Planning Application to An Bord Pleanála

Environmental Impact Assessment Report

Proposed Electricity Transmission Development – SID Application

Townland of Bracetown, Gunnocks, Paddingstown, Normansgrove, Rowan, Portmanna, and Pace, Co Meath

Prepared by

AWN Consulting
September 2020

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1.0 INTRODUCTION

1.1 PROPOSED DEVELOPMENT

This Environmental Impact Assessment Report (EIAR) has been prepared by AWN Consulting on behalf of EngineNode Ltd ("EngineNode") herein referred as 'the Applicant') to accompany a planning application to An Bord Pleanála (ABP) for the provision of a 220kV GIS substation and two underground double circuit 220kV cable installation from the proposed substation to the existing above ground line and an underground 75kVA underground rural supply along with associated and ancillary works as described in Chapter 2 (Description of the Proposed Development). This development will hereafter be referred to as the 'Proposed Development'. Figure 1.1 below presents a layout plan for the proposed development.

EirGrid will be the transmission system operator (TSO). ESB Networks will be the transmission asset owner (TAO).

The proposed development will be designed to provide a permanent power supply for the proposed data storage development which is subject to a separate concurrent application under Meath County Council Reg. Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20

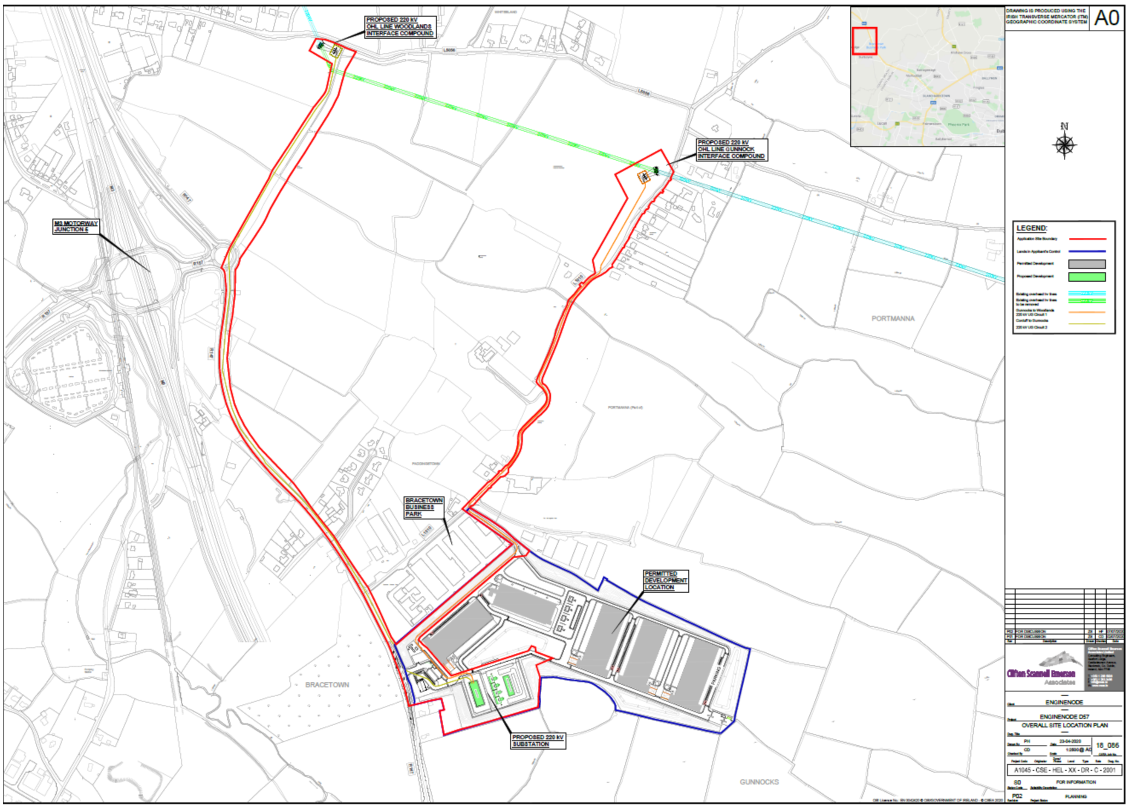


Figure 1.1 Proposed development (marked by red line boundary).

1.2 CONTEXT

1.2.1 Legislative Requirements

This application is being made under the Planning and Development (Strategic Infrastructure) Act 2006, Section 182A to 182E.

The requirement for EIA for certain types and scales of development is set out in the EIA Directives (85/337/EEC, 97/11/EC, 2003/35/EC, 2008/1/EC and most recently 2014/52/EU) and given primary effect in Ireland by the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018, European Communities (Environmental Impact Assessment) Regulations 1989-2006, Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2001-2019. It should be noted that this EIA Report is prepared in accordance with the 2014 EIA Directive (2014/52/EU) and associated Irish legislation (referred to above).

The EIA Directives list those projects for which an EIA is mandatory (Annex I) and those projects for which an EIA may be required (Annex II). With regard to Annex II projects, Member States can choose to apply thresholds or use case by case examination or a combination of both to assess where EIA is required. In Ireland, a combination of both has been applied. The Proposed Development is not listed under Annex I EIA Directives. An EIA Report has been provided as the Proposed Development is required to provide power supply for the permitted data storage facility development.

The main objective of an EIA, as set out in Article 3(1) of the 2014 EIA Directive, is to identify, describe, and assess the direct and indirect significant impacts of a project on population and human health, biodiversity, land, soils, water, air & climate (including noise), material assets, cultural heritage and the landscape and the interaction between the aforementioned factors. The EIA Report (previously referred to as an Environmental Impact Statement or EIS) reports on the findings of the EIA process to date and informs the Planning Authority, statutory consultees, other interested parties and the public in general about the likely effects of the project on the environment.

1.2.2 Format of the EIA Report

This EIA Report has been prepared in accordance with the requirements of EIA Directives (2011/92/EU and 2014/52/EU). It is prepared in a format following the guideline structure set down in the Environmental Protection Agency (EPA) Draft "*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports" (*2017) (herein referred to as the EPA Draft EIA Report Guidelines 2017).

The "*Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment"* (August 2018) and the European Commission "*Guidance on the preparation of the Environmental Impact Assessment Report"* have been considered in the preparation of the EIA report.

Using the format following the guidelines in the EPA Draft EIA Report Guidelines 2017, this EIA Report examines each environmental aspect in a separate chapter. Each chapter generally covers the following:

- Receiving Environment
- Characteristics of the Proposed Development
- Potential Impacts of the Proposed Development

- Do-Nothing Scenario
- Remedial and Mitigation Measures
- Predicted Impacts of the Development
- Residual Impacts

A Non-Technical Summary of the findings of the EIA Report is provided..

A Schedule of Mitigation measures to be implemented as part of the Proposed Development is included in Appendix 1.1.

Cumulative impacts for each environmental topic are assessed in each chapter of the EIA Report.

Interactions i.e. the interrelationship between each environmental aspect, are assessed as they occur in each chapter. The final chapter of the EIA Report, Chapter 16, shows where interactions have been identified and how they have been addressed.

1.2.3 Need for the Proposed Development

The Proposed Development will be designed to provide a permanent power supply for a proposed data storage facility (concurrent planning application). The 75kVA cable installation is intended to provide a rural power supply to the proposed GIS substation.

1.3 COMPANY BACKGROUND

EngineNode is a developer and operator of data storage facility facilities. Its affiliates have developed and operated a number of data storage facility facilities internationally. The company is committed to running its business in the most efficient and environmentally friendly way possible.

As noted in Section 1.1, Eirgrid is the transmission system operator (TSO). Since 2006, Eirgrid has operated and developed the national high voltage electricity grid in Ireland. EirGrid is a state-owned company. EirGrid is independent from ESB. They operate the flow of power on the grid and plan for its future, while ESB Networks (the TAO) is responsible for carrying out maintenance, repairs and construction on the grid. The grid moves wholesale power around the country. Eirgrid brings energy from generation stations to heavy industry and high-tech users. They also supply the distribution network operated by ESB Networks that powers every electricity customer in the country.

As noted in Section 1.1, ESB Networks are the transmission asset owner (TAO). ESB Networks is a subsidiary within ESB Group. ESB Networks finances, builds, and maintains the transmission system through which electricity flows from generation stations to bulk supply points near Ireland’s cities and towns. It does this under a TAO licence granted by the Commission for Regulation of Utilities (CRU). ESB Networks performs its transmission related functions under the direction of Eirgrid.

In summary EirGrid operates the transmission system (TSO) while ESB Networks carries out construction, maintenance, and repairs (TAO) under the direction of EirGrid. For this development, EirGrid will operate transmission stations, including the existing Corduff substation and the proposed new GIS substation, remotely from their control centres. However, ESB Networks will carry out all local operations on Eirgrid’s behalf. Eirgird and ESB Networks are committed to running their businesses in the most environmentally friendly way possible.

1.4 CONSULTATION

The Applicant met with ABP to confirm the Proposed Development was a SID application and to discuss the scope for the planning application. Consultation has also been undertaken with Eirgrid and ESB Networks to ensure the Proposed Development design meets their requirements.

In addition, the relevant specialists and project engineers (CSEA) have liaised with typical statutory bodies by correspondence during the course of the EIA Report preparation.

AWN Consulting (hereafter referred to as AWN) and the other respective EIA contributors have incorporated advice and comments received from consultees into the relevant chapters of this EIA Report.

1.5 REGULATORY CONTROL

The proposed transmission of electricity is not an EPA regulated activity in terms of the Industrial Emissions Directive (Directive 2010/75/EU) (which replaced the IPPC directive). The TSO and TAO will ensure the relevant regulatory requirements relating to power activities are met.

1.6 CONTRIBUTORS TO THE EIA REPORT

The preparation and co-ordination of this EIA Report has been completed by AWN in conjunction with specialist subcontractors. Specialist inputs were provided by the following (Table 1.1):

Table 1.1 *Roles and Responsibilities in the EIA Report*

Role		**Company**
EIA Project Management		AWN – Teri Hayes
Engineering Design		Clifton Scannell Emerson Associates (CSEA)
EIA Chapter No.	**Chapter Title**	**Company & Consultant**
	Non-Technical Summary	AWN – Input from each specialist
Chapter 1	Introduction	AWN – Teri Hayes
Chapter 2	Description of the Proposed Development	AWN – Teri Hayes
Chapter 3	Planning and Alternatives	AWN – Elaine Neary
Chapter 4	Population and Human Health	AWN – Elaine Neary with specialist input from Damian Kelly and Ciara Nolan
Chapter 5	Land, Soils, Geology & Hydrogeology	AWN – Teri Hayes / Paul Conaghan
Chapter 6	Hydrology (including Stage 1 Flood Risk Assessment)	AWN – Teri Hayes / Paul Conaghan
Chapter 7	Biodiversity (including AA)	Moore Group – Ger O'Donohoe
Chapter 8	Air Quality & Climate	AWN – Edward Porter & Ciara Nolan
Chapter 9	Noise & Vibration	AWN – Damian Kelly
Chapter 10	Landscape and Visual	Brady Shipman Martin - John Kelly
Chapter 11	Archaeological, Architectural and Cultural Heritage	CRDS Ltd. –Dr.Stephen Mandal
Chapter 12	Traffic & Transportation	Clifton Scannell Emerson Associates (CSEA) – Geoff Emerson & Hillary Owens
Chapter 13	Material Assets	AWN – Elaine Neary
Chapter 14	Waste Management (including C&D Waste Management Plan)	AWN – Chonaill Boland & Elaine Neary
Chapter 15	Interactions- Interrelationship between the Aspects	AWN – Elaine Neary

EIAR Project Manager/Selected Chapters, Teri Hayes, BSc (Geology), MSc (Hydrogeology) 1990. Teri is a member of the International Association of Hydrogeologists (Irish Group) – former president and the Institute of Geologists of Ireland – Professional Member. Teri is a Director with AWN with 25 years of experience in EIA Management, water resource management and contaminated land assessment. She has project managed and contributed to numerous environmental impact assessments and design of appropriate mitigation measures, acted as an expert witness at public hearings, lectured in EIA and providing expert advice on EIA sections for planning authorities.

Selected Chapters, Elaine Neary, BA (Natural Sciences), MApplSc. (Environmental Science) and is a Chartered Member of the Institute of Waste Management (MCWIM). She is an Associate in AWN and has over 16 years' experience in environmental consultancy with extensive experience in Environmental Impact Assessment and EPA IED/IPPC and Waste License Application and Co-Ordination. She has project managed, coordinated and prepared specialist inputs for numerous EIA Reports.

Biodiversity/Appropriate Assessment, Ger O'Donohoe, Ger graduated from GMIT in 1993 with a B.Sc. in Applied Freshwater & Marine Biology and completed an M.Sc. in Environmental Sciences, graduating from TCD in 1999. He is a Environmental Manager and Consultant Ecologist with Moore Group. Ger has over 20 years of experience as an environmental consultant with experience in the planning and management of numerous complex Environmental Impact Assessments for large scale developments nationwide. He has wide ranging experience as an expert witness at public hearings.

Land, Soils, Geology, Hydrogeology & Hydrology, Teri Hayes, (as above)

Land, Soils, Geology, Hydrogeology & Hydrology, Paul Conaghan. Paul is an Environmental Consultant at AWN with over 8 years' experience working in the environmental science and environmental engineering fields. Paul holds a degree in Environmental Science from the University of Limerick and a masters in environmental engineering from Queens University Belfast. Paul has worked on a wide range of projects including hydrogeology, contaminated land, project management, site geotechnical evaluations, site assessments specialising in environmental impact assessment. Paul is a member of the International Association of Hydrogeologists.

Air Quality & Climate, Ciara Nolan is an Environmental Consultant in the Air Quality section of AWN. She holds a BSc in Energy Systems Engineering from University College Dublin and has also completed an MSc in Applied Environmental Science at University College Dublin. She is an Associate Member of the Institute of Air Quality Management. She specialises in the fields of ambient air monitoring, indoor air monitoring and EIA.

Noise & Vibration, Damian Kelly, Director and Principal Acoustic Consultant in AWN. He holds a BSc from DCU and an MSc from Queens University Belfast. He has over 18 years' experience as an acoustic consultant. He is a member of the Institute of Acoustics. He has extensive knowledge in the field of noise modelling and prediction, having prepared the largest and most complex examples of road and industrial noise models currently in existence in Ireland. He was also co-author of the EPA document "*Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities" (2012)* and advised in relation to the noise limits applied to commercial developments by the various local authorities in the Dublin region.

Landscape and Visual, John Kelly, BArch (Hons) MRIAI. John is a qualified Architect and Managing Partner of Brady Shipman Martin and has over 25 years' experience of direct involvement in the planning, design and environmental assessment of major infrastructure, industrial, educational, commercial, tourism, leisure and energy projects, as well as large scale mixed-use masterplans. John utilises and develops photographic, surveying and digital methodologies that assist in establishing a thorough understanding of the three-dimensional characteristics of sites and their context.

Archaeology, Dr. Stephen Mandal, MIAI, PGeo, EurGeol, is founder and managing director of CRDS Ltd (established in 1997; incorporated in 1999, CRDS (www.crds.ie) is a multi-award winning archaeological and historical consultancy widely acknowledged as a leading provider of a wide range of cultural heritage services). He holds an honours science degree in Geology (1991) and a PhD in Geoarchaeology (1995) from Trinity College Dublin. In 2018, he was appointed to the Cultural Heritage Advisory Panel for the Dublin City Council Culture Company. In 2019 he was appointed to the executive board of the Discovery Programme, the state centre for archaeology and innovation in Ireland. Also in 2019, he was appointed as a Research Associate of the Smithsonian Museum. He served as Vice-Chairperson of the Royal Irish Academy Committee for Archaeology from 2009 to 2014. From 2012 to 2015 he was the External Examiner in Applied Archaeology at Sligo Institute of Technology. He is a professional member of the Institute of Archaeologists of Ireland, the Institute of Geologists of Ireland, and the European Federation of Professional Geologists.

Traffic & Transportation, Geoff Emerson, B.E., M.Sc., C.Eng., MIEI, FConsEI is a Director with CSEA. Geoff has 20+ years' experience in Civil, Structural and Transportation Consulting Engineering and Project Management acting as Project Manager for strategic Road Schemes, Street Upgrades, Quality Bus Network Schemes, Sustainable Transport Schemes, Transportation Catchment Studies & Bridge Design. Geoff has also had significant experience in large-scale site developments for private clients including Green Property Ltd, Menolly Homes Ltd and Bennett Developments. Recent Structural and Engineering experience includes the N3 Mulhuddart Overbridge and Midlands Prison Extension (€26m). Clients include National Transport Authority, Fingal County Council, South Dublin County Council, Kilkenny County Council, Louth County Council, Dun Laoghaire Rathdown County Council, Meath County Council, National Roads Authority and Dublin Transportation Office. Previously while working with RPS he was involved in the M50 South –Eastern Motorway scheme.

1.7 DESCRIPTION OF EFFECTS

The quality, magnitude and duration of potential effects are defined in accordance with the criteria provided in the EPA Draft *EIA Report Guidelines 2017*2017) as outlined in Table 1.2.

Table 1.2 *Description of Effects as per EPA Draft EIA Report Guidelines 2017*

Effect Characteristic	Term	Description
Quality	Positive	A change which improves the quality of the environment
	Neutral	A change which does not affect the quality of the environment
	Negative	A change which reduces the quality of the environment
Significance	Imperceptible	An impact capable of measurement but without noticeable consequences
	Not significant	An effect which causes noticeable changes in the character of the environment but without noticeable 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
	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 the majority of a sensitive aspect of the environment.
	Profound	An impact which obliterates sensitive characteristics
Duration of Effects	Momentary Effects	Effects lasting from seconds to minutes
	Brief Effects	Effects lasting less than a day

Effect Characteristic	Term	Description
	Temporary Effects	Effects lasting less than a year
	Short-term Effects	Effects lasting one to seven years.
	Medium-term Effects	Effects lasting seven to fifteen years
	Long-term Effects	Effects lasting fifteen to sixty years
	Permanent Effects	Effects lasting over sixty years
	Reversible Effects	Effects that can be undone, for example through remediation or restoration
Probability of Effects	Likely Effects	The effects that can reasonably be expected to occur as a result of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Type of Effects	Indirect Effects	Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	‘Do Nothing’	The environment as it would be in the future should no development of any kind be carried out
	`Worst case’ Effects	The effects arising from a project in the case where mitigation measures substantially fail
	Indeterminable	When the full consequences of a change in the environment cannot be described
	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 impact is of greater significance than the sum of its constituents

1.8 ADDITIONAL ASSESSMENTS REQUIRED

This section addresses the additional approvals and assessments required under other EU Directives and legislation.

- **Appropriate Assessment Screening Report** - A screening report has been completed for the Proposed Development, as required under the Habitats and Birds Directive (92/43/EEC and 79/409/EEC) and is included as Appendix 7.1. of this EIA Report.
- **Flood Risk Assessment** - A Stage 1 Flood Risk Assessment has been undertaken for the site and is included with the Engineering report. A summary is included in Chapter 6 Hydrology.

1.9 FORECASTING METHODS AND DIFFICULTIES IN COMPILING THE SPECIFIED INFORMATION

Forecasting methods and evidence used to identify and assess the significant effects on the environment for each environmental aspect are set out in each chapter.

There were no significant difficulties in compiling the specified information for this EIA Report. Any issues encountered during the assessment of individual factors are noted within the relevant chapters.

APPENDIX 1.1

SCHEDULE OF MITIGATION

Prepared by AWN Consulting Ltd.

Project Phase	**Mitigated By**	**Justification**	**Mitigation Measures**	**References**
Land, Soil and Geology				
Construction	Management	Environmental Pollution	The excavation will require site levelling. It is envisaged that all of the spoil generated during site preparation/levelling for the substation will be reused on site while excavated material for the grid lines along roadways will be removed for licenced disposal. A suitable area will be allocated for temporary stockpiling of excavated and infill materials which will be located away from any surface water courses or site boundaries.	Environmental Protection Agency (EPA) Draft 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (2017); Institute of Geologists of Ireland (IGI) 'Guidelines for the preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements' (2013); and National Roads Authority (NRA) 'Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' (2009); "Guidelines on protection of fisheries during construction works in and adjacent to waters" Inland Fisheries Ireland (2016)
Construction	Management	Environmental Pollution	No contaminated soil is expected at the substation site. However, localized contaminated soils and tarmacadam etc will be removed during the grid line development. This will be removed for reuse or disposed of by contractors licensed under the Waste Management Act of 1996 and amendments.	Environmental Protection Agency (EPA) Draft 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (2017); Institute of Geologists of Ireland (IGI) 'Guidelines for the preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements' (2013); and National Roads Authority (NRA) 'Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' (2009); Waste Management Act, 1996.
Construction	Management	Soil and Water Protection	Any contaminated soil or suspected contaminated soil will be isolated from clean soil pending testing to confirm its classification and removal to a licenced facility.	Environmental Protection Agency (EPA) Draft 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (2017); Institute of Geologists of Ireland (IGI) 'Guidelines for the preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements' (2013); and National Roads Authority (NRA) 'Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' (2009).
Construction	Management	Soil and Water Protection	Only material of a known clean origin will be sourced for infill. Should any material be considered suspect it will be tested prior to use as infill material.	Environmental Protection Agency (EPA) Draft 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (2017); Institute of Geologists of Ireland (IGI) 'Guidelines for the preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements' (2013); and National Roads Authority (NRA) 'Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' (2009).

Construction	Management	Soil and Water Protection	As recommended in Inland Fisheries Ireland (2016) “Guidelines on protection of fisheries during construction works in and adjacent to waters”, where stripping occurs, the resulting excavated fractions will be separated into subsoil and topsoil stockpiles. Temporary storage of spoil will be managed to reduce release of dust and uncontrolled surface water run-off which may contain sediment etc.	Environmental Protection Agency (EPA) Draft ‘Guidelines on the Information to be contained in Environmental Impact Assessment Reports’ (2017); Institute of Geologists of Ireland (IGI) ‘Guidelines for the preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements’ (2013); Inland Fisheries Ireland (2016) “Guidelines on protection of fisheries during construction works in and adjacent to waters”, and National Roads Authority (NRA) ‘Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes’ (2009).
Operational	Protection	Soil and Water Protection	No bulk chemical or fuel storage is required during operation.	Environmental Protection Agency (EPA) Draft ‘Guidelines on the Information to be contained in Environmental Impact Assessment Reports’ (2017); Institute of Geologists of Ireland (IGI) ‘Guidelines for the preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements’ (2013); Guidance to Storage and Transfer of Materials for Scheduled Activities (EPA, 2004); and National Roads Authority (NRA) ‘Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes’ (2009).
Construction	Management	Soil and Water Protection	There will be no direct discharges to surface waters during construction and a buffer protecting open water will be maintained as recommended in Inland Fisheries Ireland (2016) “Guidelines on protection of fisheries during construction works in and adjacent to waters”	As above
Construction	Management	Soil and Water Protection	Oil and fuel storage tanks shall be stored in designated areas within the contractors compound, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal.	As above
Construction	Management	Soil and Water Protection	Concrete will be delivered to site and tankers will not be allowed to be washed out on the site. Out areas will be provided to ensure protection of water quality.	As above
Operational	Prevention	Soil and Water Protection	A class 1 oil-water full retention separator will be installed to capture any oil in the run-off from the hard stand area.	As above
Operational	Protection	Soil and Water Protection	All staff will be trained in spill containment measures and emergency response.	As above

Hydrology				
Construction	Management	Water Protection	Effluent generated on the site from the contractor’s sanitary facilities will be contained and disposed of appropriately off site or where feasible directed to the existing off-site foul sewer network, once connected. These facilities will be connected to the IW foul drainage system once the pumping station is commissioned. In the short term, portable sanitary facilities will be provided with waste collected and disposed of appropriately.	CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, (C532) Construction Industry Research and Information Association; CIRIA (2002) Control of water pollution from construction sites: guidance for consultants and contractors (SPI56) Construction Industry Research and Information Association; CIRIA (2005), Environmental Good Practice on Site (C650); Construction Industry Research and Information Association; BPGCS005, Oil Storage Guidelines; CIRIA 697 (2007), The SUDS Manual; UK Pollution Prevention Guidelines, (PPG) UK Environment Agency, 2004.
Construction	Prevention	Infrastructure protection	All sewer connections will be made with the approval of IW and the Local Authority and checked prior to commissioning.	As above
Construction	Prevention	Infrastructure protection	The connection to public water supply on site will be carried out in full compliance with the requirements of MCC and IW.	As above
Construction	Prevention	Surface Water Protection	An outline construction management plan (CEMP) will be prepared for the proposed development prior to commencement of construction. This CEMP will ensure effective stormwater management during construction and will address potentially polluting activities and include emergency response procedures. All relevant personnel working on the site will be trained in the implementation of the procedures. A summary of items covering are provided below: • During the construction phase, surface water run-off collected in excavations will be diverted to settlement ponds and will not be allowed to directly discharge directly to the existing field drainage. A buffer distance with no storage of soils will be maintained along field ditches and streams in compliance with fisheries guidelines “Guidelines on protection of fisheries during construction works in and adjacent to waters” Inland Fisheries Ireland (2016); • Aggregate and infill materials such as sands and gravels will be stored in clearly marked receptacles within a secure compound area to prevent contamination. • As recommended in Inland Fisheries Ireland (2016) “Guidelines on protection of fisheries during construction works in and adjacent to waters” there will be no direct discharges to surface waters during construction and a buffer protecting open water will be maintained; • Oil and fuel storage tanks shall be stored in designated areas within the contractor’s compound, and these areas shall be bunded	As above

			to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal; and, • Concrete will be delivered to site and tankers will not be allowed to be washed out on the site. Out areas will be provided to ensure protection of water quality.	
Operational	Management	Surface and groundwater Protection	The water main system will be metered as directed to facilitate detection of leakage and prevention of water loss.	As above
Operational	Management	Surface and groundwater Protection	Surface drainage will be discharged using surface water retention pond/attenuation pond which will be designed using a hydro-brake vortex control device to restrict discharge to greenfield run-off rates.	As above
Operational	Management	Surface and groundwater Protection	Attenuation ponds will be constructed to retain a constant volume of water to promote settling and reduce conveyance of suspended solids and other particles to the receiving waters (refer to engineering report for calculations). Stormwater will discharge through oil interceptors to allow mitigation of any accidental release of hydrocarbons to ground.	As above
Operational	Management	Surface and ground Water Protection	All staff will be trained in spill containment measures and emergency response.	As above

Biodiversity				
Construction and Operation	Protection	Ecological Protection (Biodiversity))	Potential impacts on birds will be avoided by cutting of vegetation outside the bird nesting season March 1st to August 31st.	CIRIA Report C532 of Water Pollution from Construction Sites. CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland. Institute of Ecology and Environmental Management. Department of the Environment, Heritage and Local Government (2010) Guidance on Appropriate Assessment of Plans and Projects in Ireland (as amended February 2010). EC (2000) Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. EC (2001) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43EEC. European Commission, Brussels.

