the impacts of the proposed development upon views and prospects from these sensitive sites.

A total of five photomontages has therefore been prepared which clearly illustrate the visual impact of the proposed development on the surrounding landscape from the selected viewpoints (1 to 5), which as illustrated in **Figure 13.1** below, tend to be nearer the subject site. These viewpoints are discussed further in **Section 13.8.2** below.

Figure 13.1: Location of selected viewpoints (1 to 5). Source Google Earth.

13.2.5 Site Visits

Two site visits have been carried out, one was the broad reconnoitre outlined above and the second to check the photomontage images produced, from the actual viewpoints.

13.2.6 Desk Study

In addition to the normal desktop study of the site survey information and the relevant description of the proposed development, additional scrutiny of Google maps and Streetview information was also undertaken from the outset, primarily as a further check regarding intervisibility.

13.2.7 Impact Assessment Methodology

The appropriate significance criteria for the landscape and visual assessment are based on those given in Section 5 Glossary of Impacts of the EPA '*Guidelines on the information to be contained in Environmental Impact Statements'* (2002), and the DRAFT '*Guidelines on the information to be contained in Environmental Impact Assessment Reports*' (EPA, August 2017).

For this chapter they may be described as follows:

Degree or magnitude of effects (significance)

- Imperceptible / Not Significant: The development proposal is either distant or adequately screened by existing landform, vegetation or built environment.
- Slight Effects: The development proposal forms only a small element in the overall panorama / field of view, or there is substantial intervening screening by the existing landform, topography and/or vegetation. The view or character of the landscape is noticeably changed but without affecting its sensitivities.
- Moderate Impact: An appreciable segment of the existing view is affected by the proposed development or the development creates visual intrusion in the foreground. The view or the character of the landscape is altered but in a manner that is consistent with existing and emerging baseline trends.
- Significant Effects: Effects which, by their character, magnitude, duration or intensity alter a sensitive aspect of the environment.
- Very Significant Effects: Effects which, by their character, magnitude, duration or intensity alter most of a sensitive aspect of the environment.
- Profound Effects: Effects which obliterate sensitive characteristics.

Quality of effects

The quality of potential visual and landscape effects are assessed according to EPA guidelines (2017) as follows:

- Positive Effects: Changes which improve the quality of the landscape/view.
- Neutral Effects: Changes which do not affect the quality of the landscape/view.
- Negative Effects: Changes which reduce the quality of the visual environment or adversely affect the character of the landscape.

Duration of effects

Effects arising from a proposed development may also be considered in terms of duration as described in the EPA guidelines (2017):

- Temporary: Effects lasting less than one year
- Short-term: Effects lasting one to seven years
- Medium-term: Effects lasting seven to fifteen years

- Long-term: Effects lasting fifteen to sixty years
- Permanent: Effects lasting over sixty years.

13.3 Receiving Environment

13.3.1 Site Location

The Indaver Waste to Energy facility is located on the west side of the R152 at Carranstown, 4.5km to the south-west of Drogheda. The village of Duleek is located a further 2.7km south-west. The M1 motorway runs north-south approximately 2km east of the site. The majority of the proposed development works are proposed for the north-eastern area of the existing site, north-west of the 110kV power line exclusion zone which traverse the site. The proposed development works are largely on or adjacent to parts of the site which are already developed, including storage and hard-standing areas.

13.3.2 Landscape Context

The landscape surrounding the existing Indaver site is generally rural with pastoral agricultural land-uses predominating. However, there are significant areas of industrial and extractive uses immediately to the north and west of the existing Waste-to-Energy facility site. These land uses include the existing cement works and stone quarry, respectively. The mass of vertical structures on the Platin cement site is collectively a prominent visual feature and the dominant visual element which is seen from an array of distant vantage points. These structures consist of an array of tall silos, stacks and associated industrial plant and buildings. The extensive areas of extractive industry west of the cement works, whilst not overly intrusive, creates local visual impacts upon the broader agricultural landscape. It is not however, greatly visible from surrounding areas.

The topography immediately surrounding the subject site is gently rolling, typically between 35m and 70m OD. In a broader context, there is higher ground to the west and north-west of the site at Red Mountain and Donore Hill, which sit at approx. 100-120mOD. This higher ground is high enough to effectively screen views to the site from the Boyne Valley, including from the Brú na Bóinne World Heritage Site and from the main individual sites at Dowth, Newgrange and Knowth, all of which are located more than 4.5km to the north-west of the Indaver site.

Generally, the underlying topography of the facility site itself is a relatively even gradient, from a high point in excess of 39.0mOD at the eastern corner to a low point of just under 30.0mOD adjacent to the western corner. The existing buildings largely occupy the lower parts of the site and planted earth berms in the eastern part of the site further mask the natural underlying site slope. The parts of the site proposed for the larger elements of the proposed development also lie within the lower parts of the existing facility site.

The site is bounded by low hedgerows featuring occasional mature tree specimens. This reflects the general agricultural landscape around the facility site. During the original construction of the Waste-to-Energy plant, extensive screen planting was carried out, in and around the facility. This was provided as part of the visual mitigation for the main facility. In the intervening years this has been maintained, managed and supplemented. Since its original planting it has matured significantly to provide an effective partial screen which merges well with the existing field boundary hedgerows. This is particularly effective from nearer vantage points along the R152. Rates of growth are much in line with the projected growth expressed in the photomontages provided with the Landscape and Visual Impact Assessment contained in the EIS accompanying the 2009 planning application[1].

Other development in the area is largely confined to residential and farm related buildings, typically dispersed along local roads. Such development has gradually increased over time in this rural hinterland of Drogheda, along the R152 and is also clustered around the smaller villages, including Duleek and Donore, over 2km to the south-west and north-west respectively.

13.3.3 Planning Context

Appendix 7 to Meath County Development Plan 2013-2019 outlines the variation in Landscape Character within the County. The purpose of this is to identify the value, importance and sensitivity of each landscape character type and their potential capacity to accommodate development. Within Appendix 7, Map 02 indicates that the site lies within the ‘Central Lowlands’ Landscape Character Area 6, considered to be of ‘high value’ (which is actually mid-range, between ‘exceptional’ at the top end and ‘low value’ at the bottom) and it is of regional importance. Map 03 also indicates it is in an area of ‘moderate’ landscape sensitivity. It should be remembered that these are broad based landscape categorisations and it is accepted that within them there are distinct local variations and anomalies. Such is the case for the subject site, particularly in the context of the neighbouring cement works and associated quarries.

More sensitive landscape character areas are located some distance from the site. The southern edge of the ‘Boyne Valley’ (Landscape Character Area 5), is located approximately 2 km to the north-west of the proposed development site and is indicated as a landscape of exceptional value, of international importance and high sensitivity. ‘Bellewstown Hills’ (Landscape Character Area 9), characterised as ‘Hills and Upland Areas’, lies 4 km to the south-east of the site. This area is described as being of very high value with regional importance and of moderate sensitivity.

[1] Available to view from EPA IE Licence application W0167-02 at: http://www.epa.ie/terminalfour/ippc/index.jsp

13.3.4 Cultural Heritage Context

Brú na Bóinne, a UNESCO World Heritage Site, lies some 4 km to the north-west of the proposed development site. It is one of the most significant archaeological and cultural heritage sites in the country. It is an objective of Meath County Council (Development Plan Objective CH OBJ 1) to protect and enhance the outstanding universal value of the cultural landscape within this World Heritage Site so that its integrity, authenticity and significance are not adversely affected by cumulative inappropriate change and development, and to enhance views within and adjacent to the site. Map 9.1 of the Meath County Development Plan indicates a designated core as well as a surrounding buffer zone. It is the policy of Meath County Council to refuse permission for new development within the core area of Brú na Bóinne and to permit only small-scale development in the buffer zone with appropriate planning conditions. The proposed development is located outside both the designated core and buffer areas associated with Brú na Bóinne – refer to **Figure 13.2** below.

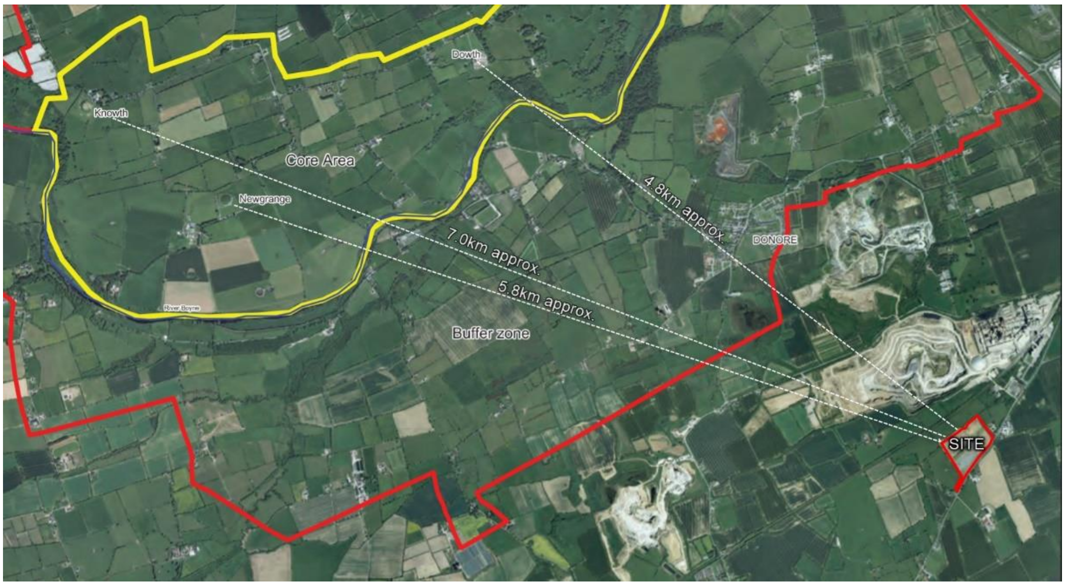

Figure 13.2: Site in the context of Brú na Bóinne - Extract from Meath CDP 2013-2019, Fig. 9.1. Source Google Earth imagery.

Previous Landscape and Visual Impact Assessments carried out for both the existing Indaver Waste-to Energy Plant and the neighbouring Platin cement works have clearly indicated that only the upper parts of the taller structures of the existing cement works close to the proposed development site, are visible from the three main prehistoric site complexes of Dowth, Newgrange and Knowth. In addition, from Dowth alone, the chimney of the Waste-to-Energy plant is just discernible beyond Donore village, away in the distance. Given the relatively small scale of the built elements of the proposed development, there will be no perceptible visual impact on views from these sensitive locations.

13.3.5 Views and Prospects

Meath County Development Plan, 2013-2019 (Map 9.5.1 and Appendix 12), identifies a total of 94 Protected Views and Prospects within the county – see **Figure 13.3** below.

Rather than intending to prohibit appropriate development within these views, the purpose of listing them is to inform the location and design of such proposed development, so as not to be intrusive in the landscape as seen from these vantage points.

Figure 13.3: Extract from Map 9.5.1 Views and Prospects. Source: Meath County Development Plan 2013-2019, Meath County Council.

Of the listed views, four are relevant in the context of the proposed development and include views from the three main prehistoric site complexes at Brú na Bóinne, including; Dowth (View 88); Newgrange (View 87, to the south-east) and; Knowth (View 59). These views are noted in the County Development Plan as being in the context of a working landscape (or working countryside), containing agricultural structures, dwellings and infrastructure. As previously noted, there will be no perceptible visual impact on views from these sensitive locations. In addition, listed View 66 is a view looking northwards from a viewpoint some 4 km from the site, on the county road between Duleek and Carnes East. It includes sight of the existing Waste-to-Energy plant, though this is somewhat dwarfed by the neighbouring Platin cement works to its east. This view is noted in the County Development Plan as already being very compromised by industry and urbanisation. The scale and positioning of the built elements of the proposed development, in the context of the existing buildings and from this distance, will have no perceptible impact on this view.

Given the aforementioned commentary in respect of Protected Views and Prospects (particularly those from the key sites at Brú na Bóinne), the principal views potentially yielding visual impacts are from along the R152 from the south and north-east. There are no significant views, from viable viewpoints closer to the site from the west, as existing hedgerows and earth berms with screen planting associated with the quarrying operations effectively block these views. This has informed the view selection for photomontages illustrating visual impact for this proposed development, as appropriate to its relatively small-scale in this context.

13.3.6 Other Landscape Aspects

There are no trees or woodlands identified for tree preservation on or surrounding the site. There are a number of walking/cycling/driving routes and tourist attractions within the vicinity of the site and in the wider area, including Brú na Bóinne as previously discussed and its associated visitors centre; the site of the Battle of the Boyne and; the River Boyne itself. Other than as already outlined above, the proposed development does not affect any of these in terms of landscape or visual impact.

13.4 Characteristics of the Proposed Development

13.4.1 General

The proposed development in terms of the proposed buildings, processes etc, is described in detail in **Chapter 4** ***Description of the Proposed Development***.

13.4.2 Aspects relevant to Landscape and Visual impact

The primary effects of the proposed development in terms of their potential effect on the landscape and upon views and visual amenity will be the proposed buildings, structures and other construction elements. These are outlined on drawing **29043/CD/003** ***Proposed Site Plan*** in **Appendix 5.2** of **Volume 3**. In summary these include:

- Area A; Proposed tank farm (North-west corner)
- Area B; Proposed Ash storage building (North-east corner)
- Area C; Concrete hardstand for access and parking
- Area D; Proposed warehouse/workshop/office and canopy over maintenance bay
- Area E; Internal movement of excavated material (from B, C, and D) onto existing berm, to increase overall height by approx. 7 metres, plus the extension of the existing berm along the southern boundary
- Area F; Proposed hydrogen electrolyser, including storage tank and access roads
- Area G; Replacement of existing modular office (single storey) with new office (single storey)
- Area H; Amendments to existing car park (31 new parking spaces, including 1 disabled space) plus the provision of the contractor’s compound and access ramp and gates
- Various amendments to internal roads, parking and lay-by zones, unloading areas, concrete footpaths and steps and new landscape (screen) planting.

13.5 Likely Significant Effects

13.5.1 'Do-Nothing' Effects

The effect of not proceeding with the proposed development essentially means the existing facility will remain in place and continue to function as is, for an undetermined period. It is however in the nature of the proposed development to improve the future prospects of the facility and improve its sustainability into the future. Doing nothing may therefore mean there is no change to its effect on the existing landscape and/or visual environment.

13.5.2 Construction Phase

The construction of this proposed array of small-scale development within the overall boundary of the existing large and working facility is likely to be of no significance. The effect of its construction will cause a small measurable change in the character of the site with, for example, a relatively small increase in site traffic. However, given the nature of the existing site this is likely to be of no significant consequence. The likely duration of any construction impacts is temporary.

13.5.3 Operational Phase

The main potential sources of impact are likely to arise from the height, scale and mass of the proposed buildings, tanks etc. The impacts on landscape and on visual amenity are however considered to be unlikely to be of a significant scale, given the relatively small scale of the proposed developments compared to the existing facility and the dominating presence of the nearby cement works. The nature of the proposal is also completely in character with other buildings in the immediate vicinity and are essentially an extension of their function. In this context, the proposed buildings are unlikely to be readily identifiable and will be effectively indistinguishable from the existing facility buildings.

In addition, as discussed in **Sections 13.3.4** 'Cultural Heritage Context' and **13.3.5** 'Views and Prospects' the proposed development will not perceptibly impact on the sensitive views from Brú na Bóinne or indeed from any views from distance.

13.6 Mitigation Measures and Monitoring

13.6.1 Construction Phase

Mitigation measures proposed during the construction stage of the development, revolve primarily around the implementation of appropriate site management procedures such as the storage of materials, placement of compounds, control of vehicular access, and effective dust and dirt control measures, etc. These are outlined in the Construction and Environmental Management Plan (CEMP) prepared by Indaver, which accompanies the EIAR (**Appendix 5.1**).

13.6.2 Operational Phase

Specific mitigation measures are not required for the operational phase.

The design of the proposed buildings and their scale, massing and heights are entirely in keeping with the existing buildings and the existing site operations. The proposed location of the proposed buildings, adjacent to existing buildings and behind the existing tree planted berms, assist further in screening them from the identified key viewpoints along the R152 road from Drogheda to Duleek. Extensions in height and length of some of the berm planted areas is proposed under the scheme proposals. The finishes of the proposed buildings, in matching with the existing main building finishes, will assist in assimilating the proposed buildings and should to an extent, reduce any visual impact.

13.7 Cumulative Effects

13.7.1 General

Current guidelines suggest that a determination should be made as to whether cumulative effects are likely to occur – these are outlined in the current GLVIA guidelines (3rd Ed., 2013) as '*additional effects caused by the proposed development when considered in conjunction with other proposed developments of the same or different types*'. It has become accepted practice that such a determination generally needs to be made as to whether any likely pending or permitted development of a similar nature will have any bearing on the assessment of the proposed development and this is subject to the assessor's judgement in the matter.

Cumulative Effects are dealt with in detail in **Chapter 18 *Cumulative Effects, Other Effects and Interactions***. **Table 18.1** therein provides a list of planned projects (existing and/or recently approved schemes) identified in the local area as having potential cumulative effects due to the construction and/or operation of the proposed development. Tthese potential cumulative effects have been considered in respect of landscape and visual effects.

The relevant projects reviewed are summarised below:

13.7.1.1 Irish Cement Limited – Planning Reference LB150375 & PL17 .PA0050

This approved project relates to a dust silo and application for the additional replacement of fossil fuels with alternative fuels respectively. Due to the scale, nature and separate location of the development and given that the assessed impacts of the proposed development are imperceptible/not significant, both of these developments do not have any potential to alter the significance of effects associated with the proposed development. Any cumulative effect will be imperceptible/not significant. Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

13.7.1.2 SSE Generation Ireland Ltd. Planning Ref : PL17.303678

This approved project is for a 110kV transmission substation in the townlands of Carranstown and Caulstown in County Meath. Due to the scale, nature and separate location of the development and given that the assessed impacts of the proposed development are imperceptible/not significant, this development does not have any potential to alter the significance of effects associated with the proposed development. Any cumulative effect will be imperceptible/not significant.

Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

13.7.1.3 Highfield Solar Ltd. Planning Reference: PL17 .303568 and .248146.

This approved project at Garballagh Lower Solar Farm, Co. Meath consists of two planning applications; a solar farm (Ref PL17.303568) and two substations (Ref. PL17.248146). This development is over 4km from the Indaver facility and will not result in any cumulative landscape or visual impact to the surrounding environment. Due to the scale, nature and distant location of the development and given that the assessed impacts of the proposed development are imperceptible/not significant, this development does not have any potential to alter the significance of effects associated with the proposed development. Any cumulative effect will be imperceptible/not significant.

Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

13.7.1.4 Summary

Overall, given the relatively small scale of the built elements in the proposed development, their location and positioning within the existing facility site and the existing industrial context within which they are placed, it is the assessor's judgement in this case, that there are no additional effects caused by the proposed development when considered in conjunction with any of the listed proposed/permitted developments of the same or different types, which could be considered likely to create cumulative effects. These developments (as listed in **Table 18.1** of **Chapter 18**), do not have any potential to alter the significance of effects associated with the proposed development. Any cumulative effects will be imperceptible/not significant.

13.8 Residual Effects

13.8.1 Landscape Impact

The proposed development will effectively not be visible from the public realm, so it will not have any impact in changing the perceivable landscape. As the proposed development will only be visible from within the facility, it therefore represents a change only to those who work in or visit the facility.

13.8.2 Visual Impact

All of the key viewpoints selected for this assessment are located on or near to the adjacent R152 road from Drogheda to Duleek. Photomontages (verified views) have been prepared by Arc Digital, illustrating the proposed development in the context of the relevant existing view – please refer to **Appendix 13.1 of Volume 3**. The view map also is presented in **Figures 13.4.1** and **13.4.2** in **Appendix 13.1.** The existing view from each viewpoint is illustrated together with the proposed development as seen from the same viewpoint. The location of each viewpoint is illustrated on the viewpoint location map accompanying the photomontages (refer also to **Figure 13.1**). The design life of the proposed development will be in excess of 30 years and therefore the duration of all visual impacts can be assessed as long term.

For each view the magnitude and quality are assessed and summarised below:

13.8.2.1 View 1

View 1 - Existing View Figure 13.5.1

This view is from the R152 looking north towards the main site entrance. The existing facility is seen left of centre and the stacks and silos of the existing cement works beyond are visible right of centre, beyond the site boundary tree planting.

View 1 - Proposed View Figure 13.5.2

The red line indicates the finished profile of the proposed development. The proposed development will not be seen as a result of intervening built elements, landforms and the earlier site boundary planting works.

Impacts from this location will be **Imperceptible / Not Significant**.

13.8.2.2 View 2

View 2 - Existing View Figure 13.6.1

This is a view from the R152 near the northern end of the site looking north-westwards. The existing facility is visible left of centre beyond the existing developing screen vegetation and the boundary fence.

View 2 - Proposed View Figure 13.6.2

The red line indicates the finished profile of the proposed development. The proposed development will not be seen as a result of intervening landform and planting.

Impacts from this location will be **Imperceptible / Not Significant**.

13.8.2.3 View 3

View 3 - Existing View Figure 13.7.1

This view is from the R152 north of the existing site, looking south-west. The existing facility and pylons for overhead power lines are visible in the centre of view, behind existing roadside hedgerows and more recent screen planting.

View 3 - Proposed View Figure 13.7.2

The red line indicates the finished profile of the proposed development. As a result of intervening landform and vegetation, only an extremely small part of one of the buildings of the proposed development will be seen to the right of view.

Impacts from this location will be **Imperceptible / Not Significant**.

13.8.2.4 View 4

View 4 - Existing View Figure 13.8.1

This view looks south-west from the minor road east of the R152, adjacent to the existing Platin cement works. The cement silos to the right dominate the view, though the landscape is generally an agricultural one of fields bounded by hedges and mature trees. The existing waste to energy facility is located in the centre of view in the distance.

View 4 - Proposed View Figure 13.8.2

The red line indicates the finished profile of the proposed development. The proposed development will not be seen as a result of intervening landform and vegetation.

Impacts from this location will be **Imperceptible / Not Significant**.

13.8.2.5 View 5

View 5 - Existing View Figure 13.9.1

This view is from the R152 road just east of the site, across the road from the entrance to a neighbouring property, looking west. The existing waste to energy facility is visible left of centre beyond the existing residential property.

View 5 - Proposed View Figure 13.9.2

The red line indicates the finished profile of the proposed development. As a result of intervening landform and vegetation, only an extremely small part of one of the buildings of the proposed development will be seen to the right of view.

Impacts from this location will be **Imperceptible / Not Significant**.

13.9 References

Guidelines on the information to be contained in Environmental Impact Statements prepared by the Environmental Protection Agency (EPA) 2002;

Advice notes on current practice in the preparation of Environmental Impact Statements - Environmental Protection Agency (EPA), September 2003;

Guidelines for Landscape and Visual Impact Assessment, prepared by the Landscape Institute and the Institute of Environmental Assessment, published by Routledge, 3rd Edition 2013;

Photography and photomontage in Landscape and Visual Impact Assessment - Landscape Institute (UK) advice note 01/11;

DRAFT 'Revised guidelines on the information to be contained in Environmental Impact Statements' - Environmental Protection Agency (EPA), September 2015;

DRAFT 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' - Environmental Protection Agency (EPA), August 2017;

Meath County Development Plan, 2013-2019.

Indaver

Site Sustainability Project

Environmental Impact Assessment Report

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14 Land and Soils

14.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) considers and assesses the likely significant effects with regards to soils, geology and hydrogeology associated with both the construction phase and operational phase of the proposed development. Measures to mitigate any likely significant adverse impacts of the proposed development on the soil, geology and hydrogeology in the vicinity of the proposed development are proposed within this chapter.

An assessment is made of the likely significant effects associated with the construction and operation of the proposed development on these resources. Measures are presented to mitigate or eliminate the effects of the soils, subsoils, bedrock, geological resources and heritage and hydrogeology.

Chapter 4 *Description of the Proposed Development* provides a full description of the proposed development.

Note: **Figures 14.1** to **14.9** of this chapter are presented in **Appendix 14.1** of **Volume 3** of this EIAR.

14.2 Assessment Methodology

14.2.1 General

The following section outlines the legislation and guidelines considered, and the adopted methodology for preparing this chapter and undertaking the soils, geology and hydrogeology assessment.

The potential effects of the proposed development on soils, geology and hydrogeology has been assessed by classifying the importance of the relevant attributes and quantifying the likely magnitude of any effect on these attributes.

14.2.2 Guidelines and Legislation

This chapter has been prepared using the following guidelines:

- European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as amended by the European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2011 (S.I. No. 389 of 2011), the European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2012 (S.I. No. 149 of 2012) and the European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016 (S.I. No. 366 of 2016)
- European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009), as amended by the European Communities Environmental Objectives (Surface Waters) (Amendment)

Regulations 2012 (S.I. No. 327 of 2012), as amended by the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2015 (SI No. 386 of 2015) and the European Union Environmental Objectives (Surface Water) (Amendment) Regulation 2019 (S.I. No. 77 of 2019)

- European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) as amended by the European Communities (Water Policy) (Amendment) Regulations, 2005 (S.I. No. 413 of 2005) and by the European Communities (Water Policy) (Amendment) Regulations, 2008 (S.I. No. 219 of 2008), as amended by the European Communities (Water Policy) (Amendment) Regulations, 2010 (S.I. No. 93 of 2010)
- European Union (Water Policy) Regulations 2014 (S.I. No. 350 of 2014)
- European Communities (Drinking Water) Regulations 2014 (S.I. No 122 of 2014), as amended by the European Union (Drinking Water) (Amendment) Regulations 2017 (S.I. No. 464 of 2017)
- European Communities (Quality of Salmonid Waters) Regulations 1988 (S.I. No. 293 of 1988)
- Institute of Geologists of Ireland (IGI, 2013). Guidelines for the Preparation of Soil, Geology and Hydrogeology Chapters of Environmental Impact Statements
- The EU Water Framework Directive (WFD), 2000/60/EC
- The Groundwater Directive, 2006/118/EC
- Water Services Acts (2007 – 2017)

14.2.3 Impact Assessment Methodology

The likely significant effects have been assessed by classifying the importance of the relevant attributes and quantifying the magnitude of any likely significant effects on these attributes. This has been undertaken in accordance with the IGI guidance (2013) which outlines a 13-step methodology that is divided across four distinct elements:

- Initial Assessment;
- Direct and Indirect Site Investigation;
- Mitigation Measures, Residual Impacts and Final Impact Assessment; and
- Completion of the Soils, Geological and Hydrogeological Sections of the EIAR.

Initial Assessment

The 'Initial Assessment' presents a description of the past and present uses of the land across the study area which may have a bearing on the proposed development. This includes a detailed description of the nature of the ground conditions beneath the site based on existing literature as well as site specific and neighbouring site investigation data.

Direct and Indirect Site Investigation

Section 14.2.6 provides information on the data available from the site-specific investigations carried within study area. **Section 14.3.2** describes ground conditions in the regional context. The information gathered on the baseline environment during ground investigations corresponds to the second element of the methodology, 'Direct and Indirect Site Investigation and Studies'.

Mitigation Measures, Residual Impacts and Final Impact Assessment

The outcome from examining this available data is a Conceptual Site Model (CSM). The CSM is a summary of geological and hydrogeological conditions beneath the proposed development that considers the likely significant effects of the proposed development.

Section 14.6 describes the likely significant effects associated with the proposed development based on the CSM in accordance with the guidance. Following the assessment, specific mitigation (**Section 14.8**) and monitoring measures (**Section 14.9**) have been developed to avoid, reduce and, if possible, remedy any predicted negative effects on the land and soils. Residual significant effects are described in **Section 14.10**. The magnitude and significance of these residual effects have also been classified based on the IGI Guidelines.

14.2.4 Study Area

The soils, geology and hydrogeology study area for the proposed development is shown on **Figure 14.1.** The study area is defined in this chapter as 2km from the existing Indaver site boundary.

14.2.5 Categorisation of Baseline Environment

In order to identify and quantify the potential impact of the construction phase and operational phase of the proposed development, it is necessary to undertake a detailed study of the (baseline) geological and hydrogeological environment of the study area. The existing soils, geology and hydrogeology conditions in the area have been interpreted from desk study information, previous studies and site investigations.

A site walkover was carried out on the 11th of October 2019.

14.2.6 Desk Study Information

A desk study was undertaken to establish the baseline conditions (i.e. soils, geological and hydrogeological environment) within the study area. The following sources of information have been used:

Site specific study:

- A soil and groundwater quality study completed by AWN Consulting Ltd in 2014, as part of Indaver Ireland Industrial Emissions (IE) licence W0167-03[1];
- Historic site investigation:
  - Site investigation (2000)[2]
  - Geotechnical investigation (2007)[3]
  - Geophysical and geotechnical field works[4];
- EIA Report for Development for Further Replacement of Fossil Fuels with Alternative Fuels and Alternative Raw Materials, prepared for Irish Cement Limited (ICL) by Brady Shipman Martin (2017)[5].

Public sources of information:

- Environmental Protection Agency (EPA) maps including[6]:
  - Registered protected areas
  - Water Features, Rivers and Streams
  - Historic Mine Sites - Inventory and Risk Classification
  - Ground Waterbodies Risk (WFD)
  - EPA Hydronet;
- Historic groundwater data - Annual Environmental Reports[7] for Indaver IE Licence W0167-03;
- Google Maps (2019) Aerial photography[8];
- Geological maps of the study area produced by Geological Survey Ireland (GSI) including[9]:
  - Groundwater Wells and Springs
  - Geological Heritage Areas
  - Groundwater Vulnerability
  - Groundwater Recharge
  - Groundwater Resources (Aquifers)

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[1] AWN Consulting Limited (2014), Indaver IRL Ltd – Soil and Groundwater Baseline Report (IED). Available from EPA IE Licence database, Indaver Reg. No. W0167-03: http://www.epa.ie/licences/lic_eDMS/090151b280502a7f.pdf

[2] Alpha Engineering Services, Consulting Engineers, Land Surveyors (2000), Geotechnical Report for Green Field Site at Platin, Co. Meath for Project Management

[3] Byrne Looby (2007), Indaver, Carranstown Geotechnical Assessment Report (B580)

[4] IGSL Ltd (2009), Meath Waste Management Facility Carranstown, Co. Meath, Geotechnical Interpretative Report (Report No. 14039)

[5] Available from EPA IE Licence database, Irish Cement Reg. No. P0030-05: https://www.epa.ie/licensing/

[6] Available at: https://gis.epa.ie/EPAMaps/ [Accessed 2October 2019]

[7] Available from EPA IE Licence database, Indaver Reg. No. W0167-03: https://www.epa.ie/licensing/

[8] Available at: https://www.google.com/maps/ [Accessed 1 October 2019]

[9] Available at: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 [Accessed 1 October 2019]

  - Teagasc Soils
  - Quaternary Sediments
  - Bedrock Geology 100k
  - Karst Features
  - Physiographic Units
  - Historic Mine Sites - Inventory and Risk Classification
  - Bettystown GWB: Summary of Initial Characterisation (GSI);
- National Parks and Wildlife Service (NPWS)[10] – Designated ecological sites;
- National Monuments Service[11];
- Water Framework Directive[12].

14.2.7 Technical Limitation

The baseline data described and considered in this assessment includes existing data from available desk study and site walkover information. The data collected provides comprehensive information on soils, geology and hydrogeology within the study area.

The baseline data provides valuable information on the existing soils, geology and hydrogeological environment at point locations within the study area. Between each point the baseline data has been assessed by conservative interpretation.

This review was completed by studying local geological maps, aerial photography and completing a site walkover to provide an understanding of the study area.

Based on the comparability of the results from the investigations commissioned specifically for the proposed development and the desk study of existing information on the baseline conditions, the information on the baseline conditions (as described in **Section 14.3**) is deemed sufficient.

14.3 The Existing Receiving Environment (Baseline)

14.3.1 Introduction

This section describes the existing soils, geology and hydrogeology within the study area. A regional overview is provided in terms of topography, soils, subsoils, solid geology and hydrogeology of the local area. This is followed by sub-sections identifying the feature importance ranking of the agricultural soils, superficial deposits, bedrock geology, soft and unstable ground, contaminated land, karst solution features, mineral and aggregate resource, hydrogeological features and geological heritage sites in accordance with the IGI guidelines.

Chapter 4 ***Description of Proposed Development*** of the EIAR outlines the proposed development.

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[10] Available at: http://webgis.npws.ie/npwsviewer/ [Accessed 1 October 2019]
[11] Available at: http://webgis.archaeology.ie/historicenvironment/, [Accessed 1 October 2019]
[12] Available at: https://wfd.edenireland.ie/

The receiving soils, subsoils, geology and hydrogeology environment is presented on **Figures 14.1-14.7** in **Volume 3** of this EIAR.

14.3.2 Regional Overview

The proposed development is located at the existing waste to energy plant at Carranstown, Duleek, County Meath. The existing waste to energy plant is located beside the R152 approximately 4.5km south-west of Drogheda and 2.7km north-east of the village of Duleek. The M1 motorway runs north-south approximately 2km of the site (**Figure 14.1**).

The general land use of the area is agricultural, however there are significant areas of industrial and extractive uses (Platin Cement Works) immediately to the north of the site. There are scattered residential houses located primarily along the existing road network.

14.3.2.1 Regional Geomorphology and Topography

The region is mainly a low-lying terrain with river channels incised into wide tracks of sand and gravel terraces. Elevated areas comprise relatively high, streamlined ridges of bedrock.

The site is located at the edge of the Nanny River Valley and in proximity to major excavation activities associated with Platin quarry located 200m to the north. Ground elevations of the study area vary from 34m to 44mOD (Ordnance Datum) in the south to 30m to 37mOD in the north of the study area. The physiography is classified by GSI as rolling ice-moulded topography with megascale lineations.

14.3.2.2 Regional Soils and Subsoils

The Teagasc soil mapping identifies the soils underlying the study area as deep well drained mineral soils derived from mainly non-calcareous parent material with pockets of mineral poorly drained soils and alluvium mapped along the north-west boundary of study area.

The quaternary mapping of the region based on the GSI indicate the study area is dominated by till derived from Namurian sandstones and shales as presented on **Figure 14.2**.

14.3.2.3 Regional Bedrock Geology

The GSI 1:100,000 bedrock map indicates the study area is underlain by Carboniferous limestones of the Platin formation as presented on **Figure 14.3**. The limestone is described as pale grey, thickly bedded, fine to coarse-grained. It is comprised of crinoidal and peloidal grainstone, locally conglomeratic.

There is no evidence of geological faults in the immediate vicinity of the study area. The closest series of faults are mapped approximately 1km north-west of the study area.

14.3.2.4 Regional Hydrogeology

The GSI Bedrock Aquifer map indicates the Platin Formation is classified as a Regionally Important karstified aquifer dominated by diffuse flow (Rk_d) as presented on **Figure 14.4**.

Under the Water Framework Directive (WFD), the GSI have delineated a number of groundwater bodies (GWB) in Ireland. The Bettystown GWB (IE_EA_G_016) underlies the study area and the Quantitative Status of the GWB is poor (WFD Status 2010-2015) due to the over abstraction and falling groundwater level. The GWB is also at risk of deteriorating or being at less than good status due to phosphate contributing to the surface water[12].

The GSI groundwater vulnerability mapping shows the vulnerability of the region is highly variable and ranges from low (L) in the east to extreme (X, E) to the north of the study area. The groundwater vulnerability within the study area is mapped as moderate (M) as presented on **Figure 14.5**.

14.3.2.5 Groundwater Resources

Groundwater resources describe any large spring, well or boreholes which are used as a groundwater abstraction source by domestic, agricultural, commercial, industrial, local authority or group water scheme users. Several boreholes used for supply have been identified in the area including two public water supply (PWS) wells (PWK1 and PWK2) in Kiltrough and two production wells located within the Indaver site. The GSI wells located in the vicinity of the study area are listed in **Table 14.2**.

Kiltrough (PWS) wells are approximately 1.5km north-east of the study area. Both wells are pumping constantly and combine daily abstraction rate is on average 2,600m^3/d.

Two production wells installed within the existing Indaver site in June 2011 have a sustainable yield of 600m^3/d and currently supply the water demand for the Indaver site. Current abstraction rate is approximately 216m^3/d, refer to **Section 4.7.1**. There are three monitoring boreholes within the Indaver site; one up-gradient (AGW1-1) and two down-gradient (AGW1-2 and AGW1-3) in relation to the site activities. The locations of both the monitoring boreholes and production wells are presented on **Figure 14.6.**

Groundwater Source Protection Zone (SPZ) reports have been produced by the GSI and the EPA. The reports aim to guide development planning and regulation to provide protection to groundwater sources. The closest SPZ report has been produced for Kiltrough PWS and does not overlap with the site.

The GSI wells and SPZ located within the study area are presented on **Figure 14.6** as well as the site groundwater boreholes (AGW1-1, AGW1-2 and AGW1-3).