Air, Dust and Climatic Factors				
Construction	Management	Dust Management	At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance. As the prevailing wind is predominantly south-westerly, locating construction compounds and storage piles downwind (to the north-east) of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.	'Guidance on the Assessment of Dust from Demolition and Construction' (IAQM, 2014); 'Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings' (The Scottish Office, 1996); 'Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance' (UK Office of Deputy Prime Minister, 2002); 'Controlling Particles, Vapours & Noise Pollution From Construction Sites' (BRE, 2003); 'Fugitive Dust Technical Information Document for the Best Available Control Measures' and the USA (USEPA, 1997). ; and 'Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition' (periodically updated) (USEPA, 1986).
Construction	Prevention	Dust Management	When rainfall is greater than 0.2mm/day, dust generation is generally suppressed (UK Office of Deputy Prime Minister (2002), BRE (2003)). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favorable in general for the suppression of dust for a significant period of the year. The following measures should be taken in order to avoid dust nuisance occurring under unfavorable meteorological conditions: • The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised; • During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions; • The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board will also include head/regional office contact details; • It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses; • A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out; • It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein; and,	As above

			• At all times, the procedures put in place will be strictly monitored and assessed.	
Construction	Management	Dust Management	The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem.	As above
Construction	Prevention	Dust Management	Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK Office of Deputy Prime Minister, 2002). • A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads; • Access gates to the site shall be located at least 10m from sensitive receptors where possible; • Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use; and, • Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.	As above
Construction	Prevention	Dust Management	Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust. • During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust; and, • During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.	As above

Construction	Prevention	Dust Management	The location and moisture content of storage piles are important factors which determine their potential for dust emissions. • Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors; • Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK Office of Deputy Prime Minister, 2002); • Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.	As above
Construction	Prevention	Dust Management	Spillage and blow-off of debris, aggregates and fine material onto public roads should be reduced to a minimum by employing the following measures: • Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust; • At the main site traffic exits, a wheel wash facility shall be installed if feasible. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.	As above
Construction	Management	Dust Management	The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be: • The specification of a site policy on dust and the identification of the site management responsibilities for dust issues; • The development of a documented system for managing site practices with regard to dust control; • The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; • The specification of effective measures to deal with any complaints received.	As above

Noise and Vibration				
Construction	Management	Noise Pollution	Management of noise and vibration on site will be minimised and managed through the implementation of the following measures: - Limit the hours during which the site activities likely to create high levels of noise or vibration are permitted; - Establish channels of communication between the contractor/developer, Local Authority and residents. Appoint a site representative responsible for matters relating to noise and vibration; - Monitoring typical levels of noise and vibration during critical periods and at sensitive locations, and; - All site access roads will be kept even so as to mitigate the potential for vibration from lorries.	British Standard BS 5228:2009+A1:2014 (Parts 1 and 2) Code of practice for noise and vibration control on construction and open sites EPA Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR) (2017) and draft revised Guidelines on information to be contained in Environmental Impact Statements; and Advice Notes for preparing EIS (2015). Draft 'Guidelines for Noise Impact Assessment' produced by the Institute of Acoustics/Institute of Environmental Management and Assessment Working Party.
Construction	Management	Noise Pollution	It is envisaged that a variety of practicable noise control measures will be employed. These may include: - selection of plant with low inherent for generation of noise and/or vibration - erection of barriers as necessary around items such as generators or high duty compressors; - situate any noisy plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.	As above
Construction	Management	Noise Pollution	Vibration from construction activities be limited to the values set out in Chapter 9 Noise and Vibration of the EIAR. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitude of vibration slightly greater than those in the EIAR are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.	As above
Operational	Management	Noise Pollution	Noise from external plant will be minimised by the following measures: • Purchasing low noise generating equipment, and; • Incorporating appropriately specified in line attenuators for stacks and exhausts where necessary. With due consideration as part of the detailed design process, this approach will result in the site operating well within the constraints of the best practice guidance noise limits that have been adopted as part of this detailed assessment.	As above

Landscape and Visual Assessment				
Construction	Management	Landscape Protection	The principal mitigation measures during construction are in ensuring a managed and orderly construction site, appropriate storage of materials, and ensuring debris is not carried onto the public roads by construction vehicles. Where the site adjoins the public road, site hoarding will be established and maintained in an orderly manner so as to minimise the effect of the construction site on along the public road.	EPA Draft ‘Guidelines on the information to be contained in Environmental Impact Assessment Reports’ (2017) ‘Draft Advice Notes for preparing Environmental Impact Statements’ (2015)
Operational	Management	Landscape Protection	Landscape and visual mitigation measures are inherent in the architectural and landscape design of the proposed development. Mitigation therefore focusses on the successful and complete implementation of the architectural and landscape designs as proposed.	As above
Construction	Management	Landscape Protection	Trees and vegetation outside of the site shall be protected in accordance with BS:5837:2012 during construction works.	EPA Draft ‘Guidelines on the information to be contained in Environmental Impact Assessment Reports’ (2017); ‘Draft Advice Notes for preparing Environmental Impact Statements’ (2015); British Standard (BS 5837:2012): Trees in Relation to Design, Demolition and Construction – Recommendations

Archaeological, Architectural and Cultural Heritage				
Construction	Protection	Protection of Local Heritage	Prior to the commencement of construction works (including enabling works), the following will be required: - A suitably qualified archaeological consultant will be required to oversee the works and undertake the required archaeological testing, excavations, monitoring and reporting. - Archaeological testing (under license to the National Monuments Service) should be undertaken of the anomalies identified by the geophysical survey. Given the nature and extent of features uncovered, limited test excavation of areas where no features were positively identified should also be undertaken, to alleviate the risk of them being uncovered during the construction phase(s). - Any archaeological features identified by testing in areas where they will be impacted on, directly or indirectly, by the development, will require permission from National Monuments for archaeological excavation (preservation by record) of these remains. - Financial, logistical and time provision should be made for archaeological excavation, if required, prior to the commencement of the construction phase of the development.	EPA Draft ‘Guidelines on the information to be contained in Environmental Impact Assessment Reports’ (2017) ‘Draft Advice Notes for preparing Environmental Impact Statements’ (2015)

Traffic and Transportation				
Construction	Prevention	Traffic Congestion	The contractor will be required to provide wheel cleaning facilities, and regular cleaning of the main access road; Temporary car parking facilities for the construction workforce (30 no. spaces) will be provided within the site and the surface of the car park will be prepared and finished to a standard sufficient to avoid mud spillage onto adjoining roads; Monitoring and control of construction traffic will be ongoing during construction works. Construction traffic will minimise movements during peak hours. Construction traffic routes minimising traffic impact on surrounding residential development will be used by construction vehicles.	TII Traffic and Transport Assessment Guidelines, 2014; Design Manual for Urban Roads and Streets (DMURS), 2013, Department of Transport, Tourism and Sport & Department of Environment, Community and Local Government.

Material Assets: Water Supply, Drainage & Utilities				
Construction	Management	Continuation of Services	Ongoing consultation with MCC, Irish Water, EirGrid, ESB Networks, Gas Networks Ireland and other relevant service providers within the locality and compliance with any requirements or guidelines they may have will ensure a smooth construction schedule without disruption to local and business community.	
Construction	Management	Surface Water Infrastructure	During the construction phase, any surface water run-off collecting in excavations or from exposed soil will likely contain a high sediment load. This will be diverted to settlement ponds and will not be allowed to enter surface water infrastructure as installed during the course of the development. A suitable area will be allocated for temporary stockpiling of excavated materials pending removal for reuse which will be located away from any surface water courses or other sensitive receptors. Aggregate materials such as sands and gravels will be stored in clearly marked receptacles within a secure compound area to prevent contamination. Liquid materials will be stored within temporary bunded areas, doubled skinned tanks or bunded containers	
Construction	Management	Surface Water Infrastructure	Strict quality control measures will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.	
Construction	Management	Foul Sewer Infrastructure	Portable toilets will be provided for construction staff until connection with the public sewer is completed.	
Construction	Management	Surface Water & Foul Sewer Infrastructure	Strict quality control measures will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.	

Operational	Management	Foul Sewer Infrastructure	Foul drainage for the proposed development will be in accordance with the Building Regulations Technical Guidance Document H for design and construction.	Building Regulations Technical Guidance Document H Drainage and Waste Water Disposal, Department of Environment, Heritage and Local Government (2010)
Operational	Management	Surface Water Infrastructure	Following attenuation, drainage will be designed to meet requirements of MCC and Irish Water requirements.	

Waste Management				
Construction	Management	Environmental Pollution	A project specific C&D WMP has been prepared in line with the requirements of the guidance document issued by the Department of Environment Heritage and Local Government (DoEHLG). Adherence to the high level strategy presented in this C&D WMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the construction phase of the Proposed Development. Prior to commencement of construction, the contractor(s) will be required to refine/update this document to detail specific measures to minimise waste generation and resource consumption and provide details of the proposed waste contractors and destinations of each waste stream.	The Eastern-Midlands Region (EMR) Waste Management Plan 2015 – 2021. The Fingal County Council Development Plan 2017 – 2023. European Communities Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC
Construction	Management	Environmental Pollution	The main contractor will endeavour to ensure that surplus material is reused on site where possible. Where there is no suitable reuse or recovery option available, it will be disposed of at an authorised facility.	As above
Construction	Management	Environmental Pollution	Building materials will be chosen with an aim to ‘design out waste’	As above
Construction	Management	Environmental Pollution	On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery – it is anticipated that the following waste types, at a minimum, will be segregated: o Concrete rubble (including ceramics, tiles and bricks); o Plasterboard; o Metals; o Glass; and o Timber.	As above
Construction	Management	Environmental Pollution	Left over materials (e.g. timber off-cuts, broken concrete blocks/bricks) and any suitable construction materials shall be re-used on-site, where possible	As above

Construction	Management	Environmental Pollution	All waste materials will be temporarily stored in skips or other suitable receptacles in designated areas of the site	As above
Construction	Management	Environmental Pollution	Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required)	As above
Construction	Management	Environmental Pollution	A person responsible for waste management will be appointed by the main contractor(s) to ensure effective management of waste during the excavation and construction works	As above
Construction	Management	Environmental Pollution	All construction staff will be provided with training regarding the waste management procedures	As above
Construction	Management	Environmental Pollution	All waste leaving site will be reused, recycled or recovered where possible to avoid material designated for disposal	As above
Construction	Management	Environmental Pollution	All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities	As above
Operational	Management	Environmental Pollution	All waste materials will be segregated into appropriate categories and will be temporarily stored in appropriate bins or other suitable receptacles in a designated, easily accessible areas of the site.	As above
Operational	Management	Environmental Pollution	All waste collected from the development will be reused, recycled or recovered where possible, with the exception of those waste streams where appropriate facilities are currently not available	As above
Operational	Management	Environmental Pollution	All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities	As above

2.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 INTRODUCTION

As described in Chapter 1 (Introduction), the Applicant is applying to ABP for planning permission for the provision of a new 220kV substation with Gas Insulated Switchgear (GIS) technology and two 220 kV underground transmission cables (connecting to existing 220 kV overhead lines to the north of the proposed substation) along with associated and ancillary works. The cable installations extend from the proposed substation to the existing overground 220 kV Woodland-Corduff overhead line, 1.9 km and 2 km from the location of the proposed substation. An underground MV circuit will be located within the roadbed of the L1010 (rural supply) to supply the proposed substation. The proposed development is designed to support power demand for the concurrent application for a data storage development (ref: Meath County Council Reg. Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20).

The following chapter presents a description of the Proposed development as required by the relevant planning legislation, 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, as amended by the 2014 EIA Directive (2014/52/EU) (herein referred to as the EIA Directive), European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018, the current EPA Draft EIA Report Guidelines 2017 and the EPA Draft “Advice Notes for Preparing Environmental Impact Statements” (2015) (herein referred to as the EPA Draft Advice Notes for EIS 2015). Guidance outlined in the ‘Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report’’ published by the European Commission in 2017 was also considered in the preparation of this EIA Report.

2.2 DESCRIPTION OF THE LOCATION AND PHYSICAL CHARACTERISTICS OF THE PROJECT

2.2.1 Description of the location

The area comprises dispersed houses, clusters of houses and farm buildings, as well as the light industrial and commercial units at Bracetown Business Park and The Hub Logistic Park that adjoin the proposed development site. At c.1.0km to the southeast, adjoining the Meath/Fingal county boundary, the first phase of the Facebook facility has been constructed and comprises a large scale data storage facility set in high quality landscaped campus. Construction of the second phase of that facility is well advanced, and will extend the Facebook facility westwards towards the proposed development site.

The proposed development comprises a new Gas Insulated Switchgear (GIS) Substation 220kV substation (Gunnocks) and two underground 220kV cable circuits which will connect to two separate points along the existing overground 220 kV (Woodland – Corduff overhead line (ref Figure 2.1).

The proposed 220 kV GIS substation is to be located on lands at Bracetown and Gunnocks, to the north of Clonee, to the west of the R147 Regional Road, and to the southeast of Bracetown Business Park. The proposed substation is located to the south of the proposed data storage development (concurrent application).

The Proposed development is located within the townlands of Bracetown, Gunnocks, Paddingstown, Normansgrove, Rowan, Portmanna, and Pace. The application site has a total area of c. 14.35 hectares. The substation site is 1.7 hectares in area and is zoned as industrial/commercial (E2 - General Industry and Employment/E3 - Warehousing and Distribution as per the Meath County Development Plan 2013-2019 (MCDP)).

The proposed substation includes the provision of four transformers, a client control building (with a gross floor area of c. 637 sq.m) and a two storey GIS substation building (with a gross floor area of c. 2,430 sq.m) within a 2.6 m high fenced compound.

The route of the 220 kV circuit comprises 2 no. underground cables, as follows:

- Circuit 1 - Gunnocks to Woodlands.
- Circuit 2 - Corduff to Gunnocks;

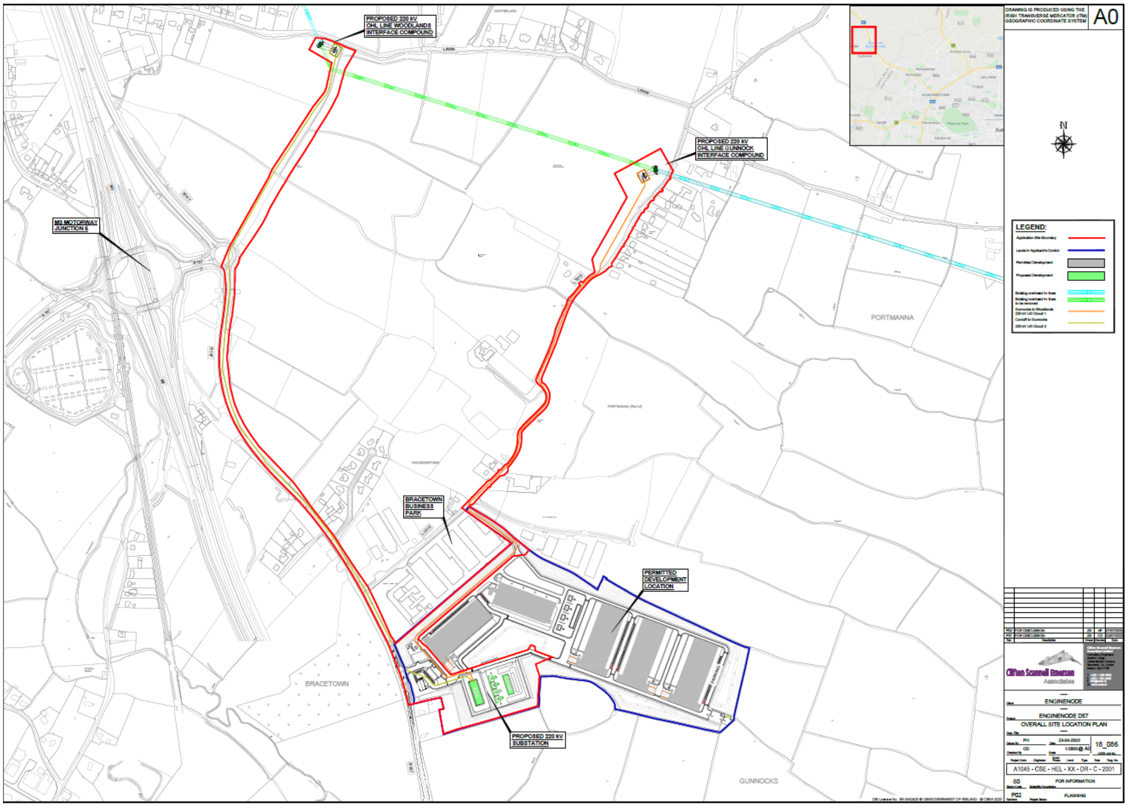
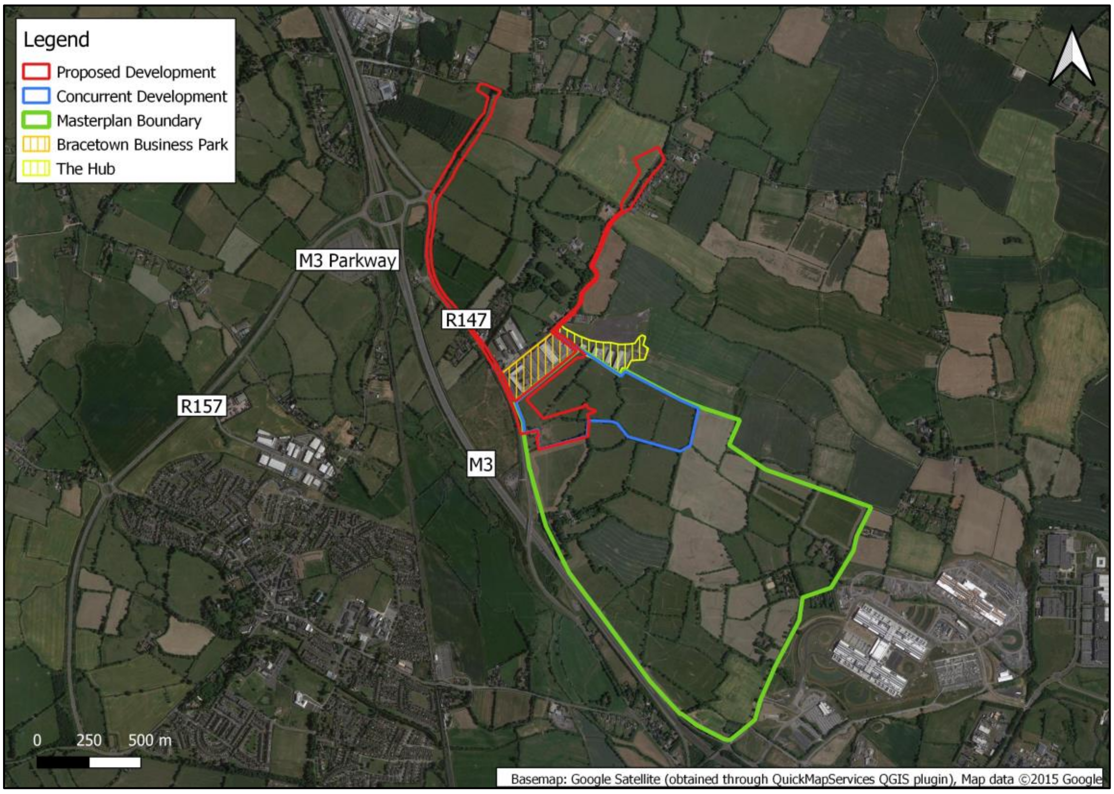


Figure 2.1 Proposed development (substation and grid lines)



Basemap: Google Satellite (obtained through QuickMapServices QGIS plugin), Map data ©2015 Google

Figure 2.1b Proposed development Lands (Red boundary), concurrent data storagedevelopment (blue) and Masterplan area (green)

One underground transmission cable circuit (the Gunnocks - Woodland circuit) will proceed from the proposed substation to the east, before following the R147 roadway northwards to an existing roundabout linking the R145 with the M3 motorway. From this roundabout, the circuit proceeds northeast through private agricultural lands, before reaching the Corduff – Woodland overhead line. This circuit will cover a distance of c. 2 kilometres.

The other underground transmission cable circuit (Gunnocks – Corduff circuit) will proceed from the proposed substation to the east, following the perimeter of the data storage facility site northwards, then northeast and exiting onto an existing rural roadway. The route then follows this rural road north-eastward, before reaching the Corduff – Woodland overhead line in private agricultural lands to the west of the roadway. This circuit will cover a distance of c. 1.7 kilometres.

Each of the two circuits will terminate in a cable – overhead interface compound containing air-insulated electrical equipment mounted on concrete plinths. Adjacent to each interface compound, an overhead line tower will be erected to facilitate connection of the new underground cables to the existing 220 kV overhead line. Each new overhead line tower will be approximately 21 metres in height, set on top of concrete foundations.

Figure 2.1 illustrates the boundary of the proposed substation (blue) and the boundary of the concurrent application for data storage development and overall landholding (red). Bracetown Business Park is located to the north-east of the concurrent application for data storage development with further warehouse development (The Hub Logistics Park) currently being constructed to the north and north west of the site. Planning for data storage facilities (Runways - Planning Ref. RA/180671)) has been obtained for lands to the west and south of the site and construction is ongoing. The R147 forms part of the western boundary.

The substation is accessible from the R147 and in time will be accessed through the concurrent data storage development from a new access in the northwest once road development works are completed.

Each underground 220 kV underground circuit will terminate at a “cable – overhead interface compound” measuring 27 m X 22 m and contain air-insulated electrical equipment mounted on concrete plinths.