A significant dewatering operation is carried out at the nearby Platin Quarry. The quarry is abstracting from the aquifer on average 17,500m^3/d to maintain dry working conditions at the quarry floor.

The hydrograph for Kiltrough EPA Monitoring borehole[6] shows a downward trend of groundwater level in the aquifer. The annual groundwater level variation in 2009 was 1.9m and in 2018 was 6.7m.

Table 14.1 GSI wells list located within 2km of the study area (Indaver site).

GSI Name	Well Type	Depth of hole (m)	Depth to bedrock (m)	Yield (m^3/d)	GSI Yield Class	Source Use
2927SEW035	Borehole	n/a	n/a	n/a	n/a	n/a
2927SEW036	Borehole	42.7	9.1	54.5	Moderate	Public Supply
2927SEW037	Borehole	61.0	0	n/a	n/a	Industrial use
2927SEW038	Borehole	47.2	15.2	872.7	Excellent	Industrial use
2927SEW039	Borehole	34.1	11.3	164	Good	Industrial use
2927SEW047[13]	Borehole	61	0	3600	Excellent	Industrial use
2927SEW048[2]	Borehole	30	n/a	3600	Excellent	Industrial use
2927SEW001	Dug well	6.7	n/a	n/a	n/a	n/a
2927SEW003	Dug well	n/a	n/a	n/a	n/a	n/a
2827SEW111	Borehole	42.7	0	1091	Excellent	Agriculture and domestic use
2927SEW110	Borehole	76.2	0	21.8	Poor	Agriculture and domestic use
2927SEW041	Borehole	21.9	n/a	28	Poor	Agriculture and domestic use
2925NEW058	Dug well	4.6	n/a	3.3	Poor	Public supply (Co Co)
2923NWW070	Borehole	22.9	8.2	109	Good	n/a

[13] Abstraction wells at the Platin Quarry used to dewater the site.

GSI Name	Well Type	Depth of hole (m)	Depth to bedrock (m)	Yield (m^3/d)	GSI Yield Class	Source Use
2925NWW071	Borehole	48.2	7.6	101	Good	Agriculture and domestic use
2925NEW070	Borehole	18.9	n/a	49	Moderate	n/a

14.3.2.6 Karst

Karst describes landforms which form in areas where the rock is readily dissolved by water. Distinctive karstic landforms include sink holes, turloughs, springs and enclosed depressions. Often these feature form along preferential groundwater flow paths such as fractures, fissures or joints. There is potential for high yields and long flow paths where these preferential pathways are present.

The GSI Karst database was consulted and no karst features are indicated as being present within the study area. The closest karst feature is an enclosed depression in Donore located approximately 2.4km north-west as presented on **Figure 14.5**.

14.3.2.7 Designated Areas

There are no European designated ecological areas i.e. Special Areas of Conservation (SAC) or Special Protection Areas (SPA), within the study it (i.e. within 2km of the Indaver site boundary).

The closest groundwater dependant ecological area is River Boyne and River Blackwater SAC/SPA (002299) located approximately 3.2km north-west of the proposed development. However, there is no direct pathway as all the groundwater is captured by the Platin Quarry.

The closest proposed Natural Heritage Area (pNHA) is Duleek Commons (001578) approximately 2km south-west of the proposed development, as presented on **Figure 14.6**. Duleek Commons is a drained marsh surrounded by wet woodlands and grassland. This ecological area is not designated for groundwater dependant habitat.

14.3.2.8 Mineral / Aggregate Resources

Various datasets were consulted in establishing the economic geology within the study area including:

- GSI: aggregate potential mapping;
- GSI: mineral localities; and
- EPA: active mine sites.

There are active quarries within the immediate vicinity of the existing Indaver facility. These include Platin Quarry approximately 200m north of the Indaver site, Duleek Quarry approximately 2km south-west, Annagor Quarry approximately 1.9km east, Mullaghcrone Quarry 1.3km north, as presented on **Figure 14.7.** Bellewstown Quarry is also 3.4 km south-east of the Indaver site boundary**.**

The GSI mineral localities database show no active metallic mines in the study area. There is no record of underground mining in the area therefore this assessment does not consider this feature any further.

According to the aggregate potential mapping data obtained from the GSI the area of the proposed development is described as having a high crushed rock aggregate potential and no granular aggregate potential. There is no aggregate potential for the overburden.

14.3.3 Site Specific Environment

14.3.3.1 Soils and Subsoils

According to the site-specific ground investigation[2] the quaternary deposit within the study area generally comprises low permeability boulder clay with occasional gravel lenses.

A summary of the subsoil deposits is presented in **Table 14.2**.

Table 14.2 Soils and subsoil deposits within study area.

Strata[14]	Depth to Top of Strata (mbgl)	Thickness Range (m)	Notes/Description
Topsoil	0.0	0.4	Well drained to poorly drained mineral soil.
Subsoils	0.4	1.0	Soft to firm silty CLAY with cobbles.
	0.4	4.0	Firm to hard silty CLAY with cobbles/boulders.
	0.4	5.0	Medium dense to dense sandy GRAVEL with local sand lenses.
	2.5	4.0	Hard silty BOULDER CLAY with cobbles/boulders.

14.3.3.2 Soil Quality

Soil samples collected during a previous investigation[1] were tested for a broad range of parameters. This included analysis for metals, total phenols, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), polychorinated biphenyls (PCBs), pesticides (OPPs, OCPs, ONPs).

There have been no exceedances noted to suggest that soil contamination has occurred on site in the past.

[14] Strata indicated may not be present at all locations along the proposed development.

14.3.3.3 Bedrock

The local limestone is described as strong to very strong (where intact) and predominantly slightly weathered to fresh, though zones of moderately weathered and heavily fractured (non-intact) limestone based on the site-specific information[4]. The depth to competent limestone ranges from approximately 10m below ground level (bgl) to 15mbgl from the west to the east of the study area respectively.

14.3.3.4 Groundwater Flow and Water Level

Three monitoring boreholes installed within Indaver site indicate the groundwater flow direction is towards the north-west. Originally the groundwater flow in the area was towards the River Nanny in south-east direction. However, groundwater flow has reversed due to dewatering at Platin Quarry.

Current water levels are in excess of 30mbgl based on these monitoring boreholes Water level measured in August 2019 in AWG1-1, AGW1-2 and AGW1-3 was 35.4mbgl, 32.7mbgl and 34.6mbgl, respectively.

14.3.3.5 Groundwater Quality

Regular groundwater sampling and analysis for the Indaver site is required as part of the EPA licence (W0167-03). The analysis includes chloride, metals, ammonia, TOC and nitrates. The recent monitoring results are presented in **Appendix 14.1**.

There are three monitoring boreholes within the Indaver site; one up-gradient (AGW1-1) and two down-gradient (AGW1-2 and AGW1-3) in relation to the site activities.

Results have been compared to the threshold values from the European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2016 (S.I. No. 366 of 2016).

Total coliforms and faecal coliforms were present in majority of the samples in all monitoring boreholes.

A review was undertaken of available groundwater quality results (2011-2019). The groundwater monitoring data review shows there have been exceedances of the ammonia, nickel and lead concentrations recorded in all monitoring boreholes, refer to **Table 14.3** below. The ground water quality at the site reflects poor water quality status of the Bettystown groundwater body which is driven by high chloride values (WFD Status 2010-2015).

There appears to be an overall incline trend in the chloride concentration in both down-gradient monitoring boreholes and decline trend in the up-gradient borehole.

However, there was no chloride exceedances recorded in any of the three monitoring boreholes, refer to **Table 14.3**. Chloride trends graph is presented in **Appendix 14.2**.

Table 14.3 Exceedances recorded in monitoring boreholes.

Parameter	Threshold Value (TV)[15]	Date	AWG1-1 (up-gradient)	AWG1-2 (down-gradient)	AWG1-3 (down-gradient)
Ammonia (NH4) µg/L as N	175	01/09/2015 01/04/2018 01/10/2018 11/03/2019	27 40 **870** 20	61 60 30 130[16]	167[1616] 120[1616] 20 100
Lead (ug/l)	7.5	11/09/2015 24/05/2017 12/03/2018 10/09/2018 06/03/2019	**10.43** **13.41** **19** **26** **25**	1.251 3.42 3 6 **12**	1.57 1.91 5 **8** **19**
Nickel (ug/l)	15	10/09/2018 06/03/2019	10 **30**	**25** **52**	**17** **52**
Chloride[16] (mg/l)	187.5	10/07/2017 09/10/2017 07/01/2019 06/03/2019 02/08/2019 05/09/2019	25.7 120 38 50 52 44	121.9 29.6 76 74 126 90	49.3 3.9 139 123 98 100

14.3.4 Conceptual Site Model

A Conceptual Sit Model (CSM) was developed based on the available site investigation information as outlined in **Sections** Error! Reference source not found.**.2** and Error! Reference source not found.**.3.3.** The information is presented on **Figure 14.8** and **14.9** in profile format with the profile illustrating the current geological and hydrogeological environment at the Indaver site.

The proposed development is underlain by silty sandy gravelly clay with cobbles and boulders underlain by dense sandy gravel. The overburden overlays the Carboniferous limestone. Depth to bedrock varies from 10 to 15mbgl across the site. The depth of soil excavation for proposed levelling and foundations varies from 0.6m to 2m. Current water levels are in excess of 30mbgl based on the monitoring boreholes.

The groundwater flow direction in the area is to the north-west, towards Platin Quarry located approximately 200m north of the Indaver site. Originally the groundwater flow was to the south-east, towards River Nanny however, due to dewatering at Platin Quarry it was reversed.

There are no sensitive receptors immediately adjacent to the facility. The closest SAC and SPA is River Boyne and River Blackwater located approximately 3.2km north-west of the proposed development. However, there is no direct pathway as the groundwater under the site is captured by Platin Quarry. The closest proposed Natural Heritage Area (pNHA) is Duleek Commons approximately 2km south-west of the proposed development, which is not a groundwater dependant habitat.

[15] Based on the European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016 (S.I. No. 366 of 2016), Threshold Values for Chemical Status Test 1 Column 4
[16] The highest recorded levels.

14.4 Summary of Features of Geological Importance

14.4.1 Environment

The environment of the proposed site falls under Type C category outlined in IGI Guidelines. The proposed site is categorised as a Type C environment which is described as man-made dynamic hydrogeological environment with nearby quarrying activities below the water table.

14.4.2 Feature Importance Classification

A summary of the geological and hydrogeological features of importance within the study area is presented in **Table 14.4**. The importance ranking of the feature is established based on the IGI guidance (2013).

Table 14.4 Features of importance.

Feature	Importance	Criteria / Justification
Bedrock	Very High	Aggregate Potential comprising large existing quarry: Platin Quarry is approximately 200m and Duleek Quarry approximately 2km from the study area.
Regional Important Aquifer (RK_d)	Very High	A regionally important aquifer with multiple well fields (Kiltrough WS).

14.5 Characteristics of the Proposed Development

A description of the proposed development and construction activities are provided in **Chapters 4** and **5**, respectively.

This section of the EIAR outlines the key design features and the characteristics and activities of the proposed development of relevance to soils, geology and hydrogeology. The potential impacts related to such construction activities are provided in **Section 14.6**.

Works proposed relevant to land and soils are summarised below:

- Strip topsoil and vegetation;
- Bulk excavation and general site re-grading, including placing of fill;
- Construction of earth retaining structures (i.e. berms);
- Development of:
  - a tank farm and tanker unloading area for the storage and processing of aqueous liquid wastes;
  - a $10MW_e$ hydrogen generation unit;
  - a bottom ash storage building;
  - a concrete yard and parking area for up to 10 trucks, tankers or containers on the site;

  - additional car-parking spaces;
  - a warehouse, workshop and ERT/office building;
  - demolition and re-building of an existing modular office building;
  - other miscellaneous site upgrades.

All proposed development elements are presented in drawing **29043-CD-003** in **Appendix 5.2** of **Volume 3**.

- Increase in the amount of hazardous waste accepted in the facility for treatment (in WtE facility) from 10,000 tonnes per annum (tpa) up to 25,000 tpa (to include the associated increase in the total waste accepted for treatment in WtE facility from 235,000 tpa to 250,000 tpa);
- Additional acceptance capacity for up to 30,000 tpa of boiler ash and flue gas cleaning residues for treatment in the currently permitted ash pre-treatment facility on site (bringing the site total to 280,000 tonnes per annum);
- There will be no change to the type or nature of the waste processed the waste to energy plant and the pre-treatment facility only the volume of waste.

14.5.1 Activities/Environment Matrix

Assessments are required by the Activities/Environments Matrix in the IGI guidelines relating to the proposed project conditions.

Table 14.5 outlines the required activities, considering the environment type and different activities which will be undertaken on site during construction and operation, and the works assessments and surveys which have been carried out to consider those activities.

Table 14.5 Details of works required under the IGI guidelines and how they were undertaken on the site.

Work required under Activity and Type Class (base on IGI guidelines)	Details of works completed to date
Earthworks	
Invasive site works to characterise nature, thickness, permeability and stratification of soil, subsoil and bedrock.	Specific ground investigation carried out across the site as presented in Section 14.3.3.1 (Soils and Subsoils) and 14.3.3.3 (Bedrock).
Works to determine groundwater level, flow direction and gradient.	As presented in Section 14.3.3.4 (Groundwater Flow and Water Level).
Identify location and abstraction rate of nearby groundwater abstraction.	As presented in Section 14.3.2.5 (Groundwater Resources).
Storage/transmission of leachable and/or hazardous material	
Establish nature and quantity of leachable material.	2000 SI, 2007 SI and 2014 SI – collection of soil samples. Analysis for quality (as presented in Section 14.3.3.2). There will be no change to the type or nature of the waste processed the waste to energy plant and the pre-treatment facility, only the volume of waste.
Site works to characterise nature, thickness, permeability and stratification of soils, subsoils and bedrock geology.	Specific ground investigation carried out across the site as presented in Section 14.3.3.1 (Soils and Subsoils) and 14.3.3.3 (Bedrock).
Works to determine groundwater level, flow direction and gradient.	As presented in Section 14.3.3.4 (Groundwater Flow and Water Level).

14.6 Likely Significant Effects of the Proposed Development

14.6.1 "Do Nothing" Scenario

Under the do-nothing scenario, Indaver Waste to Energy Facility will continue to:

- Accept the hazardous waste for treatment in the waste energy plant in an amount of 10,000 tpa;
- Accept total waste in an amount of 235,000 tpa; and
- There will be no additional acceptance capacity of boiler ash and flue gas cleaning residues for treatment.

If the proposed development will not be carried out, there would be no direct or indirect significant effects on soils, geology and hydrogeology.

14.6.2 Construction Phase

The potential impacts on soils, geology and hydrogeology during the construction phase are presented in this section. Construction methodologies for the various elements of the proposed development are presented in **Chapter 5 *Construction Activities***.

The potential construction impacts of the proposed works on the geological attributes identified in the area are outlined below:

- Loss of overburden;
- Loss of solid geology;
- Effect of local dewatering;
- Potential pollution from construction activities;
- Impacts on Duleek Commons (pNHA).

Loss of overburden

Ground works associated with the construction of the proposed development will require bulk excavation works. These excavation works include the existing berm in the northeast corner of the site. This area contains material previously excavated from the site during the construction of the existing facility, which was then used for landscaping. Overall excavations where required will be from 0.6 to 2.0mbgl. These excavation works can potentially cause minor local permanent change in aquifer vulnerability due to the loss of overburden.

The IGI guidance matrix table has been used to establish overall 'likely significant effect' on groundwater. This matrix combines the 'importance of attribute' (in this case 'very high' see **Table 14.4**) with the 'magnitude of impact' classification (for groundwater vulnerability in this area 'small adverse') to provide the overall rating. The overall rating of a 'likely significant environmental impact' on the aquifer vulnerability is 'significant/moderate'.

Loss of Solid Geology (Bedrock)

Excavation of bedrock is not expected to be required as the base of excavation (varies from 0.6 to 2mbgl) is above the depth to bedrock (10-15mbgl). As such, the 'magnitude of impact' on the bedrock is determined to be 'negligible'.

Using the IGI guidance matrix, the 'magnitude of impact' is combined with the 'importance of attribute' (the importance of bedrock in this area is defined as 'very high' see **Table 14.4**) provides a 'likely significant environmental impact' which is 'imperceptible' for bedrock.

Effect of local dewatering

There is no requirement for dewatering on-site during the construction of the proposed development. The effects of dewatering at the Irish Cement site in Platin is discussed in **Section 14.3.4**.

Potential pollution from construction activities

There is a potential risk of localised contamination of the groundwater due to accidental spillages and leaks during construction which could result in a 'permanent negative' effect on the groundwater. There are numerous substances likely to be used during the construction phase that have the potential to contaminate groundwater including fuel and hydrocarbons, lubricants and cement. The washing of construction vehicles also poses a risk due to potential release of contaminated runoff into groundwater.

The groundwater table is approximately 30mbgl and the depth to bedrock is between 10 to 15mbgl. The natural protection from the thick subsoil deposits underlying the site will limit the potential for contamination to infiltrate into the underlying aquifer.

The 'magnitude of impact' on the groundwater is determined to be 'small adverse'. Using the IGI guidance matrix, the 'magnitude of impact' is combined with the 'importance of attribute' (the importance of aquifer in this area is defined as 'very high' see **Table 14.4**) provides a 'likely significant environmental impact' which is 'significant/moderate' for aquifer.

Summary of Construction Impacts

The following **Table 14.6** summarises the predicted impacts during the construction stage of the works.

Table 14.6 Summary of Impacts on Geological and Hydrogeological Attributes at the proposed site.

Feature	Importance		Pressure	Magnitude of Impact		Significance of Impact
	Ranking	Justification		Ranking	Justification	
Bedrock	Very High	Aggregate Potential comprising large existing quarry: Platin Quarry is approximately 200m and Duleek Quarry approximately 2km from the study area.	Bulk excavation works of the topsoil, overburden and previously stored excavated material.	Negligible	Excavation of bedrock is not expected to be required.	Imperceptible
Regional Important Aquifer (RK_d)	Very High	A regionally important aquifer with multiple well fields (Kiltrough WS)	Bulk excavation works of the topsoil, overburden and existing berms.	Small Adverse	Thickness of the subsoil deposit overlying bedrock will be reduced. This can cause minor local permanent change in aquifer vulnerability.	Significant/Moderate
			Accidental localised contamination due to construction activities i.e. spillages or leaks.	Small Adverse	There is a potential risk of localised contamination of the groundwater due to construction activities. However, this would only be accidental cases.	Significant/Moderate

14.6.3 Operational Phase

The proposed development will be operating in accordance with the current Indaver EPA licence (W0167-03) requirements. There are currently, and will not in the future, be any discharges to ground other than approved percolation from the existing wastewater treatment system on site, which treats all effluent generated from toilets, showers and utility areas. Therefore, a potential impact on land, soil and groundwater quality in the operational phase of the proposed development is unchanged from the existing risk of accidental spillage of potentially polluting substances (raw materials or waste) handled at the facility today. The existing risks are discussed in further detail in **Section 17.5.3.2** of **Chapter 17** ***Major Accidents and Disasters***.

As is currently the case, good control measures in terms of containment, controlled drainage, emergency measures and training will ensure that the risk of an accidental release to soil and groundwater is low.

Additionally, the proposed tanks for aqueous waste liquid storage will be located in concrete containment bunds and designed to the required standards for water-tightness and retention capacity. Containment for the full contents of a tanker will also be provided (as is currently the case) at the upgraded tanker unloading area in the event of a spillage.

Any liquid falling on tanker unloading area, paved areas serving the hydrogen generation building and the bottom ash storage building will have a contained drainage system and will only be released into the main drainage network upon confirmation that there is no contamination present. The introduction of paving and hardstand areas with associated surface drainage where soil is removed will limit the potential for any accidental spillages to contaminate groundwater.

The increase in hardstanding will reduce local recharge to ground. However, the soils present on the site are of low permeability as such the reduction of the groundwater recharge will be insignificant. Hence, the ‘magnitude of impact’ on the groundwater is determined to be ‘negligible’. Using the IGI guidance matrix, the ‘magnitude of impact’ is combined with the ‘importance of attribute’ (the importance of aquifer in this area is defined as ‘very high’ see **Table 14.4**) provides a ‘likely significant environmental impact’ which will be ‘imperceptible’.

The existing Site Emergency Plan will be followed in case of any spillages on site, refer to **Section 4.9.2** of **Chapter 4** ***Description of the Proposed Development***.

The hydrogen generation unit will require water which will be supplied from existing groundwater production wells. Approximately 53m^3/d is required to feed the unit when running at full capacity. The current abstraction rate is approximately 216m^3/d with a potential yield of 600m^3/d.

The additional water abstraction is negligible in comparison to other major abstractions from the water body (Platin Quarry 17,500m^3/d and Kiltrough PWS 2,600m^3/d).

The ‘magnitude of impact’ from operation of the proposed development on land, soil and groundwater quality is determined to be ‘negligible’. Using the IGI guidance matrix, the ‘magnitude of impact’ is combined with the ‘importance of attribute’ for bedrock and groundwater in the study area (defined as very high see **Table 14.4**) provides the overall rating that during operation the ‘likely significant environmental impact’ is ‘imperceptible’.

14.7 Mitigation Measures and Monitoring

This section describes the mitigation measures to reduce or avoid potential impacts where possible, for both the construction phase (Section 14.6.2) and operational phase (Section 14.6.3) of the proposed development. The mitigation measures detailed below are also relevant for the protection of surface water and are hence cross referred to in **Section 15.6.1** of **Chapter 15** ***Water***. Also, **Section 15.6.1** of **Chapter 15** ***Water**,* outlines additional measures which will be implemented when working adjacent to or in the vicinity of ditches or streams to prevent uncontrolled runoff from the site into watercourses. Refer to **Section 15.6.1** for further details.

14.7.1 Construction Phase

As outlined in **Appendix 5.1** ***Construction Environmental Management Plan*** (CEMP) of **Volume 3**, the adopted construction techniques will be completed in accordance with industry best practice guidance:

- TII’s Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan and Construction Industry Research; and
- Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).

Mitigation measures regarding land and soils will be implemented to minimise the impact on land and soils (including groundwater). These mitigation measures are designed to contain any areas within the site boundary at risk to contaminated run-off.

Excavation Works

- Where possible, excavated materials will be reused on site for backfilling purposes, re-grading and landscaping.
- All earthworks will be monitored by suitably qualified and experienced geotechnical personnel.
- Earthworks will be programmed so as not to be carried out during extreme weather events.
- There is no evidence that contaminated soil should be encountered during the site works, however if any is encountered it will be disposed of as required to a suitable authorised waste facility.

Storm water and foul water management

- In general, storm water generated on site (e.g. from excavations) will be channelled away from the watercourse and infiltrated to ground via silt traps and managed soakaways.
- Drainage from the bunded and designated storage areas will be diverted for collection and safe disposal.
- All construction foul effluent will be stored in the temporary holding tank and will be regularly disposed of off-site.
- Laydown areas will be suitably drained.
- Temporary interceptors (soak pits lined with geotextile) will be constructed as necessary during the early stages of construction mitigating against silt laden run off to the existing drainage network.

Material Storage

- Storage tanks/drums of fuel, oil, chemicals and all other materials that pose a risk to waters if spilled, will be stored in designated storage areas which will be locked when not in use.
- Bunded pallets will be used for storage of drums.
- Storage areas will be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded areas.
- Secure valves will be provided on oil and fuel storage facilities.
- Filling and draw-off points will be located entirely within the bunded areas.
- Any areas which will involve the storage of fuel and refuelling will be paved and bunded and hydrocarbon interceptors will be installed to ensure that no spillages will get into the surface water or groundwater.
- Appropriate staff will be trained in environmental issues and spill response procedures.
- The contractor will maintain an incident and emergency response action plan which will cover all foreseeable risks, i.e. fire, flood, collapse etc. An Incident Response Plan (IRP) is located in Section 8 of the CEMP in **Appendix 5.1** of **Volume 3.**

Site Hygiene

- Vehicles exiting the site from excavation areas will be required to pass through wheel wash facilities to remove mud and organic material before entering main site or public roads. The discharge from the wheel wash (equipped with a filtering system) will be directed to a temporary storage tank on site and will be collected periodically for off-site treatment.

Waste Management

- All waste produced on site will be transported to licensed waste disposal facilities to avoid potential soil contamination. Refer to the Construction

Waste Management Plan in Section 7 of the CEMP in **Appendix 5.1** of **Volume 3.**

Monitoring

- Visual monitoring will be undertaken as part of the regular site audits during the construction of the proposed development to ensure existing surface water runoff is draining from the site and is not exposed to any contaminants.
- The contractor will be required to monitor the weather forecasts to inform the programming of earthworks and stockpiling of materials.
- Any excavation shall be monitored during earthworks to ensure the stability of side slopes and to ensure that the material excavated for disposal or re-use is consistent with the descriptions and classifications according to the waste acceptance criteria testing carried out as part of the site investigations.
- Movement monitoring shall be carried out during any activities which may result in ground movements. It is anticipated that the works will be monitored by a Resident Engineer.
- In relation to potential contamination, a suitably experienced environmental consultant will be required to oversee the excavation works for the proposed development so that potential contamination can be segregated, classified and suitably disposed.

Refer also to **Section 15.6.1** ***Water*** for specific monitoring measures required for the protection of (surface) water quality.

14.7.2 Operational Phase

As the significance of the 'likely significant environmental impact' on the site during operation of the proposed development is 'imperceptible' no mitigation measures have been proposed with respect to effects from operation of the proposed development.

Regular on-going monitoring of groundwater quality is already carried out at the existing Indaver facility as part of the EPA licence (W0167-03) requirement and this monitoring will continue, refer to **Section 14.3.3.5**.

No additional monitoring is necessary during the operational phase.

14.8 Cumulative Effects

Chapter 18 ***Cumulative Effects, Other Effects and Interactions***, lists a number of planned projects that may potentially have a cumulative impact on the environment. Each project has been reviewed in turn below for the potential cumulative impacts on land, soils and hydrogeology.

14.8.1 Irish Cement Ltd (Ref. LB150375) - Cement silo

The Planner's Report[17] (2015), prepared by Meath County Council, states that '*no soils, geology or habitats will be affected'* and '*the proposed development will not result in any additional water discharges'*.

Therefore, there is no potential for significant negative direct not indirect cumulative impacts on land, soils and hydrogeology.

14.8.2 Irish Cement Ltd (PL17.PA0050) - Alternative fuels and raw materials

Based on the EIA Report[18] (2017), Section 6.5 states that there is no potential for cumulative impact on land, soils and hydrogeology. The report states '*The proposed works will have no impact on the dewatering operations within the quarry'*.

Therefore, there is no potential for significant negative direct not indirect cumulative impacts on land, soils and hydrogeology as a result of the proposed and planned development.

14.8.3 SSE Generation Ireland Ltd (PL17.303678) - 110kV transmission substation

Section 6.4.1 of the EIAR[19] (2019) prepared for the SID application stated that '*There will be no discharges to ground or groundwater during the operational phase of the Substation as none of the substation infrastructure will pose a risk to land and soils during the operational phase.*'

As such, there is no potential for significant negative direct nor indirect cumulative impacts on land, soils and hydrogeology as a result of the proposed and planned development (Ref. PL17.303678).

14.8.4 Highfield Solar Ltd. (PL17.248146) - Solar Farm

Section 7.8.4 of the Inspector's Report[20] (2017) reported that '… *the construction process outlined for the solar farm to be relatively low impact from a geotechnical perspective, with significant earthworks only occurring for the access tracks, substations and cable routes*'.

As such, there is no potential for significant negative direct nor indirect cumulative impacts on land, soils and hydrogeology as a result of the proposed and planned development.

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[17] Available for inspection from Meath County Council Planning database, http://www.eplanning.ie/MeathCC/AppFileRefDetails/LB150375/0

[18] Available for inspection under EPA IE Licence application P0030-06, https://www.epa.ie/licensing/

[19] Available from: http://caulstown-platin-substation.com/downloads/environmental/substation-environmental-report.pdf

[20] Available for inspection from An Bord Pleanála: http://www.pleanala.ie/casenum/248146.htm

14.8.5 Highfield Solar Ltd. (PL17.303568) - Electrical substation (110kV)

Section 6.6.1 of the Inspector's Report[21] (2019) referred to the Chief Executive's Report from Meath County Council which stated they were satisfied that '*the underlying geology of the area will not be unduly impacted upon by the proposed development*'. As such, there is no potential for significant negative direct nor indirect cumulative impacts on land, soils and hydrogeology as a result of the proposed and planned development.

14.8.6 Conclusion

A review of these projects has shown there are no planned projects which could contribute to any potential significant negative direct nor indirect cumulative effects on the land, soils or hydrogeology during operation of the proposed development.

When the predicted effects of the proposed development at Indaver are considered cumulatively with each planned project and cumulatively with all planned projects as a whole, it is concluded that there are no significant negative cumulative effects predicted on soils, geology or hydrogeology.

14.9 Residual Impacts

The residual impacts are those that would occur after the mitigation measures have taken effect.

14.9.1 Construction Phase

Upon application of the mitigation measures outlined in **Section 14.8** the residual impact is considered to be 'neutral' in terms of quality. The magnitude of any impact in the construction phase is 'negligible' as detailed in **Table 14.7**. As a result, the significance of all the effects is 'imperceptible'.

[21] Inspector's Report (2019) Available from An Bord Pleanála : http://www.pleanala.ie/documents/reports/303/R303568.pdf

Table 14.7 Residual impacts during construction phase on the soils, geology and hydrogeology within the site after mitigation measures have been carried out.

Feature	Importance		Magnitude of Impact		Significance of Impact	Mitigation Measures	Residual Impact	Residual Significance of Impact
	Ranking	Justification	Ranking	Justification				
Bedrock	Very High	Aggregate Potential comprising large existing quarry: Platin Quarry is approximately 200m and Duleek Quarry approximately 2km from the study area.	Negligible	Excavation of bedrock is not expected to be required.	Imperceptible	Excavation of bedrock is not expected to be required.	Negligible	Imperceptible
Aquifer	Very High	A regionally important aquifer with multiple well fields (Kiltrough WS)	Small Adverse	Much of the topsoil, overburden and berm material will be excavated reducing thickness of the subsoil deposit overlying bedrock.	Significant/Moderate	Slight impact on the surrounding ground and such shall be monitored and mitigated against discharge to ground.	Negligible	Imperceptible
			Small Adverse	There is a potential risk of localised contamination of the groundwater due to construction activities.	Significant/Moderate			

14.9.2 Operational Phase

There are no planned discharges to ground or likely changes to the current groundwater regime. As such, for the proposed development the residual impact is considered to be 'neutral' in terms of quality, 'negligible' in terms of magnitude and of 'imperceptible' significance as a result of this proposed development on the surrounding soils, geology and hydrogeology.

14.10 References

AWN Consulting Limited (2017) Chapter 12 – Land, Soils and Geology of Indaver Carranstown EIAR. Available from IE Licence W0167-03 from www.epa.ie/licensing

AWN Consulting Limited (2014), Indaver IRL Ltd – Soil and Groundwater Baseline Report (IED). Available from IE Licence W0167-03 from www.epa.ie/licensing

Alpha Engineering Services, Consulting Engineers, Land Surveyors (2000), Geotechnical Report for Green Field Site at Platin, Co. Meath for Project Management.

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

IGSL Ltd (2009), Meath Waste Management Facility Carranstown, Co. Meath, Geotechnical Interpretative Report (Report No. 14039).

Geological Survey Ireland (GSI) (2019) Groundwater Viewer. Available from: https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx.

Geological Survey Ireland (GSI) Bettystown GWB: Summary of Initial Characterisation.

Institute of Geologists of Ireland (IGI) (2013) Guidelines for the Preparation of Soil, Geology and Hydrogeology Chapters of Environmental Impact Statements.

15 Water

15.1 Introduction

This chapter describes and assesses the potential effects of the proposed development on hydrology (incorporating water quality, drainage and flooding). Hydrogeology is addressed separately in **Chapter 14 *Land and Soils***. The assessment methodology is detailed in **Section 15.2** and the receiving environment is also described (**Section 15.3**). The characteristics of the proposed development (with respect to hydrology) are detailed in **Section 15.4**. The proposed development is defined in detail in **Chapter 4 *Description of the Proposed Development*** and in **Chapter 5 *Construction Activities*** of this EIAR.

Mitigation and monitoring measures are proposed (**Section 15.6**), cumulative effects (**Section 15.7**) and the predicted residual effects (**Section 15.8**) are also described.

15.2 Assessment Methodology

15.2.1 Guidance

This appraisal is based on a desk study, in which a review was undertaken of published information, existing studies and site investigations (including a site walkover) which have been carried out at the existing Indaver site in Carranstown.

This chapter has been prepared having regard to the following guidelines:

- CIRIA (2001) Good practice guidelines on the control of water pollution from construction sites (Construction Industry Research and Information Association (CIRIA) 2001);
- Guidelines for Planning Authorities on 'The Planning System and Flood Risk Management' published in November 2009, jointly by the Office of Public Works (OPW) and the then Department of Environment, Heritage and Local Government (DEHLG);
- TII (2008) Environmental Impact Assessment of National Road Schemes – A Practical Guide ((NRA) 2008a);
- TII (2008) Guideline on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA 2008c); and
- TII (2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA 2008b).

15.2.2 Desk Study

Sources of information utilised for this assessment include the following:

- Site Investigations and previous studies:
  - Site walkover carried out by Arup in October 2019; and
  - Site Specific Flood Risk Assessment completed by McElroy Associates in January 2020, refer to **Appendix 15.1**.
- Flood Risk Assessment
  - Department of the Environment, Heritage and Local Government/Office of Public works guidelines (2009), "*The Planning System and Flood Risk Management Guidelines for Planning Authorities*", including Appendix A Identification and Assessment of Flood Risk
- Chapters 4 and 5 of this EIAR;
- Drawing **29043-CD-001** "Existing Drainage Layout" (see **Appendix 5.2** of **Volume 3**);
- Drawings **29043-CD-014** to **29043-CD-018** "Proposed Drainage Layout" (in **Appendix 5.2**);
- Drawing **29043-CD-019** "Natural Drainage GA" (in **Appendix 5.2**);
- Inspector's Report[1] (2018) for a SID Alteration Request to An Bord Pleanála, Case Ref. PL17.302447.

The public sources of information used in this chapter are as follows:

- Historical Maps, Ordnance Survey of Ireland;
- Published geological, soil, groundwater, surface water, aquifer, recharge and aggregate potential maps obtained from the Geological survey of Ireland (GSI);
- Waste and IPPC licensed facility maps (EPA Geoportal);
- EPA online Envision Map Viewer (www.epa.ie);
- Eastern River Basin District (ERBD) Management Plan;
- Potential flooding information from the OPW Catchment Flood Risk Assessment and Management (CFRAM) (www.myplan.ie);
- Predicted extreme water levels and flood extent maps from the Irish Coastal Protection Strategy Study (ICPSS), May 2011;
- Flood history of the site from the OPW National Flood Hazard Mapping website (www.floodmaps.ie);

[1] Inspector's Report (2018), available from ABP at: http://www.pleanala.ie/casenum/302447.htm.

- Preliminary Flood Risk Assessment (PFRA) Mapping produced by the OPW, March 2012 (www.cfram.ie/pfra);
- Aerial photography and mapping from Google Maps (2018);
- National Waste Collection Permit Office (http://www.nwcpo.ie/);
- 'Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors' (CIRIA 532, 2001).

15.2.3 Site Description

The site of the proposed development is located at an existing waste to energy plant at Carranstown, Duleek, Co Meath and is approximately 4.5km to the south-west of Drogheda town.

The R152 forms the southern boundary of the site. The rest of site borders greenfield lands and a number of residential properties.

The ground levels of the site vary considerably sloping down in the south - north direction. In the south of the site the levels vary from circa 34mOD to circa 44mOD. In the north of the site the ground levels vary from circa 30mOD to circa 37mOD. There are embankments and elevated grounds along the south and west boundaries, keeping a minimum level of 37mOD.

A detailed description of the proposed development is provided in **Chapter 4 *Description of the Proposed Development*** of this EIAR.

15.3 Receiving Environment

The existing environment is discussed in terms of hydrology. The assessment draws on desk study information, related reports and site history.

15.3.1 Hydrology

15.3.1.1 Existing Hydrological Environment

The site is located within the Nanny-Delvin river basin catchment (EPA Catchment Code 08) which includes the area drained by the Rivers Nanny and Delvin. The main hydrological feature in the vicinity of the site is the River Nanny, which is located about 2km to the south of the site.

The nearest rivers and streams are the Cruicerath Stream that flows approximately 200m to the west of the site, and the Platin Stream that flows approximately 500m to the east of the site. These surface water features are indicated on **Figure 15.1**. It is noted that there is no water quality data available for either of these two streams.

Figure 15.1 Surface water features. Source Bing Maps and EPA.

The EPA mapping database[2] on rivers (consulted 20 April 2020) indicates the overall river water quality status of the River Nanny for the 2013-2018 monitoring is “Poor” to “Moderate”. The river water quality status is based on the least status for the six water quality elements monitored (fish, general physic-chemical, hydromorphology, macroinvertebrates-margaratifera and plants).

The River Nanny waterbody has been assigned an ‘At Risk’ status as a river at risk of not achieving Good water quality status in the future, under the Water Framework Directive monitoring programme.

In terms of Natura 2000 sites, the River Nanny discharges to the River Nanny Estuary and Shore SPA circa 11.3 km downstream the site location. This SPA includes the Laytown Dunes/Nanny Estuary pNHA, located circa 10 km downstream.

15.3.1.2 Flood Risk

Flood risk to the site of the proposed development was assessed by McElroy Associates (Refer to **Appendix 15.1 *Flood Risk Assessment***). Potential sources of flooding considered included:

- Fluvial Flooding;
- Tidal/Coastal Flooding;
- Groundwater Flooding;
- Pluvial/Urban Drainage Flooding.

[2] EPA Catchments Maps, www.catchments.ie/maps/

A summary of the findings of the flood risk assessment is as follows:

Pluvial/Urban Drainage Flooding

There is no record of pluvial flooding on the site and the existing stormwater attenuation system is designed for a 1% AEP event including an addition of 20% to allow a climate change scenario. Therefore, it was concluded that pluvial flooding risk is minimal.

Fluvial Flooding

The FEM FRAMS show the site outside the fluvial flooding risk boundary of the River Nanny. Flood risk from the Cruicerath stream is unlikely too, following the PFRA outcome and the difference in ground levels between the stream and the site (1.5 – 2.0m as noted in the FRA).

Therefore. it is concluded that the flood risk at the site is unlikely and the site meets the criteria for Flood Zone C as set out in Clause 2.23 of the Planning System and Flood Risk Management Guidelines.

Tidal/Coastal Flooding

The site is located 10km away from the coastline and meets the criteria for Flood Zone C as set out in the Clause 2.23 of the Guidelines. Therefore, it was concluded there is no tidal flooding risk.

Groundwater Flooding

There is no record of groundwater flooding. Groundwater levels at the site have been observed in excess of 30m below existing ground levels from the monitoring boreholes installed in the site. Therefore. it is considered that groundwater flooding risk is minimal.

15.3.1.3 Water Framework Directive

The Water Framework Directive (WFD) (2000/60/EC) established a framework for the protection of all waters including rivers, lakes, estuaries, coastal waters, groundwater, and their dependent wildlife/habitats.

One of the key aims of the WFD is achieving “good status” for all waters by a set deadline. The EPA database provides information on the current status of all waterbodies in Ireland including lake, river, transitional and coastal waterbodies.

As noted above, the streams in the vicinity of the Indaver site flow south into the River Nanny which is monitored as part of the WFD. The River Nanny has a River Waterbody Score that indicates it is:

“At risk of not achieving good status” (EPA database, 2018).

Table 15.1 presents water quality data on the River Nanny from two stations closest to the site:

- Bridge north east of Bellewstown Station (RS08N010500), located approximately 1.76km towards the south east, has records from 1974;

- Nanny (Meath)- bridge station, south of Beaumont (RS08N010600), has records from 2014.

Table 15.1: Q value records. Source: EPA Database

Station	1974	1978	1980	1982	1986	1988	1991	1996	1998	2001	2005	2008	2010	2014	2017	2018
Br NE of Bellewstown Ho	1-2	3	3	3-4	3-4	3	3-4	3	3-4	3	3-4	3	3-4	3-4	3-4	3-4
NANNY (MEATH) - Br u/s Beaumont Br	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	

The different Q values stand for the following status:

- 1-2: Bad
- 3: Poor
- 3-4: Moderate

It can be seen from the data presented in the table that the existing water quality in the River Nanny around the discharge point of the site is poor to moderate.

15.3.2 Onsite Drainage

15.3.2.1 Introduction

The existing storm water (i.e. surface water) drainage collection system is described below. The terms storm water and surface water are used interchangeably in this document.

15.3.2.2 Surface Water Management

A detailed description of the existing storm water control and management at the Indaver site is presented in **Section 4.3.2** of **Chapter 4** ***Description of the Proposed Development***.

Storm water runoff from the site passes through a Class 1 petrol interceptor before being collected in an attenuation pond which has a total volume of 2,887m^3. In the existing scenario only 1,649m^3 is required to provide attenuation for the 1 in 100-year storm event. The pond discharges via pump to an external drainage ditch which in turn leads to the Cruicerath River c.130m to the west of the site, and River Nanny c.2 km downstream.

Two continuous monitoring points in the system measure TOC, pH and conductivity, prior to the attenuation pond and at the outfall of the attenuation pond. Stormwater must be below set trigger levels before it can enter either the pond or before it can be discharged at the outfall. Monitoring of storm water emissions is carried out under the EPA IE Licence (W0167-03).

If the concentrations of TOC, pH and conductivity exceed the limits agreed with the EPA (under the IE Licence) at the first monitoring point, storm water is diverted to an underground storage (firewater) tank and collected for disposal at an authorised facility. Should this tank be full, the surface water overflow is diverted to the attenuation pond. If the concentrations of TOC, pH and conductivity exceed the limits at the second monitoring point the discharge pumps shutdown and water that cannot be discharged is disposed of to a licensed contractor.

Undeveloped site areas drain naturally through field boundary ditches and eventually reach the River Nanny.

Existing stormwater discharges are therefore in full compliance with EPA licence requirements.

Refer to drawing **29043-CD-001** for the existing drainage network in **Appendix 5.2** of **Volume 3**.

15.3.2.3 Foul Water

A description of the existing foul water and management at the Indaver site is presented in **Section 4.3.4** of **Chapter 4** ***Description of the Proposed Development***.

Domestic sewage is collected in an onsite effluent treatment system which passes through a septic tank and secondary treatment before being discharged to an engineered percolation area to ground, located adjacent to the 38kV sub-station. A second smaller effluent collection and discharge system is provided at the site security building. The percolation area was designed and constructed in accordance with EPA's *Wastewater Treatment Manual - Treatment Systems for Small Communities, Business, Leisure Centres and Hotels*, (1999).

Two effluent holding tanks are also utilised on site, one for the modular offices in the contractors compound and one for the temporary portacabins which are used during the annual maintenance shutdown. The contents of these holding tanks are transported off site for treatment regularly.

15.4 Characteristics of the Proposed Development

With regard to hydrology, **Section 4.6** of **Chapter 4** ***Description of the Proposed Development*** describes in detail the storm and foul water management proposed on site during operation.

Section 5.6 of **Chapter 5** ***Construction Activities*** describes in detail the storm and foul water management proposed on site during construction.

15.5 Likely Significant Effects

15.5.1 "Do-Nothing" Scenario

The do-nothing scenario refers to what would happen if the proposed development was not implemented.

In this scenario, the effects described in this chapter would not arise and for this reason the 'do-nothing' scenario is considered to have a neutral effect with regards to water.

15.5.2 Operational Phase

A detailed description of the surface water runoff and foul water management and foul proposed during the operation of the site are described in **Sections 4.6.1** and **4.6.3** of **Chapter 4** ***Description of the Proposed Development*** respectively.

The proposed development includes the construction of new buildings (warehouse, workshop & ERT/office building, rebuilt office, hydrogen generation unit and bottom ash storage building), a new concrete yard area and parking area for trucks, an upgrade to the existing staff car park and provision of additional hard standing areas on-site.

As discussed in **Section 4.6.1** of **Chapter 4** ***Description of the Proposed Development***, the storm water runoff from the new areas will discharge into the existing storm water system on site. Where required, new drainage infrastructure will be provided in order to collect runoff from new hard standing areas.

As discussed in **Section 4.6.1.2** of **Chapter 4**, the existing attenuation tank on the site has sufficient capacity to deal with the increase in surface water runoff from the proposed development. However due to specific constraints (regarding site levels and discharge rates that prohibit the expansion of the existing stormwater drainage network) it was not possible to extend the stormwater network to the concrete yard. The design solution is to attenuate the surface run-off to a tank with a pumping chamber located under the slab area from where it will be pumped to the nearest existing manhole chamber. **Tables 4.5** and **4.6** of **Chapter 4** gives the breakdown of the existing and proposed attenuation capacity for the site. This proposed attenuation tank has a volume of 146m^3 and is designed for a 30-year return period. This will increase the attenuation capacity on site from 2,887m^3, which is required for a 100-year event and includes a design allowance for climate change, to 3,033m^3, refer to **Tables 4.5** and **4.6** of **Chapter 4**.

The proposed stormwater drainage system is outlined in **Figure 4.14** of **Chapter 4** ***Description of the Proposed Development***. Full details of the proposed drainage network are included in drawing **29043-CD-015** in **Appendix 5.2** of **Volume 3**.

The proposed development will not increase flood risk off site during operation. The proposed development will therefore not have any impact on flood risk during operation.

In the event of a fire on site as is currently the case, fire water will be retained in the existing 300m^3 fire water retention tank and stored for removal from site for disposal or for transfer to the tank farm for treatment in the furnace, as described in **Section 4.6.2** of **Chapter 4**.

15.5.3 Construction Phase

Section 5.6.3 of **Chapter 5** ***Construction Activities*** describes the storm water and foul water management on site during construction.

Surface water can potentially become polluted by spillages such as hydrocarbon leaks (fuel/oil/lubricants) from construction machinery or by siltation as a result of runoff, during construction.

The main works that could potentially affect the site are:

- Construction of gabions for the proposed truck layby in the west of the site, located along an existing ditch;
- Proposed concrete footpath and stairs in the centre of the site will cross over an existing ditch; and
- Proposed laydown area and access road to proposed hydrogen electrolyser, will be built over an existing underground filter drain.

The construction activities outlined above have the potential to temporarily alter the water quality in the study area. This would be considered a short-term effect and the significance of this effect is moderate/slight.

As outlined in **Section 5.6.3** of **Chapter 5** of this EIAR, surface water in the construction areas during the construction period will be infiltrated to ground via silt traps and managed soakaways. The laydown areas will be suitably drained and any areas which will involve the storage of fuel and refuelling will be paved and bunded and hydrocarbon interceptors will be installed to ensure that no spillages will get into the surface water or groundwater. These measures are sufficient to limit the discharge of any contaminants to groundwater during the construction phase.

Foul effluent impact during construction will be minimal as the contractors compound will be provided with self-contained toilet blocks and the effluent generated will be disposed of off-site by a specialist contractor. Refer to **Section 5.6.3** of **Chapter 5**.

The contractor will utilise the existing water supply connection in the contractors compound for onsite personnel during construction. This would be considered a short-term effect and the significance of this effect is imperceptible.

The proposed development will have no impact on floodplain storage and conveyance. The proposed development will also not increase flood risk off site during construction.

Earthworks on the site can however block overland drainage flow paths which result in a marginal increase in the risk of pluvial flooding. This is considered a short-term effect and can be appropriately managed by ensuring that during construction ground levels in the vicinity of any embankment, prevent water from collecting at any one point on the site.

15.6 Mitigation Measures and Monitoring

15.6.1 Construction Phase

A Construction Environmental Management Plan (CEMP) is contained in **Appendix 5.1** in **Volume 3** of this EIAR. It will be maintained by the Contractor for the duration of the construction phase. The CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures.

The contractor will maintain an incident and emergency response action plan which will cover all foreseeable risks, i.e. fire, flood, collapse etc. An Incident Response Plan (IRP) is located in **Section 8** of the **CEMP** in **Appendix 5.1 of Volume 3.**

The employment of good construction management practices will minimise the risk of pollution of storm water run-off, and any deterioration in the quality or quantity of surface water.

Section 14.7.1 of **Chapter 14 *Land and Soils*** sets out a number of mitigation measures and monitoring measures to minimise the risk of effects on land and soils (including groundwater) during construction. These mitigation measures address excavation works; storm water and foul water management; material storage (including fuel, oil and other potentially contaminating materials); site hygiene; and waste management. These measures also apply to the protection of surface water and are therefore relevant for this chapter. Refer to **Section 14.7.1** of **Chapter 14 *Land and Soils*** for further details.

In addition, the following measures shall also be implemented when working adjacent to or in the vicinity of ditches or streams to prevent uncontrolled runoff from the site into the watercourses:

- The perimeter of the construction area adjacent to the watercourse will be bermed to create a physical barrier between the site and the watercourse. Where there is insufficient space for a berm, a barrier will be created using trench sheeting along the boundary with the watercourse.
- Where cast-in-place concrete is required, all work must be carried out in the dry and effectively isolated from any flowing water (or water that may enter streams and rivers) for a period sufficient to ensure no leachate from the concrete.
- Waterproofing and other chemical treatment to structures in close proximity to watercourses shall be applied by hand.

Monitoring

The same monitoring measures will apply in relation to water protection as those detailed in **Section 14.7.1** of **Chapter 14 *Land and Soils*** to protect soils and groundwater. In additional, the following monitoring measures for the protection of (surface) water quality are required:

- Where surface water run-off from the site construction works areas will be discharged to surface waters, monitoring will be carried out to ensure the concentration of suspended solids (SS) does not exceed 30 mg/litre.
- The contractor will be required to ensure that the sanitary facilities for the site personnel are maintained and effluent storage is regularly emptied and disposed of.
- The contractor will be required to ensure that the water supply to the site is maintained and free of contaminants.

15.6.2 Operation Phase

No mitigation measures are required to protect water quality or minimise any flood risk.

No additional water monitoring is proposed. The current monitoring carried out on site is sufficient. As described in **Section 4.9** of **Chapter 4** ***Description of the Proposed Development***, there are a number of existing monitoring measures on site to prevent any accidental emissions or spills and ensure fire water retention to minimise the risk to water quality.

Under the current EPA IE licence (W0167-03) surface water monitoring is carried out, as outlined in **Section 15.3.2.2**, and this monitoring will continue with the proposed development.

15.7 Cumulative Effects

Chapter 18 ***Cumulative Effects, Other Effects and Interactions***, lists a number of planned projects (i.e. has obtained planning permission) that may potentially have a cumulative impact on the environment if both the proposed development and the planned development (listed below) are constructed. Each planned project has been reviewed in turn below for the potential cumulative impacts on water and hydrology with the effects identified in **Section 15.5** of this chapter.

15.7.1 Irish Cement Ltd (Planning Ref. LB150375) - Cement silo

Irish Cement operate under and EPA IE Licence P0030-05. According to Section 7.3.2.1 of the EIAR[3] (2017), the average volume of water discharged to the River Nanny in 2016 from the Irish Cement site was 14,720m^3/day.

The Planner's Report[4] (2015), prepared by Meath County Council, states that '*the proposed development will not result in any additional water discharges'*.

[3] Available for inspection under EPA IE Licence application P0030-06, https://www.epa.ie/licensing/
[4] Available for inspection from Meath County Council Planning database, http://www.eplanning.ie/MeathCC/AppFileRefDetails/LB150375/0

Given the likely effects of the proposed development on hydrology and that there will be no change in surface water emissions as a result of this planned development at Irish Cement (Planning Ref. LB150375), it is concluded that there is no potential for significant negative direct or indirect cumulative effects on hydrology and water quality as a result of the proposed development and the planned development (Ref. LB150375).

15.7.2 Irish Cement Ltd (PL17.PA0050) - Alternative fuels and raw materials

The nature of proposed works at Irish Cement under PL17.PA0050 are regarding the increase in volume of alternative fuels accepted by the facility and as stated in Section 7.4.4 of the EIA Report[3] (2017), there will be no significant change in the nature or quantity of runoff to surface waters as a result of the planned development (ABP Ref. PL17.PA0050) at Irish Cement.

Given the likely effects of the proposed development on water and that there will be no change in surface water emissions as a result of this planned development at Irish Cement (ABP Ref. PL17.PA0050), it is concluded that there is no potential for significant negative direct or indirect cumulative effects on hydrology and water quality as a result of the proposed development and the planned development (ABP Ref PL17.PA0050).

15.7.3 SSE Generation Ireland Ltd (PL17.303678) - 110kV transmission substation

Chapter 9 (Water and Wastewater), of the Substation Environmental Report (ER)[5] (2019) prepared for the planning application (Ref. PL17.303678) states that surface water runoff will be discharged to the River Nanny via drainage ditches east of the site. The report states that '*There will be no change to the water volume discharged to the drainage ditch, with the volume of rainwater currently falling on site and being received by the existing drainage system, remaining the same*.' A number of mitigation measures were proposed in the ER to '*prevent any accidental contamination of surface water (rainfall) runoff from the site and prevent/contain any accidental discharges of hazardous substances'*.

Given the nature of the planned works (transmission station), it is concluded that there is no potential for significant negative direct or indirect cumulative effects on hydrology and water quality as a result of the proposed development and the planned development (ABP Ref. PL17.303678).

15.7.4 Highfield Solar Ltd. (PL17.248146) - Solar Farm

Given the nature and scale of the planned works (solar farm), surface water emissions will not be significant. The Inspector's Report[6] (2017), in Section 7.8.10 the Inspector stated, '*I am satisfied that the proposed development would not negatively impact on current drainage patterns or be at significant risk of*

[5] Substation Environmental Report (2019) available form: http://caulstown-platin-substation.com/downloads/environmental/substation-environmental-report.pdf
[6] Available from An Bord Pleanála, http://www.pleanala.ie/documents/reports/248/R248146.pdf

fluvial flooding'. Therefore, it is concluded that there is no potential for significant negative direct or indirect cumulative effects on hydrology and water quality as a result of the proposed development and the planned development (ABP Ref. PL17.248146).

15.7.5 Highfield Solar Ltd. (PL17.303568) - Electrical substation (110kV)

In Section 8.5.5 of the Inspector's Report[7] (2019) prepared by An Bord Pleanála, the Inspector stated that '*I consider that the attenuation and disposal of surface water associated with the proposed development is generally acceptable*'. Therefore, it is concluded that there is no potential for significant negative direct or indirect cumulative effects on hydrology and water quality as a result of the proposed development and the planned development (ABP Ref. PL17.303568).

Finally, from a water perspective, taking the Indaver Site Sustainability Project in combination with all of the five projects listed above, it is considered that there is no potential for any significant negative direct or indirect cumulative impact to arise given the location of the proposed development, the difference in construction programmes and the implementation of mitigation measures.

15.8 Residual Effects

15.8.1 Operational Phase

As the proposed development is predicted to have an overall neutral long-term impact on water quality and hydrology with the study area, there are no mitigation measures required and as such there will be no significant residual effect on hydrology, drainage characteristics of the site or water quality during operation.

There is no impact expected to the public sewer as a result of the proposed development.

The development will result in additional small demands on the public water network which are not considered to be significant, refer to **Chapter 4 *Description of the Proposed Development*** and **Chapter 16 *Material Assets***.

There will be no significant residual effect on flood risk caused by the operation of the proposed development.

15.8.2 Construction Phase

With the implementation of mitigation measures described in **Section 15.6.1** as well as those described in **Section 14.7.1** of **Chapter 14 *Land and Soils***, there will be no significant residual effects on water (including water quality, water supply and flood risk/hydrology. during construction.

There are also no significant residual effects expected in relation to wastewater arising from the construction phase of the proposed development.

[7] Available from An Bord Pleanála, http://www.pleanala.ie/documents/reports/303/R303568.pdf

15.9 References

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16 Material Assets

16.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) considers and assesses the likely significant impacts with regards to material assets associated with both the construction phase and operational phase of the proposed development. Measures to mitigate any likely significant adverse impacts of the proposed development on material assets are proposed within this chapter. Residual effects are also described.

The proposed development is described fully in **Chapter 4 *Description of the Proposed Development***.

16.2 Assessment Methodology

16.2.1 General

Material assets are now defined in the Draft EPA Advice notes on current practice in the preparation of Environmental Impact Assessment Reports (EPA 2017) as *'built services and infrastructure'*: Refer to Section 3, page 32 of the EPA guidelines which state:

"The meaning of this factor is less clear than others. In Directive 2011/92/EU it included architectural and archaeological heritage. Directive 2014/52/EU includes those heritage aspects as components of cultural heritage. Material assets can now be taken to mean built services and infrastructure. Traffic is included because in effect traffic consumes roads infrastructure. Sealing of agricultural land and effects on mining or quarrying potential come under the factors of land and soils".

According to the EPA guidelines, the three main areas to focus on under the heading of material assets are:

- Built Services and infrastructure (including electricity, telecommunications, gas, water supply infrastructure and sewerage);
- Roads and Traffic;
- Waste Management.

Built services and infrastructure and waste management are addressed in this chapter.

New guidance on Materials and Waste in Environmental Impact Assessment by the Institute of Environmental Management & Assessment (IEMA) in the UK, dated from March 2020 has also been consulted in the preparation of this chapter.

The aim of this guidance document is to provide a framework for the identification, assessment and determination of the significance of effects associated with material assets in project development.

Where relevant, effects on particular material assets such as the road network and construction waste disposal facilities are considered in detail elsewhere in this EIAR.

Refer to **Chapter 7** ***Traffic & Transportation*** and **Chapter 5** ***Construction Activities*** respectively for further assessment of the impact of the proposed development on these assets.

Refer also to **Chapter 4** ***Description of the Proposed Development*** of this EIAR for a detailed description of the proposed design in relation to material assets.

The use of natural resources in the context of material assets (water supply, energy and materials) is addressed in this chapter. Projections of resource use were made, for both the construction and operational phases of the development, and the impact assessed. The use of natural resources in the context of other environmental factors such as Land and Soils and Hydrogeology (Chapter 14), Water (Chapter 15) and Biodiversity (Chapter 11) are addressed elsewhere in this EIAR. There are no quarries or mineral resources within the site boundary (Refer to **Chapter 14** ***Land and Soils*** of this EIAR for further details).

"Land Take" is also addressed in this chapter. Land take is defined in the EPA Draft Guidance (2017) as "removal of productive land from potential agriculture or other beneficial uses". "Land zoning" is primarily addressed in **Chapter 2** ***Policy & Planning Framework and Need for the Scheme*** but is also touched upon in this chapter. The effects of the proposed development on land in the context of *"landscape and visual"* are addressed in **Chapter 13** ***Landscape and Visual***. The use of natural resources in the context of land use and land take is also addressed in this chapter.

The assessment of cultural heritage is presented in **Chapter 12**, ***Archaeological, Architectural and Cultural Heritage***.

A desk study was carried out on the existing material assets associated with the site of the proposed development.

16.2.2 Guidance and Legislation

This chapter has been prepared having regard to the following guidelines:

- European Commission (2017) Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report;
- Government of Ireland (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018);
- Department of Housing, Planning, Community and Local Government (2017) Key Issues Consultation Paper on the Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems;

- Department of Housing, Planning, Community and Local Government (2017) Circular PL 1/2017 - Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive): Advice on the Administrative Provisions in Advance of Transposition;
- Department of Housing, Planning and Local Government (2018) Circular PL 05/2018 -Transposition into Planning Law of Directive 2014/52/EU amending Directive 2011/92/EU on the effects of certain public and private projects on the environment (the EIA Directive) And Revised Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment;
- Environmental Protection Agency (2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft August 2017);
- European Commission (2012) Interpretation suggested by the Commission as regards the application of the EIA Directive to ancillary/associated works;
- European Commission (1999) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions;
- IEMA (2020) guide to: Materials and Waste in Environmental Impact Assessment; and
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA 2003).

16.3 Receiving Environment

16.3.1 Land

16.3.1.1 Introduction

As described previously, “Land Take” is addressed in this chapter. Land take is defined in the EPA Draft Guidance (2017) as “removal of productive land from potential agriculture or other beneficial uses”. *“Land zoning”* is primarily addressed in **Chapter 2** ***Policy and Planning Framework and Need for the Scheme*** but is also touched upon in this chapter. The effects of the proposed development on land in the context of *“landscape and visual”* are addressed in **Chapter 13** ***Landscape and Visual***. The use of natural resources in the context of land use and land take is also addressed in this chapter.

16.3.1.2 Site Location

The existing Waste to Energy facility is located in Carranstown, Duleek, Co. Meath. Refer to **Figures 1.1** to **1.3**. The site is owned by Indaver. The facility is located 1.8km west of the M1, bounded to the south by the R152 regional road and surrounded by greenfield on all other sides.

Irish Cement is to the immediate north of the site and the rest of the surrounding land is used for industrial, agricultural and residential purposes. The village of Duleek is located approximately 2.7km south west of the site.

16.3.1.3 Land Use, Land Take and Zoning

The site of the existing facility is approximately 10 hectares and is all within Indaver ownership. Generally, the underlying topography of the facility site is a relatively even gradient, from a high point in excess of 39.0mOHD. at the eastern corner to a low point of just under 30.0mOD. adjacent to the western corner. The existing buildings largely occupy the lower parts of the facility site and the existing developed parts of the site represent approximately 3.5 hectares.

The facility is bounded by low hedgerows featuring occasional mature tree specimens. This reflects the general agricultural landscape around the facility site.

Whilst the site is located outside of any designated zoned lands in the Meath County Development Plan, it is however located in an area that has been subject to a number of decisions to permit the clustering of large-scale industrial activities including the existing Platin cement works in the area (Ref. PL17.PC0221) which includes an electricity substation and an existing limestone quarry (Ref.17.243795).

16.3.1.4 Wayleaves

There are three wayleaves in existence on the site. The first relates to the 70 bar natural gas transmission line which runs underground an traverses the site from the eastern corner of the site to the western side.

The second relates to the underground 10 kV powerline running from south-east part of the site down the southern site boundary before it follows the western site boundary all the way up to the northern boundary of the site. This line originally provided power for the construction phase in 2009 but is no longer connected to the site.

The third relates to the underground 38kV line which runs from the import/export compound on the site along the northern boundary of the site. These wayleaves are indicated on the existing site layout drawing **29043-CD-002** in **Appendix 5.2** of **Volume 3** and on **Figure 4.1**.

16.3.2 Built Services and Infrastructure

16.3.2.1 Road Infrastructure Access & Traffic

The R152 which serves the Indaver site is a single-carriageway road with a typical road width of 7m. At the Indaver site entrance, the route widens to approximately 10m to include a ghost island right-turning lane (approximately 100m long) and a deceleration lane (approximately 70m long) for traffic turning left into the site.

A speed limit of 80kph applies on the R152 in the vicinity of the site.

16.3.2.2 Drainage and Foul Water/Sewerage

The site is equipped with its own stormwater/surface water management system which controls and attenuates all surface water from all roofs and hardstanding areas on site. The attenuated run-off is discharged at a controlled rate to a local drainage ditch.

There is no process effluent from the facility with any wash waters or process effluent re-used in the process.

Foul water is collected in a domestic type effluent collection system and passed through a septic tank and secondary treatment system (Puraflo) before being discharged to the percolation area. The wastewater treatment area is located on the northern boundary of the site. A second smaller effluent collection and discharge system is provided at the gatehouse building.

Full details can be found in **Sections 4.3.2** and **4.3.4** of **Chapter 4** ***Description of the Proposed Development***.

16.3.2.3 Power/Electricity

In addition to the 38kV underground line serving the site for the import and export of electricity and referred to above in **Section 16.3.1.4** on wayleaves, there are 110kV overhead power lines that traverse the site. An exclusion zone underneath these lines has been maintained since the construction of the existing facility on site.

16.3.2.4 Water Supply

The site is connected to the public water main for domestic use only. The remainder of the water supplied for the process and firefighting is supplied from two groundwater wells. The existing water usage on site is approximately 9m^3/hr.

16.3.2.5 Gas Supply

In addition to the 70bar natural gas transmission main referred to above in **Section 16.3.1.4** on wayleaves, there is also a 4bar distribution main in the R152 Regional road. This serves domestic users along the R152 and the village of Duleek itself.

Neither gas line is supplying gas to the site for use.

16.3.2.6 Underground Services along the R152 Regional road

In addition to the 4 bar natural gas distribution main mentioned in **Section 16.3.2.5** above, the following services are also present:

- Public watermain 100mm diameter.
- 300 mm diameter storm water drain.
- Eircom/telecommunications lines (located on the eastern side of the R152 carriageway).

- Low voltage power in underground ducting (fed from the Indaver site) for street lighting along the footpath on the R152.

16.4 Characteristics of the Proposed Development

The characteristics of the proposed development in relation to material assets are as follows:

- Only lands within Indaver ownership will be required for the proposed development.
- No service diversions will be required in order to facilitate the development.
- The hydrogen generation unit proposed, will use 10MW of electricity (for approx. 1,000 hrs) that would otherwise be wasted to produce approximately 160 tonnes of hydrogen annually using water as a feedstock.
- Existing power and water supplies on site will be extended to the relevant elements of the proposed development in addition to an extension foul and surface water drainage system.
- Additional raw materials will be required as process inputs.
- Additional residues from waste processing will be generated during operation phase.
- There will be movement of materials on and off site during the construction phase.
- Utilisation of land for the construction and operation of the proposed development (land take).

16.5 Likely Significant Effects

This section describes the likely significant effects of the proposed development on material assets. Potential effects represent the worst-case scenario in the absence of mitigation.

16.5.1 'Do Nothing' Scenario

If the proposed development did not go ahead, the site would continue in its current use, processing up to 10,000 tonnes of hazardous waste and a total of 235,000 tonnes of waste annually. The potential to divert up to 15,000 tonnes of hazardous waste from export to thermal treatment within the state and up to 30,000 tonnes of additional hazardous residues for recovery would be lost.

The facility would continue to convert the thermal energy produced by the combustion of the waste into approximately 21 MW of electricity (MW_e), of which approximately 2.5 MW_e will be used by the plant itself, with the remainder, approximately 18.5 MW_e being exported to the local electrical distribution system.

However, the potential to generate a carbon-free fuel in the form of Hydrogen during periods of curtailment (approximately 1,000 hours per annum) from otherwise wasted heat and electricity would be lost.

Existing services would remain the same as current baseline in the do-nothing scenario.

16.5.2 Construction Phase

16.5.2.1 Land Use and Land Take

Land Use

The construction phase will have a slight negative effect on the lands required for the proposed development as it will no longer be available for grass or wildflower growth. This will be true also for the operational phase. When operational, an approximate area of 0.5 Ha of habitat will be lost. These areas however are not of high biodiversity value (Refer to **Section 11.7.3** of **Chapter 11** ***Biodiversity***) and the effect is not significant.

Given the current use of the site, it is not considered that the additional land use on site will result in a significant negative effect.

Land Take

As described previously, land take is defined in the EPA Draft Guidance (2017) as "removal of productive land from potential agriculture or other beneficial uses". The land required for the proposed development during construction (and operation) is within the existing operational site curtilage and fully within Indaver ownership.

Given the current use of the site and Indaver ownership of lands, it is not considered that the land-take will result in a significant negative effect.

There will also be no significant negative effects on adjacent land uses as a result of the proposed development.

16.5.2.2 Wayleaves

As discussed in **Section 16.3.1.4**, there are existing wayleaves on Indaver lands. The existing wayleaves for the 10kV and 38kV powerlines will remain during construction and therefore the effect will be neutral.

The existing wayleave on Indaver owned lands for the natural gas transmission pipeline will also remain during construction and therefore the effect will be neutral.

16.5.2.3 Road Infrastructure, Access and Traffic

Construction (and operational) traffic entering and leaving the Indaver site will use the R152 and M1. There will be sufficient capacity on the R152 for the proposed development during the construction of the proposed development. Refer to **Chapter 7 *Traffic & Transportation*** of this EIAR for further details.

16.5.2.4 Storm Water Drainage, Foul Water/Sewerage

Management of surface water and domestic effluent generated on site during the construction phase is described in **Chapter 5 *Construction Activities***. Foul water generated on-site during construction will removed off-site by tanker by a licensed contractor to an approved licensed facility. Storm water/surface water collected from construction activities will be attenuated and de-silted prior to release. There will be no significant effect on the existing storm water or foul sewage system during construction.

16.5.2.5 Power/Electricity

Electricity Supply for the Site

It is anticipated that the construction phase of the proposed development will require a peak load of 120kVA. Some of this supply to meet this demand will come from the power generated on site and the remainder of the power required will be supplied by the use of on-site diesel generators. Therefore, there will be no significant effect on the local network.

Diversions

There are no diversions of any underground or overground power lines required to facilitate the proposed development.

16.5.2.6 Water Supply

Water for the construction phase will be provided via the existing water distribution network on site. No additional or temporary connection to the public watermain on the R152 is required.

16.5.2.7 Gas Supply

As detailed previously, an existing underground 70bar transmission gas main is located within the site.

The gas main is not currently supplying gas to the site and no connection to this main is required for the existing or the proposed development. Gas Networks Ireland (GNI) have been consulted in relation to the proposed development and have no objection to any of the elements proposed.

There is also an existing 4 bar gas distribution main on the R152. An application to connect to this gas main for the supply of Hydrogen has been made to GNI.

If granted, this connection will be provided by GNI via an above ground installation (AGI) at the south eastern border of the site adjacent to the R152.

16.5.2.8 Underground services along the R152

With the exception of the connection to the 4 bar natural gas distribution main described in **Section 16.5.2.7** above, there is no other interference with the existing services already described in **Section 16.3.2.6**.

16.5.2.9 Surplus Material

The import and export of material is described in **Section 5.5** of **Chapter 5** ***Construction Activities*** of this EIAR.

As discussed in **Section 5.5.2**, it is estimated that almost 31,000 m^3 of surplus material will be removed from the site.

Off-site disposal options for surplus clean and inert excavated material include:

- reuse as a by-product on other sites subject to Article 27, under the Waste Directive Regulations 2011;
- recovery at suitable waste permit facilities or licensed soil recovery facilities in accordance with relevant waste legislation; or
- disposal at suitable authorised waste facilities.

Therefore, the effect of exporting of surplus material off-site will depend on the disposal option or combination of options available to the contractor at the time. The reuse of surplus material on other sites (subject to Article 27) will likely have a slight, positive effect on material assets (waste resources) as it diverts surplus clean material from permitted waste facilities. Recovery and disposal of surplus material will likely have a slight negative effect on waste resources.

The environmental effects on these facilities in accepting material will have been addressed during the application process as discussed below. This will ensure that any material proposed to be re-used or accepted at a waste facility will not have a negative effect on the receiving environment of that site or waste facility.

The potential construction traffic effects associated with offsite re-use/recovery/disposal have been addressed in **Section 7.4.1** of **Chapter 7** ***Traffic & Transportation***.

Re-use as a By-Product (Article 27)

Under Article 5 of the Waste Framework Directive, transposed into Irish legislation under Article 27 of the European Communities (Waste Directive) Regulations 2011, uncontaminated excavated soil and other naturally occurring materials, may be used on sites other than the one from which they were excavated provided the soil and stone material meets the criteria to be considered a by-product. The EPA guidance document, Guidance on Soil and Stone By-products2 (June, 2019). There are four by-product conditions that must be met in order for the material to regarded as a by-product:

a) further use of the soil and stone is certain;

b) the soil and stone can be used directly without any further processing other than normal industrial practice;

c) the soil and stone is produced as an integral part of a production process; and

d) further use is lawful in that the soil and stone fulfil all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

In practice, the EPA[1] has outlined that:

"Prior to works (i.e. prior to commencement of the development), an economic operator (being either the material producer, or with the express written consent of the material producer) notifies the EPA of the by-product decision. A register of by-product notifications will be maintained and will be available for public inspection online to include details of origin and destination sites for soil and stone by-product.

Notifications should be accompanied by the full complement of necessary documentation to demonstrate compliance with the four by-product conditions."

At the construction stage of the proposed development, should further use of soil and stone be certain and all other criteria can be fulfilled, the appointed contractor will be responsible for notifying the EPA of the by-product decision.

Recovery

The Licensed soil recovery facilities are usually worked out quarries that are undergoing restoration. They may also be sites where relatively large volumes of soil are being imported to raise natural ground levels. In both cases the soil recovery facilities are licensed to accept only uncontaminated natural soil and stone.

Unlike landfills, soil recovery facilities are not required to have an engineered basal liner, nor are they required to install an engineered cap following completion of restoration or land raising. As such there are no engineering controls to protect groundwater from contamination that may be present in soil used as backfill at these facilities.

Soil recovery facilities, depending on the volumes of material accepted, are permitted under the Third Schedule of the Waste Management (Facility and Registration) Regulations 2001 (SI No. 821 of 2007) as amended, or are required to operate under a Waste Licence granted by the EPA under Part V of the Waste Management Act 1996, as amended.

Depending on the volumes of material recovered, the facility will operate under one of three permits:

- Certificate of Registration (<25,000 tonnes total waste accepted annually);

[1] Available at https://www.epa.ie/pubs/advice/waste/product/Guidance_on_Soil_and_Stone_By_Product.pdf

- Waste Permit (>25,000 to <100,000t total waste accepted annually); or a
- Waste Licence (>100,000t 000 tonnes total waste accepted annually).

For a waste facility (not operated by the local authority) to obtain a Certificate of Registration or a Waste Permit, the application must be made directly to the local authority for which that facility sits. For facilities that apply to operate under a Waste Licence, applications are made to the EPA.