Two existing overhead towers would be redundant after construction of the above interface infrastructure. Please refer to below figure for overview of the proposed interface compounds and associated overhead lines:

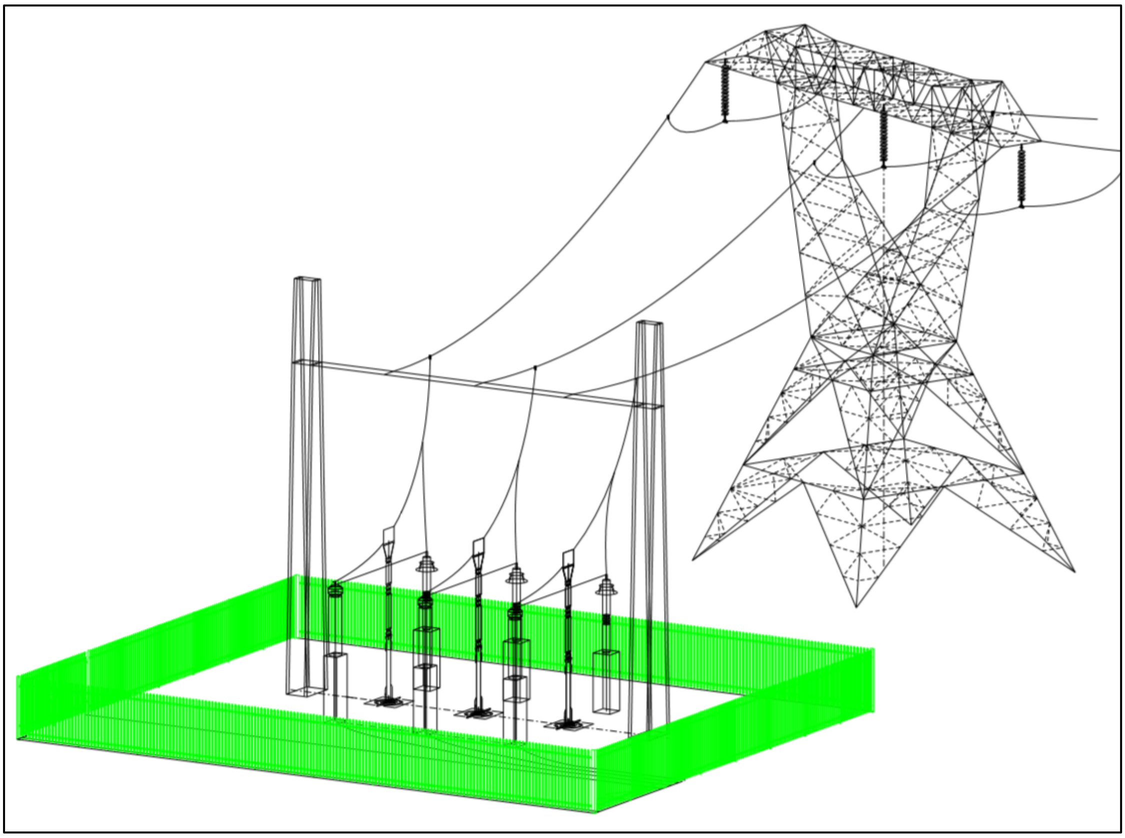


Figure 2.2 Example of Interface compound

2.2.2 Physical Characteristics of the Project

The development will comprise:

- 1 no Indoor Gas Insulated Switchgear (GIS) two storey building equipped with 8 no. 220kV bays and rated for the system voltage of 220 kV;
- Approximate building dimensions (L: 63 metre W: 21 metre H: 17.5 metre)
- Two 220kV underground cables which will connect the proposed Substation development to existing transmission system;
- A rural supply (75kVA) underground cable which will comprise a looped MV circuit installed underground in HDPE ducting;
- Two no oil-filled step-down 220/20 kV power transformers positioned within bunded enclosures; (height circa 2 x 8.6 m);
- 6 no. lightning protection masts (height circa 6 x 19 m);
- Single storey buildings used for control and ancillary;

- Internal access roads;
- A 2.6-metre-high palisade fence;
- Drainage infrastructure; and
- All associated and ancillary site development works including localised alterations to the landscape berms proposed as part of the data storage development, including altering the footprint of the larger berm to the northeast of the substation; revisions to the southern berm including incorporation of gabion walls along the inside of that berm, and, setting back the western berm facing the private residences by c. 30m, so as to enhance the residential amenity of those properties.

The substations will be connected via two underground cable feeders. The 220 kV underground cable feeders will comprise a 220 kV circuit installed underground in HDPE ducting. The 220kV cables will be a standard XLPE (cross-linked polyethylene) copper cable. XLPE does not contain oil, therefore there is no risk of migration of oil into ground in the event of a failure.

The installation of the HDPE ducting will require the excavation of a trench along each of the connection routes. The typical optimum depth of excavation required to facilitate installation of the ducting is c. 1.35m below ground level (bgl) but may increase to up to c. 3.0 to 6.0m at utility crossings. The typical optimum width of each trench is c. 1.0m, however this may vary depending on ground conditions and existing services. A width of 5 metres is required for construction access.

A typical cross section of the trench utilising flat and trefoil duct arrangement for the 220 kV cables is illustrated in Figure 2.3.

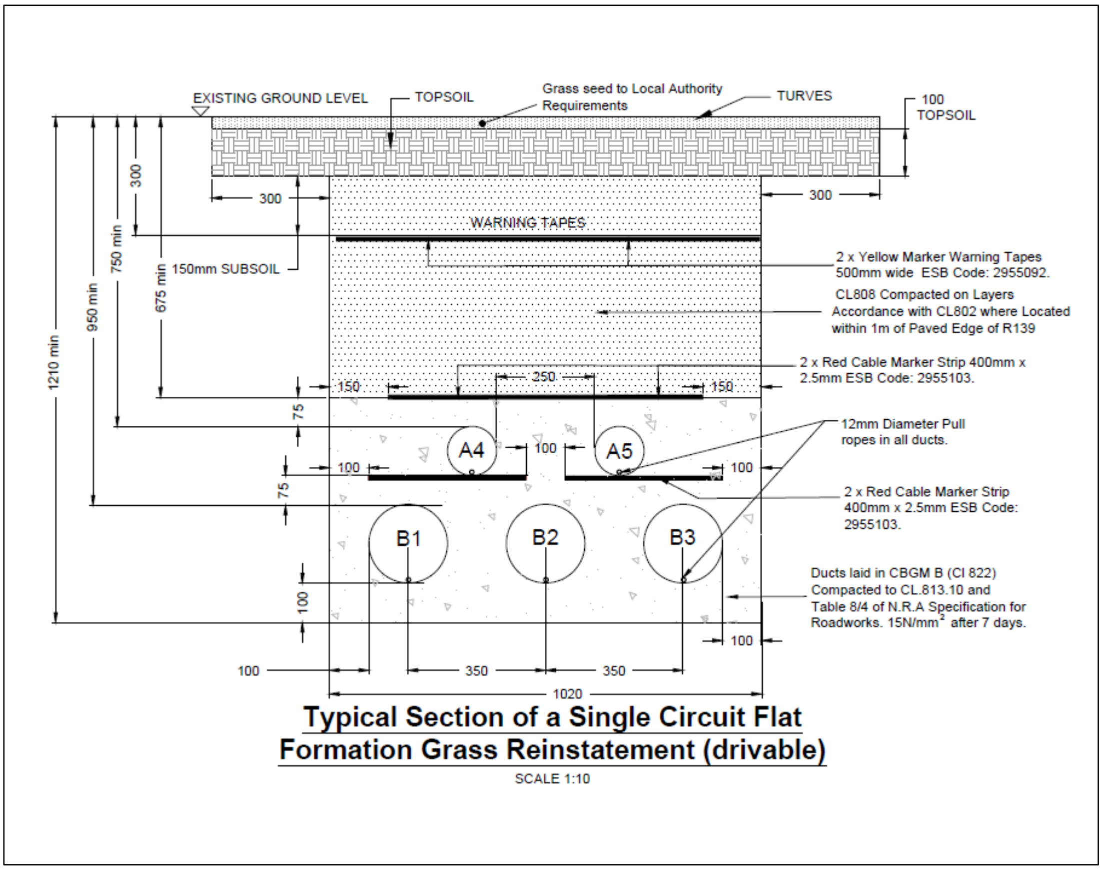


Figure 2.3 Typical Cross Section of Trench with Flat and trefoil Duct arrangement for 220 kV underground cable

The design of the rural supply (75kVA) underground cable will comprise a looped MV circuit installed underground in HDPE ducting. The MV cables will be a standard XLPE (cross- linked polyethylene) Aluminium cable. XLPE does not contain oil, therefore there is no risk of migration of oil into the ground in the event of a failure (such as a short circuit, a joint fail, a termination failure etc.).

The Proposed development is not located directly adjacent to any areas of national or local environmental sensitivity/designation.

The need for the Proposed development is described in Section 1.2.3 of Chapter 1.

2.2.3 Proposed Site Infrastructure

2.2.3.1 Surface Water Drainage

Rainwater runoff from the proposed 220kV GIS substation will discharge to the surface water drainage network for the concurrent application for data storage development. The surface water drainage network for the data storage development was designed to accommodate surface water drainage from the Proposed development. This includes oil separator interceptor systems to ensure the quality of storm water discharge is controlled prior to attenuation and discharge offsite.

The attenuated storm water will be discharged at the allowable greenfield run off rate (i.e. 24.4l/s) to the existing watercourse bordering the site to the southeast, which joins the Pinkeen Stream approximately 2 km east of the site. Further detail on the storm water drainage system and the basis of its design is provided in the *Engineering Planning Report – Drainage and Water Services*, prepared by CSEA, which accompanies this application which also includes the *Engineering and Water Services Report*, prepared by CSEA, which accompanied the planning application for the data storage development (MCC Planning Ref. RA/191593). Chapter 6 Hydrology address the impacts on storm water drainage.

The proposed underground circuit 220kV transmission lines and 75kVA cable installation are underground and the cable bays will be constructed on a primarily permeable gravel surface (with concrete bases at the towers which will drain to the gravel area). Rainfall will drain to ground, as it currently does in these areas.

2.2.3.2 Foul Water Drainage

Domestic effluent arising from the welfare facilities at the GIS substation will be collected in a newly constructed foul drainage network within the site and discharged through a new pumping station which will be constructed as part of the proposed data storage development, to the foul drainage network which runs along the R147 and ultimately discharges to Ringsend WWTP. The wastewater contribution from the Proposed development will be minimal. Chapter 13 Material Assets address the impacts on foul water drainage.

The underground 220kV cable circuits connecting to the 220 kV transmission line and the 75 kVA cable installation do not require any foul drainage infrastructure.

2.2.3.3 Water Supply

Water will be required for the welfare facilities at the GIS substation. A 450 diameter mains runs along the R147 and has capacity to supply adequate water for the proposed development. Total annual water usage for the proposed development is 365 m^3. Peak daily usage will be 6 l/day and average demand 1 l/day.

Chapter 6 Hydrology and Chapter 13 Material Assets address the impacts on water supply.

The underground 220kV cable circuits connecting to the 220 kV transmission line and 75kVA cable installation do not require any water supply.

A 450 diameter mains runs along the R147 and has capacity to supply adequate water for the proposed development. Consultation with Irish Water have confirmed that sufficient water and wastewater capacity is available.

2.2.3.4 Electricity

The proposed 220kV GIS substation, 220kV cable circuits connecting to the 220 kV transmission line and 75kVA cable installation are designed to support power demand for the proposed data storage development. The 75kVA cable installation is intended to provide a house power supply to the proposed GIS substation.

2.2.3.5 Telecommunications

The fibre network for the data storage development will be extended to the GIS substation.

2.2.3.6 Fire Water System

A fire water ring main for the data storage development will be extended to the GIS Substation as required to provide firefighting water to hydrants in the event of a fire.

2.2.3.7 Access, Security and Lighting

During construction and early phases of operation, the traffic accessing the GIS substation will approach and access the substation through an entrance to be constructed off the R147 as a temporary t-junction access onto the R147 prior to the opening of the new distributor road. This is the temporary site access for the planned Engine Node data storage development and has been designed in accordance with the Design Manual for Roads and Bridges (DMRB), with widening provided along the R147 at the junction to facilitate a short right turning lane into the site. Once the indicative distributor road has been completed, access will be through the data centre development. A maximum speed limit of 10km/hour will be in place on the access road. The temporary access will be closed and used for emergency access only at such time as a future distributor road (the Bracetown Link Road) is delivered on adjoining lands by others.

A pair of access gates to the data storage and GIS Substation will be manned and maintained by security personnel 24/7. (The access gates have been designed to act as a vehicle trap as and when required). Security will ensure that the procedure for accessing the facility is followed at all times.

A 2.6m high security fence will be constructed around the perimeter of the overall landholding as part of the data storage development. The Proposed development will be partly screened from the R147 by this fence and a planted clay berm constructed as part of the data storage development (refer to Chapter 11 Landscape and Visual Impact).

The lighting design (both security and environmental lighting) has been assessed and optimised for the site, to ensure no obtrusive glare, light spillage or other light nuisance on neighbouring residential receptors or business users.

2.3 EXISTENCE OF THE WHOLE PROJECT

Under the current Draft EPA Guidelines (2017) on the information to be contained in EIA Reports, the description of the existence of the project is required to define all aspects of the proposed lifecycle of the Proposed development under the following headings:

- Construction;
- Commissioning;
- Operation;
- Decommissioning; and
- Description of Other Developments.

The following sub-sections present a description of each of these aspects.

2.3.1 Description of Construction

The construction of the proposed 220kV GIS substation will comprise four main stages, namely;

- Site preparation works;
- Building Structure Construction;
- Building Envelop Construction; and
- Fit Out Including mechanical and electrical fit-outs and commissioning.

The construction of the underground 220 kV cable circuits connecting to the 220 kV transmission line and 75kVA cable installation will comprise three main stages, namely;

- Site preparation works and excavations;

- Cable installation, jointing and testing; and
- Reinstatement.

Working Hours

Subject to planning conditions relating to construction hours, It is anticipated that the construction will be completed during normal construction hours i.e. 7am to 7pm Monday to Friday with a half day working on Saturday (8am -1pm). All works will be carried out in accordance with the road opening licences which will be granted by Meath Co Co.

Staffing

The following construction data has been used to estimate peak daily construction traffic (assumed to occur during civil works period for substation building):

- Average construction staff: 15-20;
- Peak construction staff (peak staff levels during civil works): 30.

Construction Schedule

- Application for Planning Permission – September 2020
- Commence Site Construction works (subject to grant of planning permission) – End of Q4 2020,
- Completion of Construction and Commissioning – Q3 2022.

It is proposed that the accesses and haul roads for vehicles, the contractors' compound and fencing that have been established for the construction of the data storage proposed development will be utilised for the Proposed development. The construction compound will facilitate office, portable sanitary facilities, equipment storage, parking etc. for contractors. It will be used for the duration of the works.

The site preparation phase for the GIS substation will involve site clearance, excavations and levelling of the site to the necessary base level for construction, surveying and setting out for structures and any rerouting of services/connections to services.

A combination of bulldozer, excavators, trucks and other soil shifting plant will commence the main site clearance and levelling aspects.

The site preparation required for the underground 220 kV cable circuits connecting to the 220 kV transmission line, the 75kVA cable installation will be limited with minimal site clearance required.

Building Construction Works

Foundations and Structure

Following the completion of site clearance and levelling, all structures will require foundations to structural engineer specifications. Building structures will comprise standard structural steel frames.

It is anticipated that foundations will require moderate scale excavations. Due to the shallow depth of bedrock (see Chapter 6), some rock breaking may be necessary.

Levelling/Cut and Fill
It is envisaged that all of the spoil generated during site preparation/levelling for the substation will be reused on site (see Chapter 14) while excavated material for the grid lines along roadways for licenced disposal or recoevry.

The volume and nature of material to be excavated are estimated a follows:-

Material	**Volume (m^3)**
Tarmacadam	3,892
Soil/Gravel under Roads	9,127
Soil (Greenfield)	3,744
Trees / Shrubbery	101

The importation of fill will be required to facilitate construction at the substation. The project engineers, CSEA, have estimated that the importation of up to 6.100 m^3 of fill material will be required.

Contractors will be required to submit and adhere to a method statement (including the necessary risk assessments) and indicating the extent of the areas likely to be affected and demonstrating that this is the minimum disturbance necessary to achieve the required works.

Any temporary storage of spoil required will be managed to prevent accidental release of dust and uncontrolled surface water run-off which may contain sediment etc. (refer to Chapters 5 & 6 for further details).

Building Envelopes and Finishes
The outer finishing of the building envelopes are intended to be of a similar quality and appearance to the adjacent developments.

Reinstatement along the underground 220 kV cable circuits connecting to the 220 kV transmission line and 75kVA cable installation route will be as current, i.e. grassed in greenfield areas and hardstand along paved areas and roads.

Roads, Services and Landscaping
The internal road system for access will be completed as part of the data storage development.

Landscaping will be undertaken in accordance with the landscape masterplan for the Proposed development (refer to Chapter 11 Landscape and Visual Impact).

Material Sourcing, Transportation and Storage

Materials
Key materials will include steel, concrete, composite cladding, piping, electrical cabling, process equipment and architectural finishes. A ‘Just in Time’ delivery system will operate to minimise storage of materials on site.

Sourcing
Where possible it is proposed to source general construction materials from the Dublin area to minimize transportation distances.

Storage

Aggregate materials such as sands and gravels will be stored in clearly marked receptacles within a secure compound area to prevent contamination. Liquid materials will be stored within temporary bunded areas, doubled skinned tanks or bunded containers (all bunds will conform to standard bunding specifications – BS EN 1992-3:2006) to prevent spillage.

Transportation

Construction materials will be brought to site by road. Construction materials will be transported in clean vehicles. Lorries/trucks will be properly enclosed or covered during transportation of friable construction materials and spoil to prevent the escape of material along the public roadway.

Waste Management

Chapter 14 contains a detailed description of waste management relating to construction of the Proposed development. A site-specific Construction and Demolition Waste Management Plan is included as Appendix 14.1 of this EIA Report. This C&D Waste Management Plan will be refined and updated in advance of the works to ensure best practice is followed in the management of waste from the Proposed development.

Noise, Vibration and Dust Nuisance Prevention

With regard to construction activities, reference will be made to BS 5228 (i.e. BS 5228-1:2009+A1:2014 and BS 5228-2:2009+A1:2014) for noise and vibration control on construction and open sites, which offers detailed guidance on the control of noise and vibration from demolition and construction activities. Various mitigation measures will be considered and applied during the construction of the Proposed development, such as:

- Limiting the hours during which site activities which are likely to create high levels of noise are permitted, e.g. soil levelling/excavations;
- Establishing channels of communication between the contractor/developer, local authority and residents;
- Appointing a site representative responsible for matters relating to noise and vibration, and;
- Monitoring typical levels of noise during critical periods and at sensitive locations.

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These may include:

- Selection of plant with low inherent potential for generation of noise;
- Erection of barriers as necessary around items such as generators or high duty compressors, and;
- Siting of noisy plant as far away from sensitive receptors as permitted by site constraints.

Noise and vibration control measures are discussed in detail in Chapter 10 Noise & Vibration.

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 dust produced will be deposited close to the generated source.

In order to ensure that no dust nuisance occurs, a series of measures will be implemented including:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads will be restricted to essential site traffic only;
- If required, any area/road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions;
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. Indeed, on any un-surfaced site road, this will be 10km/hour, and on hard surfaced roads as site management dictates;
- In dry conditions vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- Wheel washing facilities will be provided for vehicles exiting the site to ensure that mud and other wastes are not tracked onto public roads;
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary; and
- At all times, these procedures will be strictly monitored and assessed. In the event of dust emissions occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Dust nuisance control measures are discussed in further detail in Chapter 8 Air Quality and Climate.

Water Discharges

Portable welfare and sanitary facilities will be provided for the construction workers at the construction compound for the proposed data storage development (concurrent application).

Any surface water run-off will be adequately contained and treated prior to being discharged into the MCC drainage network. See Chapter 6 Hydrology for a full description of mitigation measures proposed.

GHG Emissions

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. The Institute of Air Quality Management document *Guidance on the Assessment of Dust from Demolition and Construction* (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate. Therefore, the impact on climate is considered to be imperceptible and short term.

Each of the EIA Report chapters (Chapters 4-14) includes an assessment of the potential impact of construction works on their individual environmental aspect and set out the relevant mitigation measures relating to that aspects.

It is proposed that a Construction Environmental Management Plan (CEMP) will be put in place by contractors to minimise the impact of all aspects of the construction works on the local environment. The CEMP will include emergency response procedures in the event of a spill, leak, fire or other environmental incident related to construction.

The primary potential effects from construction are all short-term and are anticipated to include;

- Effects in terms of nuisances relating to the air quality of the environs due to dust and other particulate matter generated from excavation works and effects on the noise environment due to plant and equipment involved in construction;
- Effects on the land, soils, geology & hydrogeology of the site during construction i.e. some loss of protection of the underlying aquifer to contaminants during site clearance, levelling and excavations etc.; and
- Effects on the local road network and its environs due to construction works.

Mitigation measures to address each of these potential short-term effects are presented in each individual EIA Report chapter.

2.3.2 Description of Commissioning

Once the construction of the Proposed development is completed, ESB Networks will be mobilised to complete the commissioning. Commissioning will be carried out over a period of months. Commissioning works primarily involve a suitably qualified individual connecting the relevant cables to a switchgear within the substations. Following this, energisation can take place.

As there is no requirement for chemicals usage and minimal access to the route by personnel there is no likely environmental effect as a result of commissioning.

Any hard landscaping and final soft landscaping will be completed.

2.3.3. Operation of the Project

As stated in Sections 1.1 and 1.3 of Chapter 1, EirGrid will be the transmission system operator (TSO) and ESB Networks will be the transmission asset owner (TAO). EirGrid will operate the proposed new GIS substation, remotely from their control centres. However, ESB Networks will carry out all local operations on Eirgrid's behalf.

The ESB Networks will undertake local operational activities from the substations with only interim inspections along the underground 220 kV cable circuits connecting to the 220 kV transmission line and 75kVA cable installation.

The estimated staff required are outlined in the following paragraphs.

220kV GIS substation

The 220kV GIS substation does not require any full-time staff to operate it. However, maintenance of the substation will be required by ESB Networks, including a routine weekly inspection, and a more comprehensive inspection once per year. The weekly inspection of the GIS substation will take a maximum of 8 hours on a single day and will be conducted by up to 2 staff.

In addition to the weekly inspections, more comprehensive maintenance works will take place annually on each cubicle. This will require up to 4 staff to conduct testing at the substation over a maximum period of 15 days (120 hours).

Underground 220kV Cable Circuits

Once constructed, the underground 220 kV cable circuits connecting to the 220 kV transmission line will not require any staff to operate it. Instead, two ESB Networks maintenance staff will carry out a routine inspection of the asset one year after completion and once every three years thereafter.

Underground Cable Installation
Once constructed, the underground cable installation will not require any staff to operate it. Instead, two ESB Networks maintenance staff will carry out a routine inspection of the asset one year after completion and once every three years thereafter. These inspections are likely to be conducted at the same time the underground 220 kV cable circuits are inspected.

Traffic relating to staff movements have been assessed as part of the traffic and transportation chapter of this EIA Report (Chapter 13).

2.3.4 Decommissioning of the Project

The lifespan of the Proposed development is not defined but it is anticipated that it will be maintained, and periodic upgrading undertaken over a long lifetime to meet future demand and upgrade in technology.

If the GIS substation is no longer required over the long term, then full decommissioning in accordance with prevailing best practice will be undertaken.

Retirement of any cables will involve decoupling the cable from the switchgear. An excavation pit of approximately 10m^2 will then be established. The cable to be retired will be identified within this excavation pit and spiked (to ensure that decoupling from the switchgear has been successful and the cable is not live). The cable will then be cut and capped to protect the exposed cable. The excavated pit can be reinstated using the excavated material, with no import of fill required.

2.3.5 Description of Other Developments

A list of the other developments in the vicinity of the Proposed development are included in Chapter 3 Planning and Alternatives of this EIA Report.. The primary developments, include the proposed EngineNode (concurrent application) and Runways data storage developments (under construction).

2.4 SUSTAINABILITY ENERGY EFFICIENCY & RESOURCE USE

Eirgrid and ESB Networks are committed to running their businesses in the most environmentally friendly way possible. ESB Networks is a subsidiary within ESB Group. The ESB Group has identified energy efficiency as a strategic priority within its Brighter Future strategy. ESB Group is a commercial semi-state-owned company (95% state-owned) and is committed to supporting and being exemplar in the delivery of Ireland’s 2020 public sector targets. These targets, outlined in the fourth National Energy Efficiency Action Plan (2017 – 2020) (NEEAP), include an energy efficiency target of 33% for the public sector.

2.5 HEALTH & SAFETY

2.5.1 Design and Construction Health and Safety

The Proposed development has been designed in accordance with the Safety, Health and Welfare at Work Act 2005 (S.I. 10 of 2005) as amended and the Safety, Health and Welfare at Work (General Application) Regulations 2007 to 2016 (S.I. 299 of 2007, S.I. 445 of 2012, S.I. 36 of 2016) as amended and associated regulations.

The Proposed development has been designed by skilled personnel in accordance with internationally recognised standards, design codes, legislation, good practice and experience based on a number of similar developments.

2.5.2 General Operational Health and Safety

ESB Networks has an Environmental Safety and Health Management System (EMS) which will be implemented at the Proposed development.

2.6 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

The Proposed development is to be located on zoned lands (details of zoning can be found in Chapter 3). The development, when operational, will generate limited additional traffic, air, noise and water emissions and wastes generation from activities etc.

During construction, there is the potential for temporary nuisance impacts from traffic, dust, noise and construction waste, if not carefully managed. All contractors will be required to implement a CEMP to ensure each of these potential impacts are minimised.

Each chapter of this EIA Report assesses the potential impact of the construction and operation of the Proposed development on the receiving environment. Please refer to each specialist chapter respectively.

2.7 ACCIDENTS AND MAJOR ACCIDENTS/DISASTERS

The 2014 EIA Directive and associated Draft EPA EIA Guidelines requires a description of the risk of accidents and of the vulnerability of the project to major accidents, and/or natural disasters (such as earthquakes, landslides, flooding, sea level rise etc.) is considered in the EIA Report. The site has been assessed in relation to the following external natural disasters; landslides, seismic activity and volcanic activity and sea level rise/flooding as outlined below. The potential for major accidents to occur at the data storage facility has also been considered with reference to Seveso/COMAH.