All waste facilities are required to prepare an EIA under Annex II of the EIA Directive 2011 (2011/92/EU) as amended by the 2014 Directive (2014/52/EU):

"11 (b) Installations for the disposal of waste (projects not included in Annex I)"

The EIAR must accompany the waste permit application to the local authority for Certificate of Registration or a Waste Permit, or the EPA for a Waste Licence application.

Therefore, the environmental effects of accepting uncontaminated natural soil and stone will have been assessed. The EPA are in the process of preparing guidelines[2] for the waste acceptance criteria that incoming waste must meet before being accepted to the facility. This will ensure that only uncontaminated natural soil and stone will be accepted at the facility and protect the groundwater from contamination that may be present in soil used as backfill at these facilities.

Disposal

Under the scenario where material exported from site is unsuitable for re-use (under Article 27) or recovery, the disposal of material at a landfill may be a disposal option, subject to the material fulfilling certain criteria.

Landfills in Ireland operate under a Waste Licence issued by the EPA and must be constructed in accordance with strict technical requirements set out in the Council Directive 1999/31/EC on the landfill of waste.

As discussed above all waste facilities are required to prepare and submit an EIA, under Annex II of the EIA Directive 2011 (2011/92/EU) as amended by the 2014 Directive (2014/52/EU), to the EPA.

Under the Waste Licence, the EPA will set the type of waste that the landfill facility will be licensed to accept. The landfill will be licensed to accept either Inert, Non-hazardous or Hazardous waste. The criteria of these wastes are set out in Council Decision 2003/33/EC which establishes the criteria and procedures for the acceptance of waste at landfills (with regard to Article 16 of and Annex II to Directive 1999/31/EC). There are no landfills in Ireland licensed to accept hazardous waste material.

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[2] EPA (2019) Update Note on the 'Waste Acceptance Criteria and Development of Soil Trigger Values for Soil Recovery Facilities' Guidance. Available at:
https://www.epa.ie/pubs/consultation/soilrecoveryconsultation/Update%20on%20EPA%20Soil%20Waste%20Acceptance%20Criteria%20Guidance%20-%20Feb%202019.pdf

16.5.2.10 General Waste Management

Waste generated during the construction phase will be carefully managed under the Construction Waste Management Plan (CWMP) outlined in the Section 7 of the ***Construction Environmental Management Plan*** (CEMP), refer to **Appendix 5.1**, and in accordance with the accepted waste hierarchy which gives precedence to prevention, minimisation, reuse and recycling over disposal with energy recovery and finally disposal to landfill.

This hierarchy will be implemented by identifying opportunities to firstly prevent waste from being produced, and secondly minimise the amount of waste produced. Where prevention and minimisation will not be feasible, ways to reuse or recycle waste will be sought, preferably on-site to avoid the effects arising from transportation. If this is not feasible, opportunities to reuse or recycle the waste off-site will be investigated. If this is not feasible, then waste will be sent to an energy recovery facility, and only where there is no alternative, will waste be disposed of to landfill. To achieve this, existing waste management programmes and networks will be used such as the National Waste Prevention Programme, which is implemented by the Environmental Protection Agency.

Therefore, the management of general waste during construction will not have a significant effect on the waste resources.

Waste Arising

In general, construction waste materials may include general construction debris, scrap timber and steel, machinery oils and chemical cleaning solutions.

The practice of excessive purchase of materials and equipment to allow for anticipated wastage will be avoided.

As discussed above, surplus material will be generated during construction (Refer to **Section 5.5.2** of **Chapter 5** ***Construction Activities*** and in **Section 14.6.2** of **Chapter 14** ***Land and Soils*** of this EIAR).

In the unlikely event of any evidence of soil contamination being found during work on site, the appropriate remediation measures will be employed.

Any work of this nature would be carried out in consultation with, and with the approval of the Environmental Department of Meath County Council. The material would be transported to a permitted site via the national and regional road network.

16.5.2.11 Imported Materials

As discussed in **Section 5.5.1** of **Chapter 5** ***Construction Activities*** of this EIAR, almost 2,300m^3 of engineering fill and crushed stone will be imported onto the site.

The selection and specification of construction materials will be informed by local availability of these materials. Materials will be sourced locally where possible.

In the context of capacity of the market in Ireland for construction materials, the requirements of the construction phase will not be significant. Therefore, the proposed development will not have a significant effect on the resources of construction materials for the construction of the proposed development.

16.5.3 Operational Phase

16.5.3.1 Land Use, Land Take and Zoning

The proposed development will be constructed on lands within the existing site boundary and is consistent with the existing land usage as outlined **Section 2.4.3.1** of **Chapter 2** ***Policy & Planning Framework and Need for the Scheme***.

The operation of the proposed development will not have a significant effect on land take. All operations will be on Indaver lands and will not require additional land.

The hydrogen gas connection pipeline to the natural gas grid from the Hydrogen Generation unit on site will be laid underground on Indaver lands to the above ground installation provided by GNI. The final connection to the natural gas distribution main in the R152 will be made by GNI. Significant negative effects from the grid connection on land use or land take will not arise.

16.5.3.2 Wayleaves

The existing wayleaves for the 38kV and 10kV powerlines as well as the 70 bar natural gas transmission line discussed in **Section 16.3.1.4** above will remain post construction when the site is in operation.

16.5.3.3 Road Infrastructure, Access and Traffic

During the operation of the proposed development, traffic entering and leaving the Indaver site will use the R152 and M1. There will be sufficient capacity on the existing R152 for the operation of the proposed development. Refer to **Chapter 7** ***Traffic & Transportation*** of this EIAR for further details.

16.5.3.4 Foul Water/Sewerage

As discussed in **Section 4.6.3** of **Chapter 4** ***Description of the Proposed Development***, untreated sanitary (foul) water will continue to be treated in on-site packaged treatment units. An additional treatment unit will be added to replace the holding tanks currently used for the foul effluent from the administration building and temporary portacabins in the contractors compound. A further unit will also be provided to take the effluent from the toilets that will be provided in the proposed new contractors compound (refer to drawing **29043-CD-016** in **Appendix 5.2** of **Volume 3** for details).

The new ERT/office building will tie into the existing treatment unit at the Northern boundary of the site. Therefore, the proposed development will not have a significant effect on the foul water resources on site.

16.5.3.5 Power/Electricity

The existing facility uses residual waste to generate electricity to replace non-renewable fossil fuels such as natural gas, coal and oil in the generation of electricity. The electricity produced by the waste-to-energy facility is enough to supply the power needs of approximately 30,000 households annually.

The increase in electrical demand to power the tank farm, bottom ash storage building, office accommodation and warehouse, workshop, ERT/office building will be small (200 kW_e approximately) when compared to the existing house load for the site of approximately 2.6 MW_e.

As discussed in **Section 4.5.4** of **Chapter 4 *Description of the Proposed Development***, the hydrogen generation unit (HGU) will be utilised when the electricity produced by the facility is not required by the electricity grid. As outlined in **Section 9.4.2** of **Chapter 9 *Climate Change***, this power is currently wasted and with the provision of the HGU, a useful and carbon free fuel in the form of Hydrogen gas can be produced.

Therefore, the proposed facility will have a significantly positive effect on material assets in terms of energy use, climate change and power generation.

16.5.3.6 Gas Supply

There will be no gas supply required for the operation of the proposed development.

16.5.3.7 Water Supply

As discussed in **Section 4.7.1** of **Chapter 4 *Description of the Proposed Development***, the increased demand of approximately 3.5m^3 per hour for the proposed developments on site will be supplied from the existing groundwater abstraction wells on site. This is in addition to the current abstraction rate of approximately 9m^3/hr of water for the existing activities on site. **Table 16.1** below summarises this.

Table 16.1 Existing and Proposed Water Consumption

Water Usage	**m^3/hr**	**m^3/annum**
Existing Water Usage	8.88	71,398
Proposed HGU Usage	2.2	2,200
Pre-Treatment Plant Additional Capacity	1.1	9,000
Warehouse/Workshop/ERT/Office	0.2	1,629
Total Increase	3.5	12,829
Annual Max Usage	12.4	84,227

The majority of the increased water usage is associated with the HGU (2.2 m^3/h) and the treatment of an additional 30,000 tonnes per annum (1.1m^3/h) of flue gas treatment residues and boiler ash. The annualised effect of this increased water demand on the existing supply is an additional 18% per annum. As the water demand on the site is already at a low level, this increase is not considered significant.

Also, as discussed in **Section 14.3.2.5** of **Chapter 14** ***Land and Soils***, the current capacity of the two groundwater wells is approximately 600m^3 per day or 25m^3/h. The hourly demand will increase from 36% of the total production capacity of the wells to 50%. This demonstrates that the existing infrastructure on site has adequate capacity to provide water for the proposed development demand.

16.5.3.8 Other Raw Materials Usage

As outlined previously in **Section 4.5.2** of **Chapter 4** ***Description of the Proposed Development***, there will be a small increase in the use of other raw materials consumed in the waste to energy process. This has been estimated assuming that all of the additional waste to be treated in the waste to energy plant is solid waste which gives the most conservative estimate of this increase and is shown in **Table 16.2** below.

Table 16.2 Increased raw materials usage for waste to energy plant

Raw Material	Total Consumption 2019 Usage (tonnes)	Usage per tonne of waste input (kg/T)	Additional annual usage (based on 15,000 tonnes additional waste input)
Quicklime (CaO)	3,543	15.37	231
Dry Hydrated Lime ($Ca(OH)_2$)	1,352	5.86	88
Activated Clay+Carbon	318	1.38	21
Aqueous Ammonia	381	1.65	25
Fuel Oil	228	0.99	15

These increases are very small and the raw materials listed are not in short supply. In reality, the increases will be far less as the greater proportion of the 15,000 tonnes of additional hazardous waste processed will be contaminated water (aqueous waste). Hence, the impact of this increased raw materials usage is not considered significant

The HGU also requires potassium hydroxide as the electrolyte for the electrolysis of water to Hydrogen and Oxygen but this is not consumed in the process. The electrolyte may be topped up or changed out from time to time but this is not a regular occurrence. From the initial charge of approximately 100 tonnes of a 15 %

Potassium Hydroxide solution or Potassium Hydroxide pallets mixed with demineralised water of equivalent amount, usage thereafter is not considered significant.

16.5.3.9 Increased Residue Production

Based on the assumption outlined in **Section 16.5.3.8** above that all of the additional waste processed in the waste to energy plant is solid waste, and more re-agents are required for use in the flue gas treatment process, correspondingly the amount of residues produced should also increase. The calculated increases are set out in **Table 16.3** below and are based on the percentage per tonne of waste input figures for 2019 (refer also to **Tables 4.1** and **4.2** of **Chapter 4** ***Description of the Proposed Development***).

Table 16.3 Increase in residue production from waste to energy process

Residue/Re-agent	% per tonne waste input	Additional Tonnes per annum
Additional Bottom Ash	15.0%	2,250
Additional Boiler Ash	0.7%	105
Additional FGC Residues	4.0%	600
Ferrous Metals	1.2%	180
Non-1Ferrous	0.2%	30

As a result of treating an additional 30,000 tonnes per annum of boiler ash, flue gas cleaning residues and similar residues accepted from third parties, 39,000 tonnes per annum of treated residues will be sent off-site for recovery.

16.5.3.10 Bottom Ash

As explained in **Section 4.1.1.1** of **Chapter 4** ***Description of the Proposed Development***, bottom ash is currently sent to three main landfill outlets for recovery as daily cover or as a road construction material on the landfill itself. This will continue for the additional bottom ash produced as a result of the proposed development.

It is the intention of Indaver to continue to identify potential uses for bottom ash. The reuse of this material would assist in Ireland's envisaged transition to a circular economy as laid down in stated European and national policy positions as all wastes including those that are unavoidable such as residues are regarded as being capable of being transformed into useful and valuable resources. Such reuse is also compatible with the principle of self-sufficiency as laid down in the Waste Framework Directive.

The manner in which this material may be treated and transported is dependent upon how this material is classified and characterised which may be hazardous or non-hazardous, and accordingly an assessment of each finding is outlined below. Commission Regulation (EU) No. 1357/2014 and Commission Decision

2014/955/EU is utilised to determine the manner in which bottom ash may be characterised as non-hazardous or hazardous. The bottom ash residues from the plant are currently characterised as non-hazardous.

Bottom Ash as Non-hazardous

Bottom ash from waste incineration in EU countries, including the UK, Netherlands and Belgium, is processed for use as an aggregate in construction of roads or other large-scale projects. This processed material is known as incinerator bottom ash aggregate (IBAA).

The Green Deal Programme agreed between the Dutch Waste Management Association and the Dutch government represents an example of such reuse and specifies that at least half of the bottom ash produced will be suitable for use as 'freely applicable building material' since 2017.

There are currently a number of proposed bottom ash recovery developments in Ireland including Beauparc, Co. Meath and Drehid, Co. Kildare. If these developments become operational in the future, then they would provide an alternative to the current options of sending this material to landfill for recovery or disposal and the export of the bottom ash for recovery.

Landfill Options in Ireland for Bottom Ash

Any landfills utilised for bottom ash for recovery or disposal must be suitably licensed by the Environmental Protection Agency (EPA) for recovery or disposal operations as laid down in Article 23 of the Waste Framework Directive.

In addition, all landfills are required to comply with the requirements of the EIA Directive and therefore were subject to the EIA process prior to the acceptance of any material including bottom ash. This Directive on Environmental Assessment aims to provide a high level of protection of the environment and to contribute to the integration of environmental considerations into the development of projects such as landfills with a view to reducing their environmental impact.

Similarly, the existing licensing process which all landfills in Ireland are subject to, requires compliance with an ongoing environmental monitoring regime in the form of stringent licence conditions. The issuing of such licences by competent authorities pursuant to the requirements laid down in the Waste Framework Directive stipulate that all necessary safety and precautionary measures, monitoring and control operations and closure and after-care provisions must be included in the granting of all such licences.

Such conditions set out the legal constraints under which landfills must operate in order to ensure that all operations are conducted in compliance with the requirements of the Waste Framework and Landfill Directives and do not cause environmental pollution.

Such conditions include those concerning:

- leachate management;

- groundwater and surface water management;
- landfill gas management;
- odour prevention and control, and
- nuisance monitoring.

This comprehensive monitoring regime will ensure that material such as bottom ash when sent to landfill for recovery or disposal will not have a material environmental impact.

Therefore, sending bottom ash to licensed landfills for recovery or disposal is not likely to have significant negative effects on the environment as stipulated by the requirements of the EIA Directive.

Available Landfill Options

Operational landfills, which would be suitable for the disposal or recovery of the additional bottom ash, include:

- Knockharley landfill, Co. Meath.
- Bord Na Mona landfill at Drehid, Co. Kildare.
- Ballynagran landfill, Co. Wicklow.

Knockharley landfill, in County Meath, operated by Knockharley Landfill Ltd, is licensed by the EPA, licence number W0146-02, to accept 88,000 tonnes per annum of non-hazardous waste into the void. The landfill currently accepts residues from the existing facility and has capacity to accept the additional bottom ash from the proposed development.

Knockharley landfill is located a short distance from the site on the N2 national primary route. The additional truck movements associated with the increase in bottom ash production have been modelled (refer to **Chapter 7 *Traffic & Transportation***) and do not have a significant impact on the surrounding road network. The treatment of the bottom ash in Knockharley landfill is not likely to have a significant negative effect on the environment.

Drehid landfill, County Kildare, operated by Bord Na Móna Plc, is licensed by the EPA, licence number W0201-03, to accepted 120,000 tonnes per annum of non-hazardous waste. The landfill currently accepts residues from the existing facility and has capacity to accept the additional bottom ash from the proposed development.

The Drehid landfill is accessed from the M4 motorway via the R402 and the R403. Trucks carrying bottom ash to Drehid landfill would use the national road network, which has more than adequate capacity to accommodate the numbers of trucks. The disposal of the bottom ash in Drehid landfill is not likely have significant negative effect on the environment.

Ballynagran landfill is also used by the site currently but it is unclear as to whether this site will be available in the future for the additional quantities produced.

Export Options for Bottom Ash

In the alternative, bottom ash (including the additional bottom ash produced) may be exported to outlets in Europe which are already able to recover aggregates from bottom ash. To provide for this alternative, the bottom ash storage building has been proposed and is described in **Section 4.5.5** of **Chapter 4** ***Description of the Proposed Development***.

These outlets have also been subject to the requirements of the Waste Framework and EIA Directives and the EIA process of the relevant jurisdiction. As referred to above in the context of landfills, these outlets are also subject to a separate national licensing regime on an ongoing basis which is a constituent part of the European law framework as laid down in the Waste Framework Directive.

As the export of this material would involve movement to another EU country, the requirements of Regulation (EC) No 1013/2006 of 2006 on shipments of waste would also need to be adhered to.

Should this option be availed of, the bottom ash would be stored on site in the bottom ash storage building until there is enough for export in a bulk consignment. Covered trucks would bring the bottom ash from the site to Drogheda Port for loading into a vessel, typically over a two or three-day period in the same vehicles that would transport the material to a national treatment facility if it were available.

This scenario has been modelled in **Chapter 7** ***Traffic & Transportation*** and no significant effects are envisaged.

The export of bottom ash outside the Republic of Ireland has the potential for trans-boundary effects and these effects are discussed in more detail in **Section 18.5.2** of **Chapter 18** ***Cumulative Effects, Other Effects and Interactions***.

Bottom Ash Characterised as Hazardous

Should bottom ash be found to be a hazardous waste at some point in the future, the above treatment options are still suitable as they physical nature and composition of the bottom ash would not have changed. However, in this instance the facility accepting the waste would have to be licensed to accept this type of hazardous waste. Currently hazardous waste is exported from Ireland by ship for treatment in waste-to-energy facilities in Europe. The export of hazardous material outside the Republic of Ireland has the potential for trans-boundary effects and these effects are discussed in more detail in **Section 18.5.2** of **Chapter 18** ***Cumulative Effects, Other Effects and Interactions***.

16.5.3.11 Boiler Ash and Flue Gas Cleaning Residues

Circa 105 tonnes of additional boiler ash and 600 tonnes of additional flue gas cleaning residues will be produced annually from the waste-to-energy plant operations as part of the proposed development. Refer to **Table 16.3** above.

When pre-treated (after mixing with water) these residues will amount to a total of approximately 917 tonnes per annum. More significantly, an additional 39,000 tonnes per annum of pre-treated residues will be produced by the existing on-site pre-treatment facility as described in **Section 16.5.3.9** above.

It is expected that the 30,000 tonnes of boiler ash, flue gas cleaning residues and similar material from third party facilities that is accepted as part of the proposed development for pre-treatment will be similar in composition to the boiler ash and flue gas cleaning residues from the existing facility.

The total amount of additional pre-treated residues from both waste to energy plant and that accepted from third parties will be sent for recovery to salt mines licensed to accept this type of waste.

Export of Boiler Ash and Flue Gas Cleaning Residues

Salt mines are suitable environments for containing boiler ash and flue gas cleaning residues. The impervious nature of salt rock offers a long-term geological barrier and a geo-technically stable environment to guarantee that the residues are permanently isolated from the environment. The absence of water in the underground salt mine’s environment removes any risk of leaching of, for example, heavy metals from residues. Hence the recovery of this material by backfilling in the saltmines is not likely to have significant negative effect on the environment.

Boiler ash and flue gas cleaning residues from the existing facility are currently shipped (un-treated) to the Hattorf and Wintershall Reutilisation Facility, which is an underground salt mine in Germany. The facility has been approved for the reutilisation by the relevant authorities in Germany.

In 2017 a similar salt mine facility in Northern Ireland attained planning consent and an environmental permit to operate as a recovery facility for hazardous residues from waste to energy facilities.

This facility in Carrickfergus, Co. Antrim has been accepting pre-treated boiler ash and flue gas cleaning residues from the existing waste-to-energy facility since October 2018 and the facility is also suitable for receiving the additional residues from the proposed development. It is intended that the boiler ash and flue gas cleaning residues from the proposed development will be sent to this facility, which has capacity to accommodate the material.

As the material is already pre-treated and is in a solid monolithic form, as described in **Section 4.5.6** of **Chapter 4** ***Description of the Proposed Development***, the transport of the pre-treated material will not have a significant negative effect on the environment.

At times when this recovery facility may not available, for example, during a maintenance outage, the un-treated flue gas cleaning residues will be exported for treatment and final recovery to German salt mines in specialised road tank vehicles.

The salt mines in Germany and Northern Ireland are required to comply with the requirements of the EIA Directive and therefore were subject to the EIA process prior to the acceptance of any waste material.

This Directive on Environmental Assessment aims to provide a high level of protection of the environment and to contribute to the integration of environmental considerations into the development of projects such as salt mines accepting hazardous waste with a view to reducing their environmental impact.

Similarly, the existing licensing process which all of these salt mines are subject to, requires compliance with an ongoing environmental monitoring regime in the form of stringent licence conditions.

The issuing of such licences by competent authorities pursuant to the requirements laid down in the Waste Framework Directive stipulate that all necessary safety and precautionary measures, monitoring and control operations and closure and after-care provisions must be included in the granting of all such licences.

Such conditions set out the legal constraints under which salt mines must operate in order to ensure that all operations are conducted in compliance with the requirements of the Waste Framework and Landfill Directives and do not cause environmental pollution.

Therefore, the potential treatment of the boiler ash and flue gas cleaning residues is not likely to have significant negative effect on the environment.

The export of boiler ash and flue gas cleaning residues outside the Republic of Ireland has the potential for trans-boundary effects and these are discussed in further detail in **Section 18.5.3** in **Chapter 18 *Cumulative Effects, Other Effects and Interactions***.

Transport Regulations for Exporting Waste

The regulation of the transport of the boiler ash and flue gas cleaning residues will be subject to Trans Frontier Shipment (TFS) licence which is a licence which must be approved by the origin/destination/transit authorities consenting to the movement/transit and acceptance of wastes between EU member states. The regulation governing this is EU Regulation 1013/2006. This licence tracks waste from origin to destination and ensures that each authority is aware of the status of the waste until final recovery when the individual TFS notification annex consigned with each shipment is signed off as having been received and treated by the receiver. This completed licence is then circulated back to Indaver as the producer as well as all relevant authorities.

Shipping to German Saltmines

Van Den Bosch is an international logistics services provider which transports boiler ash and the flue gas cleaning residues for Indaver. Van Den Bosch confirmed that in the 51 years of its history none of its containers has ever fallen overboard and no ship has sunk with its containers on board.

If the boiler ash and flue gas cleaning residues come in contact with water, they will solidify. Thus, if there was a shipping accident, and the container entered the sea and was holed, the boiler ash and flue gas residues would solidify on contact with water. The solidified boiler ash and flue gas residues could then be removed from the seabed along with the tanker.

16.5.3.12 Ferrous and Non-Ferrous Metal Recovery

An additional 210 tonnes per annum of ferrous and non-ferrous metals will be recovered for recycling at an appropriately licensed or permitted facility.

The same facilities that are currently utilised by the existing plant will be utilised for this additional material. Before granting the licence or permit, the competent authority will have already considered the effects on the environment of the facility accepting this material through the licence or permit application process. Consequently, the recovery or recycling of the additional ferrous and non-ferrous metals is not likely to have significant negative effect on the environment. The recovery or recycling of the ferrous and non-ferrous metals is expected to have a minor positive effect on the environment.

16.5.3.13 General Waste Management

As is the case with the existing facility, adequate provision will be made for the separation of waste at source for the various elements of the proposed development. Office and canteen waste generated on site will be recycled where appropriate or treated on-site in the waste-to-energy facility.

16.6 Mitigation and Monitoring Measures

16.6.1 Construction Phase

No additional mitigation measures are required.

The proposed development will be constructed and operated in accordance with good practice in energy and resource conservation, and efficiency.

A ***Construction Environmental Management Plan*** (CEMP) has been prepared, refer to **Appendix 5.1**, and summarises the overall environmental management strategy that will be adopted and implemented during the construction phase including the responsible and efficient management of material assets including water and waste. Under the CEMP, the contractor will appoint a Construction Waste Co-Ordinator who will be responsible for implementing the construction waste management plan (CWMP). Refer to Section 7 of the CEMP in **Appendix 5.1** of this EIAR for details of the CWMP.

16.6.2 Operational Phase

No additional mitigation measures are required.

During operation of the proposed development, energy efficient power systems will be employed, water conservation measures will be implemented, and wastes will be avoided, minimised or recycled where economically feasible.

Wastes arising on site, for example from the administration building and maintenance activities, will be sent off site to be recycled where practical, and treated in the Waste-to-Energy facility if not. A beneficial reuse will be sought for the bottom ash. Metals will be recovered from the bottom ash.

The additional boiler ash and flue gas residues accepted and produced at the site will be pre-treated for recovery off-site.

16.7 Potential Cumulative Effects

The potential for cumulative effects as a result of the construction and operation of the proposed development and the following projects has been assessed where relevant in the following sections.

16.7.1 Irish Cement Ltd. (Planning Ref. LB150375)

The development will consist of the installation of a Flue Dust Portland Cement Silo at Kiln 3. The development will include the provision of a silo of circa 40m in height and 12m in diameter, together with filter, access gantries, bucket elevator and truck loading facility all on an application site of circa 0.75 hectares located within Platin Cement Works. Permission was granted in June 2015. The current timeline for construction is unknown.

There is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

16.7.2 Irish Cement Ltd. (Planning Ref. PL17.PA0050)

This planning application was for a 10-year permission to facilitate further replacement of fossil fuels and allow for the introduction of alternative raw materials in the manufacturing of cement at Platin Cement Works, Platin, Co. Meath. The proposed development is for the use of an additional 480,000 tonnes per annum of alternative fuels and alternative raw materials. Permission was granted in April 2018. The current timeline for construction is unknown.

There is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

16.7.3 SSE Generation Ireland Ltd. (PL17.303678)

This planning application refers to an air-insulated switchgear 110kV and for a transmission substation (Ref. 17.303678). The substation application was submitted to An Bord Pleanála as a Strategic Infrastructure development in February 2019 and was granted permission in January 2020.

It is noted that the substation scheme above appears to be an enabling component for a separate planning application for an open cycle gas turbine (OCGT) power plant, which was submitted to Meath County Council and permission granted in July 2019, but was subsequently appealed to An Bord Pleanála, where it was ultimately refused in December 2019. The OCGT plant therefore does not have a grant of planning.

Given the grant of permission received by the 110kV substation there is potential for this scheme to proceed as a standalone project.

There is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.

16.7.4 Highfield Solar Ltd. (Planning Ref. PL17.303568 and PL17.248146)

These two applications (for a scheme titled 'Garballagh Lower Solar Farm') comprise an application for the development of a Solar Farm (17.248146) and a separate application for an electrical substation and associated 110kV and MV infrastructure required (17.303568) to connect the ground-mounted solar PV generation to the electrical transmission system, including underground cabling and all associated ancillary site development work.

Both applications were granted planning permission by An Bord Pleanála (in March 2019 and July 2019, respectively). Construction is underway; however, the estimated opening date is unknown.

It is reasonable to assume that this scheme will be constructed and operational prior to the development of the proposed Site Sustainability Project.

Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the projects above.

16.7.5 Summary of Cumulative Effects

Refer to **Chapter 18 *Cumulative Effects, Other Effects and Interactions***, for a detailed description of each project/development listed above.

It is anticipated that the scale of the construction materials market in Ireland and the utilities capacity in the area are such that there will not be any significant negative direct or indirect cumulative impacts on material assets as a result of the proposed development.

16.8 Residual Effects

When the proposed development is in operation it will have a beneficial residual impact in the reduction in the quantity of hazardous waste being exported to Europe for disposal. The operation of the waste-to-energy facility will have residual effects in relation to the consumption of resources as outlined in **Tables 16.1** and **16.2**.

Boiler ash and flue gas residues will be sent to a salt mine in Ireland for recovery (after pre-treatment on site) or exported to landfill or to a salt mine in Germany, if no suitable facility is available in Ireland by the time the plant is commissioned.

The proposed development will also have a number of positive residual effects on material assets. The bottom ash that is generated as a result of the incineration process is reused in many EU countries for use in road construction.

Indeed, export of bottom ash for processing to other EU countries may be a route to achieve this if no facility is available in Ireland. Landfilling of these solid residues will only take place, if no viable market can be found. If these residues can be successfully used, it will have a positive effect in that it will reduce the requirement for the use of virgin materials.

The proposed development will have a beneficial residual impact as it will reduce the quantity of hazardous waste being exported to Europe for disposal.

It will produce approximately 160 tonnes of Hydrogen fuel per annum from what would be otherwise and currently wasted energy that the electricity grid cannot accept approximately 1,000 hours per annum.

This beneficial residual impact also has an additional beneficial climate change impact as the hydrogen fuel produced replaces the need for other fossil fuel usage as outlined in **Section 9.5.3** of **Chapter 9 *Climate***.

16.9 References

Department of Housing, Planning and Local Government (2018) Circular PL 05/2018 -Transposition into Planning Law of Directive 2014/52/EU amending Directive 2011/92/EU on the effects of certain public and private projects on the environment (the EIA Directive) And Revised Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment.

Department of Housing, Planning, Community and Local Government (2017) Key Issues Consultation Paper on the Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems;

Department of Housing, Planning, Community and Local Government (2017) Circular PL 1/2017 - Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive): Advice on the Administrative Provisions in Advance of Transposition.

Environmental Protection Agency (2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft August 2017).

EPA (2019) Guidance on Soil and Stone By-Products. Available at: https://www.epa.ie/pubs/advice/waste/product/Guidance_on_Soil_and_Stone_By_Product.pdf

EPA (2003) Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.

EPA (2019) Update Note on the 'Waste Acceptance Criteria and Development of Soil Trigger Values for Soil Recovery Facilities' Guidance. Available at: https://www.epa.ie/pubs/consultation/soilrecoveryconsultation/Update%20on%20EPA%20Soil%20Waste%20Acceptance%20Criteria%20Guidance%20-%20Feb%202019.pdf

European Commission (1999) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions.

European Commission (2012) Interpretation suggested by the Commission as regards the application of the EIA Directive to ancillary/associated works.

European Commission (2017) Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report.

Government of Ireland (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).

IEMA (2020) guide to: Materials and Waste in Environmental Impact Assessment

17 Major Accidents and Disasters

17.1 Introduction

This chapter of the EIAR presents an assessment of the likely significant adverse effects on the environment arising from the vulnerability of the proposed development at the Indaver's Waste-to-Energy facility at Duleek to risks of major accidents and/or disasters.

The Waste-to-Energy site was constructed in 2011 and is designed to recover energy from the residual fraction of non-hazardous household, commercial and industrial waste.

Indaver carried out a formal hazard identification and risk assessment (HAZID&RA) for the site, covering the risks presented by the existing activities and the new risk presented by the proposed development, specifically the new bulk storage facility (aqueous waste tank farm) at the site. In accordance with the European Commission's EIA guidance, there are two key considerations to consider in the risk assessment:

- The proposed development's potential to cause accidents and/or disasters for human health, cultural heritage and/or the environment;
- The vulnerability of the proposed development to potential disaster/accident.

The assessment of the vulnerability of the proposed development to risks of major accidents and disasters is included in this EIAR in accordance with the EIA Directive 2014/52/EU which states the need to provide:

"*a description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned*".

The HAZID&RA was drawn up to provide a systematic methodology for assessing these aspects. This is in accordance with the requirements of Directive 2014/52/EU and is structured in the following manner:

- Identification of the relevant major accidents (end events) that could arise at the site;
- Identification of the potential initiating event(s) that could give rise to each end event, including consideration of external events such as natural disasters;
- Assessment of the level of risk presented by each scenario;
- Identification of the measures that are in place, or that need to be in place, to reduce the risks and/or mitigate the impacts of these scenarios.

The underlying objective of the assessment is to ensure that appropriate precautionary actions are taken for those projects which "*because of their vulnerability to major accidents and/or natural disasters,[…] are likely to have significant adverse effects on the environment*".

This Chapter was written by Thomas Leonard BE MEngSc CEng MIEI, Partner at Byrne Ó Cléirigh.

17.2 Assessment Methodology

17.2.1 General

The starting point for the scope and methodology of this assessment is that the proposed development will be designed, built and operated in line with current international best practice and, as such, major accidents will be very unlikely.

As the proposed development involves the construction of additional tankage at an existing facility which engages in the storage and handling of waste, the HAZID examined the risks associated with the existing development as well as the proposed modifications. This enabled Indaver to place the risks associated with the proposed development into context with the existing site and to ensure that the assessment covered all risks presented by the site to human health and to the environment.

A formal HAZID&RA was carried out to identify all potential accident scenarios that could arise at each area of the site where dangerous substances are stored or handled. This HAZID&RA report is presented in **Appendix 17.1** of **Volume 3** in this EIAR. Each scenario was assessed using the HAZID&RA methodology to determine its likelihood of occurrence and the severity of impact to people and the environment if it did occur. This approach gives a semi-quantitative assessment of the overall level of risk associated with each accident scenario identified. When carrying out this assessment consideration was taken of any relevant prevention or mitigation measures in place when determining the risks associated with each scenario.

Each scenario was assigned a semi-quantitative Risk Rating, based on the findings of this analysis. The Risk Ratings were then compared with the various criteria established in the risk assessment methodology in order to determine the significance of the risks associated with each scenario. This approach allowed Indaver to prioritise attention on the scenarios presenting the highest risk and to ensure that all necessary measures would be in place to prevent accidents occurring and to limit the consequences of any such accidents for population and human health and for the environment. The assessment was also to determine the risks to the proposed development from major accidents and disasters.

When assessing the risks associated with scenarios identified in the risk assessment, consideration was given to potentially vulnerable receptors in the surrounding environs, i.e. occupied areas, culturally significant developments and environmental receptors such as land, soil and water.

In carrying out this assessment, a systematic approach was adopted to identify credible scenarios and to assess the probability of occurrence for scenarios. For each scenario identified, an assessment was made of the expected significant adverse effects. Consideration was also given to the range of mechanisms by which these scenarios could arise, for both on-site and off-site initiating events, including those caused by major accidents and/or disasters.

These events were identified, evaluated and their potential contribution to the risks presented at the site were considered when drawing up the scenarios in the worksheets.

The approach to carrying out the risk assessment, and consequence modelling, for this development is consistent with the approach used by many other industrial operators with respect to major accident hazards. Although this approach is primarily used for "Seveso" establishments under the COMAH Regulations (this project is not such an establishment), the methodology provides a robust framework to identify all such major accident hazards and risks as outlined below.

17.2.2 Guidance and Legislation

17.2.2.1 Legislative Requirements

In accordance with the requirements of the EIA Directive 2014/52/EU and associated Regulations, Indaver carried out a risk assessment for the Waste to Energy facility at Duleek, taking account of the risks associated with the existing activities on site and also the risks associated with the proposed new development. This was conducted using a systematic methodology, to assess the severities of impacts and likelihoods of occurrence for accident scenarios at the plant. This assessment examined the risks of these accident scenarios to human health and to the environment.

Recital 15 of the EIA Directive states that:

(15) In order to ensure a high level of protection of the environment, precautionary actions need to be taken for certain projects which, because of their vulnerability to major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes) are likely to have significant adverse effects on the environment. For such projects, it is important to consider their vulnerability (exposure and resilience) to major accidents and/or disasters, the risk of those accidents and/or disasters occurring and the implications for the likelihood of significant adverse effects on the environment. In order to avoid duplications, it should be possible to use any relevant information available and obtained through risk assessments carried out pursuant to Union legislation, such as Directive 2012/18/EU of the European Parliament and the Council1 and Council Directive 2009/71/Euratom, or through relevant assessments carried out pursuant to national legislation provided that the requirements of this Directive are met.

It is clear from the Directive that a major accident and/or natural disaster assessment should be mainly applied to establishments under the COMAH Directive or to nuclear installations. However, the EIAR requirements must be satisfied by all developments which qualify under the EIA Directive and so the risks have been assessed and this chapter has been prepared accordingly.

17.2.2.2 Guidance Documents

The Environmental Protection Agency (EPA) has published *Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (2017)*, which are referred to when identifying the information requirements for this chapter.

In accordance with the provisions in Section 3.3.5 of the EPA guidance, the scoping of this chapter considers the extent to which other assessments may address some types of effects adequately and appropriately. As such, much of the information that supports this chapter of the EIAR is described in the HAZID&RA report for the development, which is referenced throughout this chapter. A copy of the HAZID&RA report is included in **Appendix 17.1** in **Volume 3** of this EIAR.

The HAZID&RA methodology is a semi-quantitative approach, as described in **Section 17.2.4.2**. This approach enables the operator to identify the relevant accident scenarios at their site and to determine the significance of the risk that each scenario presents using a calibrated ranking system. This approach also enables the operator to identify scenarios that require further assessment, as described in this chapter and in the accompanying HAZID&RA report.

This approach is comparable to the approaches used when carrying out risk assessments for e.g. Seveso establishments, ATEX risk assessments or environmental liabilities risk assessments.