Landslides, Seismic Activity and Volcanic Activity
There is a negligible risk of landslides occurring at the site and in the immediate vicinity due to the topography and soil profile of the site and surrounding areas. There is no history of seismic activity in the vicinity of the site. There are no active volcanoes in Ireland so there is no risk of volcanic activity. Further detail is provided in Chapter 5 Land, Soils, Geology & Hydrogeology.

Flooding/Sea Level Rise
The potential risk of flooding on the site was also assessed. A Stage 1 Flood Risk Assessment was carried out and it was concluded that the development is not at risk of flooding. Furthermore, it is not expected that the Proposed development would adversely impact on flood risk for other neighbouring properties. Further detail is provided in Chapter 6 Hydrology and Appendix 6.2 Stage 1 Flood Risk Assessment.

Seveso/COMAH
The Proposed development will not be a Seveso/COMAH facility. The only substance stored on site controlled under Seveso/COMAH will be diesel for generators and the amounts proposed do not exceed the relevant thresholds of the Seveso directive.

Minor Accidents/Leaks
There is a potential impact on the receiving environment as a result of minor accidents/leaks of fuel/oils during the construction and operational phases. However, the implementation of the mitigation measures set out in Chapters 6 and 7 will ensure the risk of minor accidents/leaks of fuel/oils is low and that the residual effect on the environment is imperceptible.

2.8 RELATED DEVELOPMENT AND CUMULATIVE IMPACTS

The Proposed development is for a new 220kV GIS substation and two 220 kV cable circuits connecting to an existing 220 kV transmission line and and an underground 75kVA cable installation from an existing underground MV circuit which is loacted within the roadbed of the L1010 to the proposed substation. The propsed development is designed to support power demand for the propsoed EngineNode data storage (concurrent application).The cable installation is intended to provide a house power supply to the proposed GIS substation.

The cumulative impact of the Proposed development with the concurrent application for an Enginenode data storage development and nearby data storage development (currently in construction) have been considered within the cumulative impact section of each chapter. The author of each chapter has considered the cumulative impact (both construction and operation phases) of the grid line development and current and planned developments (construction and operation phases). Where relevant, modelling of construction and operation emissions has been undertaken to fully assess the cumulative impact on the receiving environment. With mitigation for each environmental aspect, it is concluded that there are no predicted significant cumulative effects.

3.0 PLANNING AND DEVELOPMENT CONTEXT

3.1 INTRODUCTION

This chapter describes the proposed development within the context of the relevant national, regional, and local Meath County Council (MCC) planning policy. The following sections describe how the proposed development complies with the stated and statutory requirements of the planning policy context with respect to planning and sustainable development.

The Applicant is applying to An Bord Pleanála (ABP) under section 182A(1) of the Planning and Development Act 2000, as amended for permission for the Proposed Development. The proposed substation is located to the south of a proposed data storage facility subject to a separate concurrent application under Meath County Council Reg. Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20.

The Proposed Development comprises a new Gas Insulated Substation 220kV GIS substation (Gunnocks), an underground 75 kVA cable installation and connecion to the existing underground MV circuit within the roadbed of the L1010, and two underground 220kV cable circuits which will connect to two separate points along the existing overground 220 kV (Woodland – Corduff) overhead line, and associated overhead line tower to facilitate the connection. A full description of the Proposed Development can be found in Chapter 2 (Description of Development).

The relevant national, regional and local planning policy with which the proposed development complies is defined by the:

- National Planning Framework: Project Ireland 2040 (2018);
- Regional Spatial and Economic Strategy for the Eastern and Midlands Regional Assembly (2019);
- Meath County Development Plan 2013-2019 (MCDP);
- Dunboyne / Clonee / Pace Local Area Plan 2009 – 2015; and
- Economic Development Strategy for County Meath 2014-2022.

3.2 STRATEGIC INFRASTRUCTURE DEVELOPMENT

Section 182A of the Planning & Development Act 2000 (as amended), provides that applications for approval of "*development comprising or for the purposes of electricity transmission*" shall be made directly to ABP. Section 182A, sub-section 9, also provides that "*transmission*" is to be construed in accordance with section 2(1) of the Electricity Regulation Act 1999 but shall also be construed as meaning the transport of electricity by means of:

(a) a high voltage line where the voltage would be 110 kilovolts or more, or

(b) an interconnector, whether ownership of the interconnector will be vested in the undertaker or not.

Section 2(1) of the Electricity Regulation Act 1999 defines "*transmission*", in relation to electricity, as:

> *“the transport of electricity by means of a transmission system, that is to say, a system which consists, wholly or mainly, of high voltage lines and electric plant and which is used for conveying electricity from a generating station to a substation, from one generating station to another, from one substation to another or to or from any interconnector or to final customers but shall not include any such lines which the [Electricity Supply] Board may, from time to time, with the approval of the Commission [for Energy Regulation], specify as being part of the distribution system but shall include any interconnector owned by the [Electricity Supply] Board.”*

It should be noted that the Commission for Energy Regulation is now known as the Commission for the Regulation of Utilities (CRU).

ABPs Strategic Infrastructure Development Electricity Transmission Guidelines provide that “*certain private sector Proposed Developments may constitute electricity transmission under section 182A where such proposals will ultimately form a node on or part of the transmission network. This might include for example substations and related connection infrastructure to the national grid associated with large commercial or industrial development*.”

Consultation with ABP has confirmed that the Proposed Development meets the relevant criteria and constitutes Strategic Infrastructure Development (SID) under Section 182A of the Planning and Development Act 2000 (as amended) (ABP Reg. Ref.: ABP-305657-19).

3.3 NATIONAL, REGIONAL AND LOCAL PLANNING CONTEXT

3.3.1 National Planning Framework: Project Ireland 2040

The National Planning Framework (NPF) for Ireland was published in February 2018 and contains National Strategic Outcomes’ (NSO) which are supportive of the development of ICT infrastructure. NSO 5 relates to *“A Strong Economy Supported by Enterprise, Innovation and Skills”* is a key strategic outcome underpinned by a range of objectives relating to job creation and the fostering of enterprise and innovation.

In order to deliver the largescale data storage facility development proposed under a separate application, an economic and employment-based development opportunities, the proposed substation and underground cable installation is required.

The NPF identifies that data innovation is important for future growth and identifies Ireland as an attractive destination for ICT infrastructure due to climatic factors and current and future renewable energy sources. NSO 5 states:

> *Promotion of Ireland as a sustainable international destination for ICT infrastructures such as data centres and associated economic activities.*

The NPF also states under NSO5 that:

> *“Ireland is very attractive in terms of international digital connectivity, climatic factors and current and future renewable energy sources for the development of international digital infrastructures, such as data centres. This sector underpins Ireland’s international position as a location for ICT and creates added benefits in relation to establishing a threshold of demand for sustained development of renewable energy sources.”*

The NPF notes that the data centre sector underpins Ireland's international position as a location for ICT and creates added benefits by establishing 'a threshold of demand for sustained development of renewable energy sources". The proposed development will have a flexibility in supply during its lifeline which will allow for flexibility in sourcing of power including renewable sources where feasible.

The NPF is clear that it is favourably disposed to the location of ICT infrastructure in Ireland; the proposed development is considered to be in accordance with this national planning policy.

3.3.2 Regional Spatial and Economic Strategy for the Eastern and Midlands Regional Assembly 2019-2026

The Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Regional Assembly (EMRA) 2019-2031, was agreed on June 28th 2019. This strategy includes Regional Policy Objective (RPO) 8.25 which states the following:

> *Local Authorities shall:*
> - *Promote and facilitate the sustainable development of a high-quality ICT network throughout the Region in order to achieve balanced social and economic development, whilst protecting the amenities of urban and rural areas.*
> - *Support the national objective to promote Ireland as a sustainable international destination for ICT infrastructures such as data centres and associated economic activities at appropriate locations.*

In addition to RPO 8.25 the development of enhanced electricity and new transmission infrastructure is supported by RPO 10.20:

> *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. This Includes 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.*

It is clear from the above that the RSES supports the development of ICT infrastructures at appropriate locations. The appropriateness of the proposed development in this location is evident from the grant of permission for nearby similar developments and the recent grant of Ref. RA/191593. by MCC. The proposed development is for associated infrastructure for the concurrent data storage facility development.

3.3.3 Meath County Development Plan 2013-2019

The Meath County Development Plan 2013-2019 (MCDP) sets out a coherent spatial planning framework for the County within the context of national and regional policies. The plan covers the administrative area of County Meath situated in north Leinster, along the east coast of Ireland. The aim of the MCDP is to drive the present-day evolution of the county and to establish a framework for the coordinated and sustainable economic, social, cultural and environmental development of County Meath.

The relative policies and objectives of the MCDP in relation to Water, Drainage, Environmental Services, Transport, Waste, Cultural Heritage, Natural Assets, Environment have been addressed in the relevant chapters of this EIA Report.

Core Strategy

The MCDP outlines the purpose of the Core Strategy is to show that the development objectives in the MCDP are consistent, as far as practicable, with the national and regional development objectives that are set out in the NSS and RPGs for the GDA.

The vision of the MCDP is for:

> *Meath to be a county that fosters sustainability throughout its vibrant communities, dynamic economy and unique cultural and natural heritage.*

This vision is supported by a number of Core Principles relevant to the proposed development as shown in Table 3.1 below.

Table 3.1 *MCDP Relevant Core Principles*

Core Principle 1	To develop Meath's critical role in the Dublin and Mid East Region and its role as part of the Dublin City National Economic Gateway maximising on its proximity to Dublin Airport.
Core Principle 3	To promote sustainable economic development to support the population of County Meath in accordance with the guidance and recommendations set out in the Economic Development Strategy for County Meath 2014-2022.
Core Principle 5	To encourage mixed use settlement forms and sustainable centres, in which employment, housing and community services are located in close proximity to each other and to strategic public transport corridors
Core Principle 9	To consolidate population growth and employment in areas best served by public transport and a range of transport modes.

The proposed development site is located to the north of the M3 Motorway at Clonee in terms of the settlement hierarchy Clonee is identified as a village with nearby Dunboyne as a Large Growth Town II. This area is designated as having strong potential for economic growth due to its interconnected multi-modal corridors and close proximity to the National Gateway core.

The proposed development is supported by the objectives outlined in Table 3.2 below.

Table 3.2 *MCDP Core Strategy Relevant Objectives and Policies*

CS OBJ 1	To provide and promote a strategic economic development strategy that identifies a hierarchy of employment centres related to the overall development strategy of the County which will encourage a more balanced and sustainable pattern of employment across the county in accordance with the recommendations of the Economic Development Strategy for County Meath.
CS OBJ 2	To facilitate and encourage the sustainable development of designated core economic areas, such as would allow the creation of a critical mass, in terms of residential population and economic activities, sufficient to service the proposed expanded economic function of such centres. The promotion and facilitation of large scale employment generating developments will occur within the Primary Economic Areas/ Primary Economic Growth Areas and Secondary Economic Growth Areas. From a County Meath perspective, the stated centres are: i. Navan Core Economic Area with Navan as a Primary Economic Growth . Town and including the Secondary Economic Growth Town of Kells and the town of Trim); ii. Drogheda Core Economic Area; iii. Secondary Economic Growth Towns of Ashbourne / Dunboyne; and; iv. The Environs of Maynooth and Kilcock located in the administrative area of Meath (in addition to Dunboyne / Pace and Clonee) are included in the Gateway Core Economic Area corresponding with the Metropolitan Area. Maynooth and Leixlip are identified as a Core Economic Area with the towns of Kilcock and Celbridge providing a supporting role.

The proposed development lands are partially zoned as E2 General Industry and Employment / E3 Warehousing and Distribution in the Meath CDP, with a portion of the site (relating to the proposed underground transmission cables and connections to the existing overhead transmission lines) without any zoning. The land use zoning objectives are outlined in Table 3.3. The site zoning map is provided in Figure 3.1, the proposed development lands are outlined in red.

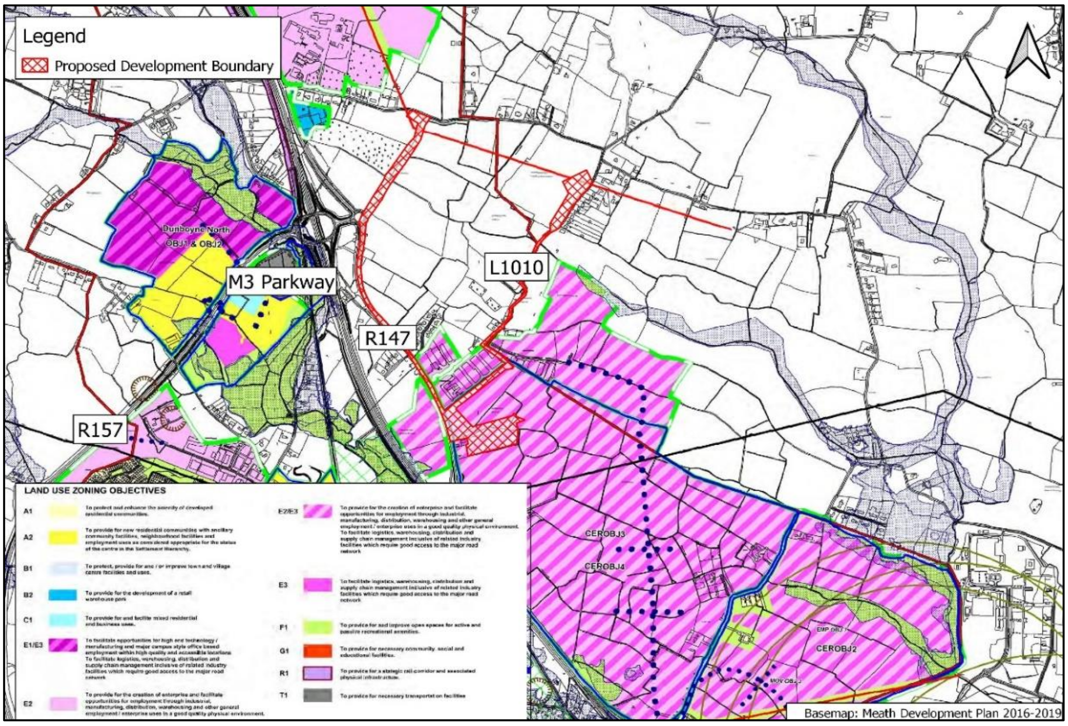


Figure 3.1 *Meath CDP proposed development lands zoning*

Public services are permitted in principle under the E2 and E3 zoning objectives as set out within section 2.9. of the County Development Plan. The proposed development is ancillary and required to service to the approved EngineNode data storage facility development within the overall landholding.

Settlement Strategy and Housing

The nearby existing and permitted data storage facility and substation developments (MCC Ref: RA150605 and RA180671) provide precedent for development in this area. The development is a natural extension of the Damastown Industrial area and the land is appropriately zoned.

Additionally, the MCDP as adopted, classified Dunboyne and Clonee as a single settlement for the purposes of the settlement hierarchy and population and household distribution.

It is also made clear that the Dunboyne/Dunboyne North and Clonee area, is located within the Metropolitan Area of Dublin. The below settlement objectives in the MCDP supports the proposed development of this area.

Table 3.3 *MCDP Relevant Settlement Strategy Policies and Objectives*

SS OBJ 3	To seek the consolidation of development within the existing built up footprint of urban centres in the Metropolitan Area of County Meath including around the public transport interchange at M3 Parkway rail station in Dunboyne North in order to achieve a more compact urban form and secure the use of rural areas for agricultural, horticultural and equestrian farmlands and amenity facilities, subject to the requirements of ED POL 13.
SS OBJ 9	To ensure that Dunboyne develops as a key settlement centre in the Metropolitan Area of the Greater Dublin Area and to ensure that the settlement grows in a manner that is balanced, self sufficient and supports a compact urban form and the integration of land use and transport.

Economic Development Strategy

It is the policy of the Council to facilitate 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.

The proposed development is located in a Secondary Economic Growth Centre adjacent to Dunboyne North which is one of the 5 no. strategic sites on County Meath identified for economic development and employment. This is due to being positioned in a unique access rich environment proximate to both public rail and motorway links in the National Gateway area of the county. The proposed development is supported by the objectives and policies in Table 3.4 below.

The development in this area has been promoted through additional lands have been zoned for E2/E3 purposes. The proposed development will act on the potential of the undeveloped lands and provide construction jobs, direct and indirect employment in the area.

Table 3.4 *MCDP Relevant Economic Development Policies and Objectives*

Policy/Objective	Summary	Compliance
ED POL 3	To encourage and facilitate the successful development of the 5 no. key strategic employment sites in the County as identified in the Economic Development Strategy for County Meath 2014-2022. These are to develop as regional anchors of enterprise and employment creation, promoting a mix of employment types and thereby reducing the need for residents of County Meath to commute outside the County for employment.	The area is identified as a key strategic employment site, the proposal will bring Foreign Direct Investment into the Clonee / Dunboyne area
ED POL 9	To promote innovative economic sectors and encourage clustering which positively exploits synergies between interconnected companies and / or which forge synergies with adjoining third level education institutions including lifelong learning synergies and start up technology enterprises given Meath's locational advantages being close to a number of high quality third level campuses where research and development activity is forstered.	The site is located near to a number of high quality third level campuses where research and development activity is fostered. The proposed development enhances the existing clusters of similar development in the surrounding area.
ED OBJ 4	To ensure that sufficient and suitable land is zoned for logistics, distribution and supply chain management industries at Ashbourne, Dunboyne / Clonee, Kells, Enfield and Stamullen and in addition to land zoned for large scale and general industry.	The proposed development will realise the potential of the currently undeveloped lands within the secondary economic growth area and bring employment to the area.

Water, Drainage & Environmental Services

The availability of water supply and wastewater treatment and disposal are critical infrastructure requirements for any development. The MCDP sets out a number of environmental objectives and policies relevant to the proposed development set out in Table 3.4 and addressed further in the relevant chapters of this EIA Report.

The surface water and foul water drainage system for the proposed development discharges to the concurrent development drainage infrastructure.

The following measures and assessments have been incorporated into the to ensure the proposed development is in compliance with the objectives and policies:

- The new drainage system provides for a separate foul and surface water drainage system;
- Hydrocarbon interceptors have been included in the design to maintain the quality of the foul and surface water discharge;
- Suitable SuDS measures including pervious paving and attenuation storage; Chapter 7 (Hydrology) of this EIA Report takes into consideration the relevant River Basin Management Plan and Programme of Measures, and;

Table 3.5 *MCDP Relevant Water, Drainage & Environmental Services Policies and Objectives*

Policy/Objective	Summary	Compliance
WS POL 7	To ensure that in the case of all developments where public mains are available or likely to be available, the development will be required to connect into them.	The development will connect to public mains.
WS POL 14	To implement the policies developed for the Greater Dublin Area by the Greater Dublin Strategic Drainage Study and to ensure that all developments will have regard to the policies as expressed in the Greater Dublin Strategic Drainage Study.	The development will implement the policies developed for the Greater Dublin Strategic Drainage Study.
WS POL 17	To ensure that all new developments have access to or are provided with satisfactory drainage systems in the interests of public health and to avoid the pollution of ground and surface waters.	The development will provide satisfactory drainage systems.
WS POL 19	To protect groundwater resources having regard to the County Meath Groundwater Protection Plan.	The proposed development will not adversely impact on groundwater resources.
WS POL 20	To ensure through the implementation of the River Basin Management Plans and their associated programmes of measures, and any other associated legislation, the protection and improvement of all drinking water, surface water and ground waters throughout the county.	Through appropriate SuDs features and the use of hydrocarbon interceptors, as well as monitoring of site emissions, the proposed development will not adversely impact on drinking water, surface water (the Pinkeen Stream) and ground waters resources.
WS POL 25	To protect, maintain and improve the natural character of the watercourses and rivers in the county Meath.	The proposed development site is located at the source of the Pinkeen Stream. Through appropriate SuDs features and the use of hydrocarbon interceptors, as well as monitoring of site emissions, the development will not adversely impact on the natural character of the watercourse.
WS OBJ 8	To generally require new developments to provide for the separation of foul and surface water drainage networks within the application site.	Foul water and surface water will be separated.
WS OBJ 17	To require the use of Sustainable Urban Drainage Systems in accordance with the Greater Dublin Regional Code of Practice for Drainage Works for new developments (including extensions).	The development will implement the Sustainable Urban Drainage Systems in accordance with the Greater Dublin Regional Code of Practice for Drainage Works.
WM POL 7	To encourage the recycling of construction and demolition waste and the reuse of aggregate and other materials in future construction projects.	A construction and demolition waste management plan will be developed for the proposal that will include the recycling of construction and demolition waste and the reuse of aggregate where possible.

WM OBJ 17	To require developers to prepare construction and demolition waste management plans for new construction projects over certain thresholds which shall meet the relevant recycling/recovery targets for such waste in accordance with the national legislation and national and regional waste management policy.	A construction and demolition waste management plan will be developed for the proposal.
WS SOBJ 9	To promote compliance with environmental standards and objectives established— (i) for bodies of surface water, by the European Communities (Surface Waters) Regulations 2009; (ii) for groundwater, by the European Communities (Groundwater) Regulations 2010; which standards and objectives are included in river basin management plans.	The development includes measures to protect both surface water and groundwater quality.
NH POL 12	To have regard to the geological and geomorphological heritage values of County Geological Sites listed in Appendix 13 and avoid inappropriate development, through consultation with the Geological Survey of Ireland.	The development has no impacts om areas of geological and geomorphological heritage values.

Energy & Communications

The proposed development is proposing to supply electricity requirements through the national grid. The proposed development will incorporate an Energy Efficient Design from the outset in order to maximise energy efficiency.

The MCPD supports the improvement of ICT infrastructure across the County as detailed. Table 3.6 below shows the relevant policies and objectives from this section of the MCDP.

Table 3.6 *MCDP Relevant Energy & Communications Policies and Objectives*

Policy/Objective	Summary	Compliance
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.	The proposed development is associated with the electricity network that will serve the future needs of an employment generating business within the County.
EC POL 13	To ensure that energy transmission infrastructure follows best practice with regard to siting and design particularly to ensure the protection of all important recognised landscapes.	The proposed energy transmission infrastructure has been designed to best practice. The majority of the development is subsurface, no significant landscape impacts are anticipated.
EC POL 16	To require that the location of local energy services such as electricity, be underground, where appropriate.	The majority of the electrical cables will be underground, with the exception of the connection points.
EC POL 25	To facilitate the delivery of a high capacity Information and Communications Technology (ICT) infrastructure and broadband network and digital broadcasting throughout the county.	The proposed development is ancillary to the development of a significant ICT facility within the County.
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.	An Appropriate Assessment Screening has been carried out for the Proposed development. The report concluded that a Natura Impact Statement is not required.

3.3.4 Dunboyne / Clonee / Pace Local Area Plan

This Local Area Plan (LAP) relates to the Dunboyne/Clonee/Pace Corridor, this is seen as a single entity in based on the geographical proximity of each settlement, their location within the railway corridor, and strong urban influence from the GDA and location in the Metropolitan Area.

The purpose of the LAP is to give effect to the provisions of the MCDP as they relate to this area. MCC has stated its commitment to placing sustainable development principles at the heart of its decision making.

This document is not a statutory plan but is non-statutory guidance to drive development of this area. The goal is to develop this corridor as a centre for regional population growth, and for local and strategic employment.

The local area plan reiterates the specific zoning objectives for the development of lands between Portan, Clonee and Bracetown. The below objectives have been identified from this zone and are important to development in this area.

This objective has been satisfied previously via the updating and submission to MCC of the non-statutory Masterplan (Revision One) that was previously provided with planning permission (MCC ref RA/191593). That masterplan was agreed in writing by the Executive of the Planning Authority prior to the submission of the concurrent application under Reg. Ref.: RA191593 & ABP Reg. Ref.: ABP-307546-20.

Table 3.7 *Dunboyne / Clonee / Pace LAP Relevant objectives and Policies*

EMP OBJ 7	It is a requirement of the Local Area Plan that the development of the employment generating lands at Portan, Clonee identified on Map Number 3 will be subject to the provisions of a Framework Plan to be agreed with the Executive of the Planning Authority and specific servicing and access arrangements set out in the Movement Section of this Local Area Plan. Any uses proposed shall have regard to and be consistent with the range of uses indicated as being appropriate to E2 'General Enterprise & Employment' Category 1 (Primary & Secondary Economic Centres) and E3 'Warehousing & Distribution' as provided for in Volume I of the Meath County Development Plan 2013-2019.
CER OBJ 3	To facilitate the development of lands between Portan Clonee and Bracetown for E2 'General Industry & Employment' and E3 'Warehousing & Distribution' as provided for in Volume I of the County Development Plan. A Master Plan and a detailed Roads Needs Assessment of said lands shall accompany any planning application for the development of these lands. This Master Plan shall obtain the prior written agreement of the Executive of the Planning Authority. The Master Plan shall accompany any application for planning permission on these lands and shall address land use, transportation, connectivity, urban design, recreation, environmental impacts including flood risk, phasing and implementation issues to the satisfaction of the Executive of the Planning Authority. Development shall be contingent on the phased delivery of the distributor road. The Master Plan shall address the following: A Design Concept for the lands; • Guidance for high quality design throughout the development; • Building heights and densities; • A landscape plan for the development and landscape management plan (post-completion of the development); • Flood Risk Assessment which takes account of the most up to date available CFRAM data Draft Variation No. 3 of the Meath County Development Plan, 2013-2019 A Transport Assessment which addresses the following issues: • Access arrangements to the Development Site; • Provision of safe cycle ways and pedestrian routes throughout the Development Site; • Provision and access for Service Vehicles to the Site. The Master Plan shall be agreed in writing with the Executive of the Planning Authority in advance of the lodging of any planning application.
CER OBJ 4	To facilitate the development of lands between Portan Clonee and Bracetown for E2 "General Industry & Employment" and E3 "Warehousing and Distribution" purposes solely for the development of major employment proposals, primarily FDI, requiring a significant site area, having regard to this strategic location within the county, as provided for in Volume I of the County Development Plan.

3.3.5 Draft Meath County Development Plan 2020-2026

The *Draft Meath County Development Plan* for 2020-2026 was published on the 18th of December 2019. Public consultation on the Draft Plan was until March 6th, 2020 and the plan is likely to be adopted by Q4 2020 or Q1 2021. The Planning Report (JSA 2020) produced by John Spain Associates and included with this application details the aspects of the draft development plan as they relate to the subject site.

The key thing of note is that under the Draft Development Plan, the lands on which the proposed new 220kV substation will be located remain zoned E2/E3. The lands to the northwest of the proposed substation site are also proposed to be zoned E2/E3 under the Draft Development Plan (currently unzoned under the 2013-2019 Development Plan). These lands are traversed by the proposed underground cable circuits.

3.3.6 Economic Development Strategy for County Meath 2014-2022

The Economic Development Strategy for County Meath 2014-2022 (EDS) sets evidence-based measures aimed at accelerating the economic transformation, revitalisation and sustainable development of County Meath.

The locality of the proposed development within the Dunboyne/Clonee/Pace corridor has been identified as a strategic area for development due to the favourable locations, ready-to-go sites, fibre-based broadband and telecoms, power and gas, water, easy access to the national motorway network and are in close proximity to Dublin Airport and Dublin Port.

The zoning, and location of the proposed development location is clearly a strategic site with the potential for development. Strategic sites are opportunities for economic and employment development around the county, including for the ability to attracting more foreign direct investment into the county.

The proposed development facilitates the potential for the development of the concurrent data storage facility application, which is identified as a strength due to the capacity to accommodate these larger developments.

The EDS identifies a number of Actions required to deliver the strategy, including:

- Constructive engagement between Meath County Council and businesses (including developers/landowners). Fundamental to this action is to ensure that officials continually think about how best the Council can serve businesses and wealth creators, who have the capacity to help deliver the identified sites and create jobs.
- Promotion of the hierarchy of economic centres and targeted sectors in Meath with the objective of facilitating significant new enterprise employment in Meath (map shown earlier).
- Meath County Council to undertake an assessment of the available infrastructure and services on all of the identified sites with employment potential, in conjunction with the relevant landowners, the goal being to complete the proposed site services matrix and to plan for how best to address any deficiencies identified through framework plans.

3.4 MASTERPLAN (REVISION ONE) / FRAMEWORK PLAN

A Masterplan (Revision One) has been prepared by Clifton Scannell Emerson Associates (CSEA) on behalf of the applicant to comply with objective CER OBJ 3 of the Dunboyne, Clonee & Pace Local Area Plan 2009-2015 (Table 3.7). This Masterplan (Revision One) was previously provided with planning application (MCC ref RA/191593) and outlines the multi-disciplinary design rationale for the granted data storage facility campus expansion within the wider context of the neighbouring E2 / E3 zoned lands.

The Masterplan (Revision One) has been prepared in consultation with the Planning Authority and builds on previous Masterplans submitted for the boundary. The site covers approximately 60.5 acres or 14% of the E2 / E3 zoned lands within the Masterplan (Revision One) area.

3.5 PLANNING PERMISSIONS

As part of the assessment of the impact of the proposed development, account has been taken of developments that are currently permitted, or under construction and substantial projects for which planning has been submitted within the surrounding areas.

The MCC Planning Department website was consulted in order to generate a list of relevant planning permissions from the surrounding areas of the proposed development within the previous five years. The outcome of this search is presented in Table 3.8 below.

The project is designed to support the power demand for the development MCC Ref. RA/191593 for: *The construction of 4 number 2 storey data storage buildings with a combined gross floor area of c. 92, 172 sq.m, associated single storey energy centre with a gross floor area of c. 8,906 sq.m with an ancillary 1 storey MV operations building with part basement with a gross floor area of c. 1,016 sq.m, 2 storey offices with a gross floor area of 736 sq.m.* The project will also support the potential future development of the surrounding area.

The proposed data storage facility development is subject to a separate concurrent application under Meath County Council Reg. Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20.

There is no other recent planning history on the proposed development site, and no recent planning history for the cable route. The cable route primarily passes through undeveloped agricultural land and public roads.

Table 3.8 Planning Search relevant to the proposed development site

Planning Reference, Applicant & Location	Development Description	Decision & Decision Date
RA/150605 and ABP Reg. Ref.: PL.17.245347 Runways Information Services Limited Lands at Portan, Gunnocks and Clonee County Meath	Construction of a data centre campus in two phases within 10 years which consists of: Three data centre buildings containing 8 no. data halls with a gross floor area of 50,800 m2 and with a data capacity of 36MW per building (each building is 25,400 m2 and contains 4 no. data halls) together with associated mechanical and electrical spaces and parking. 1 No. single storey ancillary administration/office building with gross floor area of 6,424 m2 linking and accessing the data centre buildings. Ground-level emergency back-up generators (with internal fuel tanks). New site access and temporary construction access and car parking arrangements off the Kilbride Road (L5028). Closure of existing accesses (following the demolition of 2no. residential units). Upgrade to L5028 Kilbride Road to provide cycle path and pedestrian footpath between the R147 and the proposed new site access. Installation of temporary electrical infrastructure to service the data centre campus before final connection. Ancillary site works including underground electricity 20kV cables between substation and data centres. An Environmental Impact Statement (EIS) has been prepared for the Proposed development and has been submitted with this planning application.	Decision to grant by Meath County Council subject to conditions on 23rd July 2015
DA70730 Bennett Developments Ltd. Kilsaran Concrete Portan Clonee Co. Meath	An industrial/light industrial/warehousing development and associated access roads on a 30.71 hectare site to the north of the N3. The development will consist of the construction of an industrial/light industrial/warehousing development with a total gross floor area of 74,334sq.m. The development will include the construction of 13 no. double/triple height detached and subdivided warehouse units with a total gross floor area of 62,794 sq. m. and the development of 5 no. own door units with a total gross floor area of 11,540 sq. m. The proposed development include ancillary office space and outdoor storage yard and associated plant. The proposal involves the demolition of 2 no. habitable houses on the western boundary of the site. The proposed development also includes the partial realignment of the Kilbride Road (CR589) to include a new roundabout and a proposed new access road. The entire development is to be served by 944 no. surface car parking spaces. The proposed development includes all site development works including the construction of a foul treatment plant and pump station, a water treatment plant and pump station, a fire and potable water storage/retention tank, eight electricity sub-stations and four ground water wells with associated housing of pumps for the four wells, associated service roads, service yards, pedestrian accesses, foul sewer drainage network, surface water drainage with attenuation feature lake	Decision to grant by Meath County Council subject to conditions on 22nd September, 2015
VA0018 Runways Information Services Limited Lands at Portan, Gunnocks and Clonee County Meath	Strategic Infrastructure Development application to ABP for a 220kV substation compound and associated loop-in connection to the existing Corduff-Woodland No. 1 overhead 200kV line.	Granted by ABP subject to conditions on 22th October 2015

RA160433 Runways Information Services Limited Land Of Portan, Gunnocks & Clonee Co. Meath	Minor Amendment to previously approved Data Centre Campus application (ref: RA/150605) comprising two elements: 1. a 16sq metre illuminated entrance sign to the immediate north of the main Data Centre Kilbride Road entrance; and 2. a 3.5m high Weather Transmitter mounted on the roof of Datahall CLN-1.1, projecting 2m above the building's perimeter screen wall and associated works.	Granted Permission with conditions by Meath County Council on 14th June, 2016.
RA160843 Axial Properties Ltd. Bracetown Business Park Clonee Co. Meath	Retention permission is sought for 1.) A single storey pitched roof structures and covered double dock levellers with associated ramp to north-west elevation of block 1. 2.) A dock leveller with associated ramp to south-west elevation of Block 2. 3.) A dock leveller with associated ramp to north-east elevation of Block 3. 4.) A single storey pitched roof structures to south-east elevation of Block 4	Granted Permission with conditions by Meath County Council 4th August 2016
RA160937 Runways Information Services Limited Portan, Gunnocks and Clonee County Meath	The development will consist of the minor alteration to the previously approved road layout as part of Data Centre Campus Reference RA/150605 and ABP Reference PL 17.245347 involving the relocation of a landscaping berm and associated works to provide a new internal two lane access road to a secondary entrance for emergency and incidental service use only at the south east corner of the site. (The above mentioned application is concurrent with a separate planning application to Fingal County Council for a secondary access road for emergency incidential service use only to the previously approved Clonee Date Centre Campus Reference RA/150605 and ABP Reference PL 17.245347, comprising a new entrance and associated works on Damastown Road, 2.4m height perimeter security fencing with associated entrance gate, CCTV and intercom system)	Granted Permission with conditions by Meath County Council on 17th October, 2016.
RA161021 Shire Pharmaceuticals (Ireland) Limited Piercetown, Craddockstown and Ballymagillin Townlands, Dunboyne, County Meath	Permission for a two storey Biopharmaceutical Production Building sized 17,445 square metres in total and 19.5 metres high with roof mounted plant and equipment. A three storey laboratory and administration building sized 12,453 square metres and 22 metres high including roof mounted penthouse and plant and equipment. A permanent staff and visitor car park for 496 cars and a temporary construction related car park for 420 cars. The temporary car park will be decommissioned upon completion of the facility. A single storey link building sized 1,751 square metres and 12.4 metres high. Including ancillary site works.	Granted Permission with conditions by Meath County Council on 28th October, 2016.
RA170887 Shire Pharmaceuticals (Ireland) Limited Piercetown, Craddockstown and Ballymagillin Townlands, Dunboyne, County Meath	Revised design and configuration of previously permitted Biopharmaceutical Manufacturing Facility, Planning Register Reference No. RA/161021. A revised design and configuration of the permitted facility to a three storey Biopharmaceutical Production Building sized 10,083 square metres in total and 25.3 metres high and related external plant and equipment including boiler stacks 26 metres high. A single storey Warehouse Facility sized 2,625 square metres in total and 17.3 metres high with roof mounted plant and equipment and associated docking and yard areas. A three storey laboratory and administration building sized 7,022 square metres and 25.3 metres high including roof mounted plant and equipment. Ancillary site works include a bunded tank farm, water and waste water, pipe bridges, cooling	Granted Permission with conditions by Meath County Council 14th September 2017

	towers, gas storage facilities, emergency generators, a waste recycling compound (15 metres wide by 30 metres long) and structures, items of plant and equipment and their associated yards, internal roads and services, fencing, exterior lighting, landscaping and landscape berms, and underground water attenuation tank and building mounted and ground mounted signage. Ancillary site buildings include a single storey sprinkler pump house sized 106 square metres and 6.2 metres high and associated tanks, a single storey waste water pump house sized 7 square metres and 3.2 metres high, a gas reducing station and compound, a covered bicycle facility for 100 bicycles and 3 no. flagpoles 15 metres high, 2 no. Waste Management/Storage buildings 243 square metres and 7.2m high each and a single storey bunded drum storage building sized 122 square metres and 6.2 metres high and a single storey waste water building sized 60 square metres and 6.2 metres high, a single storey covered walkway 180 metres long and 5 metres high joining the car park to the proposed facility and a new bus shelter at the site entrance. The proposed new works include a single storey security building sized 129 square metres and 5.2 metres high to the centre of the site and a single storey security	
RA180048 Runways Information Services Limited Lands at Portan, Gunnocks & Clonee, County Meath - bounded to the south by the R147, to the west by the Kilbride Road, to the north by The Mayne and to the east by lands at Damastown Industrial Park	The development will consist of alterations to a previously approved Data Centre Campus application (Meath County Council ref: RA/150605/An Bord Pleanala ref: PL17.245347) comprising the following elements: 1) Alterations to the layout, design, external lighting and siting of the previously consented entrance guardhouse of the Data Centre Campus (granted under reg. ref: RA/150605 and ABP reg. ref: PL17.245347) involving the extension of the guardhouse canopy and adddition of Corten steel to the facade and canopy of the building; 2) Proposed boundary treatment improvements including: 3.0m high weathered steel Corten Picket fencing on a concrete base wall (Type 1); 3.0m high mesh boundary fencing with matching gates (Types 2 and 3) and associated works; 3) CCTV cameras; 4) 3.0m high fence and matching gates along the internal substation access road; 5) 600mm high oak bollards on the edge of road/pathways; and 6) All other associated works. The above application is concurrent with a separate planning application to Fingal County Council for alterations to the previously approved boundary treatments under register reference FW16A/0127	Granted Permission with conditions by Meath County Council on 13th April, 2018.
PL17.301172 Runways Information Services Limited Lands at Portan, Gunnocks and Clonee County Meath	Request to alter previously approved 220kV substation compound and associated loop-in connection to the existing Corduff-Woodland No. 1 200kV overhead line, Clonee, Co. Meath (planning application reference number 17.VA0018). The proposed amendments relate to Outdoor Air Insulated Switchgear (AIS) equipment, Outdoor AIS equipment and associated site works.	Amendments granted by An Bord Pleanála on 2nd May 2018
RA180671 Runways Information Services Limited (RISL)	The proposed development will consist of an expansion of the existing approved data centre Campus (Meath County Council ref: RA/150605 / An Bord Pleanala ref: PL 17.245347) comprising the following elements (a) Construction of two single-storey data centre buildings with a gross floor area (GFA) of circa 57,400m2; (b) A single storey administration / office building with a GFA of circa 5,710m2 which is physically linked to the proposed data centre buildings; (c) Site infrastructure to include entrance gates and appropriate signage, a security guardhouse of circa 60m2 and associated canopy; (d) Road works	Granted Permission with conditions by Meath County Council on 27th July 2018.

Portan, Gunnocks, Loughsallagh & Clonee Co. Meath	including a new permanent site access, internal roadways, underpass & footpaths, circa 276 no. car parking spaces, bicycle parking facilities, upgrades to a section of the L5028 Kilbride Road together with an emergency access via the L10101 to include resurfacing only a section of the road and additional of circa 1 no. passing bay; (e) General drainage networks and arrangements and a connection to the existing public sewer network; (f) Surface level back-up generators with internal fuel tanks; (g) Hard & soft landscaping incorporating perimeter fencing to include both external and internal circa 3.0 metre high architecturally designed metal fencing and matching gates; (h) Temporary construction access and associated car parking arrangements off the Kilbride Road (L5028); and (i) Associated & ancillary site works. Planning permission is being sought for a 10 year period. An Environmental Impact Assessment Report (EIAR) has been prepared for the proposed development and has been submitted with this application.	
RA181060 & PL17 .304613 Three Ireland (Hutchison) Ltd Bracetown Business Park, Bracetown, Clonee, Co. Meath	The construction of a 45m high telecommunications support structure carrying antennas and transmission dishes, with associated equipment units, and security fencing. Significant further information/revised plans submitted on this application	Granted Permission with conditions by Meath County Council 8 May 2019
RA190854 Shire Pharmaceuticals Ireland Limited Piecretown, Cradockstown & Ballymagillin Townlands, Dunboyne, Co. Meath	Temporary development located at our site at Piecretown, Cradockstown & Ballymagillin Townlands, Dunboyne, Co. Meath, including the following: - The continued use for a period of 5 years, of two existing temporary contractor-related portacabins. The temporary portacabins consist of: - A two storey structure sized 3,326 square meters and 10.6 meters high, and - a two storey structure sized 1,172 square meters and 7.1 meters high, both located to the rear of the site - The application also includes the continued use of a temporary contractor car park and yard area of up to 288 cars in a gravelled area, and the de-commissioning of the remaining (168No.) temporary car spaces. These car spaces will be utilised according to need and will be closed off when not in use. - The proposed works include site works, landscaping, drainage and site lighting and all necessary services.	Grant Permission with conditions by Meath County Council 16 August 2019
RA200214 Runways Information Services Limited Portan , Gunnocks To The North Of Clonee, Co. Meath	The proposed development will consist of an amendment to the existing approved data centre campus (Meath County Council ref: RA/150605 / An Bord Pleanala ref; PL17.245347) and associated boundary treatments application (Meath County Council ref: RA/180048) comprising the following elements: (a) Addition of grasscrete and 6 no. cira 8m high lighting poles for the provision of circa 54 no. overflow car parking spaces to the north of building CLN 3 for commissioning contractors; (b) Demolition of vacant properties at the following addresses (including removal of all services / utilities and septic tanks where necessary): D15 KW99, Portan, Clonee, County Meath (c. 266m2); D15 E102, Steelbones, Portan, Clonne, County Meath (c.305m2); D15 C9RK, Portan, Clonee, County Meath (c. 155m2); D15 A294, Gunnocks, Clonee, County Meath (c. 105m2); D15 PX47, Greenacres, Gunnocks, Clonee, County Meath (c. 145m2); Total approximate area to be demolished - c. 976m2, (c) Addition of boundary treatments (c. 3.0m high green mesh fence) and site landscaping; and (d) All associated and ancillary works. Planning permission is being sought for a ten-year period.	Proposed Decision to grant 05 June 2020

3.6 SEVESO SITES

The Seveso Directive (Directive 82/501/EEC, Directive 96/82/EC, Directive 2012/18/EU) was developed by the EU after a series of catastrophic accidents involving major industrial sites and dangerous substances. Such accidents can give rise to serious injury to people or serious damage to the environment, both on and off the site of the accident.

The Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015) (the “COMAH Regulations”), implement the latest Seveso III Directive (2012/18/EU).

The purpose of the COMAH Regulations is to transpose the Seveso Directive into Irish law and lay down rules for the prevention of major accidents involving dangerous substances, and to seek to limit as far as possible the consequences for human health and the environment of such accidents, with the overall objective of providing a high level of protection in a consistent and effective manner.

In the vicinity of the site there are a number of existing Seveso sites. The proposed development is not within the consultation zone of these sites. The sites are located sufficiently far away from the proposed development to have no effects with regard to COMAH related effects.

Table 3.9 Seveso site near to the development site

Name	**Address**	**Tier**	**Distance from site (kn)**	**Consultation Zone (km)**
Chemco Ireland Limited	Damastown Road, Damastown Industrial Park, Mulhuddart, Dublin 15	Upper	2.7	1.0
Astellas Ireland Co., Ltd	Damastown Road, Damastown Industrial Park, Mulhuddart, Dublin 15	Lower	2.2	1.0
Barclay Chemicals Manufacturing Ltd (t/a Barclay Crop Protection)	Damastown Way, Damastown Industrial Park, Mulhuddart, Dublin 15	Upper	3.2	1.0
Guerbet Ireland ULC	Damastown, Mulhuddart, Dublin 15	Upper	2.0	1.0
Clarochem Ireland Limited	Damastown, Mulhuddart, Dublin 15	Lower	2.3	1.0
Contract & General Warehousing Ltd	Westpoint Business Park, Navan Rd. Mulhuddart, Dublin 15	Upper	3.0	0.7

3.7 PRE-PLANNING CONSULTATION AN BORD PLEANÁLA (ABP)

Prior to the submission of this application a pre-planning meeting was undertaken with ABP where a range of issues were discussed. This meeting allowed for a discussion on the in scale, nature and extent of the proposed development to ensure the requirements for EIA assessment were included. A pre-application meeting was also undertaken with Meath County Council.

3.8 CONCLUSIONS

The proposed development is in accordance with the policies and objectives of the National Planning Framework, Regional Spatial and Economic Strategy for the Eastern and Midlands Regional Assembly, and the Meath County Development Plan.

The development is an appropriate land use for the area and meets the requirements of the MCDP zoning objectives. The development will minimise the potential environmental impacts as described in various chapters of this EIA Report.

In conclusion, it can be stated that the Proposed Development complies fully with the stated requirements of the planning policy context, including the Meath County Development Plan and will deliver a key piece of supporting infrastructure which is of significant importance to the development of a major Information and Communications Technology (ICT) facility in Ireland.

4.0 ALTERNATIVES

4.1 INTRODUCTION

EIA legislation and the prevailing guidelines and best practice require that EIA Reports consider 'reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied 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'. This section will address:

- Do Nothing Alternative;
- Alternative project locations;
- Alternative designs/layouts;
- Alternative processes; and
- Alternative mitigation measures.

This chapter describes the alternatives that were considered for the Proposed Development, where applicable, under each of these headings and the reasons for the selection of the chosen options, including a comparison of environmental effects.

4.2 DO NOTHING ALTERNATIVE

As the site is greenfield, there are no environmental effects on the receiving environment associated with the do-nothing scenario. The Do-Nothing scenario has been considered in each chapter of the EIAR.

4.3 ALTERNATIVE PROJECT LOCATIONS

<u>GIS Substation</u>

The proposed substation was located as close as possible for technical reasons to the overall masterplan for the concurrent data storage facility. The proposed location is deemed to be the most suitablelocation on the site for such a development to facilitate an independent substation site and facilitate power supply for the development.

<u>220kV Transmission Line Route Options</u>

The assessment of the alternative routes considered three subsurface route options for the 220kV transmission line as follows:

- **Option A –** Double circuit underground line along L1010 (2.2 km) and 2 no HV towers connecting to the Woodland-Corduff overhead line

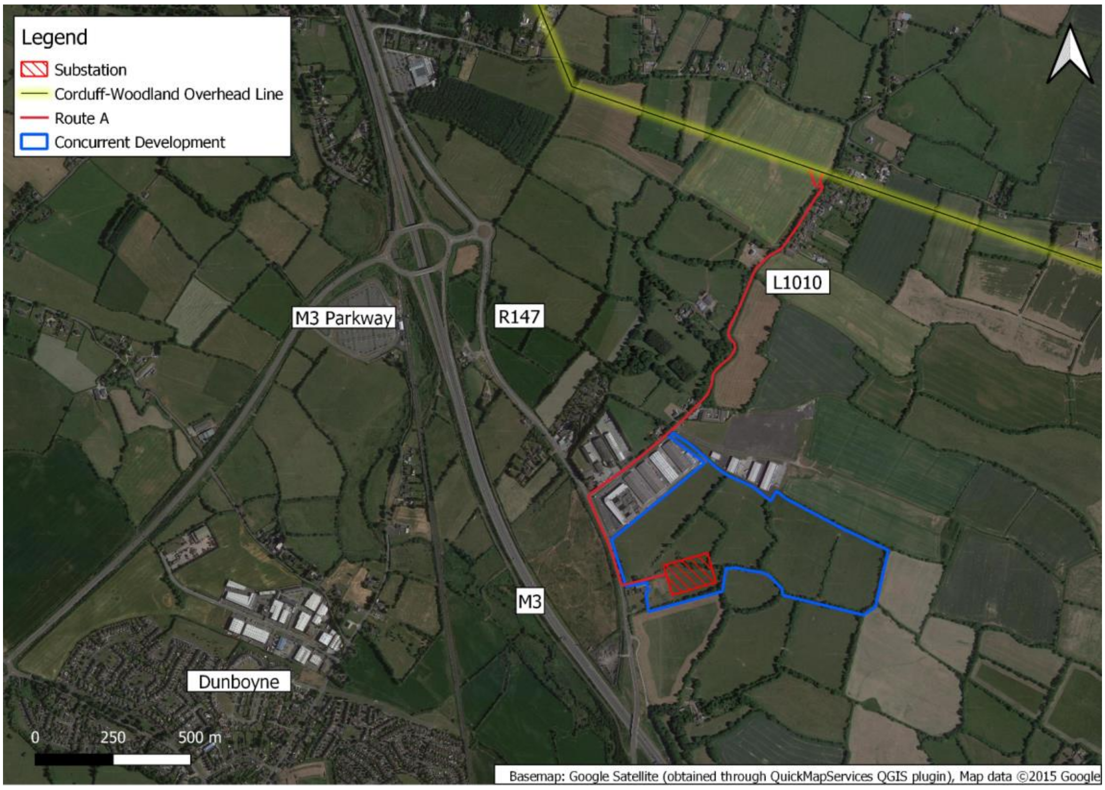


Figure 4.1 *Option A*

A survey of the L1010 concluded that option A would have impacts in construction due due tothe width of the trench required for a double circuit and conflict with exiting services in the narrow road. Closing of the entire road during construction would be required during works.