17.2.3 Study Area

As part of the process of conducting the risk assessment, details of the surrounding environment were collated, to ensure that full consideration was given to the specific nature of surrounding environs when determining the severity of impact in the event of an accident at the site. The surrounding environment is discussed in the following sub-sections.

17.2.3.1 Geology and Hydrogeology

As discussed in **Chapter 14 *Land and Soils***, the bedrock under the site is identified on the GSI website[1] as “Crinoidal peloidal grainstone-packstone” and is part of the Platin Formation (CDPLTN). The rock type is limestone and the website states that “the dominant lithology is crinoidal and peloidal grainstone, locally conglomeratic. Cherty and micritic units are also present. It is generally coarser, paler and less well-sorted than the underlying Crufty Formation. Local dolomitisation is common.”

Aquifer or groundwater vulnerability is the ease with which the groundwater may be contaminated by human activity and depends upon the aquifer’s intrinsic geological and hydrogeological characteristics. The vulnerability is determined by the permeability and the attenuation capacity of any overlying deposits.

[1] http://www.gsi.ie/

For example: bedrock with a thick, low permeability, and clay-rich overburden is less vulnerable than bedrock with a thin, high permeability, and gravelly overburden.

The aquifer beneath the site is identified as Rkd “Regionally Important Aquifer - Karstified (diffuse)”. The vulnerability of this aquifer is identified as moderate.

Two production wells were installed within the site area in June 2011. These have a sustainable yield of 600 m^3/d and supply the water demand for the site. These wells are located at the south of the site, close to the R152 site boundary. There are no activities at the site, under the current operations or under the proposed new operations, which present a major accident risk to these wells. There is no pathway by which a loss of containment event identified in the HAZID could reach these wells.

The GSI map indicates that there are several wells or springs to the north of the site; these are at the nearby Irish Cement Platin site.

Chapter 14 *Land and Soils* of the EIAR provides a more detailed description of the geology and hydrogeology of the site and surrounding environs.

The HAZID&RA took note of the vulnerability of the surrounding geology and hydrogeology when determining the severity ratings for scenarios involving an environmental release at the site.

17.2.3.2 Flora and Fauna

As discussed in **Chapter 11 *Biodiversity***, there are no environmental designations pertaining to the site footprint; in other words, the site does not form part of any proposed Natural Heritage Area (pNHA), Natural Heritage Area (NHA), Special Protection Area (SPA), Special Area of Conservation (SAC) or candidate Special Area of Conservation (cSAC), Nature Reserve, or National Park.

Referring to the NPWS map viewer, the closest such protected site to the Indaver facility is the Duleek Commons, located approximately 2 km south-west of the site. This is a drained marsh surrounded by wet woodlands and grassland. This ecological area is not designated for groundwater dependant habitat.

The closest groundwater dependant ecological area is River Boyne and River Blackwater SAC and SPA (002299) located approximately 3.2km north-west of the proposed development. However there is no direct pathway as the groundwater under the Indaver site is captured by Platin Quarry.

The stormwater system is attenuated at the point of discharge to the watercourse located at the north west corner of the site. The storm water drainage system routes the surface water from roads and hardstanding to a monitoring station. If contaminated, this is routed to the firewater retention tank; if not contaminated it is discharged via a petrol interceptor.

The River Nanny discharges to the River Nanny Estuary and Shore SPA, which is approximately 9.1 km downstream from the site. This SPA includes the Laytown Dunes/Nanny Estuary pNHA, located circa 7.3km downstream.

There are several other ecological sites in the broader vicinity of the Indaver facility. **Table 11.1** (**Chapter 11 *Biodiversity***) identifies the designated conservation areas within a 20 km radius and shows the distances to each from the proposed development.

17.2.3.3 Watercourses

As discussed in **Chapter 15 *Water***, there are no significant watercourses in the vicinity of the Duleek site. The site is located inland, at a distance of approximately 10 km west of the coast.

The nearest rivers and streams are the Cruicerath stream that flows approximately 200m to the west of the site, and the Platin that flows approximately 500m to the east of the site. The main hydrological feature in the vicinity of the site is the River Nanny, which is located approximately 2km to the south of the site.

Surface water runoff from the site passes through a Class 1 petrol interceptor before being collected in an attenuation pond. The pond discharges via pump to an external drainage ditch which in turn leads to the Cruicerath stream. A detailed description of the surface water drainage system is provided in **Chapter 4**. The Cruicerath stream flows into the River Nanny. The River Nanny discharges to the River Nanny Estuary and Shore SPA approximately 11.3 km downstream of the site location. This SPA includes the Laytown Dunes/Nanny Estuary pNHA, located approximately 10km downstream.

17.2.3.4 Weather Conditions

For the purposes of the HAZID&RA exercise, the meteorological parameters of most interest are ambient temperature, wind speed, atmospheric stability and rainfall. High ambient temperatures lead to increased evaporation rates from spilled materials. Low wind speeds and high atmospheric stability lead to reduced dispersion of a release, allowing higher concentrations to accumulate in the atmosphere. High wind speeds on the other hand can give rise to high angles of flame tilt in the event of a pool fire.

Dublin Airport is the closest weather monitoring station to the site and weather data for this station was obtained from Met Éireann for the period 1981-2010, which is the latest 30-year period reported on by Met Éireann. This data is shown in Table 1.1 of the HAZID&RA report.

The temperature data shows that the average daily maximum temperature varies from 8.1°C in January to 19.5°C in July. The highest temperature recorded at the station over the 30-year reporting period was 28.7°C.

Wind speed and atmospheric stability are strongly interrelated.

Greater atmospheric stability is found at low wind speeds and only certain combinations of wind speed and stability can occur. The data shows an average wind speed of 10.3 knots or 5.3 m/s.

The primary concerns with respect to rainfall is to determine whether there is the potential for flooding.

This hazard, and the measures that will be put in place to mitigate it, is described in **Appendix 15.1** ***Flood Risk Assessment*** in **Volume 3** of this EIAR**.**

17.2.3.5 Listed Buildings and Monuments

As discussed in **Section 12.3.1** of ***Chapter 12 Archaeology, Architectural and Cultural Heritage***, there are no recorded archaeological monuments listed in the Record of Monuments and Placed (RMP) for County Meath or in the Sites and Monuments Record (SMR) database of the Archaeological Survey of Ireland (ASI) within the proposed development site. The closest known recorded monuments to the proposed development site are a ringfort (ME027-109) in Carranstown, an embanked enclosure (ME027-078) in Carranstown/Caulstown and an enclosure (ME027-078001) and a redundant record (ME027-079) in Caulstown situated between 150m and 210m to the southeast. Refer to Table 12.1 in Chapter 12 for a full list of archaeological sites included in the RMP and SMR database within a 1.5km radius of the site.

17.2.4 Impact Assessment Modelling

Due to the range of materials stored at the site, the HAZID&RA examined scenarios involving flammable risks (fires and explosions), risks of acute toxic exposure to human health and risks of spills to the environment.

When assessing the impacts of accident scenarios to people in the vicinity, a consequence modelling exercise was carried out, using a range of pre-determined endpoints.

17.2.4.1 Current Practice

The methodology that was used for the risk assessment is based on a technique outlined in Annex D of BS 8800: 1996, *Guide to Occupational Health and Safety Management Systems*. Similar risk assessment techniques have also been outlined by the IChemE and the US Naval Weapons Centre's Practical Risk Analysis for Safety Management. The methodology that was used at the Duleek site is one that has been built on and developed over many years, based on operational experience of applying it at numerous industrial facilities, both in Ireland and overseas.

The approach that was adopted is consistent with guidance from the Health & Safety Authority[2]. The assessment includes the elements of risk identification, risk analysis and risk evaluation.

- Risk identification is the process of finding and recognising risks and includes the process of hazard identification.
- Risk analysis consists of determining the range of consequences and probabilities of identified events and the effectiveness of existing controls. The methods used may be qualitative, semi-quantitative or quantitative.

[2] "Guidance to Inspectors on the Assessment of Safety Reports under the COMAH Regulations 2015"

- Risk evaluation is the process of comparing estimated risk levels with pre-defined tolerance criteria to inform decisions. For the operator, risk evaluation will be about evaluating the risks that have been identified and analysed to determine whether they are tolerable.

17.2.4.2 Site-specific Risk Assessment Methodology

This section describes the risk assessment methodology that was used when carrying out the risk assessment at the site. This methodology is described in more detail in the accompanying HAZID&RA report in **Appendix 17.1** of **Volume 3**.

The risk assessment was carried out by a team of personnel from Indaver and from Byrne Ó Cléirigh (external consultants). The team divided the resource recovery centre into a series of installations (i.e. areas where dangerous substances are stored or handled and which were identified as potentially presenting a significant accident scenario), each of which was assessed in turn. The assessment initially focused on the existing installations at the site. The Team then assessed the additional scenarios associated with the proposed development – this involved an assessment of the new installation(s) associated with the development and, where appropriate, reviews of the risks at existing installations, where there may be interactions with the existing site.

Each installation identified a series of scenarios, or end events, and documented them in the HAZID&RA worksheets. The potential consequences of each scenario was described and a Severity Rating was assigned, using the descriptors shown in **Table 17.1**.

Table 17.1: Severity Ratings for Accident Scenarios

Severity Rating	Category Description	Health & Safety Impact		Environmental Impact
		On-Site	Off-Site	
0	Negligible	None	None	None
1	Minor	Minor injury	None	None
2	Appreciable	Multiple injuries with return to work	Discomfort	Discoloration of water or air
3	Severe	Major permanent disability	Some hospitalisation for screening	Minor short-term damage to adjacent land or water courses
4	Very Severe	Single fatality	Minor injuries	Significant short-term damage or minor long-term damage requiring clean up action
5	Catastrophic	Multiple fatalities	Major injuries or fatalities	Major incident with significant loss of species or habitat

When assessing impacts to health & safety, consideration is given to both on-site and off-site impacts, based on the descriptors shown above, to determine the appropriate Severity Rating. The range of impacts covered by this scale enables

Indaver to assess and rank the impacts of a wide range of scenarios, from relatively minor events to major accidents.

To support this assessment, a representative selection of credible worst-case scenarios was identified and consequence modelling was carried out to calculate the impacts of these scenarios to the surrounding area. The consequence modelling endpoints that were used in this assessment are described in the accompanying HAZID&RA report.

Once the various accident scenarios for a particular installation were identified and Severity Ratings assigned to each, the Team then examined the various initiating events which could potentially give rise to each scenario and the details were set out in the Risk Assessment Register (RAR) sheet. The potential initiating events which were considered included, inter alia, mechanical failure, human error, control equipment failure, as well as external events such as domino effects from an external event or a disaster such as flooding or earthquake. A copy of the RAR worksheets is included in the HAZID&RA report.

Each initiating event – end event combination was assigned a Frequency Rating by the team, based on the descriptors shown in **Table 17.2** below.

Table 17.2: Frequency Ratings for Accident Scenarios

Frequency Rating	Descriptor	Frequency Range per Annum
1	Virtually impossible	< 1 × 10-8
2	Improbable	1 × 10-8 to 1 × 10-5
3	Unlikely	1 × 10–5 to 1 × 10-3
4	Infrequent	1 × 10-3 to 0.1
5	Occasional	0.1 to 10
6	Frequent	> 10

Numerical Risk Ratings were determined for each scenario identified in the course of the exercise using the following equations:

$$R_H = S_H \times L$$

$$R_E = S_E \times L$$

Where:

RH is the Risk Rating with respect to health and safety

RE is the Risk Rating with respect to the environment

SH is the Severity Rating with respect to health and safety

SE is the Severity Rating with respect to the environment

L is the Likelihood Rating for a specific initiating event – end event combination.

The significance of the Risk Rating for each scenario was assessed using the matrix shown in **Table 17.3**.

Table 17.3: Matrix of Risk Ratings

Risk Rating		Severity 1	2	3	4	5
Frequency	1	1 - Trivial	2 - Trivial	3 - Trivial	4 - Trivial	5 - Minor
	2	2 - Trivial	4 - Trivial	6 - Minor	8 - Minor	10 - Moderate
	3	3 - Trivial	6 - Minor	9 - Moderate	12 - Substantial	15 - Priority
	4	4 - Trivial	8 - Minor	12 - Substantial	16 - Priority	20 - Priority
	5	5 - Minor	10 - Moderate	15 - Priority	20 - Priority	25 - Priority
	6	6 - Minor	12 - Substantial	18 - Priority	24 - Priority	30 - Priority

A Risk Reduction Register (RRR) was then completed for each scenario on the back of this assessment. This was used to set out any specific scenarios or locations at the site where the HAZID&RA Team identified or recommended additional risk reduction or mitigation measures. When making these recommendations, consideration was given to the risk level associated with each scenario using the criteria set out in **Table 17.4**.

Table 17.4: Significance of Risk Ratings for Accident Scenarios

Risk Rating	Risk Level	Action and Timescale
≤ 4	Trivial	Generally, no action is required for scenarios with such low risk levels and if so there would be no need for detailed working to demonstrate ALARP (i.e. are As Low As Reasonably Practicable).
5 to 8	Minor	No additional controls are required in most cases. Consideration may be given to a more cost-effective solution or improvement that imposes no additional cost burden. Monitoring is required to ensure that controls are maintained.
9 to 11	Moderate	Efforts should be made to reduce the risk, but the cost of prevention should be carefully measured and limited. Risk reduction measures should be implemented within a defined time period. Where a moderate risk is associated with a scenario whose consequences are in the category of Very Severe or Catastrophic (Severity Rating 4 or 5) further assessments may be necessary to establish more precisely the likelihood of harm as a basis for determining the need for improved control measures.
12 to 14	Substantial	The activity should not be started until the risk has been reduced. Considerable resources may have to be allocated to reduce the risk. Where the risk involves a current activity, urgent action should be taken.
≥ 15	Priority	The activity should not be started or continued until the risk has been reduced. If it is not possible to reduce risk, even with unlimited resources, this activity must be prohibited.

17.3 Receiving Environment

17.3.1 Natural Disasters / External Impacts

In carrying out the risk assessment, the team considered worst case scenarios, including scenarios involving complete loss of containment from a vessel or tank, or scenarios involving a fully developed fire. The risk assessment worksheets in the HAZID&RA report show that a variety of initiating events was considered when determining the probabilities of occurrence for these scenarios. As part of this assessment, consideration was also given to the potential for an accident to arise at the site as a result of a natural disaster or other external impact. These are discussed in the following sub-sections.

17.3.1.1 Earthquakes

The School of Cosmic Physics (part of the Dublin Institute for Advanced Studies) was consulted regarding the risks posed by seismic activity in Ireland. The School has had a seismic network in operation in Ireland since 1978. They have indicated that Ireland is seismically very stable and that there is nothing to suggest that this will change in the coming millennia.

The HAZID&RA report includes a series of maps (Figures 2.1 to 2.3) showing earthquake incidents and earthquake risk which were developed by The *Seismic Hazard Harmonization in Europe* (SHARE) project, comprising eighteen European partner institutions.

- There is a map with incidents of earthquakes in Europe between 1900 and 2006. This shows that there were no earthquakes exceeding the threshold of M3.5 recorded in Ireland during that time period.
- The maps of earthquake hazards show that the risk of an earthquake in Ireland is amongst the lowest in Europe.

These maps are contained in Section 2.4.1 of the HAZID&RA report.

Based on these considerations, the risk associated with earthquakes or ground movement at the site is extremely remote. If this did occur, there would be the potential for loss of containment of materials from vessels. These loss of containment events are identified and assessed in the HAZID&RA worksheets. It was considered that the risk from an earthquake or ground movement would have a negligible contribution to the probabilities of occurrence of these scenarios.

17.3.1.2 Flooding

Referring to the meteorological data for Dublin Airport in the HAZID&RA report, in the worst-case rainfall event, the highest quantity of rainfall that could fall onto a bund area would be 73.9 mm in 24-hours. Any build-up of water in the bunds can therefore be easily managed by Indaver operators by allowing the rainwater to drain via oil-water separators, in accordance with normal operating procedures at the site.

A flood risk assessment (FRA) report was prepared by McElroy Associates (MEA), refer to **Appendix 15.1** of **Volume 3**.

Section 15.3.1.2 of **Chapter 15** ***Water***, summarises the conclusions of the report whereby the site is minimal risk of groundwater or pluvial flooding; not at risk to fluvial or coastal/tidal flooding.

17.3.1.3 Power Failure

There are no accident scenarios identified at the site which would be associated with a power failure. There will be no materials at the site which are unstable or which require a power supply to ensure that they are stored or handled safely, e.g. materials requiring a temperature controlled environment.

The site has an uninterruptible power supply (UPS) system and emergency diesel generator to provide power in the event of a power cut. This means that Indaver retains the facility to activate the fire protection systems in the event of a disruption to the electrical supply to the site.

If a power failure occurred to a key item of plant or equipment at the same time as potentially hazardous materials were being delivered to the site (e.g. a delivery of aqueous ammonium hydroxide to the storage tank), the transfer would be halted for the duration of the loss of power event.

Based on the controls that will be in place it was considered that there was no credible risk of a major accident scenario associated with a power failure to the site.

17.3.1.4 Aircraft Impact

The closest major airport to the Duleek site is Dublin Airport. **Figure 17.1** and **Figure 17.2** show the plot of the Public Safety Zone (PSZ) for this airport. This is taken from a report[3] by ERM (Environmental Resources Management) Ireland Ltd (2003), which was commissioned by the Department of Transport and the Department of the Environment and Local Government.

The aim of these PSZs was to protect people on the ground from the risk of an aircraft crash by using land use planning controls on developments in the vicinity of airports. Essentially a PSZ is used to prevent inappropriate use of land where the risk to people is the greatest. The two plots show the PSZs based on the (then) current airport configuration and on a proposed configuration incorporating expanded facilities at the airport.

The plots show that the zones do not extend to the Duleek site. The Duleek site is located more than 10km outside of the PSZ contours. As such the risk of an aircraft impacting the Duleek site is therefore considered to be extremely remote and therefore was not considered as a credible scenario in the HAZID&RA.

[3] Public Safety Zones: Cork, Dublin and Shannon Airports, ERM, June 2003 (Draft) on behalf of Department of Transport and Department of Environment & Local Government.

Figure 17.1: Proposed Public Safety Zones around Dublin Airport (existing runways) (Source: ERM)

Based on Ordnance Survey Ireland Permit No. 7643. © Ordnance Survey Ireland & Government of Ireland

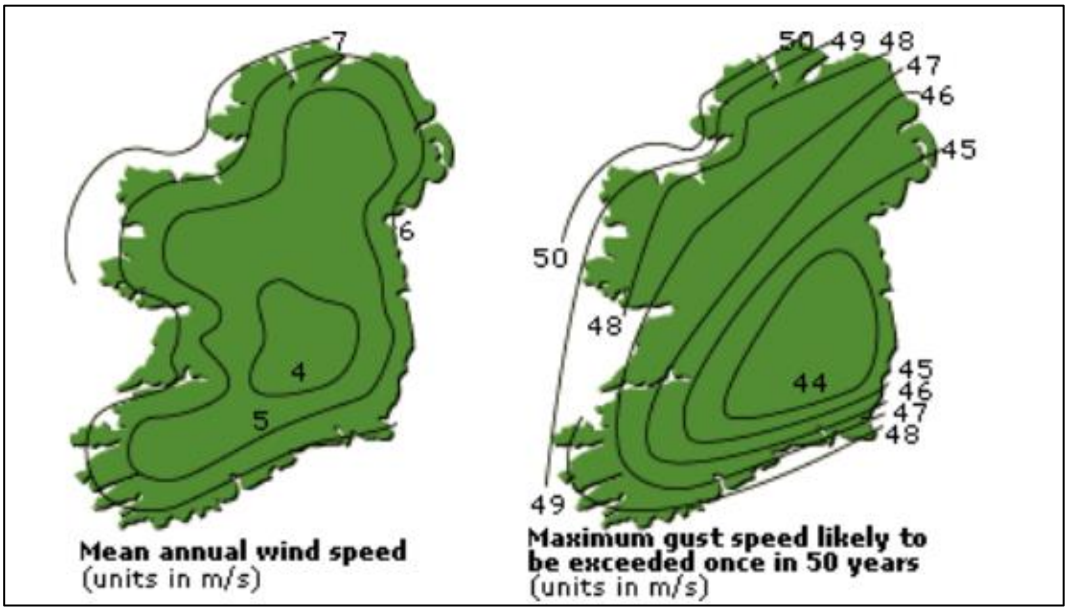
Figure 17.2: Proposed Public Safety Zones around Dublin Airport including proposed runway 10L/28R (Source: ERM)

Based on Ordnance Survey Ireland Permit No. 7643. © Ordnance Survey Ireland & Government of Ireland

17.3.1.5 High Wind Speeds

Met Éireann has produced a map showing the estimated maximum gust speeds for a 50-year return period in Ireland. This is reproduced here as **Figure 17.3**.

Figure 17.3: Mean and maximum wind speeds (Met Éireann)



Typical maximum gust speeds for Ireland range up to 50 m/s depending on the location of the site. For Duleek, the estimated speed for this return period is c.44 m/s.

The historical data for the Dublin Airport weather station shows the highest 10-minute mean wind speed over the period to be 55 knots (102 km/h), with a maximum gust of 80 knots (148 km/h).

No credible accident scenario resulting from high wind loading was included as an initiating event by the HAZID&RA Team.

17.3.1.6 Extremes in Ambient Temperature

The highest ambient temperature at the site (based on a 30-year return period) would be of the order of 28.7°C. There are no scenarios envisioned in which high ambient temperatures could give rise to an accident scenario at the site.

The data shows that the lowest temperature recorded during this period was -12.2°C. The only hazards identified which would be presented by extreme low temperatures are the risk of a vehicle collision at the site due to formation of ice on the ground and the risk of freezing in the water main. The potential for a traffic accident exists at all times and is included as an initiating event for relevant scenarios in the HAZID&RA. While there may be an increased risk in the event of heavy icing on site, this would be mitigated by the measures that Indaver would put in place. Indaver ensures that only operators with appropriate waste collection permits are allowed to bring vehicles onto the site.

Furthermore, all vehicles arriving on site are checked at security and Indaver provides induction training for all drivers operating at the site. The induction training is provided to new drivers and renewed every year to all drivers. Indaver maintains records of this training.

There is also a speed limit on site. Indaver also monitors ground conditions on site in areas accessed by vehicles during freezing temperatures and will salt/grit areas if required to reduce the risks associated with icy conditions. Indaver also supervises all deliveries to the tipping hall and a Tipping Hall Operator guides the driver to ensure that the deliveries are carried out in a safe and controlled manner.

Indaver mitigates against the risk of water freezing in the water main on site by ensuring that it was designed to meet the necessary standards and the requirements of the Fire Certificate and those of the insurance company. The ring main is underground and any chambers for hydrants are insulated and heat traced.

As a result, no credible accident scenario resulting from extremes in ambient temperature was included as an initiating event by the HAZID&RA Team.

17.3.1.7 Lightning

Referring to guidance from the UK HSE, it advises that the use of BS 62305 is the expected standard for lightning protection at hazardous industries[4]. The HSE states that the likelihood of a major accident being initiated by a lightning strike at a well-designed and maintained hazardous installation is, therefore, low so Inspectors must act proportionately to focus on those major hazard installations where reasonably foreseeable risk remains.

In other guidance, the UK HSE notes that the probability of an accident arising as a result of lightning strike at a typical facility involved in the storage of flammable liquids is extremely remote, with a probability of 1×10^{-7} per annum[5]. This guidance is for activities involved in the storage and handling of materials which would present a greater fire hazard than the materials at the Indaver facility.

All areas of the site which are used for the storage and handling of dangerous substances have been assessed under BS EN/IEC 62305 and, where required, are fitted with lightning protection systems which are designed and installed in accordance with same. The proposed new development will also be fitted with appropriate earthing protection.

Based on the measures that will be in place and on the guidance from the UK HSE, it was considered that the risk that a lightning strike could initiate a major accident was found to be negligible.

17.3.2 Major Accident Hazards from Offsite Establishments

The Indaver Duleek site is located to the northeast of Duleek village.

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[4] http://www.hse.gov.uk/foi/internalops/og/og-00044.htm
[5] http://www.hse.gov.uk/comah/sraghfl/highly-flammable-liquids.pdf

The maps of the site and surroundings illustrate that there are large separation distances between the installations at the Indaver Duleek site and any neighbouring facilities which could have any potential to act as an initiator for an accident at the site. The R152 runs along the south / east boundary of the site and there are several minor developments along this stretch of road (DSG Stores, Paul Kavanagh VTN, Platin Motor Factors). These closest of these is over 200 m from the production buildings and none of these developments present any risk of initiating an accident at the Duleek plant.

There are no COMAH establishments[6] in the vicinity of the Indaver Duleek site. The closest major industrial development is the Irish Cement Factory Platin. There are large separation distances between the installations at Indaver and at Irish Cement; the closest buildings are over 400 m away from each other.

Prior to the construction of the Indaver site, discussions were held with Irish Cement to determine whether there is any risk to the Duleek site as a result of the blasting activities carried out at the quarry. This is carried out by Irish Cement in a controlled manner, in accordance with the conditions of their licence from the EPA. At the time of these discussions, it was noted that Irish Cement's licence specified a peak particle velocity limit of 12 mm/s for ground-borne vibration at the nearest noise sensitive location. The Indaver site is located at a similar distance from the quarry as the sensitive location identified in the licence and so it was anticipated at the time of construction of the Indaver site that the worst-case vibration levels at the foundations of the buildings would be of the order of 12 mm/s. This assumed that geological ground conditions are consistent between the Irish Cement site and receptor locations around the quarry site. The latest version of the Irish Cement Industrial Emissions Licence (P0030-05) retains the 12 mm/s limit, which applies now to three locations around the perimeter of the site.

In addition, to reflect the presence of the quarry in the vicinity, the building foundations at the Indaver site are designed to accommodate this potential seismic activity. On this basis it was anticipated prior to the commencement of construction of the site that there would not be any cosmetic or structural damage at Indaver as a result of the activities at Irish Cement. This has since been borne out and there has been no evidence of any such damage over the years of operation at Duleek.

17.4 Characteristics of the Proposed Development

The proposed development involves the construction of new installations at the existing Indaver site in Duleek, with other changes to increase the throughput at the site.

With respect to potential major accident hazards, the key developments are as follows:

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[6] Establishments to which the Control of Major Accident Hazards Regulations (SI 209 of 2015) apply

- Construction of a new tank farm for aqueous waste storage prior to treatment. The tank farm will facilitate an increase from 235,000 tpa to 250,000 tpa capacity at the site. this will involve the construction of a tank farm with 2 no. 300 m^3 tanks for aqueous waste storage and an upgrade to the tanker unloading area. The tanks will be housed in a bund, in accordance with good practice, and will be maintained under a nitrogen blanket.
- Construction of a hydrogen generation unit. This will be rated for up to 10 MW_e power generated on site in 4 no. modular units. The plant will be capable of generating over 160 tpa of hydrogen gas for injection to the gas network and for refuelling hydrogen-compatible vehicles. There will be a maximum of 2 tonnes of hydrogen storage on site.

The HAZID assessment of the site examines the risks associated with the existing and the proposed development at the site. This is described in more detail in the HAZID&RA report in **Appendix 17.1** ***HAZID&RA Report***.

17.5 Likely Significant Effects

17.5.1 "Do Nothing" Scenario

The site already engages in the storage and handling of dangerous substances, as noted in this report. The introduction of the new plant and facilities at the site will introduce new hazards, associated with the increased storage and handling of aqueous wastes at the tank farm and the introduction of the hydrogen generation unit. The current level of risk presented by the existing activities at the site would continue to be managed by Indaver in accordance with good practice.

17.5.2 Construction Phase

There are no special or unique hazards associated with the construction of the plant on this particular site that would not be encountered on any typical construction site for an industrial building. None of the new hazards identified in the risk assessment worksheets for the new bulk tank and its associated facilities could arise during the construction phase of the project. However, the construction activities could potentially present a risk of acting as an initiator to an accident at the existing site, e.g. where mis-operation of heavy lifting equipment causes damage to nearby plant.

As discussed in **Section 5.14** of **Chapter 5** ***Construction Activities***, a Health and Safety Plan will be prepared which will address health and safety issues from the design stages through to the completion of the construction and maintenance phases as required by the Safety, Health and Welfare at Work (Construction) Regulations 2013.

The Construction and Environmental Management Plan (CEMP) included in **Appendix 5.1** of **Volume 3** of this EIAR, summarises the environmental strategy that will be adopted to ensure all risks are mitigated. The CEMP sets out the mechanism by which environmental protection is to be achieved.

The effective implementation of the CEMP will help to reduce the risks to the environment associated with the construction phase of the project.

This will ensure that the potential risks of major accident and/or disaster are identified, avoided and mitigated, as necessary.

The CEMP also includes the development of a Construction Waste Management Plan (CWMP) to ensure that waste arising during the construction of the site will be minimised and that wastes will be managed and disposed of in accordance with regulatory requirements, ensuring that optimum levels of reduction, re-use and recycling are achieved.

17.5.3 Operational Phase

The risk assessment team examined 144 scenarios at the site, using the methodology described in Section 17.2.4.2 above. Of these, 133 scenarios were found to present credible accident hazards and they were each assigned a Severity Rating and a Frequency Rating, as described above.

The distributions of risk ratings, based on the risks presented to human health and to the environment, are shown in **Figure 17.4** and **Figure 17.5**.

Figure 17.4: Accident Scenario Risk Ratings for Human Health

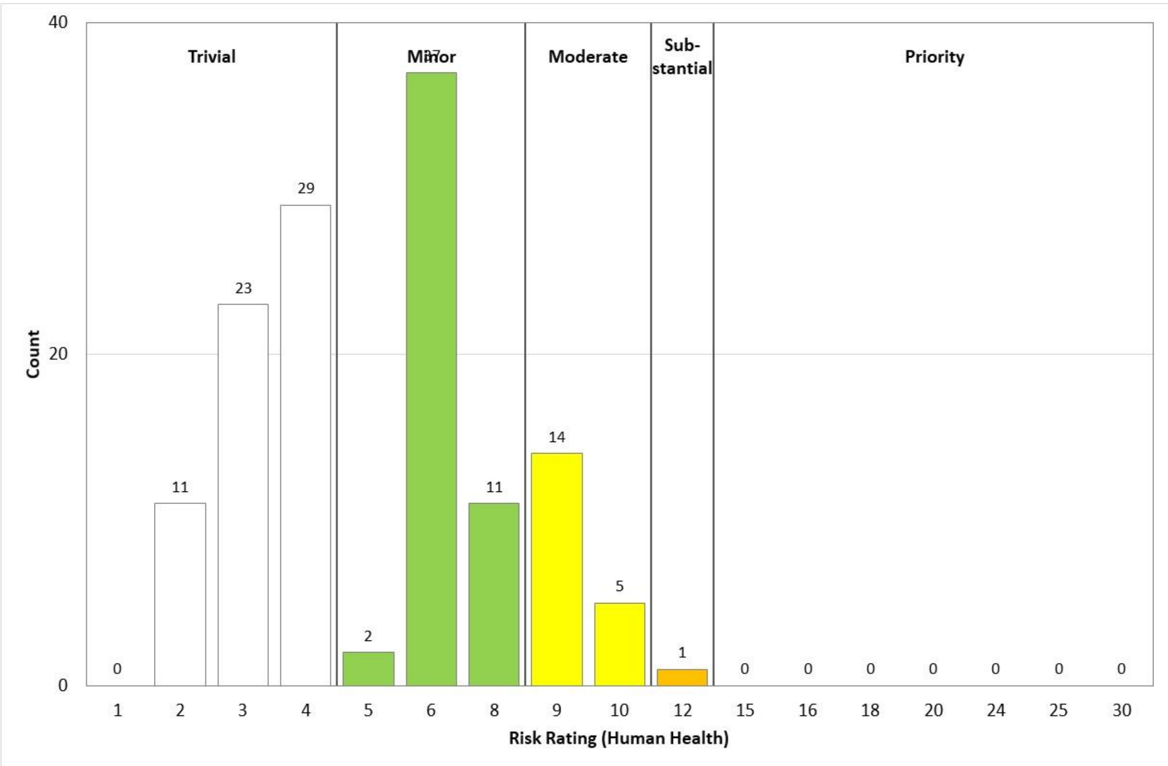
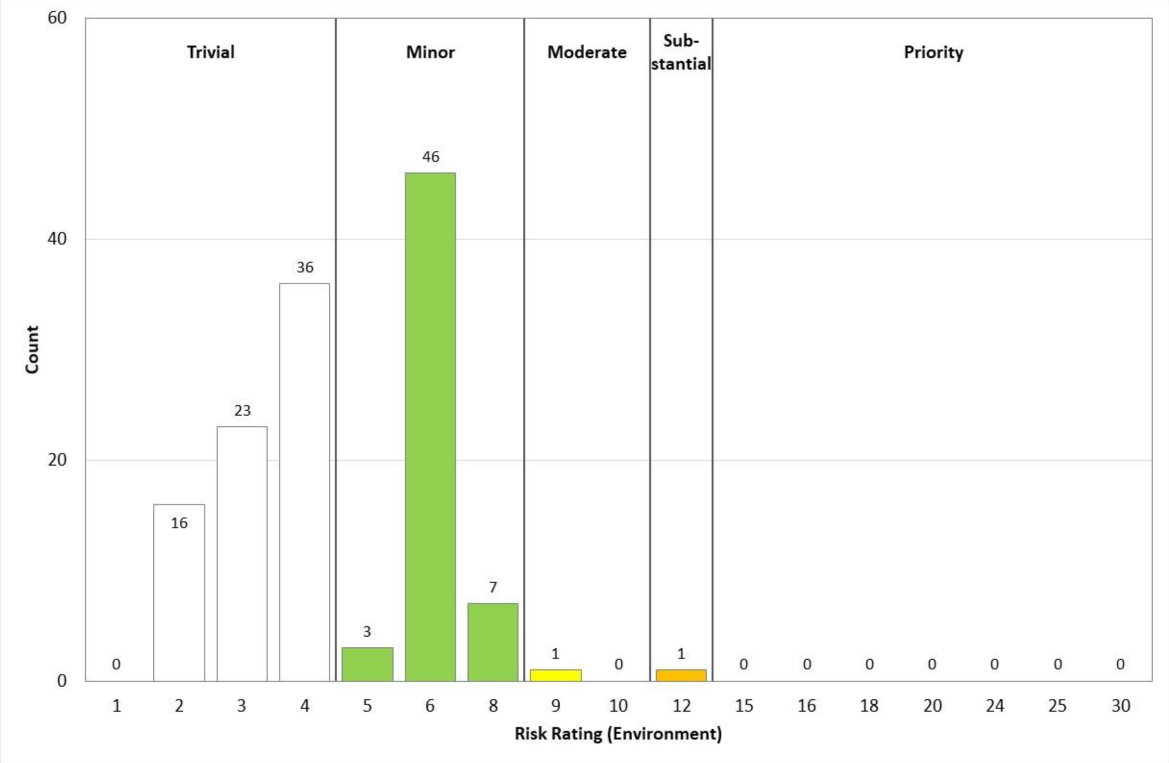


Figure 17.5: Accident Scenarios Risk Ratings for Environmental Impacts



These two graphs reflect the risks presented by all major accident scenarios identified at the site, both under the *current* operations and under the *proposed new* development. The scenarios identified in the HAZID&RA report involve accident scenarios such as fires and loss of containment events involving materials classed as hazardous to human health and/or the environment. The most significant scenarios identified in the report are summarised below. These scenarios have been split into two sub-headings, to distinguish between accident scenarios identified for the existing site infrastructure and scenarios identified for the proposed development.

Existing scenarios

- Bunker fire.
- Loss of containment of aqueous ammonia from storage tank.

Scenarios associated with proposed new development

- Fire at aqueous waste tank farm.
- Fire / explosion at hydrogen generation unit.

The effects arising from these scenarios would involve direct impacts to human health and/or to the environment. The assessment also considered whether there would be any risk that an accident scenario at Indaver could initiate an accident off site.

These scenarios are discussed in more detail in the following subsections. Discussion of the protective measures that are in place, and of the measures that will be put in place, to ensure that the risks are as low as practicable, is provided in **Section 17.6.2.**

17.5.3.1 Major Accident Scenarios at Existing Plant

Bunker Fire

This scenario received a Severity Rating of 3 for both Human Health and for the Environment and a Likelihood Rating of 4. This reflects the scenario of a fully developed bunker fire at the facility. As such the risk mitigation measures to protect against this scenario were examined in more detail to ensure that all necessary measures have been put in place.

The combined effects of all three phases of a bunker fire on human health (i.e. from an initial spot fire, to escalation within the bunker, to a fully developed bunker fire scenario) have been examined and are described the report in **Appendix 17.1 *HAZID&RA Report***. Based on this assessment, the calculated values for the PCDD/F contribution made by the Indaver facility were found to be insignificant. There is no significant impact to the soils and/or the food chain from dioxins released in the event of accidental fires in the solid waste bunker at Indaver.