- **Option B** – Proposed Route as described in Chapter 2.
  One underground transmission cable circuit (the Gunnocks - Woodland circuit) will proceed from the proposed substation to the east, before following the R147 roadway northwards to an existing roundabout linking the R145 with the M3 motorway. From this roundabout, the circuit proceeds northeast through private agricultural lands, before reaching the Corduff – Woodland overhead line. This circuit will cover a distance of c. 2 kilometres.

  The other underground transmission cable circuit (Gunnocks – Corduff circuit) will proceed from the proposed substation to the east, following the perimeter of the data storage facility site northwards, then northeast and exiting onto an existing rural roadway. The route then follows this rural road north-eastward, before reaching the Corduff – Woodland overhead line in private agricultural lands to the west of the roadway. This circuit will cover a distance of c. 1.7 kilometres.

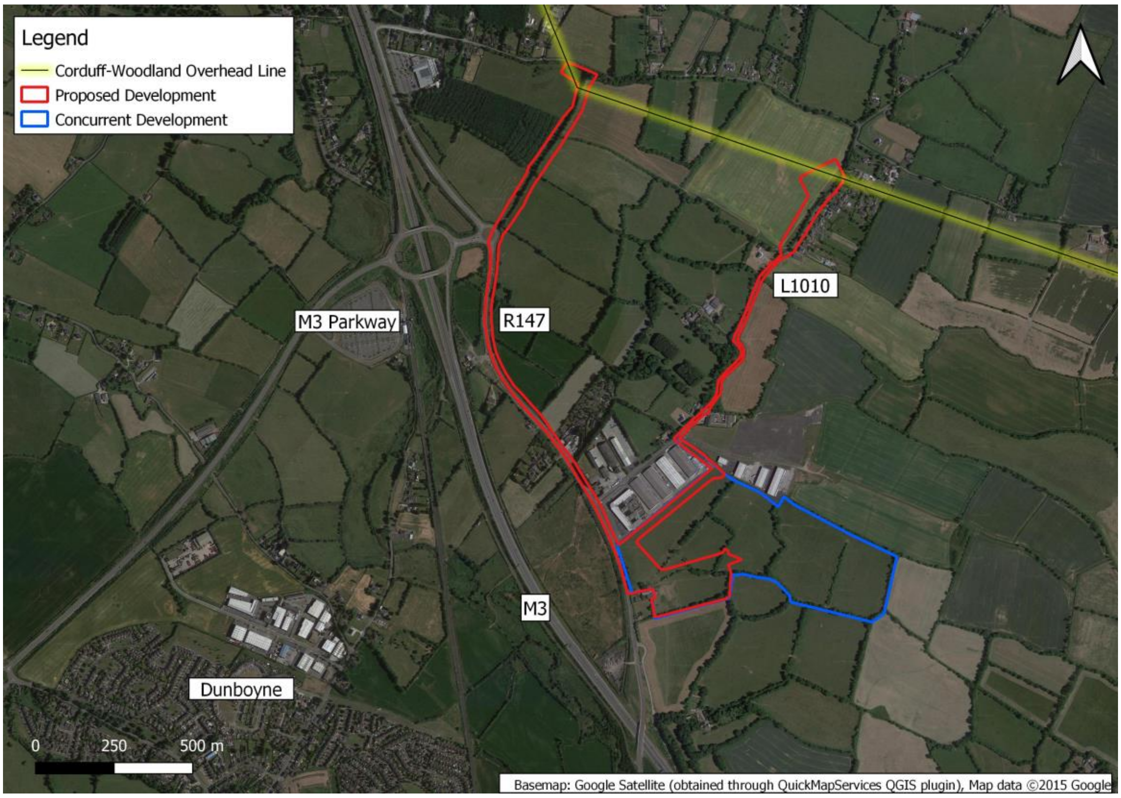


Figure 4.2 *Option B*

- **Option C**– Double circuit underground line south along the L147 (crossing the Tolka) to the Woodlands Clonee overhead line.

Figure 4.3 *Option C*

A preliminary appraisal of the environmental effects of Options B and C was undertaken as part of the route selection process. Both routes were determined as feasible with minimal short or long-term impacts on the environment.

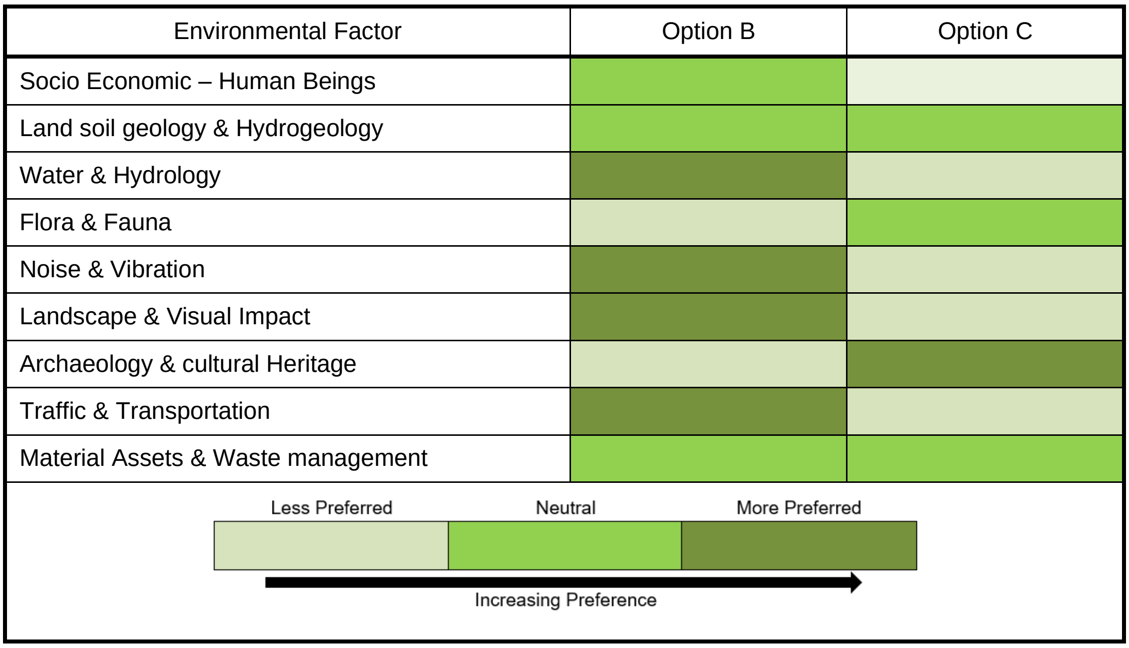
In terms of the operational phase for either of the route options, each of the environmental factors were considered to have a ***long-term***, ***neutral*** and ***imperceptible*** impact on the environment.

For the construction phase, the duration of impacts for both route options would be ***short term*** as the works for the transmission line will have a duration of less than 1 year. There are no significant environmental effects predicted for the construction phase for the chosen route as set out in the subsequent chapters of this EIA Report. Based on a high-level environmental assessment of the alternative route, it is considered that the construction phase would not result in any significant environmental effects for either route. However, the following issues weighed against option C.

- Extensive public road closures required to facilitate installation of double circuit 220 kV underground connection
- Proposed route would require extensive works on bridge crossing M3 motorway potentially impacting its operation
- Proposed route would require a crossing of the Tolka river
- Limited land for construction of 2 no. required cable/overhead line interface compounds to facilitate this option
- Proposed route was longer than chosen option resulting in higher costs, and longer construction time

Each of the environmental factors were assessed for the construction phase using a similar methodology to determine the more preferred and less preferred route option, and in some cases there was no discernible difference between the two options and are considered neutral. The environmental factors are listed in Table 4.1 below with the conclusions of the preliminary assessment of each presented.

Table 4.1 *Summary of route preference for each environmental factor*



Environmental Factor	Option B	Option C
Socio Economic – Human Beings	▒	░
Land soil geology & Hydrogeology	▒	▒
Water & Hydrology	▓	░
Flora & Fauna	░	▒
Noise & Vibration	▓	░
Landscape & Visual Impact	▓	░
Archaeology & cultural Heritage	░	▓
Traffic & Transportation	▓	░
Material Assets & Waste management	▒	▒

Less Preferred	Neutral	More Preferred
░	▒	▓

Increasing Preference →

There were no environmental constraints which would preclude development of either route options. A review of relevant environmental criteria by each specialist show a preference for Option B based on the potential short-term impacts during construction. This is primarily due to the Option C requiring a river crossing and resulting in greater disruption along the existing roads during construction works. Option B requires crossing a greater length of greenfield area and therefore has potential for short term impact on biodiversity and archaeology (if encountered). It is noted that standard mitigation measures are available to minimise impacts on these receptors.

It is also noted that the above preferences were based on construction impacts only. For the operational phase, it was determined that there would be a neutral preference for either route as the impacts are the same for each environmental factor (i.e. *long-term, neutral* and *imperceptible*).

4.4 ALTERNATIVE DESIGN/LAYOUTS

The proposed GIS substation is designed based on requirements stipulated by the ESB Networks. The design of the substation units is centred around the equipment requirements of ESB Networks that are required to provide an efficient and safe service. From a “design and layout” point of view, therefore, the flexibility to select alternative designs and layouts was not available to the Applicant.

Alternative design options considered included above overhead lines. By their very nature, above overhead lines require extensive land on which to erect the additional pylons required, and direct “land corridors” available to the Enginenode development i.e. areas that area free of other properties or structures and will remain so indefinitely for maintenance purposes. Neither of which were available to facilitate connection in this instance. In addition, overground lines have a long-term negative impact on the existing landscape.

The design of the cable bays are based on ESB Networks mandatory specifications.

4.5 ALTERNATIVE PROCESSES

This section typically examines the project processes in relation to likely emissions to air and water, likely generation of waste and likely effect on traffic to determine the process that is least likely to impact on these parameters.

The underground 220kV transmission line will become an integral part of the national high voltage electricity grid which is currently operated by ESB Networks. As such the underground cable installations must meet ESB Network’s strict specifications to ensure it will be seamlessly absorbed into the national grid infrastructure and can provide a reliable power supply. From a “process design” point of view, therefore, the flexibility to select alternative processes for integrating into the current national grid is not available to the Applicant.

The ESB Networks specifications for auxiliary power supplies (i.e. the 75 kVA cable installation) are set out in Document Reference: XDS GFS 08 001 R2 *Functional Specification Station Auxiliary Power Supplies*.

In terms of the proposed processes, the proposed GIS substation and new cable bays will employ the same electricity generation and transmission processes that are used by ESB Networks at their other facilities in Ireland and represents the most up-to-date and state of the art processes currently available. As appropriate, alternative processes are considered on an ongoing basis by ESB Networks as a part of each of their operations based on many factors including technical feasibility, environmental impact, efficiency, security, reliability, and cost. Therefore, from a “process design” point of view, the flexibility to select alternative processes for integrating into the current national grid is not available to the Applicant.

4.6 ALTERNATIVE MITIGATION

For each aspect of the environment, each specialist has considered the existing environment, likely impacts of the Proposed Development, and reviewed feasible mitigation measures to identify the most suitable measures appropriate to the environmental setting of the Proposed Development.

In making a decision on the most suitable mitigation measure the specialist has considered relevant guidance and legislation. In each case, a comparison of environmental effects was made, and the specialist has reviewed the possible mitigation measures available and considered the use of the mitigation in terms of the likely residual impact on the environment.

The four established strategies for mitigation of effects have been considered: avoidance, prevention, reduction and offsetting (not required in this development). Mitigation measures have also been considered based on the effect on quality, duration of impact, probability and significance of effects. The selected mitigation measures are set out in each of the EIA Report Chapters 4-14.

4.7 CONCLUSIONS ON ALTERNATIVES

The selected route for the GIS Substation and 220kV transmission line was deemed to be most suitable route for the Proposed Development from an engineering and environmental perspective taking into account access to land, cost and environmental effects. During construction, the proposed 220kV route (similar to the alternative route assessed i.e. Option C) will have a ***short-term***, ***neutral*** and ***imperceptible*** *to* ***not significant*** environmental effect. It is noted that the proposed route and the alternative route considered were considered to have a ***neutral, imperceptible, long-term*** environmental effect during the operational phase.

The design of the proposed GIS substation and new cable bays have been selected with due regard to minimising the environmental and visual impact once in-situ. The selection of the design has been constrained to the standard specifications required by ESB Networks for connection to the national grid.

In conclusion, it is considered that the Proposed Development and design is the most suitable choice to provide the support required to meet the power requirements of the data storage development.

5.0 HUMAN HEALTH AND POPULATIONS

5.1 INTRODUCTION

This chapter of the EIAR has been prepared to assess the likely impacts associated with Human Health and Populations for the proposed development. In accordance with the *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2017), this chapter has considered that:

> *"in an EIAR the assessment of impacts on population and human health should refer to the assessment of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under environmental factors of air, water soil etc".*

In accordance with the *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2017) and *Draft Advice Notes for Preparing Environmental Impact Statements* (EPA, 2015), 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"*. Natural hazards are considered in Chapter 2 (Section 2.7) and Chapter 6. Issues examined in this chapter include:

- Demography;
- Population;
- Employment;
- Social Infrastructure;
- Landscape, Amenity and Tourism;
- Natural Resources;
- Air Quality;
- Noise & Vibration;
- Material Assets;
- Traffic; and
- Health and Safety.

Where these topics are dealt with in further detail elsewhere in this EIA Report, the relevant chapters have been cross referenced in this Chapter.

5.2 METHODOLOGY

The effects of the proposed development on the population and human health are analysed in compliance with the requirements of the *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2017.

5.3 RECEIVING ENVIRONMENT

The proposed development is to be located along the R147 in the townlands of Bracetown and Gunnocks, to the north of Clonee. The site is not directly adjacent to any areas of national or local environmental sensitivity.

The potential receptors within the environs of the site include other industrial and commercial businesses in the area, as well as nearby residential developments and farms. The southwestern boundary of the development site is shared by residential development.

There are residential developments in the area surrounding the proposed development site, the nearby residential developments occur predominantly in a one-off development pattern, or small clusters typical of the rural setting.

The most notable concentrations of residential settlements occur in Dunboyne, south west of the site.

The surrounding area and development context is described in further detail in Chapter 2 (Description of Development) and Chapter 3 (Planning and Development Context).

5.4 CENSUS AND DEMOGRAPHICS

The most recent census of population was carried out by the CSO on the 24th April 2016. The previous census was completed on the 10th of April 2011. The census compiles data for the whole state as well as smaller individual areas including counties, cities, towns and electoral divisions. The proposed development site is located in County Meath, adjacent to the Dublin county border. Taking into consideration the location of the proposed development, the census information on population, age profile, employment and social class, has been analysed in relation to the Meath East and Dublin West regions. Further, data from the Dunboyne electoral division (CSO Area Code ED 11009) will be examined.

5.4.1 Population and Demographics

The latest census data shows that the population in the Meath East area grew by 5.0% between the years 2011 and 2016 compared with only 3.8% nationally. Growth of 7.2% was seen in the Dublin West region over the same period. Dunboyne, the electoral division within which the site is located, saw a slightly higher rate of growth than the Meath East region, with an increase of 5.1% (Table 5.1). Projections for the National and the County populations are predicted to continue this trend of moderate to high population growth into the short-term future.

Table 5.1 *Population change at National, primary and secondary hinterland level from 2011 – 2016 (Source: www.cso.ie)*

Area	2011	2016	% Change 2011-2016
State	4,588,252	4,761,865	+ 3.8%
Meath East	86,572	91,142	+ 5.0%
Dublin West	113,179	121,897	+ 7.2%
Dunboyne	9,578	10,094	+ 5.1%

Age Profile

The age profile of the population in the area is an important parameter as it provides a good insight into the potential labour force, the demand for schools, amenities, other facilities and the future housing demand.

Table 5.2 shows the age profiles Nationally and in Meath East and Dublin West for 2016.

Table 5.2 *Age profile at National and County level 2016 (Source: www.cso.ie)*

Area	0-14	15-24	25-44	45-64	65+	Total Persons
State	21%	12%	30%	24%	13%	4,761,865
Meath East	24%	12%	29%	24%	11%	91,142
Dublin West	25%	11%	36%	20%	7%	121,897

This table shows that both Nationally, and in the Meath East and Dublin West areas, the dominant age grouping is 25-44 at 30%, 29% and 36% of the total population, respectively, indicating a young working age population in the area which is above the national level. This also reflects that the overall labour force population (15-64 age group) in Meath East and Dublin West is reflective of the National level of 66%, at 68% and 67% respectively. This is in keeping with census data from 2011 and 2006.

Employment

Table 5.3 presents the employment statistics in 2016 compared with 2011. The data shows that unemployment decreased significantly in the County, as well as nationally, reflecting the economic recovery in recent years.

Table 5.3 *Employment statistics Nationally and at County level in 2011 and 2016 (Source: www.cso.ie)*

	At Work	Looking for first regular job	Unemployed having lost or given up previous job	Total in labour force	% Unemployment
2011 Labour Force					
State	1,807,360	34,166	390,677	3,608,662	11.8
Meath East	36,017	500	6,416	56,500	11.4
Dublin West	49,399	1,101	9,457	75,864	12.5
2016 Labour Force					
State	2,006,641	31,434	265,962	3,755,313	7.9
Meath East	40,128	448	3,788	58,231	6.5
Dublin West	55,958	894	6,514	80,166	8.1

The 2016 census data shows that the majority of people in employment in the Meath East area are in ‘Managerial and Technical’ employment (31.6%) with the least represented social class being ‘Unskilled’ workers at (3.5%). In the Dublin West area, the majority of people in employment in ‘Managerial and Technical’ employment (31.2%) with the least represented social class being ‘Unskilled’ workers at (3.1%).

At a local level, the dominant social class in the Dunboyne area is ‘Managerial and Technical’ labour (37.1%) with ‘Unskilled’ being the least representative (2.7%).

Education

Census data presenting the highest level of education completed by people living in the Dunboyne community and the Meath East and Dublin West areas is presented in Table 5.4. (*Note the table presents key milestone education levels and excludes lower secondary, technical or vocational qualification, advanced certificate/completed* *apprenticeship, higher certificate, ordinary bachelor degree/national diploma, Ph.D./higher or where information was not stated*).

Table 5.4 *Highest level of education completed locally and at County level in 2016 for key educational levels. (Source: www.cso.ie)*

Area	No formal education	Primary education	Upper secondary	Honours Bachelor's Degree, Professional qualification or both	Postgraduate Diploma or Degree	Total Persons
Dunboyne	40	433	1,191	862	743	6,239
Meath East	733	5,314	11,330	5,957	4,661	57,184
Dublin West	879	4,843	13,193	9,690	8,961	71,889

5.4.2 Labour Force Survey

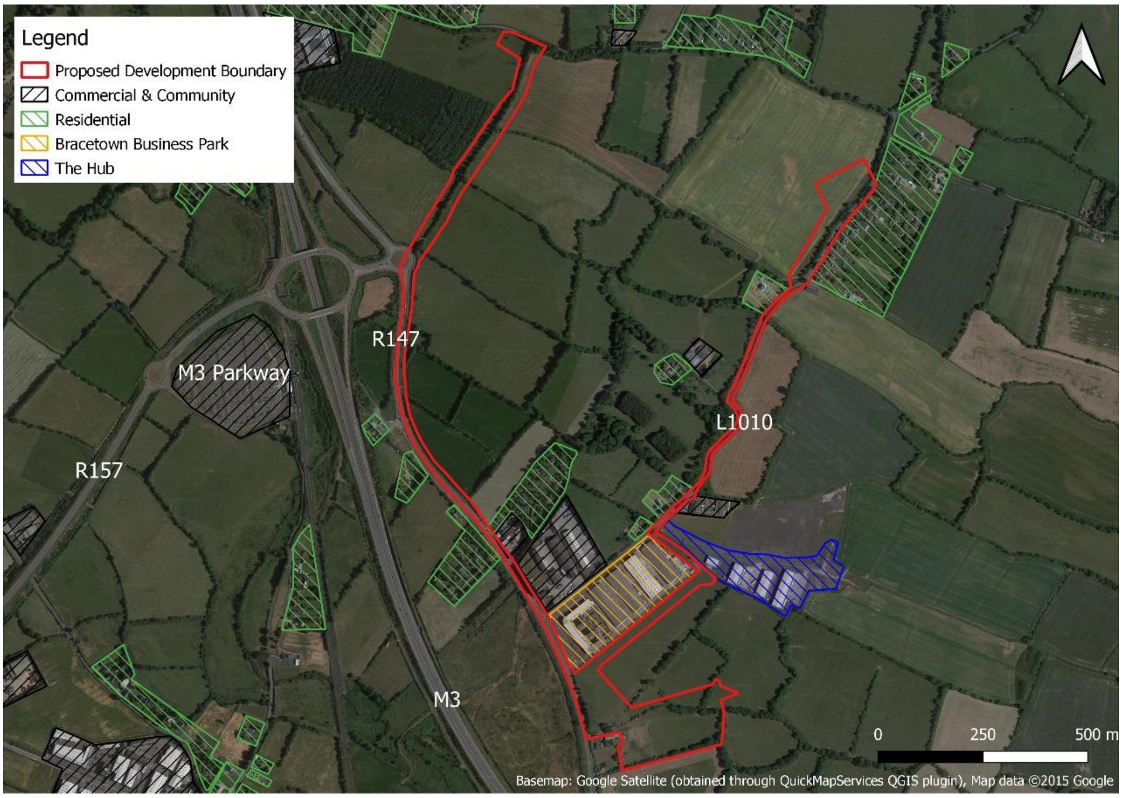
The Labour Force Survey (LFS) is a large-scale, nationwide survey of households in Ireland carried out every three months. It generates labour force estimates which include the official measure of employment and unemployment for the state.

The LFS results nationally for Q1 2020 showed that there were 2,467,900 people employed in the state with 114,400 registered as unemployed. In Q1 2020, the majority of people were employed in the broad occupations of 'professionals' or as 'skilled trade'.

It is important to note that the effects of COVID-19 on the labour market are not fully reflected in the results from the Labour Force Survey (LFS) in Quarter 1 (Q1) 2020. The announcement for business closures and associated restrictions on employment coincided with the weekend at the end of the reference period for Q1; the last reference week of Q1 2020 ended on Sunday, 29 March 2020. The LFS estimates that 382,311 will be unemployed by the end of Q1 2020, (www.cso.ie, 2020).

5.5 SOCIAL INFRASTRUCTURE

Social infrastructure covers a range of services and facilities that meet local and strategic needs and contribute towards a good quality of life. In this context it includes local business, residential areas, education, health facilities, emergency services, places of worship, and green infrastructure.



Basemap: Google Satellite (obtained through QuickMapServices QGIS plugin), Map data ©2015 Google

Figure 5.1 Sensitive social infrastructure near the proposed development lands

Businesses

Bracetown Business Park is located to north-east of the site with further warehouse development (The Hub Logistics Park) currently being constructed to the north and north west of the site. A new data centre development is currently under construction on the lands to the east and south of the substation site (MCC Ref. RA/180671). This development is owned by Runways Information Services Limited and is adjoining to their existing facility (MCC Ref. RA150605).

Residential Dwellings

Figure 5.1 presents the residential areas immediately surrounding the proposed development area. Beyond this, the most notable cluster of residential developments occurs in Dunboyne, south west of the proposed development site. Number of private residences located to the north west of the development lands. Number of residential units on the opposite side of the R147 to the west of the proposed development lands.

Schools

There are a number of primary and secondary schools in the vicinity of the proposed development including:

- St. Peter’s College c. 1.2km south-south-west of the site;
- Dunboyne Junior Primary School c. 1.2km south-south-west of the site;
- Dunboyne Senior National School c. 1.2km south-south-west of the site;
- St. Peter’s National School, c. 1.6km southwest of the site; and
- Gaelscoil Thulach na nÓg c. 1.7km south-south-west of the site.

The closest third level institution in the area is Technical University Dublin Blanchardstown, located c. 5.9km east-south-east of the site.

Health

The nearest hospital to the site is Connolly Hospital Blanchardstown located c. 7.4km to the southeast of the site. Family Practitioners, a local GP service, is located c. 1.2km southwest of the site.

Security

There is a Garda station located on the Summerhill Road in Dunboyne c. 1.5km southwest of the site. The closest fire station is c. 6.2km southeast of the site on the Snugborough Road in Blanchardstown.

5.6 LANDSCAPE, AMENITY AND TOURISM

In terms of landscape amenity, there are no listed or scenic views, no landscape or amenity designations or protected trees pertaining to the site, and no protected structures or National Monuments on the site. There is a protected structure, Gunnocks House, (RPS No. MH051- 100) c. 400m south of the site. Normansgrove House, a protected structure (RPS No. MH050-106) is located c. 475m north of the site. These protected structures are described further in Chapter 11 (Cultural Heritage and Archaeology) and in Chapter 12 (Landscape and Visual Impact).

The majority of the land surrounding the proposed lands are zoned as E2 General Industry and Employment / E3 Warehousing. The development lands themselves are greenfield, with the exception of the lands within the public domain (roads). The site is bounded by the R147 to the west. Beyond this, the lands surrounding the site are dominated by undeveloped agricultural lands. The site is not considered to be significant or sensitive from a landscape and visual aspect. The development is suitable for the zoning of the lands and Masterplan for the area. and has an established industrial park (to the north), and regional road and motorway developments (to the west).