In addition to the smoke plume, the fire would result in thermal radiation being emitted to the surroundings. The credible worst case fire scenario is the escalation event, involving a fully developed fire at the bunker; it is assumed that the structure of the building could be damaged by the fire and so no shielding effect would be provided. The thermal radiation contours in the HAZID&RA report show that there are no offsite impacts from the bunker fire scenario, even in the case of the fully developed bunker fire.

The on-site impacts would be mitigated by the emergency response arrangements that are in place at the site. As discussed in the HAZID&RA report, there are controls in place to protect against this scenario.

Loss of containment of aqueous ammonia from storage tank

This scenario involves a major release from the aqueous ammonia storage tank at the Indaver Duleek site. It was identified in the HAZID that, in the event of a loss of containment of aqueous ammonia, there is the potential for the evolution of ammonia gas to atmosphere.

The modelling results for the credible worst case scenario, involving a complete loss of containment from the aqueous ammonia tank, with evolution of ammonia gas to atmosphere, shows that the maximum distances to a dangerous dose would be 78 m, for a release in typical atmospheric conditions and would be 285 m for a release in calm conditions.

The effects of loss of containment events such as this are assessed in the HAZID report in **Appendix 17.1**.

This report also describes the controls in place to mitigate the risks associated with this scenario – to reduce the probability of occurrence and to mitigate the impacts to human health and to the environment.

17.5.3.2 Fire at proposed aqueous waste tank farm

This scenario involves a major release of aqueous solvent waste, with ignition to give rise to a pool fire on site. The tanks are fitted with shields in place around the perimeter of the tank walls, which will help to minimise the risks associated with a release outside the bund due to, e.g. overjetting or overtopping of the bund wall. In the event of a major release, the size of the resulting pool of liquid will be restricted by the installation of a bund at the tank.

In the event of a major release, the risk of ignition is low when compared with other bulk storage facilities, e.g. in solvent or petroleum service, as the materials in the tanks are aqueous solutions, where the water content is in excess of 90%. Nonetheless a scenario involving a bund fire was considered credible and modelling conducted to determine the impacts to the surrounding area.

The modelling results show that, in the credible worst-case event of a full bund fire, there would be no impacts off site. The tank farm is located at the site boundary to the north of the site and so, in the event of a full bund fire, there would be high levels of thermal radiation at the boundary. However, the modelling also shows that heat flux decreases rapidly with distance, to a level of 4 kW/m^2 at a distance of 22 m from the bund. There are no vulnerable offsite receptors within this range.

17.5.3.3 Fire / explosion at proposed hydrogen generation unit

The credible worst case scenario in this area of the site involves a major release following catastrophic failure of the hydrogen storage vessel, resulting in overpressures to the surrounding area.

The hydrogen storage vessel operates at high pressure and so, in the event of an explosion, this would result in high levels of overpressure in the immediate vicinity.

The nearest off-site receptor is the R152 road, which runs to the south of the site. At its closest point, this is located at a distance of approximately 85 m from the hydrogen plant. In the worst-case scenario, the maximum overpressures at the roadway would be of the order of 50 mbar. Exposure to this level of overpressure does not present a risk to people.

17.6 Mitigation Measures and Monitoring

17.6.1 Construction Phase

As noted in **Section 17.5.2**, none of the hazards identified in this report arise during the construction phase of the development.

The new accident scenarios associated with the new plant will only arise during the operational phase of this plant. However, the construction activities could present a risk of acting as an initiator to an accident scenario at the existing plant.

A Construction and Environmental Management Plan (CEMP) will be in place to ensure that the construction is carried out in a safe manner with regard to safeguarding the environment from potential incidents on site. The CEMP also sets out the Construction Traffic Management Plan which will be finalised and implemented by the Contractor. The CEMP is described in **Appendix 5.1** of **Volume 3** of this EIAR.

Risk assessment is an integral part of the CEMP. Furthermore, the appointed PSCS (Project Supervisor Construction Stage) will ensure that the interaction of different activities at the site is managed safely so as not to present any unacceptable risks. The CEMP will also incorporate the development of an Incident Response Plan (IRP) to ensure that, in the unlikely event of an incident, response efforts are prompt, efficient, and appropriate. The objectives of the IRP will be to:

- Ensure the health and safety of workers and visitors along the site.
- Minimise any impacts to the environment and ensure protection of the water quality and the aquatic species dependent on it.
- Minimise any impacts on properties, services etc.
- Establish procedures that enable personnel to respond to incidents with an integrated multi-departmental effort (including a link to the existing on-site Emergency Plan) and in a manner that minimises the possibility of loss and reduces the potential for affecting health, property, and the environment.
- The CEMP also sets out provisions for traffic management during the carrying out of the construction works.

The CEMP will include provision for continuous inspections, auditing and monitoring of the construction works. The Site Environmental Manager (SEM) will draw up a schedule of monitoring, which will set out roles and responsibilities for monitoring and reporting the works. In the event that the monitoring results indicate that the works are not being carried out in accordance with the contractual requirements, the SEM is responsible for initiating and reporting on the corrective actions to be implemented.

The SEM and the Construction Manager will also carry out quarterly audits to ensure that the Contractor engaged in carrying out the works is successfully meeting all environmental commitments / requirements under the CEMP.

The effective implementation of the CEMP will help to reduce the risks associated with the construction phase of the project in terms of the environmental effects. The PSCS (Project Supervisor Construction Stage) will monitor performance against the CEMP to ensure that it is adhered to throughout the process.

17.6.2 Operational Phase

In assessing the risks presented at each installation at the site (both existing and proposed installations), the HAZID&RA noted a range of measures that are in place, or will be put in place for the new development, to mitigate the risks associated with the accident scenarios that were identified.

For those areas identified as presenting a credible risk of a significant accident scenario, the scenarios were documented and assessed in the HAZID&RA worksheets, which are included in Appendix 3 to the HAZID&RA report (**Appendix 17.1** in **Volume 3** of this EIAR). The worksheets were also used to document the risk reduction and mitigation measures to protect against these scenarios.

Based on the findings of the HAZID exercise, there were no scenarios identified which presented a Priority Risk (see **Table 17.3**). There was one scenario identified as presenting a Significant Risk; this is an existing scenario involving a fire in the bunker area.

In addition to the bunker fire scenario, several other accident scenarios were also considered for further assessment. These present lower risks but broaden the assessment of credible worst-case scenarios that could arise at the Duleek site.

For these scenarios, the risk assessment team reviewed the protection systems to ensure that all necessary measures would be in place to protect against these scenarios. Full details are contained in the HAZID&RA report in **Appendix 17.1** in **Volume 3** of this EIAR.

Details of the measures that will be put in place to reduce and mitigate the risks associated with the key scenarios associated with the proposed development are discussed in the following sub-sections:

Risk Reduction and Mitigation Measures at New Aqueous Waste Tank Farm

- Tanks will be fully bunded, in accordance with the 110% rule and 25% rule (i.e. bund is large enough to retain at least 110% of the volume of the largest tank and 25% of the total inventory stored at the bund).
- Tanks will be fitted with shielding to protect against the risk of a release outside of the bund due to tank failure.
- Tanks will operate with a nitrogen blanket on the vapour space, to protect against the potential for evolution of flammable vapours from the liquid surface.
- Welded pipelines to minimise the use of flanged connections.
- Preventative maintenance regime to ensure integrity.
- Design to incorporate measure to protect against siphoning of the tank contents in the event of line failure.
- Permit to work system to control potentially invasive works on site.
- Impact protection at tank farm and at tanker loading area.

- Deliveries will be manned activities carried out by trained operators.
- Hoses will be inspected prior to transfers taking place.
- Visual inspection of tankers prior to acceptance on site.
- Overfill protection system on tanks (level gauges, level switches).
- Personnel protective equipment (PPE) for operators involved in carrying out deliveries, as required.
- Contents of the aqueous waste tank are dilute (>90% water), thereby reducing the fire hazard.

Risk Reduction and Mitigation Measures at New Hydrogen Plant

- Interlocks on system, to enable a leaking section of line to be isolated, reducing the potential quantity released to atmosphere.
- Pressure reduction at connection for vehicle fuelling.
- Siting of facility and separation distances to other plant, equipment, buildings, etc. in accordance with NFPA 55.
- Preventative maintenance system on plant and equipment, to ensure integrity and fitness for purpose.
- Forced ventilation at indoor area of plant, to prevent risk of hydrogen accumulation at ceiling level.
- Impact protection on hydrogen plant.
- Speed limit in place on site.
- Road tanker movements supervised by trained Indaver operator.
- Visual inspection of road tankers prior to acceptance on site.
- Transfer hoses inspected prior to use.
- ATEX zoning, with control of ignition sources.

These include measures to reduce the probability of an accident scenario developing (risk prevention) and measures to reduce the consequences if an accident did occur (risk mitigation). The measures protect against the conditions arising under which an accident could occur, enable rapid detection and response and protect against the risk of environmental contamination.

With these measures in place, the HAZID&RA found that Indaver would have all necessary measures to in place at the bunker, throughout all phases of the operation. As such the risks associated with this scenario were considered to be ALARP (as low as reasonably practicable).

17.7 Cumulative Effects

In the context of a discussion of cumulative effects, consideration was made of the risk that a major accident arising at the Indaver site could act as an initiator of a further accident. Consideration was also made of the risk that a major accident elsewhere could give rise to a major accident at the site.

This consideration applies to on-site cumulative effects (between the existing site and the proposed development) or between the Indaver plant and a neighbouring site.

The consequence modelling results in the HAZID&RA report show the extent of the impacts from accident scenarios arising at Indaver. When considering the potential for cumulative effects, in which a fire or explosion could damage other plant or equipment, the following endpoints have been used:

- Thermal radiation of 8 kW/m^2: This is the threshold value reported in IP19[7] at which protective cooling water may be required to prevent escalation of a fire event to exposed items of plant and equipment.
- Thermal radiation of 25 kW/m^2: This heat flux is reported in the Green Book[8] as being sufficient to cause Damage Level 2 in steel structures (serious discolouration of surface, peeling off of paints and/or appreciable deformations of structural elements).

Referring to the model results in the HAZID&RA report (**Appendix 17.1**), for most of the fire scenarios identified in the report, there are no significant offsite consequences and the contour plots for these scenarios are contained within the site footprint. The on-site impacts of these scenarios are mitigated by the means of the emergency response measures that Indaver has in place.

The scenario identified as giving rise to the highest levels of thermal radiation off-site is the bund fire scenario at the aqueous waste tank farm. Due to the proximity of the tank farm to the site boundary, the scenario of a full bund fire would result in elevated levels of thermal radiation at the boundary. The modelling also shows that heat flux decreases rapidly with distance, to a level of 4 kW/m^2 at a distance of 22 m from the bund. There are no vulnerable off-site receptors within this range.

In addition to consideration of the effects to existing infrastructure, it is also noted that there are several planned developments in the vicinity. The potential for cumulative effects as a result of the construction and operation of the proposed development and the following projects has been assessed where relevant in the following sections.

17.7.1 Irish Cement Ltd. (Planning Ref. LB150375 and Planning Ref. PL17.PA0050)

The development (Planning Ref. LB150375) will consist of the installation of a Flue Dust Portland Cement Silo at Kiln 3. The development will include the provision of a silo of circa 40m in height and 12m in diameter, together with

[7] "Model Code of Safe Practice Part 19: Fire precautions at petroleum refineries and bulk storage installations" (Energy Institute)
[8] "Methods for the determination of possible damage to people and objects resulting from releases of hazardous materials (CPR 16E)" (TNO)

filter, access gantries, bucket elevator and truck loading facility all on an application site of circa 0.75 hectares located within Platin Cement Works. Permission was granted in June 2015. The current timeline for construction is unknown.

The planning application (Planning Ref. PL17.PA0050) was for a 10-year permission to facilitate further replacement of fossil fuels and allow for the introduction of alternative raw materials in the manufacturing of cement at Platin Cement Works, Platin, Co. Meath. The proposed development is for the use of an additional 480,000 tonnes per annum of alternative fuels and alternative raw materials. Permission was granted in April 2018. The current timeline for construction is unknown.

As noted in **Section 17.3.2**, the distance between the closest buildings at Indaver and at Irish Cement is more than 400 m. The new developments at Irish Cement would therefore be well outside the hazard distances calculated for any of the scenarios identified in the HAZID. There is no risk to either of the planned developments at Irish Cement arising from the activities or the planned activities at Indaver.

In conclusion, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from major accidents or disasters associated with the Indaver Site Sustainability Project in combination with the projects above

17.7.2 SSE Generation Ireland Ltd. (PL17.303678)

This planning application refers to an air-insulated switchgear 110kVand for a transmission substation (Ref. 17.303678). The substation application was submitted to An Bord Pleanála as a Strategic Infrastructure development in February 2019 and was granted permission in January 2020.

It is noted that the substation scheme above appears to be an enabling component for a separate planning application for an open cycle gas turbine (OCGT) power plant, which was submitted to Meath County Council and permission granted in July 2019, but was subsequently appealed to An Bord Pleanála, where it was ultimately refused in December 2019. The OCGT plant therefore does not have a grant of planning.

Given the grant of permission received by the 110kV substation there is potential for this scheme to proceed as a standalone project.

The proposed site for development of this facility is located to the south of the R152. As noted previously, there are no significant impacts at this road from the major accident scenarios. This in turn also means that there are no significant impacts at the site of the SSE project, which is located across the road from the Indaver site.

In conclusion, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from major accidents or disasters associated with the Indaver Site Sustainability Project in combination with the project above.

17.7.3 Highfield Solar Ltd. (Planning Ref. PL17.303568) and 17.248146

These two applications (for a scheme titled 'Garballagh Lower Solar Farm') comprise an application for the development of a Solar Farm (17.248146) and a separate application for an electrical substation and associated 110kV and MV infrastructure required (17.303568) to connect the ground-mounted solar PV generation to the electrical transmission system, including underground cabling and all associated ancillary site development work.

Both applications were granted planning permission by An Bord Pleanála (in March 2019 and July 2019, respectively). Construction is underway; however, the estimated opening date is unknown.

It is reasonable to assume that this scheme will be constructed and operational prior to the development of the proposed Site Sustainability Project.

The new developments at Highfield Solar are at a much further distance from Indaver than the developments at Irish Cement. There is no risk to either of the planned developments at Highfield Solar arising from the activities or the planned activities at Indaver.

In conclusion, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from major accidents or disasters associated with the Indaver Site Sustainability Project in combination with the projects above.

Finally, taking the Indaver Site Sustainability Project in in combination with the five projects listed above it is considered that there is no potential for any significant negative direct or indirect cumulative impact to arise from major accidents or disasters, given the distance of these permitted projects and the proposed Site Sustainability Project.

17.8 Residual Effects

17.8.1 Construction Phase

The accident scenarios discussed in this chapter of the EIAR mainly relate to hazards associated with the storage and handling of dangerous substances or the storage and handling of waste at the site. As such, these hazards will not arise at the new plant until after the construction phase has been completed and the operational phase has commenced.

As the construction works for the new plant will take place on an operational site, there will be a Construction and Environmental Management Plan (CEMP) to ensure that all risks are mitigated, both the risks inherent in any construction activity and any site-specific risks associated with the proximity of the works to existing infrastructure. The effective implementation of the CEMP will help to reduce the risks to the environment associated with the construction phase of the project. This will ensure that the potential risks of major accident and/or disaster are identified, avoided and mitigated, as necessary.

The CEMP is included in **Appendix 5.1** to **Volume 3** of this EIAR. There are no significant residual effects associated with the construction works.

17.8.2 Operational Phase

A discussion of the effects arising from normal operations of the plant is provided in other chapters of this EIAR. There are no residual effects associated with the scenarios discussed in this chapter, except in the case of an accident scenario. In the event of an accident occurring during operations, Indaver will have emergency response measures in place to minimise the impacts to human health and to the environment.

As the site is already licensed by the EPA (ref. W0167-03), Indaver has conducted an environmental liabilities risk assessment (ELRA) and prepared a closure restoration and aftercare management plan (CRAMP), in accordance with the EPA's guidance[9] both of which will be reviewed to reflect the expanded works on site. In accordance with the EPA's guidance, Indaver has put the appropriate financial provisions in place to cover the liabilities and potential liabilities identified in the ELRA and CRAMP. These provisions will also be reviewed. There are no significant residual effects associated with the operation phase.

17.9 References

Environmental Protection Agency (2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports

European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report

BS 8800: 1996, Guide to Occupational Health and Safety Management Systems

Health & Safety Authority (2017 Guidance to Inspectors on the Assessment of Safety Reports under the COMAH Regulations 2015

Energy Institute (2012) Model Code of Safe Practice Part 19: Fire precautions at petroleum refineries and bulk storage installations

TNO (Green Book) Methods for the determination of possible damage to people and objects resulting from releases of hazardous materials (CPR 16E)

EPA (2006) Guidance on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision

[9] EPA (2006) Guidance on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision

18 Cumulative Effects, Other Effects and Interactions

18.1 Introduction

This chapter presents:

- an assessment of the likely effects of the proposed development on the environment resulting from the cumulation of effects with other existing and/or approved projects, and
- an assessment of the interaction/inter-relationship of effects between environmental factors.

The methodology used to assess interaction/inter-relationship and cumulative effects is presented in **Section 18.2**. Cumulative effects are discussed in **Section 18.3** whilst the interaction between environmental factors are discussed in **Section 18.4.** Potential transboundary effects are also discussed in **Section 18.5.** The Do-Nothing scenario is briefly discussed in **Section 18.6** for the individual assessment topics of **Chapters 6-17** of this EIAR). This chapter concludes with references (**Section 18.6**).

18.2 Assessment Methodology

18.2.1 Guidance

This chapter has been prepared in accordance with the following guidance:

- Department of Housing, Planning and Local Government (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, August 2018.
- EPA (2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports, Draft, August 2017.
- European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report. (Office for Official Publications of the European Communities 2017).
- EPA (2015) Revised Guidelines on the Information to be contained in Environmental Impact Statements, Draft, 2015.
- EPA (2015) Advice Notes on Current Practice in the Preparation of Environmental Impact Statements, Draft, 2015.
- EPA (2003) Advice Notes on Current Practice in the Preparation of Environmental Impact Statements, 2003.
- EPA (2002) Guidelines on the Information to be contained in Environmental Impact Statements, 2002.

- European Commission (1999) Guidelines for the Assessment of Indirect and Cumulative Effects as well as Impact Interactions, (Office for Official Publications of the European Communities 1999).

18.2.2 Definitions

The following definitions are generally used in the description of cumulative effects or interaction of effects.

It is noted that the terms "*effects*" and "*impacts*" are used interchangeably in this chapter.

The EC guidance (2017) uses the following definition for cumulative effects are defined as:

"Changes to the environment that are caused by activities/projects in combination with other activities/projects".

EC guidance (2017) also states that:

"It is important to consider effects not in isolation, but together, that is cumulatively. [….] Cumulative effects are changes to the environment that are caused by an action in combination with other actions. They can arise from:

- *The interaction between all of the different projects in the same area;*
- *The interaction between various impacts within a single Project (while not expressly required by the EIA Directive this has been clarified by the CJEU [Court of Justice of the European Union] […]".*

Under the EPA draft guidance (2017) cumulative effects are defined as*:*

"The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects".

The EC guidelines (1999) use slightly different definitions as follows:

"Cumulative Impacts: Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project".

The EC guidelines (1999) use definitions as follows:

"Impact Interactions: The reactions between impacts whether between the impacts of just one project or between the impacts of other projects in the area".

The term *'impact interactions'* is equivalent to the term *'inter-relationship of effects'*. The EC guidelines (1999) accept that their definitions overlap to a certain extent. The EC guidelines also refer to '*Cross-Media Impacts'*, in which the impact in one environmental medium may also have an indirect impact on another medium.

18.2.3 Cumulative Effects Assessment Methodology

Annex IV (5)(e) of the EIA Directive as amended by Directive 2014/52/EU requires that the EIAR shall contain:

"A description of the likely significant effects of the project on the environment resulting from, inter alia:

(e) the ***cumulation of effects*** *with other* ***existing and/or approved projects****, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; Furthermore, Annex IV (5) states that the EIAR shall contain:*

"The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any indirect, secondary, ***cumulative****, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project".*

At the initial stage of preparing the EIAR for the proposed development, the potential for significant cumulative impacts were examined and any potential effects were identified. These potential effects were included in the scope and addressed in the baseline and impact assessment studies for each of the relevant environmental factors.

Likely significant cumulative effects of the proposed development in-combination with other existing and/or approved projects for each of the environmental factors were initially identified, considered and assessed in respective chapters of the EIAR.

Section 18.3 of this chapter presents a summary of all of the individual assessments together and examines and assesses whether the proposed development in combination with those other existing/approved projects would be likely to have significant effects (direct and indirect) both on an individual basis with the proposed development and also cumulatively with all such projects. No additional mitigation measures are proposed in this chapter. The process for identifying "other existing and/or approved projects" is described in **Section 18.3.1** below.

18.2.4 Interactive Effects Assessment Methodology

Article 3 (1) of the EIA Directive as amended by Directive 2014/52/EU requires that:

"The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors: (a) population and human health; (b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC; (c) land, soil, water, air and climate; (d) material assets, cultural heritage and the landscape; ***(e) the interaction between the factors referred to in points (a) to (d)".***

The consideration of interactive effects was an integrated process which commenced at the very outset of the project. At the initial stage of preparing the EIAR for the proposed development, the potential for significant interactions between environmental factors were examined and any potential effects were identified. These potential effects were included in the scope and addressed in the baseline and impact assessment studies for each of the relevant environmental factors. There were numerous discussions and communications between the environmental specialists and the design team throughout the design process which helped to identify and minimise the potential for significant interactions of effects arising in the first instance.

The interaction of effects within the proposed development in respect of each of the environmental factors, listed in Article 3(1) of the EIA Directive, have been identified and addressed in detail in the respective chapters in this EIAR. Thus, no additional mitigation is proposed in this chapter.

Section 18.4 of this chapter presents a summary of each assessment of the interaction (inter-relationship) of effects (from the proposed development) between the various environmental factors. Mitigation measures relative to those interactions are addressed in individual chapters.

The matrix and expert opinion approaches, as outlined in the EC Guidelines (2017), were used in the identification of the potential for significant interactions of effects. Refer to **Table 18.4** for the matrix of potential interactions.

18.2.5 Transboundary Effects Assessment Methodology

This EIAR has considered and assessed the potential for transboundary effects arising from the construction and operation of the proposed development. Certain environmental effects of a proposed development have the potential to cross state boundaries, for example, air or water emissions, and have a 'transboundary effect'. Under the EIA Directive (2014/52/EU) the likely significant transboundary effects of a proposed development must be described. Annex IV (5)(e) of the EIA Directive as amended by Directive 2014/52/EU states:

"The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any indirect, secondary, cumulative, ***transboundary****, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project."*

Section 18.5 of this chapter considers the transboundary effects of the proposed development. All activities associated with the construction and operation of the proposed development were assessed for the likely significant transboundary effects.

18.3 Cumulative Effects

This section presents an assessment of the likely effects of the proposed development on the environment resulting from the cumulation of effects with other existing and/or approved projects. The first stage was to identify the “other existing and/or approved projects to be included in the assessment. This process is described in **Section 18.3.1** below. The projects that were included in the assessment are presented in **Table 18.1** below.

Likely significant cumulative effects of the proposed development in-combination with those projects listed in **Table 18.1** for each of the environmental factors were initially identified, considered and assessed in respective chapters (6-17) of the EIAR. All of the experts have reviewed the available materials relating to the existing/approved projects in **Table 18.1** below in order to conduct their assessments.

Table 18.2 presents the results of the likely significant direct, indirect and cumulative effect assessment (under all of the individual environmental factors) for each project listed in **Table 18.1** individually, in-combination with the proposed development. **Table 18.3** presents the results of the likely significant direct, indirect and cumulative effects assessment of each project listed in **Table 18.1** all together as a whole in combination with the proposed development.

The conclusion of the assessment presented in this chapter is that there are no likely significant cumulative effects (direct and indirect) arising from an assessment of the projects listed in **Table 18.1** as explained in the tables below. No additional mitigation measures are necessary or required following this assessment.

18.3.1 Identification of “other existing and/or approved projects”

A review was initially carried out to identify other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular importance likely to be affected or the use of natural resources. A review was carried out of the planning files for:

- Meath County Council (MCC);
- Neighbouring County Councils (such as Louth County Council);
- An Bord Pleanála (ABP); and
- Department of Housing, Planning and Local Government (DHPLG) EIA Portal.

Arising from this review, a number of existing and/or approved projects (as listed in **Table 18.1** below) were identified which could have the potential for likely significant cumulative effects.

The assessment in this chapter considers and assesses whether any of these existing/approved projects will likely have significant cumulative effects in combination with the proposed Site Sustainability project.

The assessment also considers whether all of the existing/approved projects taken together as a whole will likely have significant cumulative effects in combination with the proposed Site Sustainability Project.

There are many projects listed on the planning database for Meath County Council, neighbouring county councils, An Bord Pleanála and the DHPLG EIA Portal. However, the focus for this assessment was on the proximity, scale and nature of those projects in relation to the proposed Site Sustainability Project and on those which could potentially exacerbate environmental effects and thus be of significance to the cumulative effects assessment.

For example, particular attention was given to those projects which were designated as Strategic Infrastructure Developments (SID) or Strategic Housing Development (SHD) in proximity to the proposed development given the larger scale and nature of these developments. Those projects where EIARs or NIS's accompanied the planning applications were also given due regard at review stage.

Live or proposed projects which have not yet been permitted were not considered in this assessment. Further, there are other applications which have been refused planning consent or have been withdrawn or invalidated and these have also not been considered or assessed in this cumulative effects assessment.

It is noted that the SID electricity application for SSE Generation Ireland (ABP Ref. PL17. 303678) (110kV substation) was approved and is therefore included in this assessment. Refer to **Table 18.1** below. However, this project relates to a larger "parent project application"; an open cycle gas turbine power plant planning application (Meath Planning Ref. LB190031) which has since been refused. It is not known whether or not the approved SID electricity application may be constructed if the parent project is not developed in the future.

Table 18.1 List of planned projects identified as having potential cumulative effects due to the construction and/or operation of the proposed development.

Applicant	Planning Ref.	Description	Status	Source
Irish Cement Ltd.	LB150375	The development will consist of the installation of a Flue Dust Portland Cement Silo at Kiln 3. The development will include the provision of a silo of circa 40m in height and 12m in diameter, together with filter, access gantries, bucket elevator and truck loading facility all on an application site of circa 0.75 hectares located within Platin Cement Works. This application relates to an activity for which an Industrial Emissions Licence applies under the Environmental Protection Acts 1992 as amended. (IE Licence Register Number P0030).	Planning permission granted June 2015. Construction status unknown	MCC
Irish Cement Ltd.	PL17 .PA0050	10-year permission to facilitate further replacement of fossil fuels and allow for the introduction of alternative raw materials in the manufacturing of cement at Platin Cement Works, Platin, Co. Meath. The proposed development is for the use of an additional 480,000 tonnes per annum of alternative fuels and alternative raw materials. SID application. Irish Cement is at licence review stage to facilitate the planned activity at the plant under Licence No. P0030-66. In February 2020, the EPA issued a Proposed Determination to grant a revised licence. The window for submitting objections to the EPA has passed (18 March 2020). The EPA is currently considering submissions.	Planning permission granted April 2018. Construction status unknown	ABP, EPA
SSE Generation Ireland Ltd	PL17. 303678	Application to ABP (Electricity Development Application) for the Air insulated switchgear 110kV transmission substation. http://www.pleanala.ie/casenum/303678.htm It is noted that the substation scheme above appears to be an enabling component for a separate planning application for an open cycle gas turbine (OCGT) power plant, which was submitted to Meath County Council and permission granted in July 2019, but was subsequently appealed to An Bord Pleanála, where it	Planning permission granted January 2020. Construction status unknown.	MCC & ABP

Applicant	Planning Ref.	Description	Status	Source
		was ultimately refused in December 2019. The OCGT plant therefore does not have a grant of planning and has not been included in this assessment.		
Highfield Solar Ltd.	PL17. 248146	Garballagh Lower Solar Farm Applicant applied to Meath CC for solar farm on 2 sites (Site 1 and Site 2) and a 110kV substation. Meath CC granted permission (conditional) under Ref. LB160898 on 10/02/17. Decision appealed to ABP (Ref. PL17.248146). ABP granted the solar farm on Site 1 only and ordered that planning for 110kV substation be applied under SID (see Ref. PL17.303568 below) http://www.pleanala.ie/casenum/248146.htm	Planning permission granted March 2019. Construction status unknown.	MCC & ABP
Highfield Solar Ltd	PL17 .303568	Garballagh Lower Solar Farm Related to project above (ABP Ref. PL17.248146). Proposed electrical substation and associated 110kV and MV infrastructure required to connect ground mounted solar PV generation to the electrical transmission system, underground cabling and all associated ancillary site development work. SID application. http://www.pleanala.ie/casenum/303568.htm	Planning permission granted July 2019. Construction status unknown.	ABP

18.3.2 Overall Cumulative Effects Assessment

Table 18.2 Likely significant direct, indirect and cumulative effects[1] assessment of approved projects listed in Table 18.1 in combination with the proposed development.

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
Irish Cement Limited **LB150375** **Flue Dust Portland Cement Silo**	**Population and Human Health:** Should the construction of the planned cement silo at Irish Cement and the proposed development occur concurrently, there is potential for temporary indirect cumulative effects on population and human health due to increased construction traffic and nuisances associated with site activities (dust, noise). However, given the scale of the of the planned development it is unlikely there will be a significant direct or indirect cumulative effect on population during construction. No significant direct or indirect cumulative effects on population or human health are predicted during the operation of the planned and proposed development. As this planned development will not result in any additional emissions to atmosphere during operation the cumulative effects on human health are deemed imperceptible.	None
	Traffic and Transport: The current timeline for construction is unknown. No detail relating to anticipated traffic movements was available for this project; however, it is stated in the planning report on file that *'The planning authority would anticipate that during construction works the proposed development will have an imperceptible to slight impact on traffic but at operational stage there will be no impact'*. Therefore, it is anticipated (based on the information above) that there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above. Therefore, no further allowance has been made for this scheme within the Traffic and Transportation chapter.	
	Air Quality: There is the potential for cumulative dust emissions during construction. However, it is predicted that this development will not result in any additional emissions to atmosphere during operation. The planners report submitted as part of the application details that "*projected pollutant emissions are insignificant*". Therefore, cumulative impacts are deemed imperceptible and there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	

[1]It is noted that the terms "effects" and "impacts" are used interchangeably in this chapter and assessment.

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
	Climate: There are no climate related impacts predicted as part of this development and therefore there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Noise and Vibration: The proposal has a negligible noise impact on the surrounding noise environment. In additional, any amendments to on-site operations within the Platin cement works IE licence are required to operate within the relevant noise emission limit values. Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Biodiversity: The development will consist of the installation of a Flue Dust Portland Cement Silo. This application relates to an activity for which an Industrial Emissions Licence applies under the Environmental Protection Acts 1992 as amended. (IE Licence Register Number P0030). In the absence of significant emissions to air or water no significant cumulative impact on biodiversity has been identified. Therefore, there is no potential for significant negative direct nor indirect cumulative effects on biodiversity.	
	Archaeology, Architecture and Cultural Heritage: The majority of the proposed development at Indaver lies within the footprint of ground which has already been archaeologically resolved and is predominantly brownfield. The overall impact of ground works on the small remaining areas of unstripped ground has been assessed as slight. When the predicted impact of the proposed development at Indaver is combined with the development by Irish Cement Limited, no significant negative direct nor indirect cumulative effects are predicted on the overall archaeological landscape.	
	Landscape and Visual: Due to the scale, nature and separate location of the development and given that the assessed impacts of the proposed development are imperceptible/not significant, this development does not have any potential to alter the significance of effects associated with the proposed development. Any cumulative effect will be imperceptible/not significant. Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Land and Soils: The Planner's Report[2] (2015), prepared by Meath County Council, states that '[…] *no soils, geology or habitats will be affected'* and '*the proposed development will not result in any additional water discharges'*. Therefore, there is no potential for significant negative direct not indirect cumulative impacts on land, soils and hydrogeology.	

[2] Available for inspection from Meath County Council Planning database, http://www.eplanning.ie/MeathCC/AppFileRefDetails/LB150375/0

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
	Water: Irish Cement operate under and EPA IE Licence P0030-05. According to Section 7.3.2.1 of the EIAR[3] (2017), the average volume of water discharged to the River Nanny in 2016 from the Irish Cement site was 14,720m^3/day. The Planner's Report[4] (2015), prepared by Meath County Council, states that '*the proposed development will not result in any additional water discharges'*. Given the likely effects of the proposed Indaver development on hydrology and that there will be no change in surface water emissions as a result of this planned development at Irish Cement (Planning Ref. LB150375), it is concluded that there is no potential for significant negative direct or indirect cumulative effects on hydrology and water quality as a result of the proposed Indaver development and the planned development (Ref. LB150375).	
	Material Assets: The development will include the provision of a silo of circa 40m in height and 12m in diameter, together with filter, access gantries, bucket elevator and truck loading facility all on an application site of circa 0.75 hectares located within Platin Cement Works. Permission was granted in June 2015. The current timeline for construction is unknown. There is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Major Accidents and Disasters: The distance between the closest buildings at Indaver and at Irish Cement is more than 400 m. The new developments at Irish Cement would therefore be well outside the hazard distances calculated for any of the scenarios identified in the HAZID. There is no risk to either of the planned developments at Irish Cement arising from the activities or the planned activities at Indaver. In conclusion, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from major accidents or disasters associated with the Indaver Site Sustainability Project in combination with this Irish Cement project above.	
Irish Cement Limited **PL17 .PA0050**	**Population and Human Health**: Should the construction of the planned development at Irish Cement and the proposed development occur concurrently, there is potential for temporary indirect effects on population due to increased construction traffic and nuisances associated with site activities (dust, noise). However, given the location of the of the planned development in relation to the Indaver site, it is unlikely there will be a significant cumulative indirect effect on population during construction. No significant direct or indirect cumulative effects are predicted during the operation of the planned and proposed developments.	None

[3] Available for inspection under EPA IE Licence application P0030-06, https://www.epa.ie/licensing/
[4] Available for inspection from Meath County Council Planning database, http://www.eplanning.ie/MeathCC/AppFileRefDetails/LB150375/0

Plan/Project Ref No	**Potential Cumulative Effects on Environmental Factors**	**Overall Cumulative Impact (if any)**
Alternative fuels and raw materials.	**Traffic and Transport:** The planned development is for the use of an additional 480,000 tonnes per annum of alternative fuels and alternative raw materials. Permission was granted in April 2018. The current timeline for construction is unknown. Nevertheless, the traffic flows associated with this scheme have been obtained from the planning documentation and have been included within this chapter for assessment purposes (it is noted that the majority of estimated construction and operational traffic flow associated with this development is assumed in the relevant planning documentation to be via the M1 and R152 to the north of the proposed development site). Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Air Quality: There is the potential for cumulative construction stage dust emissions, however, in the EIA Report prepared by Brady Shipman Martin (2017), Section 8.4.1 states that dust soiling effects are predicted within 25m of the works area and PM_{10} effects within 10m. As there are no sensitive receptors within this area and there is sufficient distance between the works areas and the Site Suitability Project area and cumulative dust impacts are not predicted. Section 8.44 of the EIA Report (Brady Shipman Martin, 2017) determined that cumulative operational phase emissions from both the Platin site and the Indaver site were insignificant. Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Climate: This development is predicted to have a positive impact on climate due to the CO_2 savings through the use of alternative fuels relative to fossil fuels. As outlined in the EIA Report (Brady Shipman Martin, 2017) it is estimated that a saving of approximately 314,340 tonnes CO_2 per annum will be achieved as a result of the project. Cumulative impacts are considered neutral. Impacts to climate are not predicted during the construction phase of this development. Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Noise and Vibration: The proposal has a negligible noise impact on the surrounding noise environment. In additional, any amendments to on-site operations within the Platin cement works IE Licence are required to operate within the relevant noise emission limit values. Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
	Biodiversity: In the absence of significant emissions to air or water no significant cumulative impact on biodiversity has been identified. Therefore, there is no potential for significant negative direct nor indirect cumulative effects on biodiversity as a result of the proposed and planned development.	
	Archaeology, Architecture and Cultural Heritage: The majority of the proposed development at Indaver lies within the footprint of ground which has already been archaeologically resolved and is predominantly brownfield. The overall impact of ground works on the small remaining areas of unstripped ground has been assessed as slight. When the predicted impact of the proposed development at Indaver is combined with the development by Irish Cement limited, no significant negative direct nor indirect cumulative effects are predicted on the overall archaeological landscape.	
	Landscape and Visual: Due to the scale, nature and separate location of the development and given that the assessed impacts of the proposed development are imperceptible/not significant, this development does not have any potential to alter the significance of effects associated with the proposed development. Any cumulative effect will be imperceptible/not significant. Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Land and Soils: Based on the EIA Report[5] (2017), Section 6.5 states that there is no potential for cumulative impact on land, soils and hydrogeology. The report states '*The proposed works will have no impact on the dewatering operations within the quarry'.* Therefore, there is no potential for significant negative direct not indirect cumulative impacts on land, soils and hydrogeology as a result of the proposed and planned development.	
	Water: The nature of proposed works at Irish Cement under PL17.PA0050 are regarding the increase in volume of alternative fuels accepted by the facility and as stated in Section 7.4.4 of the EIA Report[3] (2017), there will be no significant change in the nature or quantity of runoff to surface waters as a result of the planned development (ABP Ref. PL17.PA0050) at Irish Cement. Given the likely effects of the proposed Indaver development on water and that there will be no change in surface water emissions as a result of this planned development at Irish Cement (ABP Ref. PL17.PA0050), it is concluded that there is no potential for significant negative direct or indirect cumulative effects on hydrology and water quality as a result of the proposed development and the planned development (ABP Ref PL17.PA0050).	

[5] Available for inspection under EPA IE Licence application P0030-06, https://www.epa.ie/licensing/

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
	Material Assets: This planning application was for a 10-year permission to facilitate further replacement of fossil fuels and allow for the introduction of alternative raw materials in the manufacturing of cement at Platin Cement Works, Platin, Co. Meath. The proposed development is for the use of an additional 480,000 tonnes per annum of alternative fuels and alternative raw materials. Permission was granted in April 2018. The current timeline for construction is unknown. There is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Major Accidents and Disasters: The distance between the closest buildings at Indaver and at Irish Cement is more than 400 m. The new developments at Irish Cement would therefore be well outside the hazard distances calculated for any of the scenarios identified in the HAZID. There is no risk to either of the planned developments at Irish Cement arising from the activities or the planned activities at Indaver. In conclusion, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from major accidents or disasters associated with the Indaver Site Sustainability Project in combination with the project above.	
SSE Generation Ireland Ltd. **PL17.303678** **110kV transmission substation**	**Population and Human Health**: Should the construction of the planned substation and the proposed development occur concurrently, there is potential for temporary indirect effects on population due to increased construction traffic and nuisances associated with site activities (dust, noise). However, given the scale of the of the planned development, it is unlikely there will be significant indirect cumulative effects on population during construction. No significant direct or indirect cumulative effects are predicted during the operation of the planned and proposed developments.	None
	Traffic and Transport: Given the grant of permission received by the 110kV substation there is potential for this scheme to proceed as a standalone project. Within the associated Environmental Report for the proposed developments (both schemes are presented as one single ‘project’), the construction stage is expected to be 18 months duration. No distinction is provided within the report between the open cycle gas turbine (OCGT) construction traffic and the substation construction traffic. Furthermore, the report outlines that the proposed development will require a new priority junction to be constructed on the R152, to the north of the Indaver site, and it is also stated that construction HGV traffic will only access the site from the north (via the M1). On this basis, with construction likely to be complete before 2022 and construction traffic only permitted to route to and from the M1, no further allowance has been made within the Traffic and Transportation chapter for the proposed substation element of the scheme.	

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
	Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Air Quality: There is the potential for cumulative construction dust related impacts as a result of the substation development if the construction phase overlaps with the construction of the Site Suitability Project. However, due to the small scale of the development there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Climate: Significant impacts to climate are not predicted as a result of the substation development as there are no direct emissions to atmosphere during operation. Construction vehicles and machinery may give rise to some GHG emissions during construction, however, due to the small scale of the development and the predicted low volume of machinery required GHG emissions are considered imperceptible. The cumulative impact to climate is overall imperceptible and therefore there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Noise and Vibration: The environmental report for this development concludes there are no potential significant noise sources identified with respect to the substation, and therefore no operational noise impacts are predicted. On the basis of the assessment presented, the cumulative impact of this development coupled with the proposed development under consideration here is therefore negligible. Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Biodiversity: Section 6.4.1 of the EIAR[6] (2019) prepared for the SID application stated that '*There will be no discharges to ground or groundwater during the operational phase of the Substation as none of the substation infrastructure will pose a risk to land and soils during the operational phase*.' Therefore, there is no potential for significant negative direct nor indirect cumulative effects on biodiversity as a result of the proposed and planned development.	
	Archaeology, Architecture and Cultural Heritage: The majority of the proposed development lies within the footprint of ground which has already been archaeologically resolved and is predominantly brownfield. The impact of ground works on the small remaining areas of unstripped ground has been assessed as slight. When the predicted impact of the proposed development at Indaver	

[6] Available from: http://caulstown-platin-substation.com/downloads/environmental/substation-environmental-report.pdf

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
	is combined with the development by SSE Generation Ireland Ltd, no significant negative direct nor indirect cumulative effects are predicted on the overall archaeological landscape.	
	Landscape and Visual: Due to the scale, nature and separate location of the development and given that the assessed impacts of the proposed development are imperceptible/not significant, this development does not have any potential to alter the significance of effects associated with the proposed development. Any cumulative effect will be imperceptible/not significant. Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Land and Soils: Section 6.4.1 of the EIAR[7] (2019) prepared for the SID application stated that '*There will be no discharges to ground or groundwater during the operational phase of the Substation as none of the substation infrastructure will pose a risk to land and soils during the operational phase*.' As such, there is no potential for significant negative direct nor indirect cumulative impacts on land, soils and hydrogeology as a result of the proposed and planned development (Ref. PL17.303678).	
	Water: Chapter 9 (Water and Wastewater), of the Substation Environmental Report (ER)[8] (2019) prepared for the planning application (Ref. PL17.303678) states that surface water runoff will be discharged to the River Nanny via drainage ditches east of the site. The report states that '*There will be no change to the water volume discharged to the drainage ditch, with the volume of rainwater currently falling on site and being received by the existing drainage system, remaining the same*.' A number of mitigation measures were proposed in the ER to '*prevent any accidental contamination of surface water (rainfall) runoff from the site and prevent/contain any accidental discharges of hazardous substances'*. Given the nature of the planned works (transmission station), it is concluded that there is no potential for significant negative direct or indirect cumulative effects on hydrology and water quality as a result of the proposed development and the planned development (ABP Ref. PL17.303678).	
	Material Assets: It is noted that the substation scheme above appears to be an enabling component for a separate planning application for an open cycle gas turbine (OCGT) power plant, which was submitted to Meath County Council and permission granted in July	

[7] Available from: http://caulstown-platin-substation.com/downloads/environmental/substation-environmental-report.pdf
[8] Substation Environmental Report (2019) available form: http://caulstown-platin-substation.com/downloads/environmental/substation-environmental-report.pdf

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
	2019, but was subsequently appealed to An Bord Pleanála, where it was ultimately refused in December 2019. The OCGT plant therefore does not have a grant of planning. Given the grant of permission received by the 110kV substation there is potential for this scheme to proceed as a standalone project. There is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above with regard to material assets.	
	Major Accidents and Disasters: The proposed site for development of this facility is located to the south of the R152. As noted previously, there are no significant impacts at this road from the major accident scenarios. This in turn also means that there are no significant impacts at the site of the SSE project, which is located across the road from the Indaver site. In conclusion, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from major accidents or disasters associated with the Indaver Site Sustainability Project in combination with the project above.	
Highfield Solar Ltd. **PL17.248146** **Solar farm**	**Population and Human Health**: Should the construction of the planned substation and the proposed development occur concurrently, there is potential for temporary indirect cumulative effects on population due to increased construction traffic and nuisances associated with site activities (dust, noise). However, cumulative noise or air quality impacts associated with the construction of the proposed development and the planned solar farm development are not envisaged due to the low volume of construction required and the use of materials with a low dust generation potential planned for the solar farm. In addition, given the location of the of the planned development in relation to Indaver, it is unlikely there will be significant indirect cumulative effects on population during construction. There are no emissions to atmosphere associated with the operational stage of this development. Therefore, no direct or indirect cumulative human health impacts are predicted.	None
	Traffic and Transport: This application relates to a scheme titled 'Garballagh Lower Solar Farm' for the development of a Solar Farm. This application was granted by An Bord Pleanála in March 2019. Construction is underway; however, the estimated opening date is unknown. It is assumed that this scheme will be constructed before construction commences for the Site Sustainability Project. Operationally, the solar farm will have a negligible impact. Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
	Air Quality: Cumulative air quality impacts associated with the solar farm development are not envisaged due to the low volume of construction required and the use of materials with a low dust generation potential. There are no emissions to atmosphere associated with the operational stage of this development. Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Climate: The solar farm development will have a positive impact on climate by reducing the reliance on fossil fuels and increasing the capacity of renewable energy available on the national grid. Cumulative impacts are considered neutral and therefore there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Noise and Vibration: This development is over 4km from the Caranstown Indaver WtE facility and will not result in any cumulative noise impact to the surrounding environment. Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Biodiversity: Applicant applied to Meath County Council (CC) for solar farm on 2 sites (Site 1 and Site 2) and a 110kV substation. Meath CC granted permission (conditional). In the absence of significant emissions to air or water no significant cumulative impact on biodiversity has been identified. Therefore, there is no potential for significant negative direct nor indirect cumulative effects on biodiversity as a result of the proposed and planned development	
	Archaeology, Architecture and Cultural Heritage: The majority of the proposed development lies within the footprint of ground which has already been archaeologically resolved and is predominantly brownfield. The impact of ground works on the small remaining areas of unstripped ground has been assessed as slight. When the predicted impact of the proposed development at Indaver is combined with the development by Highfield Solar Ltd., no significant negative direct nor indirect cumulative effects are predicted on the overall archaeological landscape.	
	Landscape and Visual: This development is over 4km from the Caranstown WtE facility and will not result in any cumulative noise impact to the surrounding environment. Due to the scale, nature and distant location of the development and given that the assessed impacts of the proposed development are imperceptible/not significant, this development does not have any potential to alter the significance of effects associated with the proposed development. Any cumulative effect will be imperceptible/not significant.	

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
	Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Land and Soils: Section 7.8.4 of the Inspector's Report[9] (2017) reported that '[…] *the construction process outlined for the solar farm to be relatively low impact from a geotechnical perspective, with significant earthworks only occurring for the access tracks, substations and cable routes'*. As such, there is no potential for significant negative direct not indirect cumulative impacts on land, soils and hydrogeology as a result of the proposed and planned development.	
	Water: Given the nature and scale of the planned works (solar farm), surface water emissions will not be significant. The Inspector's Report[10] (2017), in Section 7.8.10 the Inspector stated, '*I am satisfied that the proposed development would not negatively impact on current drainage patterns or be at significant risk of fluvial flooding*'. Therefore, it is concluded that there is no potential for significant negative direct or indirect cumulative effects on hydrology and water quality as a result of the proposed development and the planned development (ABP Ref. PL17.248146).	
	Material Assets: It is reasonable to assume that this scheme will be constructed before construction commences for the Site Sustainability Project. In relation to material assets, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Major Accidents and Disasters: The new development at Highfield Solar is at a much further distance from Indaver than the developments at Irish Cement. There is no risk to the planned development at Highfield Solar arising from the activities or the planned activities at Indaver. In conclusion, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from major accidents or disasters associated with the Indaver Site Sustainability Project in combination with the project above.	
Highfield Solar Ltd.	**Population and Human Health**: Should the construction of the planned substation and the proposed development occur concurrently, there is potential for temporary indirect effects on population due to increased construction traffic and nuisances associated with site activities (dust, noise). However, given the location of the of the planned development, it is unlikely there will be significant indirect	

[9] Available for inspection from An Bord Pleanála: http://www.pleanala.ie/casenum/248146.htm
[10] Available from An Bord Pleanála, http://www.pleanala.ie/documents/reports/248/R248146.pdf

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
PL17 .303568 **Electrical substation (110kV)**	cumulative effects on population during construction. No significant direct or indirect cumulative effects on population or human health are predicted during the operation of the planned and proposed developments as there will be no emissions from the substation	
	Traffic and Transport: Construction is underway however, the estimated opening date is unknown. It is assumed that this scheme will be constructed before construction commences for the Site Sustainability Project. Operationally, this development will have a negligible impact. Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	None
	Air Quality: Cumulative air quality impacts associated with the electrical substation development are not envisaged due to the low volume of construction required. There are no emissions to atmosphere associated with the operational stage of this development. Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Climate: The electrical substation development will allow for the renewable electricity generated by the solar farm development to be transported to the national grid. This will have a positive impact on climate by reducing the reliance on fossil fuels and increasing the capacity of renewable energy available on the national grid. Cumulative impacts are considered neutral and therefore there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Noise and Vibration: This development is over 4km from the Caranstown WtE facility and will not result in any cumulative noise impact to the surrounding environment. Therefore, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the project above.	
	Biodiversity: Proposed electrical substation and associated 110kV and MV infrastructure required to connect ground mounted solar PV generation to the electrical transmission system, underground cabling and all associated ancillary site development work. SID application. In the absence of significant emissions to air or water no significant cumulative impact on ecology has been identified. Therefore, there is no potential for significant negative direct nor indirect cumulative effects on biodiversity as a result of the proposed and planned development	
	Archaeology, Architecture and Cultural Heritage: The majority of the proposed development lies within the footprint of ground which has already been archaeologically resolved and is predominantly brownfield. The impact of ground works on the small remaining areas of unstripped ground has been assessed as slight. When the predicted impact of the proposed development at Indaver	

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
	is combined with the development by Highfield Solar Ltd., no significant cumulative negative direct nor indirect effects are predicted on the overall archaeological landscape.	
	Landscape and Visual: This development is over 4km from the Caranstown WtE facility and will not result in any cumulative noise impact to the surrounding environment. Due to the scale, nature and distant location of the development and given that the assessed impacts of the proposed development are imperceptible/not significant, this development does not have any potential to alter the significance of effects associated with the proposed development. Any cumulative effect will be imperceptible/not significant. Thus, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the projects above.	
	Land and Soils: Section 6.6.1 of the Inspector's Report (2019) referred to the Chief Executive's Report from Meath County Council which stated they were satisfied that '*the underlying geology of the area will not be unduly impacted upon by the proposed development*'. As such, there is no potential for significant negative direct nor indirect cumulative impacts on land, soils and hydrogeology as a result of the proposed and planned development.	
	Water: In Section 8.5.5 of the Inspector's Report[11] (2019) prepared by An Bord Pleanála, the Inspector stated that '*I consider that the attenuation and disposal of surface water associated with the proposed development is generally acceptable'*. Therefore, it is concluded that there is no potential for significant negative direct or indirect cumulative effects on hydrology and water quality as a result of the proposed development and the planned development (ABP Ref. PL17.303568).	
	Material Assets: It is assumed that this scheme will be constructed before construction commences for the Site Sustainability Project. In relation to Material Assets, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from the Indaver Site Sustainability Project in combination with the projects above.	

[11] Available from An Bord Pleanála, http://www.pleanala.ie/documents/reports/303/R303568.pdf

Plan/Project Ref No	Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact (if any)
	Major Accidents and Disasters: The new development at Highfield Solar is at a much further distance from Indaver than the developments at Irish Cement. There is no risk to the planned development at Highfield Solar arising from the activities or the planned activities at Indaver. In conclusion, there is no potential for any significant negative direct nor indirect cumulative impacts to arise from major accidents or disasters associated with the Indaver Site Sustainability Project in combination with the project above.	

Table 18.3 Likely significant direct, indirect and cumulative effects[12] assessment of all projects listed in Table 18.1 taken together in combination with the proposed development

Plan/Project Ref No	Potential Cumulative Impacts on Environmental Factors	Overall Cumulative Impact (if any)
Cumulative impact assessment of all projects listed in Table 18.1 together with the proposed development.	**Population and Human Health**: Overall, taking all of the projects together in-combination with the proposed development, cumulative population and health effects during the construction phase have been assessed to be imperceptible. Cumulative operational phase effects are also imperceptible.	None
	Traffic and Transportation: From a traffic perspective, taking the Indaver Site Sustainability Project in in combination with all of the five projects listed above, it is considered that there is no potential for any significant negative direct or indirect cumulative impact to arise given the differences in construction programmes and construction routes and operational traffic flows between the projects.	
	Air Quality: Taken together, cumulative air quality impacts during the construction phase have been assessed to be imperceptible. Cumulative operational phase impacts are long-term and insignificant.	
	Climate: Cumulative impacts are considered neutral in terms of climate.	
	Noise and Vibration: The predicted noise effects associated with the proposed development at the Caranstown WtE facility are therefore well below those in the existing noise environment and hence will be imperceptible in terms of noise to its surrounding environment. On review of the projects discussed above, given their distance to the WtE facility and /or the low predicted noise levels associated with each, the cumulative effect of all projects operating simultaneously will result in a negligible change in the prevailing noise environment. The cumulative noise impact is determined to be not significant.	
	Biodiversity: It has been concluded that should the construction of any of the developments mentioned above occur concurrently, the potential cumulative effects will not be significant, given the distances involved, the implementation of standard construction environmental measures, the limited risk of significant effects, the dilution provided in the nearby watercourses and the distance from Natura 2000 sites. In the absence of significant emissions to water or air during operation or impacts from noise, no significant cumulative impacts on biodiversity during operation have been identified.	

[12] It is noted that the terms “effects” and “impacts” are used interchangeably in this chapter and assessment.

Plan/Project Ref No	Potential Cumulative Impacts on Environmental Factors	Overall Cumulative Impact (if any)
	When the predicted effects of the proposed development at Indaver are considered cumulatively with each planned project and cumulatively with all planned projects as a whole, it is concluded that there are no significant negative cumulative effects predicted on biodiversity.	
	Archaeology, Architecture and Cultural Heritage: The majority of the proposed development lies within the footprint of ground which has already been archaeologically resolved and is predominantly brownfield. The impact of ground works on the small remaining areas of unstripped ground has been assessed as slight. Construction work for all these projects will require some degree of ground works, which in combination could have an impact on hitherto unknown subsurface archaeological finds or features. This would ultimately have a cumulative effect on the archaeological landscape in the vicinity of the Indaver development site and in the wider area. The more extensive the area of ground to be disturbed, the greater the risk of negatively impacting on potential subsurface archaeological finds or features. If such features are preserved by record they will be permanently removed from the archaeological landscape.	
	Landscape and Visual: Overall, given the relatively small scale of the built elements in the proposed development, their location and positioning within the existing facility site and the existing industrial context within which they are placed, it is the assessor's judgement in this case, that there are no additional effects caused by the proposed development when considered in conjunction with any of the listed proposed/permitted developments of the same or different types, which could be considered likely to create cumulative effects. These developments (as listed in Table 18.1), do not have any potential to alter the significance of effects associated with the proposed development. Any cumulative effects will be imperceptible/not significant.	
	Land and Soils: A review of these projects has shown there are no planned projects which could contribute to any potential significant negative direct nor indirect cumulative effects on the land, soils or hydrogeology during operation of the proposed development. When the predicted effects of the proposed development at Indaver are considered cumulatively with each planned project and cumulatively with all planned projects as a whole, it is concluded that there are no significant negative cumulative effects predicted on soils, geology or hydrogeology.	
	Water: From a water perspective, taking the Indaver Site Sustainability Project in combination with all of the five projects listed above, it is considered that there is no potential for any significant negative direct or indirect cumulative impact to arise given the location of the proposed development, the difference in construction programmes and the implementation of mitigation measures.	

Plan/Project Ref No	Potential Cumulative Impacts on Environmental Factors	Overall Cumulative Impact (if any)
	Material Assets: It is anticipated that the scale of the construction materials market in Ireland and the utilities capacity in the area are such that there will not be any significant negative direct or indirect cumulative impacts on material assets as a result of the proposed development.	
	Major Accidents and Disasters: Taking the Indaver Site Sustainability Project in in combination with all of the five projects listed above, it is considered that there is no potential for any significant negative direct or indirect cumulative impacts to arise from major accidents or disasters, given the distance of these permitted projects and the proposed Site Sustainability Project.	

18.4 Interactive Effects

18.4.1 Overview

All environmental factors are inter-related to some extent, and the relationships can range from tenuous to inextricable. The interactions between the identified environmental impacts have already been considered and assessed within the individual chapters of this EIAR. There have been numerous discussions and communications between the environmental specialists and the design team throughout the design process which helped to identify and minimise the potential for significant interaction of impacts. Measures to minimise impacts have been incorporated into the design and are also included in all of the assessments and the residual impacts have been assessed.

Table 18.4 presents the potential interactions between the environmental factors in a matrix format. It examines the potential for the environmental factor or issue in the left hand column to have an impact on the environmental factor listed in the top row of the matrix as a result of the proposed development. As discussed above, these potential interactions of impacts were identified throughout the design process and measures addressing these impacts have already been included within the individual chapters of this EIAR. The paragraphs following **Table 18.4** present an assessment of the potential interactions of impacts, mitigation measures and residual impacts. This assessment is based on information contained within this EIAR and the outcome of discussions and interactions between the environmental specialists and the design team.

The effects matrix examines the potential for the environmental effect in the left-hand column to have an interactive or indirect effect on the environmental medium listed in the top row of the matrix.

If there is the potential for an effect during the construction, this is indicated by a ‘C’.

An ‘O’ indicates the potential for an effect during the operational phase.

‘CO’ indicates the potential for an effect during construction and/or operational phases.

If there is considered to be no potential for an effect, this is indicated by ‘-‘.

Table 18.4: Interactive Effects Summary Matrix

Key Environmental Interaction Matrix	Population and Human Health	Traffic and Transportation	Air Quality	Climate	Noise and Vibration	Biodiversity	Archaeology, Architectural and Cultural Heritage	Landscape and Visual	Land and Soils	Water	Material Assets	Major Accidents and Disasters
Population and Human Health		CO	-	-	-	-	-	-	-	-	-	-
Traffic and Transportation	CO		CO	CO	CO	C	-	-	-	-	-	-
Air Quality	CO	-		-	-	CO	-	-	-	-	-	-
Climate	-	-	-		-	-	-	-	-	-	-	-
Noise and Vibration	CO	-	-	-		C	-	-	-	-	-	-
Biodiversity	-	-	-	-	-		-	-	-	-	-	-
Archaeology, Architectural and Cultural Heritage	-	-	-	-	-	-		-	-	-	-	-
Landscape and Visual	O	-	-	-	-	-	O		-	-	-	-
Land and Soils	-	C	C	-	-	C	C	-		C	-	-
Water	-	-	-	-	-	C	-	-	-		-	-
Material Assets	-	CO	-	O	-	-	-	-	-	-		-
Major Accidents and Disasters	CO	-	-	-	-	C	-	-	C	C	-	

18.4.2 Potential Interactions

18.4.2.1 Population and Human Health and Traffic and Transportation

The increase in population on the Indaver site during construction (contractors, etc.) and operation (additional employees) has the potential to increase traffic in the vicinity of the site. This potential impact was taken into account in the traffic and transportation assessment (**Chapter 7**). Significant negative residual effects will not arise.

18.4.2.2 Traffic and Transportation and Population and Human Health (via Air Quality and Noise and Vibration)

The increase in traffic associated with the proposed development has the potential to have an indirect effect on population and human health in the surrounding area through an increase in air and noise emissions.

This potential impact was taken into account in the Air Quality (**Chapter 8**) and noise and vibration (**Chapter 10**) assessment.

The change in AADT values during the construction and operational phases is not of the magnitude to require an air quality assessment as per the DMRB screening criteria. Therefore, no significant negative residual effects on air quality due to traffic are predicted.

A noise modelling assessment was completed and confirmed that the increase in traffic during the construction and operational phase of the proposed development will not result in any notable change in noise levels over existing road traffic noise levels. Therefore, no significant negative residual effects on noise and vibration are predicted.

18.4.2.3 Traffic and Transportation and Climate

The increase in traffic associated with the proposed development has the potential to have a direct impact on climate. This potential impact was taken into account in the climate assessment (**Chapter 9**).

During the construction phase, greenhouse gas emissions (in relation to an increase in traffic) during the construction phase will not be significant in the context of Ireland's total GHG emissions.

The change in AADT values during the operational phase is not of the magnitude to require a detailed climate assessment as per the DMRB screening criteria. Therefore, the traffic related CO_2 and N_2O emissions are imperceptible.

The proposed development will provide additional capacity for up to 15,000 tpa of hazardous waste. This will avoid the need for transport of this waste to mainland Europe for treatment. This will result in an overall reduction in transport-related GHG emissions due to the reduced distance for travel required.

This reduction is considered minimal but will result in a long-term, positive, imperceptible impact on climate. Thus, no significant negative residual effects are predicted.

18.4.2.4 Traffic and Transportation and Biodiversity

The increase in traffic as a result of the proposed development has the potential to have an indirect effect on biodiversity through increased noise emissions. The potential interactive effects of noise and biodiversity are described below in **Section 18.4.2.8**.

18.4.2.5 Air Quality and Population and Human Health

A potential interaction between air quality and population and human health during the construction phase of the proposed development was identified. Dust and other emissions generated during the construction works could have the potential to affect the surrounding population. Mitigation measures are proposed in **Section 8.6.1** of **Chapter 8 *Air Quality.*** The conclusion of the assessment **(Section 8.8.1)** is that "*provided the dust minimisation measures outlined in Section 8.6.1 are implemented construction stage impacts to air quality are predicted to be short-term and not significant*".

Impacts to air quality during operation are not significant therefore no mitigation is proposed. The site will continue to operate within the EPA IE licence conditions set for the plant, which will ensure no significant impacts to air quality occur.

As such, no significant negative residual effects on population and human health are predicted.

18.4.2.6 Air Quality on Biodiversity

Chapter 8 *Air Quality* concluded that the Waste to Energy Process (WtE) would be expected to be the dominant source of air emissions associated with the facility. The majority of this increase is intended for the treatment of aqueous wastes which, when evaporated, is converted to water vapour in the flue gas flow. As the flue gas flow is corrected to standard, dry conditions, the total flue gas flowrate will not increase. In any event, the facility will still be obligated to comply with its licensed emission limit values and maximum flue gas flowrate and thus the increase in waste tonnage proposed will not cause a significant impact to the ambient air quality.

It has been concluded that in the absence of any significant impacts on air quality, the effect on fauna via direct toxicological impacts or via bioaccumulation will be imperceptible.

18.4.2.7 Noise and Vibration and Population and Human Health

A potential interaction between noise and vibration and population and human health during the construction and operational phases of the proposed development was identified. Mitigation measures are proposed in **Section 10.6** of **Chapter 10** ***Noise and Vibration.***

The conclusion of the operational noise assessment **(Section 10.8.1)** is that "*cumulative operational noise levels associated with the existing and proposed development can continue to operate within the facilities IED noise emission limits. The overall effect is imperceptible to not significant when added to the prevailing noise environment.*

The conclusion of the construction noise assessment **(Section 10.8.2)** is that significant residual effects will not arise.

Therefore, no significant negative residual effects are predicted.

18.4.2.8 Noise and Vibration and Biodiversity

Increased noise emissions have the potential to have a direct effect on biodiversity during the construction of the proposed development. As discussed in **Section 11.5.1** of **Chapter 11** ***Biodiversity***, bats which use the Indaver site, albeit in small numbers, are currently habituated to existing noise and activity levels and given no significant changes in the management of the facility will occur, bats are likely to continue to use the site during and post construction. Similarly, birds would already be habituated to the noise and disturbance of the existing Indaver facility and therefore should continue to use these fields during and after construction of the proposed development.

With regard to otter species, noise associated with construction works will be of negligible significance in the context of otter's largely nocturnal habits, ability to move away from short-term disturbance and the negligible significance of increased noise and disturbance in the context of existing noise levels at the Indaver facility.

18.4.2.9 Landscape and Visual and Population and Human Health

A number of photomontages were prepared to assess the potential landscape and visual effect of the proposed development on population and human health.

The main potential sources of impact are likely to arise from the height, scale and mass of the proposed buildings, tanks, etc. The impacts on landscape and on visual amenity are however considered to be unlikely to be of a significant scale, given the relatively small scale of the proposed developments compared to the existing facility and the dominating presence of the nearby cement works.

Thus, no significant negative residual effects are predicted on population.

18.4.2.10 Landscape and Visual and Cultural Heritage

The potential interaction between landscape and visual and cultural heritage was considered in relation to Brú na Bóinne.

Chapter 13 ***Landscape and Visual*** assessed the views and prospects and concluded that the proposed development will not perceptively impact on the sensitive views from Brú na Bóinne or indeed from any views from distance.

18.4.2.11 Land and Soils and Traffic and Transportation

Excavated material will be required to be removed off-site and this will result in an increase in construction traffic. This has been assessed in **Chapter 7** ***Traffic & Transportation***. No significant negative residual effects are predicted.

18.4.2.12 Land and Soils and Air Quality

The excavation of land and soils will generate dust emissions during the construction. This has been assessed in **Chapter 8** ***Air Quality***. With the implementation of mitigation measures, no significant negative residual effects are predicted.

18.4.2.13 Land and Soils and Biodiversity

The proposed development will include the removal of habitats on site to facilitate the construction works. There will be no significant direct loss of the habitats given the low value of the habitats identified on site to be removed.

Construction activities such as excavation works, and truck movements have the potential to have an indirect effect on biodiversity due to the generation of dust. Following the implementation of standard dust minimisation measures construction stage impacts to air quality are predicted to be short-term and not significant. Given that there are no sensitive or high value habitats within the site or in proximity to it, any impacts from dust generation will be short-term and imperceptible.

18.4.2.14 Land and Soils and Archaeology, Architecture and Cultural Heritage

Excavation of land and soils during the construction phase of the proposed development has the potential to have a direct effect on archaeology.

It is possible that hitherto unknown archaeological finds or features may be present under the overhead power line in Area 13 and under the berm in Areas 1 and 2 (ref. **Figure 4.4** of **Chapter 4** ***Description of the Proposed Development***) where the land has not been disturbed previously. The potential impact of construction works in these areas has been assessed as slight given that no archaeological finds or features were found in proximity to Areas 1 and 2 and given the limited area of ground to be disturbed in Area 13.

During construction, archaeological monitoring will be carried out in these areas.

Therefore, no significant negative residual effects are predicted.

18.4.2.15 Land and Soils and Water

Excavation works during construction have the potential to cause a direct impact on water quality through siltation as a result of runoff.

This could result in a short-term moderate slight effect. However, the implementation of suitable mitigation measures as detailed in **Chapters 14** ***Land and Soils*** and **15** ***Water***, will ensure that there will be no significant negative effects on water quality.

18.4.2.16 Water and Biodiversity

The potential for surface water to become polluted through spillages such as hydrocarbon leaks (fuel/oil/lubricants) from construction machinery or by siltation as a result of run-off during construction has the potential to have a direct effect on biodiversity, specifically the aquatic ecology.

However, the potential impacts on water quality are low as the drainage ditches within the site boundary are seasonal and will not have running water during dry periods. Given the short term nature of construction works, the existing surface water management systems, the implementation of standard mitigation measures, the limited and seasonal flow in drainage ditches and the Cruicerath Stream and the dilution provided in the River Nanny (located approximately 2km south), any direct impacts on water quality and aquatic ecology will be localised, short term and not significant during construction works and imperceptible in the long term.

During operation, there is a potential interactive effect from storm water runoff on aquatic ecology. However, the existing storm water drainage system on site has sufficient capacity to adequately deal with any additional surface water arising from the expanded site during operation. Existing controls are already in place to deal with sanitary services, prevention of potential accidents and spillages, unloading of aqueous liquid wastes, management of firewater and transport of bottom ash and flue gas residues.

18.4.2.17 Material Assets and Traffic and Transportation

The import of engineering fill material and crushed stone and the export of surplus material from site is required during the construction phase of the proposed development and could have a potential interactive effect on traffic and transportation due to the number of vehicle movements required to transport the material to and from site. This interaction was assessed in **Chapter 7** ***Traffic and Transportation***. The assessment concluded that there will be no residual effects associated with the construction of the proposed development.

18.4.2.18 Material Assets and Climate

During operation, the proposed development has the potential to generate approximately 160 tonnes of hydrogen gas for use as a clean fuel each year. This is generated from 10 GWh of electricity which would otherwise be lost as waste heat to the atmosphere over the air-cooled condenser on site.

As assessed in **Chapter 9 *Climate***, the generation of this hydrogen gas has the potential to offset greenhouse gas emissions and has a positive interactive effect on climate during the operation of the proposed development.

18.4.2.19 Major Accidents and Disasters and Population and Human Health

During the construction of the proposed development there is a potential interaction of effects associated with human health and major accidents with regards to hazards associated with construction works as would be the case for any construction works. There are no special or unique hazards associated with the construction of the plant on this particular site that would not be encountered on any typical construction site for an industrial building. As discussed in **Section 5.14** of **Chapter 5 *Construction Activities***, a Health and Safety Plan will be prepared which will address health and safety issues from the design stages through to the completion of the construction and maintenance phases as required by the Safety, Health and Welfare at Work (Construction) Regulations 2013.

During operation phase, the HAZID&RA prepared identified potential accident scenarios for the existing facility and those associated with the proposed development for example bunker fire (existing scenario) and fire/explosion at the hydrogen generation unit (under the proposed development scenario). As described in **Section 17.6.2** of **Chapter 17 *Major Accidents and Disasters***, with all the existing and proposed site risk reduction measures in place, the risks associated with the identified accident scenarios were considered to be as low as reasonably possible (ALARP).

18.4.2.20 Major Accidents and Disasters and Land, Soils, Water and Biodiversity

There is potential for the proposed development to have an interactive effect on land, soils, water and biodiversity during the construction and operation of the proposed development under certain accident scenarios that were identified by the HAZID&RA.

For example, there is the risk of spills or leaks which could enter the ground and streams however effective implementation of the construction environmental management plan (CEMP) will help to reduce the risks to the environment associated with the construction phase of the project.

Accident scenarios were identified for the operation phase of the project for both the existing site and proposed development that could potentially impact land, soils, water and biodiversity. However, as described in **Section 17.6.2** of **Chapter 17 *Major Accidents and Disasters***, with all the existing and proposed site risk reduction measures in place, the risks associated with the identified accident scenarios were considered to be as low as reasonably possible (ALARP).

18.5 Transboundary Effects

18.5.1 Introduction

This section describes potential transboundary effects from the proposed Site Sustainability Project. The potential for transboundary effects arises as follows:

- Bottom ash could possibly be exported from the proposed development to continental Europe for recovery if there are no landfill or recovery options available at a given time. Refer to **Section 18.5.2** below.
- Boiler ash and flue gas cleaning residues from the proposed development will be transported to a salt mine facility in Northern Ireland (Carrickfergus, Co. Antrim) or to continental Europe (Hattorf and Wintershall Reutilisation Facility, which is an underground salt mine in Germany). Refer to **Section 18.5.3** below.
- Non-ferrous metals will be exported for treatment to mainland Europe.

18.5.2 Shipment of Bottom Ash to Continental Europe

Bottom ash is currently sent to three main landfill outlets for recovery as daily cover or as a road construction material on the landfill itself. Three landfills are currently utilised for this process, Knockharley Landfill Limited, Drehid Landfill and Ballynagran Landfill. This will continue for the additional bottom ash produced as a result of the proposed development (Refer also to **Section 4.4.1** of **Chapter 4 *Description of the Proposed Development*** for further details on bottom ash volumes).

Section 16.5.3.10 of **Chapter 16 *Material Assets*** presents a detailed description of the existing available landfill options for bottom ash in Ireland. This also includes a detailed description of the existing licencing process for landfills. The existing licensing process which all landfills in Ireland are subject to, requires compliance with an ongoing environmental monitoring regime in the form of stringent licence conditions. This comprehensive monitoring regime ensures that material such as bottom ash when sent to landfill for recovery or disposal will not have a material environmental impact.

Section 16.5.3.10 of **Chapter 16 *Material Assets*** notes that bottom ash (including the additional bottom ash produced) may be exported to outlets in Europe which are already able to recover aggregates from bottom ash if there is no landfill capacity in Ireland. To provide for this alternative, the bottom ash storage building has been proposed and is described in **Section 4.5.5** of **Chapter 4 *Description of the Proposed Development*.**

Should this option be availed of, the bottom ash would be stored on site in the bottom ash storage building until there is enough for export in a bulk consignment. Covered trucks would bring the bottom ash from the site to Drogheda Port for loading into a vessel, typically over a two or three-day period in the same vehicles that would transport the material to a national treatment facility if it were available.

Therefore, the potential for transboundary effects has been considered in this EIAR.

Bottom ash from waste incineration in EU countries, including the UK, Netherlands and Belgium, is processed for use as an aggregate in construction of roads or other large-scale projects. This processed material is known as incinerator bottom ash aggregate (IBAA).

The Green Deal Programme agreed between the Dutch Waste Management Association and the Dutch government represents an example of such reuse and specifies that at least half of the bottom ash produced will be suitable for use as 'freely applicable building material' since 2017.

There are currently a number of proposed bottom ash recovery developments in Ireland including Beauparc, Co. Meath and Drehid, Co. Kildare. If these developments become operational in the future, then they would provide an alternative to the current options of sending this material to landfill for recovery or disposal and the export of the bottom ash for recovery.