Tourism is not a major industry in the immediate environs of the site. Dunboyne town centre provides a small commercial district along Main Street, c. 1.5km south west of the site. The closest shopping centres of note is the Blanchardstown Centre c. 5.7km south-east of the site. Dunboyne Castle Hotel and Spa is located c. 1.7km south east of the site. Dublin Airport is located c. 12.5km east of the site.

5.7 NATURAL RESOURCES

Natural resources and land use in the hinterland of the proposed development have also been considered as they may have implications for the development of the lands.

The site itself is currently in agricultural use. In terms of extractive industries, the closest quarries are Huntstown Quarry in Finglas (c. 9.5km east of the site) and Fortunestown Quarry in Belgard (c. 14.9km south-south-east of the site), both of which are operated by Roadstone Ltd. There are no anticipated impacts on these facilities from the proposed development. Further detail on extractive industries is presented in Chapter 7 (Land, Soils, Geology and Hydrogeology). The proposed development will cause no impact on natural resources.

5.8 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

The main potential impacts on population and human health from the proposed development are likely to comprise the potential for spills/leaks, air emissions, noise, visual, and traffic impacts. These aspects have been assessed in terms of the appropriate relevant standards within the corresponding specialist chapters; Chapter 6 (Soils, Geology and Hydrogeology); Chapter 7 (Hydrology); Chapter 9 (Air Quality and Climate), Chapter 10 (Noise and Vibration); Chapter 11 (Landscape and Visual); and Chapter 13 (Traffic and Transportation).

A summary of the potential impacts of construction, commissioning, operation and decommissioning of the proposed development is presented herein.

5.8.1 Potential Impacts on Businesses and Residences

The main potential impacts on local businesses and residences associated with the proposed development will be in relation to air quality, noise, visual impact and traffic. The potential impacts and mitigation measures to address them are dealt with within the corresponding chapters of this EIAR as follows:

- Chapter 9 – Air Quality and Climate
- Chapter 10 – Noise and Vibration
- Chapter 11 – Landscape and Visual Impact
- Chapter 13 – Traffic and Transportation

The proposed development will result in increased employment during construction and operation. It is also anticipated that the proposed development will have indirect positive effects on employment in terms of construction material manufacture, maintenance contracts, equipment supply, landscaping etc. This may result in a short-term pressure for housing supply locally. The provision of the wastewater pumping station as port of the proposed development will benefit the adjacent business park.

5.8.2 Potential Impacts on Human Health from Air Quality

The key elements of construction and operation of the proposed development with potential impacts on human health from air quality and climate impacts are:

- Potential fugitive dust emissions from general site preparation and construction activities;
- Potential fugitive dust emissions from trucks associated with construction;
- Engine emissions from construction vehicles and machinery.
- A change in traffic flows on road links nearby the proposed development.

The construction phase impacts will be short-term in duration, the potential impacts during the operational phase of the proposed development are deemed long-term.

As outlined in Chapter 9 (Air Quality and Climate), 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 based on the protection of the environment as well as the protection of human health. Additional factors such as natural background levels, environmental conditions and socio-economic factors are also considered in the limit values which are set (see Chapter 9, Table 9.1). The ambient air quality standards established are designed to minimise harmful effects to health.

5.8.2.1 Construction Phase

As detailed in Chapter 9 (Air Quality & Climate), best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure compliance with all EU ambient air quality legislative limit values which are based on the protection of human health. Similar mitigation measures and impact assessment will apply for decommissioning.

5.8.2.2 Operational Phase

There are no works during the operational phase which have a potential to impact on air quality or climate as the cables will be underground. There is the potential for some imperceptible air pollutant emissions associated with maintenance vehicles accessing the substation site.

5.8.3 Potential Impacts on Human Health from Noise & Vibration

Exposure to excessive noise is becoming recognised as a large environmental health concern. According to the 2015 European Commission report ‘Noise Impacts on Health’, (European Commission, 2015), the most common effects of noise on the vulnerable include;

- Annoyance
- Sleep Disturbance
- Heart and circulation problems
- Quality of Life
- Cognitive Process
- Hearing

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of road traffic, vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes. Noise and vibration impacts associated with the development have been fully considered within Chapter 10 of the EIA Report.

Noise and vibration impacts associated with the development have been fully considered within Chapter 10 of the EIA Report. Modelling of construction and operation has been undertaken to assess likely impact at residential and commercial boundaries. Commentary on the impact assessment and related noise levels are summarised below with respect to potential environmental health impacts.

5.8.3.1 Construction Phase

As detailed in Chapter 10 (Noise and Vibration), there will be some impact on nearby commercial and residential receptors during construction due to noise emissions from site activity and traffic. The application of noise limits and limits on the 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. Due to the distance between the site and the nearest sensitive locations, vibration impacts generated during construction are expected to be negligible. Construction noise and vibration will be typically limited to daytime periods only.

In terms of health effects these are typically associated with long term exposure to elevated levels of noise and/or vibration which will not be the case in relation to construction sources which would be expected to be the order of or below existing ambient levels in the vicinity of the site for the vast majority of the construction period. There are no health risks associated with operational noise resulting from the construction of the development subject to implementation of good site management practices and mitigation measures as required, as outlined in the relevant sections of the noise assessment and referenced documents.

5.8.3.2 Operational Phase

There will be no significant noise emissions from the operation of the underground cable or proposed substation compound. Consequently, there are no expected operational noise impacts.

There will be no vibration emissions from the operation of the underground cable or proposed substation compound. Consequently, there are no expected operational vibration impacts.

5.8.4 Potential Impacts on Local Amenities and Tourism

The location of the proposed development is adjacent to an industrial park area, adjacent to a national motorway and in close proximity to a townland (Dunboyne) will have a minimal impact on the local landscape amenity. There will be no impact on the local parks.

It is not anticipated that the development will have a significant negative impact on local tourism or shopping amenities. The location of the site on greenfield agricultural land, means that the proposed development may have an impact on use of local amenity through the change from an agricultural environment to a built environment.

It is considered that the potential impact of the proposed development on landscape character will vary from ***not significant/slight*** to ***moderate***, and ***neutral***. Further discussion is presented in Chapter 11 (Landscape and Visual).

5.8.5 Potential Impacts from Additional Traffic

The World Health Organisation Report ‘Health Effects and Risks of Transport Systems: The Hearts Project’ (World Health Organisation, 2006) states that road traffic is a major cause of adverse health effects - ranking with smoking and diet as one of the most important determinants of health in Europe. The report states;

> *“Traffic-related air pollution, noise, crashes and social effects combine to generate a wide range of negative health consequences, including increased mortality, cardiovascular, respiratory and stress-related diseases, cancer and physical injury. These affect not only transport users but also the population at large, with particular impact on vulnerable groups such as children and elderly people, cyclists and pedestrians”*

In the Department of Communications, Climate Action & Environment document *Cleaning Our Air – Public Consultation to Inform the Development of a National Clean Air Strategy* vehicle emissions are included as a key source of health impacts in Ireland (DOCCA&E, 2017).

An assessment of the additional traffic movements associated with the proposed development during the construction and operational phases is presented in Chapter 13 (Traffic and Transportation).

The increase in traffic volumes associated with the construction and operational phases of development is not likely to have any adverse transport-related environmental effects in terms of noise, air quality, vibrations, etc.

The traffic assessment shows that the additional traffic movements associated with the proposed development were found to be ***short-term, negative*** and ***not significant*** for the construction phase and ***long-term, neutral*** and ***imperceptible*** for the operational phase.

Chapter 13 also includes information on traffic accidents over the last 5 years in the vicinity of the site. Based on the collision data analysis, it can be concluded that there are no accident black spots or notable accident patterns that would indicate a road safety design flaw on the road infrastructure surrounding the site.

5.8.6 Potential Impacts on Health and Safety

The proposed development has been designed in accordance with the Safety, Health and Welfare at Work Act 2005 (S.I. 10 of 2005) as amended and the Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. 299 of 2007) as amended and associated regulations. The plant has been designed by skilled personnel in accordance with internationally recognised standards, design codes, legislation, good practice and experience based on a number of similar existing facilities operated by the operator.

The proposed development has the potential for an impact on the health and safety of workers employed on the site, particularly during the construction phase. The activities of contractors during the construction phase will be carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) as amended to minimise the likelihood of any impacts on worker’s health and safety.

The potential health and safety risks have been addressed for certain aspects including the vulnerability of the project to natural disasters, flooding and other hazards, air quality, noise and vibration, and traffic in Chapters 6, 9, 10 and 13 respectively.

The proposed development will not be a Seveso/COMAH facility. The proposed development site is not located within the consultation distance of any COMAH establishment that is notified to the HSA.

Potential impacts associated with electromagnetic fields (EMF) for 220kV electronic and magnetic fields are assessed by EirGrid in their policy document *Information on Electric and Magnetic Fields* (Eirgrid, 2007). Substations produce small fields with the maximum values generally occurring where the line(s) and/or cable(s) enter and exit the substation. There are no significant impacts due to EMP anticipated.

There is a potential impact on the receiving environment as a result of minor accidents/leaks of fuel/oils during the construction and operational phases. However, the implementation of the mitigation measures set out in Section 6.6 of Chapter 6 (Land, Soils, Geology and Hydrogeology) and Section 7.6 of Chapter 7 (Hydrology) of the EIA Report will ensure the risk of a minor accident is low and that the residual effect on the environment is imperceptible.

5.9 REMEDIAL AND MITIGATION MEASURES

The impacts on the local population in terms of residents and businesses are considered to be mainly positive in the sense of creating direct employment opportunities and indirect additional business, both during the construction and operational phases.

Mitigation measures proposed to minimise the potential impacts on human health in terms of air quality and climate, traffic, noise and vibration are discussed in the relevant sections of Chapters 9, 10 and 13 respectively.

5.10 IMPACTS OF THE PROPOSED DEVELOPMENT

5.10.1 Impacts on Businesses and Residences

5.10.1.1 Construction Phase

It is predicted that there will be a slight positive impact on local business activity during the construction phase with the increased presence of construction workers using local facilities.

5.10.1.2 Operational Phase

The proposed development is required to support the concurrent data storage development. The completed data storage development will have a positive impact in the provision of additional capacity in cloud computing and data storage, the demand for which remains high. The operator offers a broad set of global compute, storage, database, analytics, application and deployment services that help organisations (both locally, nationally and internationally) operate faster, lower ICT costs and scale applications. The provision of these services will also improve individuals online experience and accessibility.

5.10.2 Impacts on Human Health from Air Quality

5.10.2.1 Construction Phase

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. In addition, the area is of low sensitivity to human health impacts as established in Section 9.3.4. Therefore, the impact of construction of the proposed development is likely to be ***short-term and imperceptible*** with respect to human health.

5.10.2.2 Operational Phase

As detailed in Chapter 9 Air Quality & Climate, there is no impact during the operational phase.

5.10.3 Impacts on Human Health from Noise & Vibration

5.10.3.1 Construction Phase

As detailed in Chapter 10 Noise and Vibration, noise emissions associated with the construction phase of the development are expected to be less than the prevailing ambient noise level at the nearest sensitive locations. As a result, the existing noise environment is not expected to change significantly because of the short-term construction phase. In addition, due to the distance between the site and the nearest sensitive locations, vibration impacts generated during construction are expected to be negligible. Therefore, the noise and vibration impact of the construction phase of the Proposed Development is likely to be ***short-term*** and ***not significant*** with respect to human health because of the short-term construction phase.

5.10.3.2 Operational Phase

The Proposed Development will not generate any perceptible levels of vibration or noise during operation and therefore there will be no impact from noise emissions or vibrations on human health.

5.10.4 Impacts on Local Amenities and Tourism

Despite the development's compliance with the policy for the area, it must be recognised that some local receptors would experience a negative effect on visual amenity. These include a small number of houses near the site east along the L1010, and to the east along the R147.

The proposed development will introduce an additional built element that will form part of a planned high-tech campus development. It is anticipated that construction of the data storage facility will intensify that built urban edge in a manner that is consistent with the emerging trend in the locality and with the land use zoning for the area, and that the proposed substation will represent a further intensification, but at a smaller scale.

The predicted impact on local amenities and tourism with respect to human health***, neutral, not significant, and long-term***

5.10.5 Impacts on Human Health from Additional Traffic

An assessment of the additional traffic movements associated with the proposed development during the construction and operational phases is presented in Chapter 13 (Traffic and Transportation).

The increase in traffic volumes associated with the construction and operational phases of development is not likely to have any adverse transport-related environmental effects in terms of noise, air quality, vibrations, etc.

The predicted impact on human health from additional traffic is ***short-term, negative*** and ***not significant*** for the construction phase and ***long-term, neutral*** and ***imperceptible*** for the operational phase.

5.11 CUMULATIVE IMPACT ASSESSMENT

The cumulative impact of the proposed development together with any/all relevant other planned or permitted developments are discussed herein.

The construction of the proposed development and the concurrent data storage development would proceed in tandem. The construction phase for the substation would be restricted by the same binding limits for noise, dust, and emissions to water. It is considered that there would be no cumulative impact on human health.

The subsurface grid connection line and substation would have no post-construction impacts on human health. Therefore there is no potential for cumulative effects. There is not anticipated to be any cumulative impacts during operations.

The overall cumulative impact is therefore concluded as ***negative*** and ***not significant*** with respect to human health.

5.12 RESIDUAL IMPACTS

It is expected that the proposed development in combination with adjacent development will have a ***long term, neutral, not significant impact*** on the immediate hinterland with positive changes in terms of employment opportunities and the associated economic and social benefits.

All other environmental aspects relating to the human environment which have the potential to impact on the local population such as air quality and climate, noise and vibration, material assets and traffic are addressed in Section 5.8 and in more detail in the relevant chapters of this EIA Report.

6.0 HYDROLOGY

6.1 INTRODUCTION

This chapter assesses and evaluates the potential impacts on the surrounding hydrological environment associated with the Proposed Development. The Proposed Development will involve the installation of underground cables and construction of a substation building as described in Chapter 2 (Description of the Proposed Development). The impact on land, soils, geology & hydrogeology is addressed in Chapter 7.

The proposed development is located in c. 1.8km north-east of Dunboyne and traverses the townlands of Bracetown, Gunnocks, Normanstown, Pace and Portmanna, in the Barony of Dunboyne and the Civil Parish of Dunboyne.

6.2 METHODOLOGY

6.2.1 General

The Assessment has been carried out generally in accordance with the following guidelines:

- EPA Draft ‘Guidelines on the Information to be contained in Environmental Impact Assessment Reports’ (2017);
- EPA ‘Draft Advice Notes on Current Practice in the Preparation of Environmental Impact Statements’ (2015);
- National Roads Authority (NRA) ‘Guidelines on Procedures for the Assessment and Treatment of Hydrology for National Road Schemes’ (2009).

In the EIA assessment, consideration is given to both the importance of an attribute and the magnitude of the potential environmental impacts of the proposed activities on that attribute. Appendix 5.1 presents the impact assessment criteria provided in the IGI publication[1].

The principal attributes (and impacts) to be assessed include the following:

- Surface watercourses near the site and potential impact on surface water quality arising from the proposed development related works including any discharge of surface water run-off;
- Localised flooding (potential increase or reduction) and floodplains including benefitting lands and drainage districts (if any).

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[1] The NRA/IGI criteria for rating the magnitude and significance of impacts at EIA stage on the soils/ geological related attributes are also relevant in determining attribute importance and impact assessment and are presented in Appendix 6.1.

6.2.2 Sources of Information

This assessment was considered in the context of the available baseline information, potential impacts, consultations with statutory bodies and other parties, and other available relevant information. In collating this information, the following sources of information and references were consulted:

- Current EPA on-line database -Envision water quality monitoring data for watercourses in the area; and,
- River Basin District (ERBD) Management Plan;
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW));
- Office of Public Works (OPW) flood mapping data (www.floodmaps.ie);
- Dublin City Council (2005), Greater Dublin Strategic Drainage Study: Technical Documents of Regional Drainage Policies. Dublin: Dublin City Council;
- DoEHLG & OPW (2009) Flood Risk Management Guidelines for Planning Authorities;
- ‘Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors’ (CIRIA 532, 2001);
- “Guidelines on protection of fisheries during construction works in and adjacent to waters” Inland Fisheries Ireland (2016);
- Meath County Council 92018), Making Meath Climate Ready: Our climate Action Strategy;
- Enginenode EIAR (2019: Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20);
- Various design site plans and drawings.

6.3 RECEIVING ENVIRONMENT

6.3.1 Existing Environment

The proposed development will comprise the laying of 2 no. underground 220kV circuit transmission cable installation between the proposed substation (Gunnocks) located at the southern boundary of the planned Enginenode data storage facility and the existing 220kV line located c.80m to the south of the L5026. The projected substation and the existing above ground line are located c. 1.5km apart, and are separated by industrial buildings, agricultural lands (including lands with planning for a data storage development), local drainage (including the Normansgrove and Pace stream) and roadways;

The substation will be located south of the planned Enginenode data storage (concurrent application Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20) which is currently a large greenfield area located in Bracetown, Dunboyne, Co. Meath just off the M3 Motorway. The surrounding environment can be described as a mix of agricultural and industrial. The substation site is 1.7 hectares in area and is zoned as industrial/commercial (E2 - General Industry and Employment/E3 - Warehousing and Distribution as per the Meath County Development Plan 2013-2019 (MCDP)).

The Gunnocks-Woodland route is projected along the R147 road from the Enginenode site c.1km to its junction with the R157 road. At this point, the route enters agricultural lands where it continues to the NE c. 550m towards the existing 200kV line, located c.80m to the south of the L5026.

The Corduff-Gunnoncks route is projected along the L1010 road from the Enginenode site c. 750m to the NE where it enters the planned Enginenode data storage site and continues along the L1010 route but within the site to the NE c. 300m towards the existing 200kV line, located c.160m to the south of the L5026.

The site lies within the River Tolka catchment. Figure 6.1 below presents the hydrological environment of the development site and surrounding area on a regional scale.

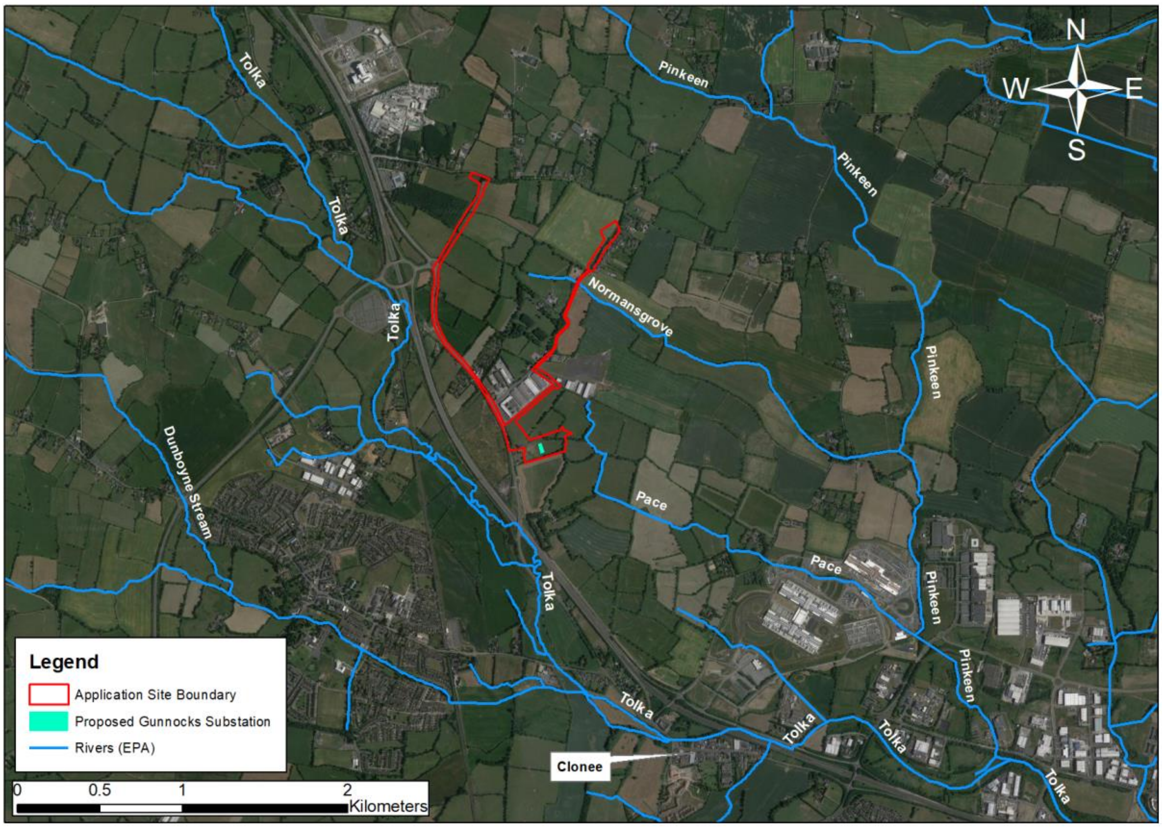


Figure 6.1 Surface Water – Regional Scale. (source: www.epa.ie)

The Enginenode site drainage comprises internal field drains and the Pace stream which crosses the site in open channel flowing from north to south. The internal ditches drain toward the Pace Stream which joins the Pinkeen Stream c. 2.5km downstream to the southeast. The Pinkeen Stream joins the River Tolka c. 1 km further downstream. The River Tolka discharges to North Dublin bay over 30 km downstream.

The proposed cable installation, specifically the Corduff-Gunnoncks route crosses a local stream which flows to the Pace stream and the Normansgrove stream, which flows to the SE towards its junction with the Pinkeen river, which is located c 2km downstream of the route. There are existing crossings in place for the road so no further works are required.

Figure 6.2 below presents the local hydrological environment of the development site and surrounding area. Figure 6.3 presents the above mentioned crossing points.

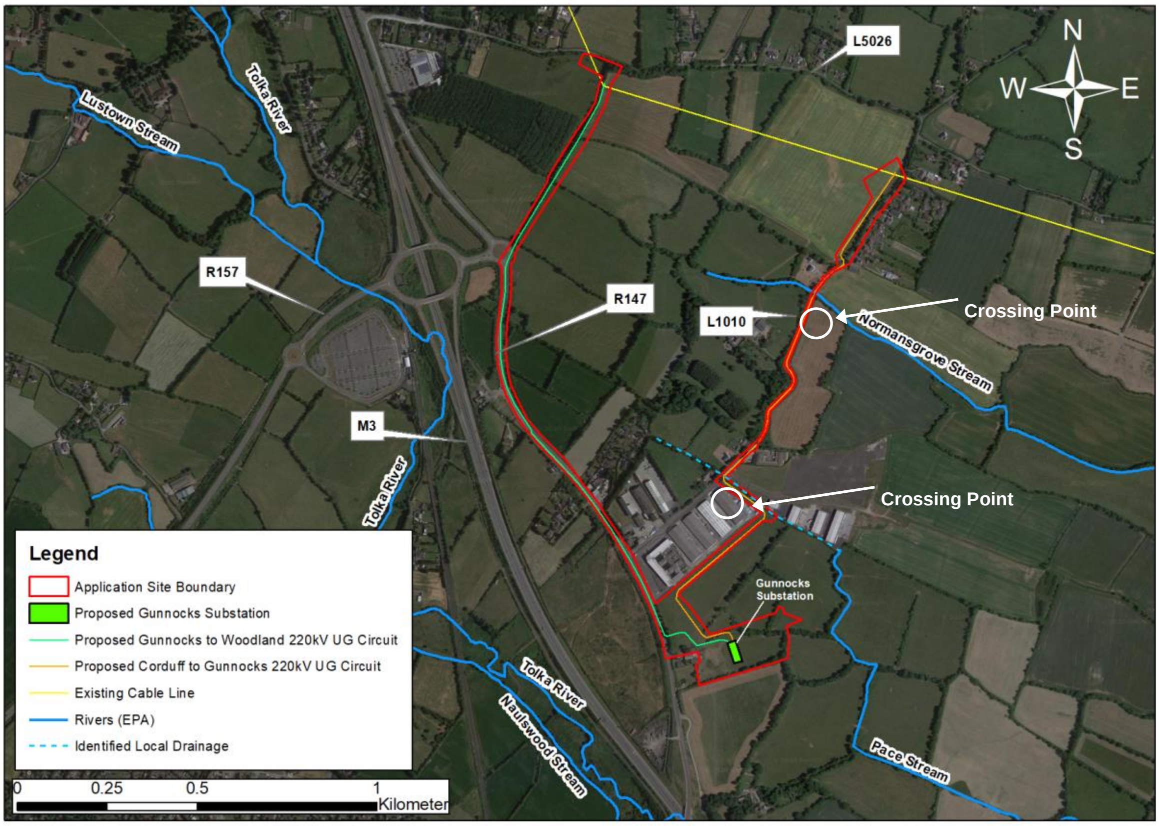


Figure 6.2 Surface Water – Local Scale. (source: *www.epa.ie*)

A. Crossing point the Identified Local Drainage and the L1010 route

B. Crossing point between the Normansgrove Stream and the L1010 route

Figure 6.3 Crossing points identified along the L1010 route

The site does not have hydrological connection with the Rye Water Valley/Carton SAC (6.45km to the South) which is part of the Liffey catchment.