Section 16.5.3.10 of **Chapter 16** ***Material Assets*** notes that as the export of bottom ash material would involve movement to another EU county, the requirements of Regulation (EC) No 1013/2006 of 2006 on shipments of waste would also need to be adhered to. The transfrontier shipment (TFS) of waste deals with the movement of waste between countries. A TFS will be sought to facilitate the shipment of this waste to Europe if this arises. The overall objective of the TFS Regulation is to implement measures for the supervision and control of shipments of waste in order to ensure that the movement, recovery, or disposal of waste, is managed in an environmentally sound manner, for the protection of the environment and human health. The Transfrontier Shipment of Waste (TFS) process is described in **Section 4.10.4** of **Chapter 4** ***Description of the Proposed Development.***

Section 16.5.3.10 of **Chapter 16** ***Material Assets*** notes that the bottom ash residues from the plant are currently characterised as non-hazardous. The manner in which this material is treated and transported is dependent upon how this material is classified and characterised which may be hazardous or non-hazardous. Commission Regulation (EU) No. 1357/2014 and Commission Decision 2014/955/EU are utilised to determine the manner in which bottom ash may be characterised as non-hazardous or hazardous.

Section 16.5.3.10 of **Chapter 16** ***Material Assets*** notes that should bottom ash be found to be a hazardous waste at some point in the future, the above treatment options are still suitable as the physical nature and composition of the bottom ash would not have changed. However, in this instance the facility accepting the waste would have to be licensed to accept this type of hazardous waste. Currently hazardous waste is exported from Ireland by ship for treatment in waste-to-energy facilities in Europe.

Therefore, the potential shipment of bottom ash to continental Europe is not likely to have significant negative effects on the environment. Thus, significant transboundary effects will not arise.

18.5.3 Transport of Boiler Ash and Flue Gas Cleaning Residues Northern Ireland and/or Continental Europe

Boiler ash and flue gas cleaning residues from the existing facility are currently shipped (un-treated) from the site to the Hattorf and Wintershall Reutilisation Facility, which is an underground salt mine in Germany. The facility has been approved for the reutilisation by the relevant authorities in Germany.

In 2017 a similar salt mine facility in Northern Ireland attained planning consent and an environmental permit to operate as a recovery facility for hazardous residues from waste to energy facilities. This facility in Carrickfergus, Co. Antrim has been accepting pre-treated boiler ash and flue gas cleaning residues from the existing waste-to-energy facility since October 2018 and the facility is also suitable for receiving the additional residues from the proposed development.

The salt mines in Germany and Northern Ireland are required to comply with the requirements of the EIA Directive and therefore were subject to the EIA process prior to the acceptance of any waste material. This Directive on Environmental Assessment aims to provide a high level of protection of the environment and to contribute to the integration of environmental considerations into the development of projects such as salt mines accepting hazardous waste with a view to reducing their environmental impact.

Similarly, the existing licensing process which all of these salt mines are subject to, requires compliance with an ongoing environmental monitoring regime in the form of stringent licence conditions.

The issuing of such licences by competent authorities pursuant to the requirements laid down in the Waste Framework Directive stipulate that all necessary safety and precautionary measures, monitoring and control operations and closure and after-care provisions must be included in the granting of all such licences.

Such conditions set out the legal constraints under which salt mines must operate in order to ensure that all operations are conducted in compliance with the requirements of the Waste Framework and Landfill Directives and do not cause environmental pollution.

Refer further to **Section 16.5.3.11** of **Chapter 16** ***Material Assets*** for further detail on environmental aspects associated with the disposal of boiler ash and flue gas cleaning residues in salt mines.

The Transfrontier Shipment of Waste (TFS) process is described in **Section 4.10.4** of **Chapter 4** ***Description of the Proposed Development.*** A TFS is already in place for the export of treated boiler ash and flue gas cleaning residues between the existing Indaver facility in Meath and the existing salt mine facility in Carrickfergus, Northern Ireland. A TFS is also in currently place for the export of untreated boiler ash and flue gas cleaning residues between the existing Indaver facility in Meath and the Hattorf and Wintershall Reutilisation Facility, salt mine in Germany.

Additional boiler ash and flue gas cleaning residues will be generated from the proposed development. The additional volumes are presented in **Section 16.5.3.11** of **Chapter 16** ***Material Assets***. It is intended that the additional residues will be transported primarily to the salt mine facility in Northern Ireland (Carrickfergus, Co. Antrim) or to continental Europe (Hattorf and Wintershall Reutilisation Facility will be used as a back-up). Both of those facilities have the capacity to accommodate the additional residue volumes.

New TFSs or modifications to the existing TFSs (for both the Northern Ireland facility and the Hattorf and Wintershall Reutilisation Facility) will be sought to accommodate the increase in boiler ash and flue gas cleaning residues proposed as part of the proposed development.

As noted in **Section 16.5.3.11** of **Chapter 16** ***Material Assets***, Van Den Bosch is an international logistics services provider which transports un-treated boiler ash and flue gas cleaning residues for Indaver. Van Den Bosch confirmed that in the 51 years of its history none of its containers has ever fallen overboard and no ship has sunk with its containers on board.

If the un-treated boiler ash and flue gas cleaning residues come in contact with water, they will solidify. Thus, if there was a shipping accident, and the container entered the sea and was holed, the boiler ash and flue gas residues would solidify on contact with water. The solidified boiler ash and flue gas residues could then be removed from the seabed along with the container truck.

In addition, the monolithic pre-treated residues sent to Carrikfergus are already in block rom as mentioned previously in **Section 16.5.3.11** of **Chapter 16** ***Material Assets***: "*As the material is already pre-treated and is in a solid monolithic form, as described in Section 4.5.6 of Chapter 4 Description of the Proposed Development, the transport of the pre-treated material is not likely to have significant negative effects on the environment*."

Therefore, the potential treatment of the boiler ash and flue gas cleaning residues is not likely to have significant negative effect on the environment. Thus, significant transboundary effects will not arise.

18.5.4 Non-Ferrous Metal Recovery

Ferrous metals are currently sent for recovery in Ireland and non-ferrous metals are exported to mainland Europe for recovery. (Refer also to **Section 4.4.1** of **Chapter 4** ***Description of the Proposed Development*** for further details).

Section 16.5.3.12 of **Chapter 16** ***Material Assets*** notes that additional volumes of ferrous and non-ferrous metals will be generated as a result of the proposed development. **Section 16.5.3.12** of **Chapter 16** ***Material Assets*** notes that same facilities that are currently utilised by the existing plant will be utilised for this additional material. Before granting the licence or permit, the competent authority will have already considered the effects on the environment of the facility accepting this material through the licence or permit application process. Consequently, the recovery or recycling of the additional non-ferrous metals is not likely to have a significant negative effect on the environment.

The recovery or recycling of the non-ferrous metals is expected to have a minor positive effect on the environment. Thus, significant transboundary effects will not arise.

18.6 Do-Nothing Scenario

The Do-Nothing Scenario (i.e. a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline thereof without implementation of the proposed development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge) is provided in each of the specialist of chapters. Refer to **Chapters 6-17** of the EIAR.

Each specialist assessment chapter (Ch 6 – 17) includes a detailed description of the baseline conditions with regard to the specific environmental aspect based on the best available environmental information and scientific knowledge. Each of these specialist assessments also includes an outline of the potential changes from the baseline scenario without the implementation of the project. In conclusion, if the project were not to proceed, significant adverse effects on the environment would not arise.

For clarity, the “Do-Nothing scenario” in the context of a “Do-Nothing Alternative” is discussed in **Chapter 3 *Alternatives***.

18.7 References

Department of Housing, Planning and Local Government (2018) Circular PL 05/2018 -Transposition into Planning Law of Directive 2014/52/EU amending Directive 2011/92/EU on the effects of certain public and private projects on the environment (the EIA Directive);

Department of Housing, Planning, Community and Local Government (2017) Key Issues Consultation Paper on the Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems;

Department of Housing, Planning, Community and Local Government (2017) Circular PL 1/2017 - Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive): Advice on the Administrative Provisions in Advance of Transposition;

Department of the Environment, Community and Local Government (2013) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment;

Environmental Protection Agency (2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft August 2017);

European Commission (2017) Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report;

European Commission (1999) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions;

Government of Ireland (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018);

Louth County Council (2020) Find a Planning Application Available at: http://www.eplanning.ie/LouthCC/searchtypes

Meath County Council (2020) View or Search Planning Applications Available at: https://www.meath.ie/council/council-services/planning-and-building/planning-permission/view-or-search-planning-applications

An Bord Pleanála (2020) Strategic Housing Development Applications Available at: http://www.pleanala.ie/shd/applications/index.htm

An Bord Pleanála (2020) Strategic Infrastructure Development Applications (SID) Available at: http://www.pleanala.ie/sid/

19 Summary of Mitigation and Monitoring Measures

19.1 Introduction

This chapter provides a summary of the proposed mitigation and monitoring measures associated with the proposed development (as identified in **Chapters 6** to **17**).

A number of safeguards and management measures have been identified in order to mitigate negative environmental effects during construction and operation. It should be noted that the project already includes any inherent measures and elements that have been incorporated in the design. Further, any environmental management measures during construction that have been identified and are associated with construction activity and methodology are documented in the ***Construction Environmental Management Plan*** (CEMP) which is available as **Appendix 5.1** in **Volume 3** of this EIAR.

19.2 Construction Mitigation and Monitoring Measures (Assessment Chapters)

19.2.1 Population and Human Health

Construction phase mitigation measures relating to those factors under which population and human health effects might occur have been addressed elsewhere in this EIAR, under the environmental factors for traffic and transportation, air quality and noise and vibration. Other than the mitigation measures outlined in **Section 19.2.2 Traffic and Transportation**, **Section 19.2.3 Air Quality**, **Section 19.2.5 Noise and Vibration**, **Section 19.2.9 Land and Soils**, **Section 19.2.10 Water** and **Section 19.2.12 Major Accidents and Disasters** below, no further mitigation measures are proposed with respect to population and human health.

19.2.2 Traffic and Transportation

Construction hours will be from 07:00-19:00. This will result in construction personnel arriving on site before 07:00 and departing after 19:00, thereby avoiding the peak hours on the local road network.

Furthermore, HGV traffic associated with the construction of Phases 1 and 2 will not be permitted to route through Duleek Village.

A Construction Traffic Management Plan (CTMP) will also be in place for the duration of the construction phases of the proposed development (see Section 9 of the ***Construction Environmental Management Plan*** in **Appendix 5.1** of **Volume 3** of this EIAR). This will be agreed with Meath County Council in advance of commencement of construction, and the overall goal of the CTMP will be to minimise insofar as possible the potential impacts arising from the construction phase of the development on the local road network.

19.2.3 Air Quality

Construction activities are likely to generate some dust emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction.

The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within 200m of the construction area. The measures to be implemented will include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted, and this speed restriction will be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
- Hoarding or screens shall be erected around works areas to reduce visual impact. This will also have an added benefit of preventing larger particles of dust from travelling off-site and impacting receptors.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

19.2.4 Climate

As impacts to climate are imperceptible no mitigation is proposed.

19.2.5 Noise and Vibration

The impact assessment has determined that construction activities can comply with the construction noise and vibration criteria included in **Section 10.5.2.1** of **Chapter 10** ***Noise and Vibration*** of this EIAR at the closest noise sensitive locations. Notwithstanding this, best practice control measures from BS5228-Parts 1 and 2 are included. BS5228 offers detailed guidance on the control of noise and vibration from demolition and construction activities that will be complied with during the construction phase. Various mitigation measures should be considered and applied during the construction phase and specific examples of such measures are:

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise;
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract;
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers;
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use;
- Any plant, such as generators or pumps that is required to operate outside of normal permitted working hours will be surrounded by an acoustic enclosure or portable screen.

BS 5228 -1:2009+A1 2014 includes guidance on several aspects of construction site practices, which include, but are not limited to selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise monitoring.

The ***Construction Environmental Management Plan*** (CEMP) prepared as part of this EIAR (see **Appendix 5.1**) summarises the overall environmental management strategy that will be adopted and implemented during the construction phase of proposed development. The CEMP is a working document and will be finalised by the Contractor following appointment and prior to commencing works on site. For the control of noise, the contractor will be required to conduct construction noise predictions prior to works taking place and put in place the most appropriate noise control measures depending on the level of noise reduction required at any one location.

Further comment is offered on these items in the following paragraphs, however specific control measures will be chosen depending on the works involved and the noise reduction required.

19.2.5.1 Selection of Quiet Plant

The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item of plant will be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action will be to identify whether or not said item can be replaced with a quieter alternative.

For static plant such as compressors and generators used at work areas such as construction compounds etc., the units will be supplied with manufacturers' proprietary acoustic enclosures where possible.

19.2.5.2 General Comments on Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant, or the application of improved sound reduction methods in consultation with the supplier or the best practice use of equipment and materials handling to reduce noise.

- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant will be switched off when not in use and not left idling.
- For piling plant, steady continuous noise such as that generated by diesel engines, it is possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover.
- For all materials handling, the contractor will ensure that best practice site noise control measures are implemented including ensuring that materials are not dropped from excessive heights and drop chutes/dump trucks are lined with resilient materials, where relevant.
- Where compressors, generators and pumps are located in areas in close proximity to noise sensitive properties/ areas and have potential to exceed noise criterion, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- Resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can be controlled by fixing resilient materials in between the surfaces in contact.
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

19.2.5.3 Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen, its mass, and its position relative to both the source and receiver.

In addition, careful planning of the site layout will also be considered. The placement of temporary site buildings such as offices and stores between the site and sensitive locations can provide a good level of noise screening during the phasing of works.

19.2.5.4 Hours of Work

Construction noise impacts will be controlled through strict working hours. Construction activity will take place during daytime hours Monday to Friday and Saturdays. It may be necessary to work outside of these hours for example for the consideration of safety, weather or sub- contractor availability.

Consideration will be given to the scheduling of activities in a manner that reflects the location of the site and the nature of neighbouring properties. Each potentially noisy event/activity will be considered on its individual merits and scheduled according to its noise level, proximity to sensitive locations and possible options for noise control.

19.2.5.5 Liaison with the Public

Clear forms of communication will be established between the contractor and noise sensitive areas in proximity so that residents or building occupants are aware of the likely duration of activities likely to generate higher noise or vibration.

19.2.5.6 Monitoring

During the construction phase of the proposed project, spot check noise monitoring will be undertaken at the nearest sensitive locations to ensure construction noise limits are not exceeded. Noise monitoring will be conducted in accordance with the International Standard ISO 1996: *Acoustics – Description, measurement and assessment of environmental noise* Part 1 (2016) and Part 2 (2017).

19.2.6 Biodiversity

The following mitigation measures will be implemented:

19.2.6.1 Protection of Habitats

- There will be a defined working area which will be fenced off to prevent inadvertent damage to adjoining habitats.
- To prevent incidental damage by machinery or by the deposition of spoil during site works, any habitats earmarked for retention nearby will be securely fenced or sign posted early in the construction phase. These will be clearly visible to machine operators.

- Habitats that are damaged and disturbed will be left to regenerate naturally or will be rehabilitated and landscaped, as appropriate, once construction is complete. Disturbed areas will be seeded or planted using appropriate native grass or species native to the areas where necessary.
- Any woodland habitat disturbed during construction will be replanted using a suitable mix of native species.
- Tree root systems can be damaged during site clearance and groundworks. No materials will be stored within the root protection area of semi-mature trees. Materials, especially soil and stones, can prevent air and water circulating to the roots. Retention of the existing woodland areas will provide natural screening and help to maintain biodiversity.

19.2.6.2 Protection of Water Quality and Surface Water Management

Detailed mitigation and monitoring measures in relation to water quality and preventing effects on aquatic habitats, in particular when working adjacent to or in the vicinity of ditches or streams are specified in **Section 15.5.3** and **15.6.2** of **Chapter 15** ***Water*** and in **Section 14.8.1** and **14.8.2** of **Chapter 14** ***Land and Soils.***

The surface water discharge will continue to be monitored prior to discharge and if an out of specification reading is detected all contaminated runoff will be contained within the storage tank system. No change from the current situation is required.

A ***Construction Environmental Management Plan*** (CEMP) is included as **Appendix 5.1**. It will be maintained by the Contractor for the duration of the construction phase. The CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures.

The employment of good construction management practices will minimise the risk of pollution of storm water run-off, and any deterioration in the quality or quantity of surface water. In particular, the measures detailed in **Section 15.5.3** and **15.6.2** of **Chapter 15** ***Water*** and in **Section 14.8.1** and **14.8.2** of **Chapter 14** ***Land and Soils*** will be implemented when working adjacent to or in the vicinity of ditches or streams to prevent uncontrolled runoff from the site into the watercourses. In particular, the contractor will maintain an incident and emergency response action plan which will cover all foreseeable risks, i.e. fire, flood, collapse etc. An Incident Response Plan (IRP) is located in Section 8 of the CEMP in **Appendix 5.1.**

19.2.6.3 Noise and Vibration

Mitigation measures in relation to noise and vibration are addressed in **Section 19.2.5** above of this chapter and **Chapter 10** ***Noise and Vibration*** of this EIAR.

19.2.6.4 General Ecology Protection

The Wildlife Act 1976, as amended, provides that it is an offence to cut, grub, burn or destroy any vegetation on uncultivated land, or any such growing in any hedge or ditch from the 1st of March to the 31st of August. Exemptions include the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure is intended to be provided. Nonetheless, it is recommended that vegetation is removed outside of the breeding season.

Retention of the native treelines, hedgerows and woodland along the site boundaries will reduce the loss of breeding and nesting habitat for birds. NRA guidelines on the protection of trees and hedges prior to and during construction should be followed (NRA, 2006b).

19.2.7 Archaeology, Architecture and Cultural Heritage

There will be no impact on the archaeological, architectural and cultural heritage environment for the bulk of the development on the site in areas 3-12 and 14-18 (refer to **Figure 4.4**). Hence, no archaeological mitigation measures are required for these development areas.

During construction archaeological monitoring will be carried out on areas of ground disturbance under the berm in Areas 1 and 2 and under the overhead powerline in Area 13. In the event of archaeological material being uncovered such material will be preserved *in situ*, where possible or preserved by record. Preservation *in situ* will require the relocation of the element of the development beyond the area of archaeological sensitivity.

Preservation by record will require the excavation of the archaeological material and such material will be fully resolved to professional standards of archaeological practice (Policy Guidelines on Archaeological Excavation[1] – Department of Arts, Heritage, Gaeltacht and the Islands, 1999). This work will be funded by the developer.

19.2.8 Landscape and Visual

Mitigation measures proposed during the construction stage of the development, revolve primarily around the implementation of appropriate site management procedures during the construction works – such as the storage of materials, placement of compounds, control of vehicular access, and effective dust and dirt control measures, etc. These are outlined in the ***Construction Environmental Management Plan*** prepared by Indaver, which accompanies the submission (**Appendix 5.1**).

[1] Department of Arts, Heritage, Gaeltacht and the Islands (1999) Policy Guidelines on Archaeological Excavation, https://www.archaeology.ie/sites/default/files/media/publications/excavation-policy-and-guidelines.pdf

19.2.9 Land and Soils

The mitigation measures detailed below are also relevant for the protection of surface water and are hence cross referred to in **Section 19.2.10** ***Water*** below. Also, **Section 19.2.10** outlines additional measures which will be implemented when working adjacent to or in the vicinity of ditches or streams to prevent uncontrolled runoff from the site into watercourses. Refer to **Section 19.2.10** for further details.

As outlined in **Appendix 5.1** ***Construction Environmental Management Plan*** (CEMP) of **Volume 3**, the adopted construction techniques will be completed in accordance with industry best practice guidance:

- TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan and Construction Industry Research; and
- Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).

Mitigation measures regarding land and soils will be implemented to minimise the impact on land and soils (including groundwater). These mitigation measures are designed to contain any areas within the site boundary at risk to contaminated run-off.

19.2.9.1 Excavation Works

- Where possible, excavated materials will be reused on site for backfilling purposes, re-grading and landscaping.
- All earthworks will be monitored by suitably qualified and experienced geotechnical personnel.
- Earthworks will be programmed so as not to be carried out during extreme weather events.
- There is no evidence that contaminated soil should be encountered during the site works, however if any is encountered it will be disposed of as required to a suitable authorised waste facility.

19.2.9.2 Storm water and foul water management

- In general, storm water generated on site (e.g. from excavations) will be channelled away from the watercourse and infiltrated to ground via silt traps and managed soakaways.
- Drainage from the bunded and designated storage areas will be diverted for collection and safe disposal.
- All construction foul effluent will be stored in the temporary holding tank and will be regularly disposed of off-site.
- Laydown areas will be suitably drained.

- Temporary interceptors (soak pits lined with geotextile) will be constructed as necessary during the early stages of construction mitigating against silt laden run off to the existing drainage network.

19.2.9.3 Material Storage

- Storage tanks/drums of fuel, oil, chemicals and all other materials that pose a risk to waters if spilled, will be stored in designated storage areas which will be locked when not in use.
- Bunded pallets will be used for storage of drums.
- Storage areas will be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded areas.
- Secure valves will be provided on oil and fuel storage facilities.
- Filling and draw-off points will be located entirely within the bunded areas.
- Any areas which will involve the storage of fuel and refuelling will be paved and bunded and hydrocarbon interceptors will be installed to ensure that no spillages will get into the surface water or groundwater.
- Appropriate staff will be trained in environmental issues and spill response procedures.
- The contractor will maintain an incident and emergency response action plan which will cover all foreseeable risks, i.e. fire, flood, collapse etc. An Incident Response Plan (IRP) is located in Section 8 of the CEMP in **Appendix 5.1** of **Volume 3.**

19.2.9.4 Site Hygiene

Vehicles exiting the site from excavation areas will be required to pass through wheel wash facilities to remove mud and organic material before entering main site or public roads. The discharge from the wheel wash (equipped with a filtering system) will be directed to a temporary storage tank on site and will be collected periodically for off-site treatment.

19.2.9.5 Waste Management

All waste produced on site will be transported to licensed waste disposal facilities to avoid potential soil contamination. Refer to the Construction Waste Management Plan in Section 7 of the CEMP in **Appendix 5.1** of **Volume 3.**

19.2.9.6 Monitoring

- Visual monitoring will be undertaken as part of the regular site audits during the construction of the proposed development to ensure existing surface water runoff is draining from the site and is not exposed to any contaminants.
- The contractor will be required to monitor the weather forecasts to inform the programming of earthworks and stockpiling of materials.

- Any excavation shall be monitored during earthworks to ensure the stability of side slopes and to ensure that the material excavated for disposal or re-use is consistent with the descriptions and classifications according to the waste acceptance criteria testing carried out as part of the site investigations.
- Movement monitoring shall be carried out during any activities which may result in ground movements. It is anticipated that the works will be monitored by a Resident Engineer.
- In relation to potential contamination, a suitably experienced environmental consultant will be required to oversee the excavation works for the proposed development so that potential contamination can be segregated, classified and suitably disposed.

Refer also to **Section 19.2.10** below for specific monitoring measures required for the protection of (surface) water quality.

19.2.10 Water

A ***Construction Environmental Management Plan*** (CEMP) is contained in **Appendix 5.1** in **Volume 3** of this EIAR. It will be maintained by the Contractor for the duration of the construction phase. The CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures.

The contractor will maintain an incident and emergency response action plan which will cover all foreseeable risks, i.e. fire, flood, collapse etc. An Incident Response Plan (IRP) is located in **Section 8** of the CEMP in **Appendix 5.1 of Volume 3.**

The employment of good construction management practices will minimise the risk of pollution of storm water run-off, and any deterioration in the quality or quantity of surface water.

Section 19.2.9 above (and also replicated in **Section 14.7.1** of **Chapter 14 *Land and Soils)*** sets out a number of mitigation measures and monitoring measures to minimise the risk of effects on land and soils (including groundwater) during construction. These mitigation measures address excavation works; storm water and foul water management; material storage (including fuel, oil and other potentially contaminating materials); site hygiene; and waste management. These measures also apply to the protection of surface water and are therefore relevant for this chapter. Refer to **Section 19.2.9** above for further details.

In addition, the following measures shall also be implemented when working adjacent to or in the vicinity of ditches or streams to prevent uncontrolled runoff from the site into the watercourses:

- The perimeter of the construction area adjacent to the watercourse will be bermed to create a physical barrier between the site and the watercourse. Where there is insufficient space for a berm, a barrier will be created using trench sheeting along the boundary with the watercourse.

- Where cast-in-place concrete is required, all work must be carried out in the dry and effectively isolated from any flowing water (or water that may enter streams and rivers) for a period sufficient to ensure no leachate from the concrete.
- Waterproofing and other chemical treatment to structures in close proximity to watercourses shall be applied by hand.

Monitoring

The same monitoring measures will apply in relation to water protection as those detailed in **Section 19.2.9** above (and also replicated in **Section 14.7.1** of **Chapter 14 *Land and Soils*** to protect soils and groundwater. In additional, the following monitoring measures for the protection of (surface) water quality are required:

- Where surface water run-off from the site construction works areas will be discharged to surface waters, monitoring will be carried out to ensure the concentration of suspended solids (SS) does not exceed 30 mg/litre.
- The contractor will be required to ensure that the sanitary facilities for the site personnel are maintained and effluent storage is regularly emptied and disposed of.
- The contractor will be required to ensure that the water supply to the site is maintained and free of contaminants.

19.2.11 Material Assets

The proposed development will be constructed and operated in accordance with good practice in energy and resource conservation, and efficiency.

A ***Construction Environmental Management Plan*** (CEMP) has been prepared, refer to **Appendix 5.1**, and summarises the overall environmental management strategy that will be adopted and implemented during the construction phase including the responsible and efficient management of material assets including water and waste.

Under the CEMP, the contractor will appoint a Construction Waste Co-Ordinator who will be responsible for implementing the construction waste management plan (CWMP). Refer to Section 7 of the CEMP in **Appendix 5.1** of this EIAR for details of the CWMP.

19.2.12 Major Accidents and Disasters

None of the hazards identified in this report arise during the construction phase of the development. The new accident scenarios associated with the new plant will only arise during the operational phase of this plant. However, the construction activities could present a risk of acting as an initiator to an accident scenario at the existing plant.

A ***Construction Environmental Management Plan*** (CEMP) will be in place to ensure that the construction is carried out in a safe manner with regard to safeguarding the environment from potential incidents on site.

The CEMP also sets out the Construction Traffic Management Plan which will be finalised and implemented by the Contractor. The CEMP is described in **Appendix 5.1** of **Chapter 5 *Construction Activities*.**

Risk assessment is an integral part of the CEMP. Furthermore, the appointed PSCS (Project Supervisor Construction Stage) will ensure that the interaction of different activities at the site is managed safely so as not to present any unacceptable risks. The CEMP will also incorporate the development of an Incident Response Plan (IRP) to ensure that, in the unlikely event of an incident, response efforts are prompt, efficient, and appropriate. The objectives of the IRP will be to:

- Ensure the health and safety of workers and visitors along the site.
- Minimise any impacts to the environment and ensure protection of the water quality and the aquatic species dependent on it.
- Minimise any impacts on properties, services etc.
- Establish procedures that enable personnel to respond to incidents with an integrated multi-departmental effort (including a link to the existing on-site Emergency Plan) and in a manner that minimises the possibility of loss and reduces the potential for affecting health, property, and the environment.
- The CEMP also sets out provisions for traffic management during the carrying out of the construction works.

The CEMP will include provision for continuous inspections, auditing and monitoring of the construction works. The Site Environmental Manager (SEM) will draw up a schedule of monitoring, which will set out roles and responsibilities for monitoring and reporting the works. In the event that the monitoring results indicate that the works are not being carried out in accordance with the contractual requirements, the SEM is responsible for initiating and reporting on the corrective actions to be implemented.

The SEM and the Construction Manager will also carry out quarterly audits to ensure that the Contractor engaged in carrying out the works is successfully meeting all environmental commitments / requirements under the CEMP.

The effective implementation of the CEMP will help to reduce the risks associated with the construction phase of the project in terms of the environmental effects. The PSCS (Project Supervisor Construction Stage) will monitor performance against the CEMP to ensure that it is adhered to throughout the process.

19.3 Operational Mitigation and Monitoring Measures (Assessment Chapters)

19.3.1 Population and Human Health

Operational phase mitigation measures relating to those factors under which population and human health effects might occur have been addressed elsewhere in this EIAR, under the environmental factors for traffic and transportation, noise and vibration and major accidents and disasters. Other than the mitigation measures outlined in **Section 19.3.2 Traffic & Transportation**, **Section 19.3.5 Noise and Vibration** and **Section 19.3.12 Major Accidents and Disasters** below, no further mitigation measures are proposed with respect to population.

As there will be no significant change in emissions in the operational phase, no further mitigation is proposed regarding human health.

19.3.2 Traffic and Transportation

19.3.2.1 Staff Operational Hours

Arrival and departure times for the additional 20 personnel to be employed on site following completion of Phases 1 and 2 of the proposed development will result in all new personnel arriving on site before 08:00 and departing the site before 17:00, thereby avoiding the morning and evening peak periods on the local road network (08:15-09:15 and 17:00-18:00, respectively).

19.3.2.2 HGV Arrival and Departure Profiles

The arrival profile of HGVs to the site is distributed across the working day. This is as a result of specific deliveries to the site being co-ordinated by the Indaver planner, and also a result of the current operators and deliveries to the site settling into an established pattern since the existing facility became operational. It is expected that this will continue for the proposed development.

Furthermore, it is Indaver policy to instruct those companies that use the existing facility to ensure that HGV traffic does not route through Duleek Village, although some localised routing is sometimes necessary for specific cases.

19.3.3 Air Quality

Impacts to air quality during operation are not significant therefore no mitigation is proposed. The site will continue to operate within the EPA licence conditions set for the plant, which will ensure no significant impacts to air quality occur.

19.3.4 Climate

There are no significant impacts to climate predicted as part of the operational phase of the proposed development therefore no mitigation is proposed.

19.3.5 Noise and Vibration

19.3.5.1 On-site Noise Sources

The results of the assessment have confirmed that once noise emission levels associated with the new plant items do not exceed the equipment noise limit applied at the site, discussed **Section 10.5.4** of **Chapter 10** ***Noise & Vibration***, the facilities noise emission limit values will not be exceeded. The following best practice measures will be applied to the proposed development to ensure noise levels are controlled to the surrounding environment and to comply with the facilities IE licensed noise emission limits:

- Roller shutter doors within the Bottom Ash Storage building will be maintained closed at all times, except for access/egress during activities, and;
- Vehicles parked at the truck parking bay will be required to switch engines off when parked on site.

In addition to the measures outlined above, the following best practice measures which form the basis of ongoing noise management at the site will be applied to the proposed development to ensure operational plant noise levels are kept to a minimum:

- All new items of external plant will be limited to a sound pressure noise level of 82dB at 1m;
- Plant will be sited as far away from noise-sensitive locations as is practicable;
- External plant items (pump, motors, fans) will be switched off when not required, particularly during night-time periods;
- The use of acoustic attenuators/ enclosures etc., will be employed to any items of external plant in order to ensure this limit value is complied with.
- Duct mounted attenuators will be installed on the atmosphere side of all air moving plant, where required;
- Splitter attenuators will be installed providing free ventilation to internal plant areas, where required, and;
- Anti-vibration mounts will be installed on all reciprocating plant, where required.

19.3.5.2 Additional Vehicles on Public Roads

The noise effect assessment outlined above has demonstrated that mitigation measures are not required.

Monitoring

The facility is licensed by the EPA under an Industrial Emissions (IE) licence. As part of the IE licence, annual noise monitoring is undertaken at the nearest noise sensitive locations to compare against the operational Emission Limit Values (ELV's).

Monitoring results will be submitted to the EPA for review and will also be included within the facilities Annual Environmental Report (AER) issued to the EPA.

19.3.6 Biodiversity

No specific mitigation measures are required for biodiversity at operational stage.

19.3.7 Archaeology, Architecture and Cultural Heritage

Mitigation measures are not required for operational stage.

19.3.8 Landscape and Visual

Specific mitigation measures are not required for the operational phase.

The design of the proposed buildings and their scale, massing and heights are entirely in keeping with the existing buildings and the existing site operations. Their proposed locations adjacent to existing buildings and behind the existing tree planted berms, assist further in screening them from the identified key viewpoints along the R152 road from Drogheda to Duleek. Extensions in height and length of some of the berm planted areas is proposed under the scheme proposals. The finishes of the proposed buildings, in matching with the existing main building finishes, will assist in assimilating the proposed buildings and should to an extent, reduce any visual impact.

19.3.9 Land and Soils

As the significance of the 'likely significant environmental impact' on the site during operation of the proposed development is 'imperceptible' no mitigation measures have been proposed with respect to effects from operation of the proposed development.

Monitoring

Regular on-going monitoring of groundwater quality is already carried out at the existing Indaver facility as part of the EPA licence (W0167-03) requirement and this monitoring will continue, refer to **Section 14.3.3.5** of **Chapter 14 *Land & Soils***. No additional monitoring is necessary.

19.3.10 Water

No specific mitigation measures are required to protect water quality or minimise any flood risk for the operation of the proposed development.

Monitoring

No additional water monitoring is proposed. The current monitoring carried out on site is sufficient. As described in **Section 4.9** of **Chapter 4 *Description of the Proposed Development*** of the EIAR, there are a number of existing monitoring measures on site to prevent any accidental emissions or spills and ensure fire water retention to minimise the risk to water quality.

Under the current EPA IE licence (W0167-03) surface water monitoring is carried out, as outlined in **Section 15.3.2.2** of **Chapter 15 *Water***, and this monitoring will continue with the proposed development.

19.3.11 Material Assets

During operation of the proposed development, energy efficient power systems will be employed, water conservation measures will be implemented, and wastes will be avoided, minimised or recycled where economically feasible.

Wastes arising on site, for example from the administration building and maintenance activities, will be sent off site to be recycled where practical, and treated in the Waste-to-Energy facility if not. A beneficial reuse will be sought for the bottom ash. Metals will be recovered from the bottom ash.

The additional boiler ash and flue gas residues accepted and produced at the site will be pre-treated for recovery off-site.

19.3.12 Major Accidents and Disasters

In assessing the risks presented at each installation at the site (both existing and proposed installations), the HAZID&RA in **Appendix 17.1** of this EIAR noted a range of measures that are in place, or will be put in place for the new development, to mitigate the risks associated with the accident scenarios that were identified.

Details of the measures that will be put in place to reduce and mitigate the risks associated with the key scenarios associated with the proposed development are discussed in the following sub-sections:

19.3.12.1 Risk Reduction and Mitigation Measures at New Aqueous Waste Tank Farm

- Tanks will be fully bunded, in accordance with the 110% rule and 25% rule (i.e. bund is large enough to retain at least 110% of the volume of the largest tank and 25% of the total inventory stored at the bund).
- Tanks will be fitted with shielding to protect against the risk of a release outside of the bund due to tank failure.
- Tanks will operate with a nitrogen blanket on the vapour space, to protect against the potential for evolution of flammable vapours from the liquid surface.
- Welded pipelines to minimise the use of flanged connections.
- Preventative maintenance regime to ensure integrity.
- Design to incorporate measure to protect against siphoning of the tank contents in the event of line failure.
- Permit to work system to control potentially invasive works on site.
- Impact protection at tank farm and at tanker loading area.
- Deliveries will be manned activities carried out by trained operators.

- Hoses will be inspected prior to transfers taking place.
- Visual inspection of tankers prior to acceptance on site.
- Overfill protection system on tanks (level gauges, level switches).
- Personnel protective equipment (PPE) for operators involved in carrying out deliveries, as required.
- Contents of the aqueous waste tank are dilute (>90% water), thereby reducing the fire hazard.

19.3.12.2 Risk Reduction and Mitigation Measures at New Hydrogen Plant

- Interlocks on system, to enable a leaking section of line to be isolated, reducing the potential quantity released to atmosphere.
- Pressure reduction at connection for vehicle fuelling.
- Siting of facility and separation distances to other plant, equipment, buildings, etc. in accordance with NFPA 55.
- Preventative maintenance system on plant and equipment, to ensure integrity and fitness for purpose.
- Forced ventilation at indoor area of plant, to prevent risk of hydrogen accumulation at ceiling level.
- Impact protection on hydrogen plant.
- Speed limit in place on site.
- Road tanker movements supervised by trained Indaver operator.
- Visual inspection of road tankers prior to acceptance on site.
- Transfer hoses inspected prior to use.
- ATEX zoning, with control of ignition sources.

These include measures to reduce the probability of an accident scenario developing (risk prevention) and measures to reduce the consequences if an accident did occur (risk mitigation). The measures protect against the conditions arising under which an accident could occur, they enable rapid detection and response and protect against the risk of environmental contamination.

With these measures in place, the HAZID&RA found that Indaver would have all necessary measures to in place at the bunker, throughout all phases of the operation. As such the risks associated with this scenario were considered to be ALARP (as low as reasonably practicable).