6.3.2 Hydrology (Surface Water)

The site is relatively flat in terms of topography with an elevation to Ordnance Datum (AOD Malin) ranging between 76-71mAOD north to south.

6.3.2.1 *Surface Water Quality*

The EU Water Framework Directive (2000/60/EC) European Communities Directive 2000/60/EC, establishing a framework for community action in the field of water policy, (commonly known as the Water Framework Directive [WFD]).

The WFD requires 'Good Water Status' for all European waters to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both 'good ecological status' and 'good chemical status'. In 2018, the River Basin Management Plan for Ireland 2018-2021 was published. The impacts of a range of pressures were assessed including diffuse and point pollution, water abstraction and morphological pressures (e.g. water regulation structures). The purpose of this exercise was to identify water bodies at risk of failing to meet the objectives of the WFD and include a programme of measures to address and alleviate these pressures.

The strategies and objectives of the WFD in Ireland have influenced a range of national legislation and regulations. These include the following:

- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003);
- European Communities (Drinking Water) Regulations 2014 (S.I. 122 of 2014);
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009);
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010);
- European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2010 (S.I. No. 610 of 2010); and
- European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489 of 2011).

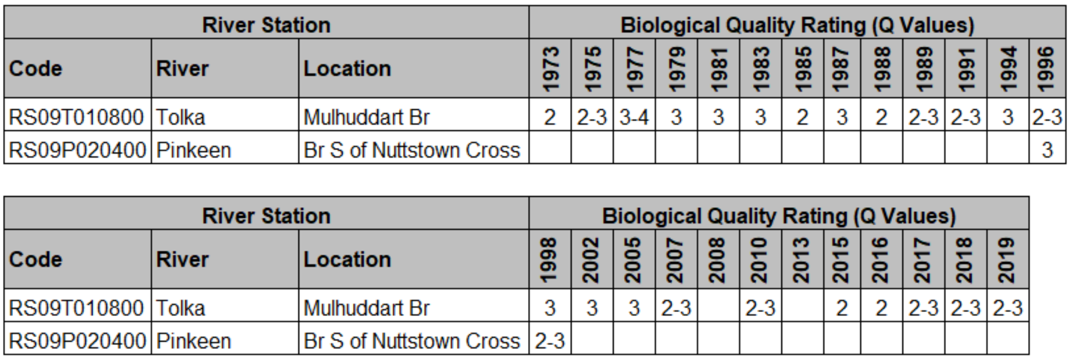
In relation to the local hydrological environment, the local stream which outfalls into the Pace stream belongs to the Tolka surface water body (Tolka_030) whose status is determined based on the 'Mulhuddart Br' monitoring station. This station is located in the Tolka river c. 2.5km downstream of the join between the Pace stream and the Pinkeen river and c. 1.4km downstream of the join between the Pinkeen and Tolka rivers.

The Normansgrove stream belongs to the Pinkeen surface water body (Pinkeen_010). However, its monitoring station (called 'Bridge S of Nuttstown Cross' and located in the Pinkeen river c. 2km upstream of the join with the Normansgrove river) has been inactive since 1998.

The most recent published status (www.epa.ie - River Waterbody WFD Status 2013-2018) of the Tolka and Pinkeen surface water bodies is '*Poor*' and its environmental risk is qualified by the WFD as '*At Risk*'. Their 'Poor' status was determined based on their poor ecological/biological status.

The available results of the biological water quality monitoring at the EPA water quality monitoring locations are provided in Table 6.1 and the legends to explain the Biological Rating System (Q Values) are provided in Table 6.2.

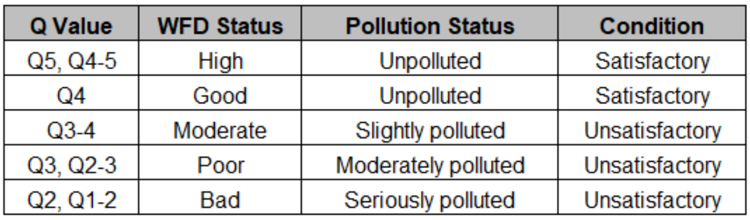
Table 6.1 EPA Q Ratings for the Tolka River and Pinkeen Stream



River Station			Biological Quality Rating (Q Values)												
Code	**River**	**Location**	**1973**	**1975**	**1977**	**1979**	**1981**	**1983**	**1985**	**1987**	**1988**	**1989**	**1991**	**1994**	**1996**
RS09T010800	Tolka	Mulhuddart Br	2	2-3	3-4	3	3	3	2	3	2	2-3	2-3	3	2-3
RS09P020400	Pinkeen	Br S of Nuttstown Cross													3

River Station			Biological Quality Rating (Q Values)											
Code	**River**	**Location**	**1998**	**2002**	**2005**	**2007**	**2008**	**2010**	**2013**	**2015**	**2016**	**2017**	**2018**	**2019**
RS09T010800	Tolka	Mulhuddart Br	3	3	3	2-3		2-3		2	2	2-3	2-3	2-3
RS09P020400	Pinkeen	Br S of Nuttstown Cross	2-3											

Table 6.2 Pollution Status and Condition associated with the *Q Rating*



Q Value	WFD Status	Pollution Status	Condition
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2	Bad	Seriously polluted	Unsatisfactory

As can be seen from the monitoring data in Table 6.2, the Tolka River was classified as '*Moderately Polluted*' status according to the 2017-2019 monitoring rounds. Figure 6.3 below presents the location of the monitoring stations presented above.

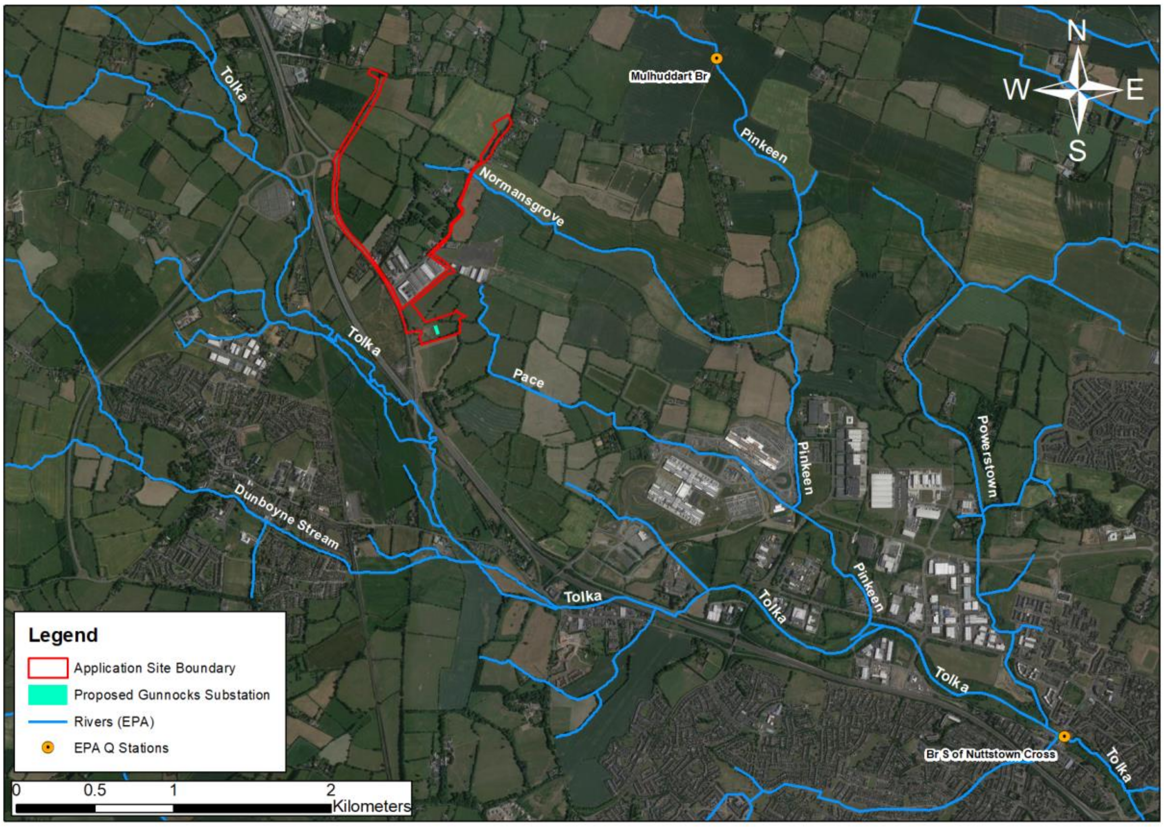


Figure 6.3 Surface Water Quality Monitoring Points (source: *www.epa.ie*).

6.3.2.2 *Flood Risk*

A Strategic Flood Risk Assessment (SFRA) was developed as part of the Meath County Development Plan 2013-2019. In this it shows the site as being outside any identified flood zones and does not indicate the site is at risk from any fluvial, pluvial or coastal flooding event.

A review of available information has identified no flood hazards for the proposed development therefore, in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities, the site is deemed to be located within Flood Zone C, where the probability of flooding is low (i.e. less than 0.1% AEP or 1 in 1,000 years). Refer to Figure 5.4 below.

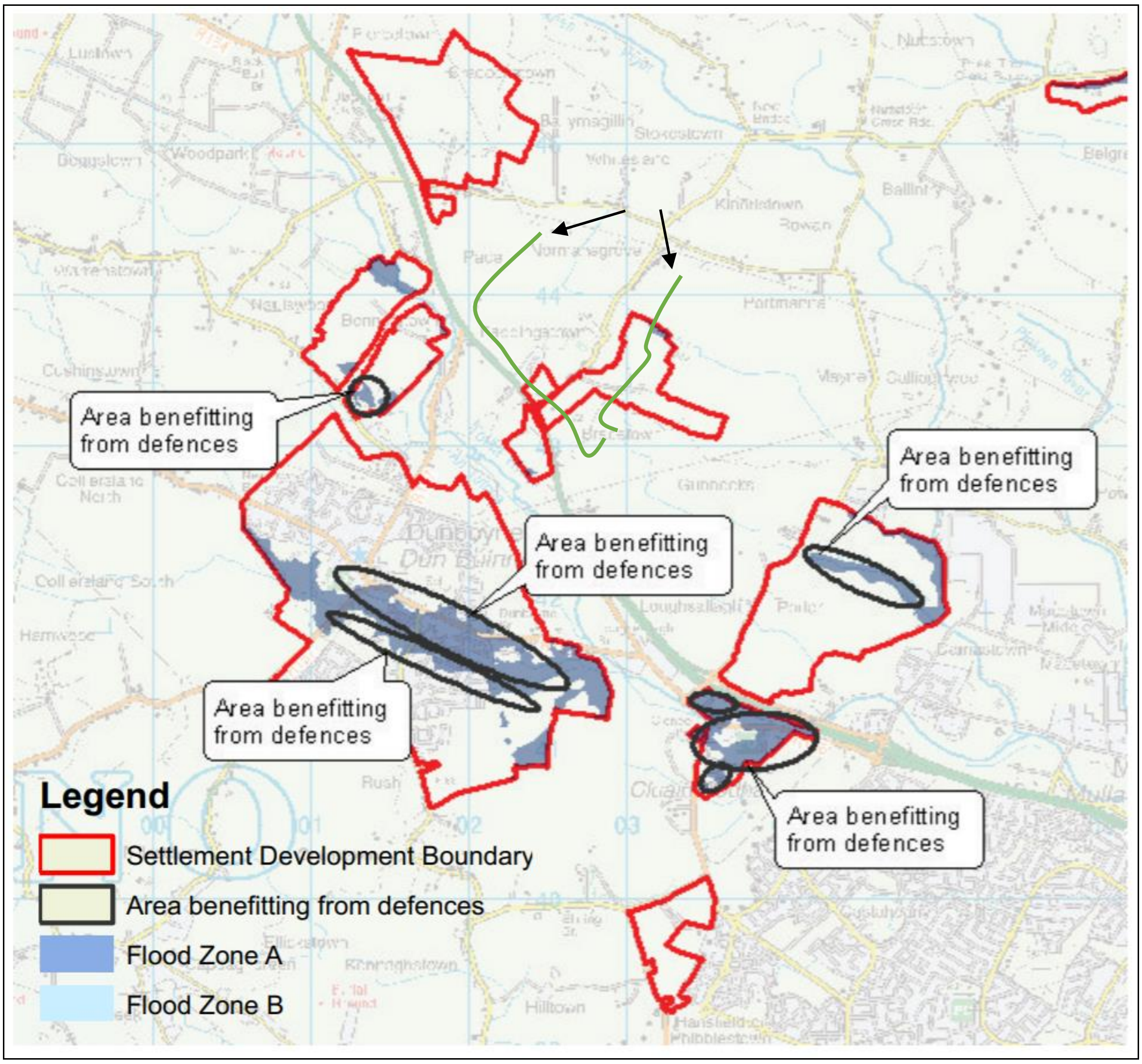


Figure 6.4 Flood Zone Map (source: SFRA Meath County Development Plan).

There are also no historic flood events recorded in the vicinity of the site, as can be seen in Figure 6.5 below.

Figure 6.5 Flood Risk Map (source: OPW Flood Hazard Mapping).

6.3.2.3 Rating of site importance of the hydrological features

Based on the NRA methodology (refer to Appendix 6.1), criteria for rating site importance of hydrological features, the importance of the hydrological attributes at this site is rated as '***Medium***' **importance**, due to the status of the river waterbodies in the vicinity of the site, which are classified as 'Poor' by the WFD and biological index 2-3.

6.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development will comprise the development of a substation (Gunnocks) and the laying of two underground 220kV circuit transmission cable installation between the aforementioned substation and existing 220kV line and a rural supply.

A detailed description of the proposed development is provided in Chapter 2 of this EIA Report. There are a number of elements associated with the construction of the proposed development which could have potential to impact on the environment with respect to the hydrological environment. There will be no potential impacts on the hydrological environment during the operational phase of the proposed development.

The characteristics of the proposed development with regard to the hydrological environment, relate to the construction activities and are described below.

6.4.1 Construction Phase

The key civil engineering works which will have potential impact on the hydrological environment during the construction phase are:

(i) Shallow excavations within the topsoil/overburden are required for installation of the cable installation and the ducting for the cable installation. The typical optimum depth of excavation required to facilitate installation of the ducting is c. 1.35m below ground level (bgl) but may increase to up to c. 3.0 to 6.0m at utility crossings. The typical optimum width of each trench is c. 1.0m, however this may vary depending on ground conditions and existing services. A width of 5 metres is required for construction access.

(ii) Based on available site investigation information, the natural overburden deposits (glacial clays, gravels and made ground) would have minor inflows only, mostly localised perched water or pore water only. However, much of the excavation will be in more permeable infill deposits beneath the R147 and L1010 where a discontinuous perched water table may be encountered. Based on the shallow depth of excavation minimal dewatering (if any) will be required during excavation works and groundworks. Should localised pumping of the excavations due to rainfall be required, settlement through a siltbuster or similar will be undertaken prior to release to stormwater or foul sewer;

(iii) Construction activities will necessitate storage of cement and concrete materials, temporary oils, and fuels at the projected construction compound at Enginenode site, and adjacent lands. As such there is only potential for small localised accidental releases of contaminating substances including hydrocarbons from construction traffic and vehicles operating on site if not mitigated adequately. Mitigation measures are set out in Section 6.6 below; and

(iv) The projected Corduff-Gunnoncks cable installation will utilise two existing crossings of local streams along the L1010 route (local unnamed stream and the Normansgrove stream).

6.4.2 Operational Phase

There are no potential hydrological impacts during the operational phase of this development. There are oil bund present but no pathway to surface water as:

- Rainwater falls in bunds and collects in a pump sump. The pump is an oil discriminating pump.
- If the oil discriminating pump does not detect oil it pumps the rainwater to the foul sewer.
- If oil is detected the pump cuts out and an alarm is raised in the BMS system.
- If the pump fails to detect oil there is a petrol interceptor provided on the foul sewer line to collect any oil which may be accidentally pump. The petrol interceptor is also fitted with an alarm linked to the BMS system.
- As noted all this infrastructure is connected to the foul network, so if both the pumps and interceptor fail, rainwater polluted rainwater will discharge to the foul network rather than storm.

6.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

The potential impacts in relation to surface water during the construction and operational phases are outlined below and the assessment of effects defined based on the description of effects as set out in the Draft EPA *'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'* (2017); (Table 1.2 Chapter 1) and the NRA criteria detailed Appendix 6.1. is provided in section 6.7.

6.5.1 Construction Phase

Increased Run-off and Sediment Loading

Surface water run-off from site preparation, levelling and excavations during the construction phase may contain increased silt levels or become polluted from construction activities if not adequately mitigated. There is no direct hydraulic connection between the construction area and the Pace or Normansgrove streams (as crossings of streams are already in place). There will be a sediment management plan in place as per the CEMP, measures include the use of a silt fence between the construction area and the streams.

Crossing of the local Streams

The projected Corduff-Gunnoncks cable installation requires crossing 2 no. local streams (the Normansgrove and a tributary to Pace stream). As the crossings are in place for the existing road – no further interference with the waterway is required.

However, in the event that the development needs to intervene these existing crossing points in order to develop the cable routes, further approval from the OPW and the Meath County Council will be required.

Excavations

The proposed development will require site preparation and excavations. Excavations are shallow and will not extend to bedrock. The natural clays are unlikely to have any inflow other than pore water while a perched water table may be encountered in the infill deposits, but it is not expected that any significant dewatering will be required during excavation works. Some removal of rain water from the excavation may be required.

Contamination Events

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of fuels (and oils) from construction machinery or site vehicles; and
- Alkaline run-off from cement works.

To minimise the potential for anything other than a vehicle leak, refuelling will be undertaken offsite in the already approved construction compound located at the existing data storage facility which minimises the potential for more significant spills.

6.5.2 Operational Phase

There are no potential impacts in relation to surface water during the operational phase due to the type of development.

6.5.3 Do Nothing Scenario

The proposed development area will encompass industrial buildings, open greenfield lands (not used for agriculture) and roadways. Should the proposed development not take place, the hydrological regime will be unchanged.

6.6 REMEDIAL AND MITIGATION MEASURES

6.6.1 General

The design of the proposed development has taken account of the potential impacts of the development and the risks to the water environment specific to the areas where construction is taking place.

There are two water courses, the Normansgrove river and a tributary to the Pace stream, running through the site. These streams will be crossed by the projected Corduff-Gunnoncks circuit along the existing roadway. There is no direct linkage between the construction site for the proposed development and the rivers. Caution will be taken to mitigate the potential effects on indirect pathways via surface water run off in public drainage along the R147 and L1010 and construction runoff from the substation site. These mitigation measures are described below. These will seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

6.6.2 Construction Phase

Construction Environmental Management Plan (CEMP)

A project-specific CEMP will be prepared and maintained by the appointed contractors during the construction phase of the proposed project. This CEMP will include measures outlined to protect water as identified in this chapter and the Schedule of Mitigation Measures included with this EIAR. The CEMP will include a reference to this Biodiversity Chapter which establishes the connectivity of the Normasgrove stream, Pace stream and River Tolka and the requirement for avoidance in terms of both direct and indirect construction activity.

The Plan 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. At a minimum, the manual will be formulated in consideration of the standard best international practice including, but not limited, to:

- CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, (C532) Construction Industry Research and Information Association;
- CIRIA (2002) Control of water pollution from construction sites: guidance for consultants and contractors (SPI56) Construction Industry Research and Information Association;

- CIRIA (2005), *Environmental Good Practice on Site* (C650); Construction Industry Research and Information Association;
- BPGCS005, Oil Storage Guidelines;
- CIRIA 697 (2007), *The SUDS Manual*; and
- *UK Pollution Prevention Guidelines,* (PPG) UK Environment Agency, 2004.

Surface Water Run-off

There is no significant dewatering anticipated during the construction works due to the shallow nature of the excavation. The excavation will not intercept the natural water table and as such dewatering will only be required for stormwater which may collect in the open trench following rainfall. Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise potential for water ingress into excavations. Should any discharge of construction water be required, discharge will be to surface water/foul sewer drainage system. The water will be treated before it will be discharged, with the use of a sediment trap or siltbuster to avoid any siltation of the drainage system. Discharge will require a Section 4 permit (Council) or licence to discharge (Foul Sewer) (Irish Water) and may include a requirement for monitoring for simple parameters such as suspended solids, and pH as set out by the appropriate regulator. Weather conditions will be considered when planning construction activities to minimise risk of run-off from the site.

Foul Sewer

Temporary facilities will be set up for workers at the construction compound on Applicant's current site at projected Enginenode site, and adjacent lands. Additional foul sewer capacity will not be required.

Fuel and Chemical Handling

To minimise any impact from material spillages, all oils, paints etc. used during construction will be stored within temporary bunded areas at the construction compound at the Applicant's current site. Oil and fuel storage tanks shall be stored in designated areas, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/ container within the bunded area(s) (plus an allowance of 30mm for rainwater ingress). Drainage from the bunded area(s) if required shall be diverted for collection and safe disposal.

Refuelling of construction vehicles will take place at the construction compound. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double-skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment.

All ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline waste waters or contaminated storm water to the underlying subsoil. Wash-down and washout of concrete transporting vehicles will take place at an appropriate facility offsite.

In the case of drummed fuel or other chemicals, which may be used during construction, these will be stored in the construction compound within a dedicated internally bunded chemical storage cabinet and labelled clearly to allow appropriate remedial action in the event of a spillage.

Accidental Releases

In order to reduce the risk of contamination arising as a result of spills or leakages, measures including, but not limited to, the following will be employed:

- All re-fuelling of plant, equipment and vehicles will be carried out at the construction compound at the Enginenode site, and adjacent lands. All fuels, chemicals, liquid and solid waste will be stored in areas bunded in accordance with established best practice guidelines at the construction compound also;
- Provision of spill kits;
- Training of staff in emergency response and
- Provision of a water and sediment management plan, to ensure that surface water run-off is controlled such that no silt or other pollutants enter local water courses or drains.
- At both projected river crossing, the site contractor will provide a method statement which will address damming the stream upstream and over pumping of water

Soil Removal and Compaction

It is envisioned that all soil/stones arising on the site will be removed from the site and disposed of as a waste or, where appropriate, as a by-product by a licensed contractor and disposed to a licenced waste facility. Movement of material will be minimised to reduce degradation of soil structure and generation of dust. There will be no stockpiling or storage of excavated soil on site.

6.6.3 Operational Phase

During the operational phase of the substation and the underground transmission cable installation there is no potential for site activities to impact on the natural hydrological regime. There will be no emissions to surface water from operational activities.

6.7 PREDICTED IMPACT OF THE DEVELOPMENT

This section describes the predicted impact of the proposed development before and following the implementation of the remedial and mitigation measures.

6.7.1 Construction Phase

Without mitigation measures highlighted in Section 6.6.1 the predicted local impact in the Normansgrove and Pace streams will be ***temporary-non significant-neutral***. There is no likely measureable impact anticipated at the Rye Water Valley/Carton SAC which is over 6.4 km of the site, based on the hydrological distance to the SAC.

The implementation of construction design for the river crossing and the mitigation measures highlighted in Section 6.6.1 will provide additional protection to the surface water environment and the predicted impact is assessed as ***temporary-imperceptible-neutral***.

6.7.2 Operational Phase

No mitigation measures are required during operation as there are no likely discharges to receiving waters. The predicted impact will be ***long-term-imperceptible-neutral.***

The cumulative impact of the proposed development with any/all relevant other planned or permitted developments (including the substation and both grid options (described in Chapter 2)) are discussed in Sections 6.9.1 and 6.9.2 below.

6.8 CUMULATIVE IMPACT ASSESSMENT

6.8.1 Construction Phase

Impacts to water during construction are associated with spillage and leakage of oils and fuels and potential silt deposition in watercourses due to disturbance of land. With standard mitigation in place to manage run-off using sediment ponds, stockpiling of soil away from open water, and management of accidental discharges, there is a low potential for construction at the proposed development to impact on receiving waters. Contractors for the proposed EngineNode data storage development (concurrent application) and nearby Runways data storage development which is n construction will be contractually required to operate in compliance with a project-specific CEMP which will include the mitigation measures outlined in this EIA Report. With these measures in place, there will be no change in water body status, water quality or flow as a result of construction for the proposed project and the impact as described above are concluded as being of ***imperceptible*** significance with a ***neutral*** impact *o*n water. All other developments will be required, during construction, to protect water quality in compliance with legislative standards for receiving water quality and as such the cumulative impact is considered to be of ***imperceptible*** significance with a ***neutral*** impact on water.

6.8.2 Operational Phase

The operation of the proposed development will have an ***imperceptible*** significance with a ***neutral*** impact on quality due to the mitigation measures in place to protect water quality and manage stormwater discharge within the design for the proposed development. The proposed development has incorporated suitable containment measures for proposed oil storage, incorporated interceptors in areas of potential accidental spills/leaks and provided sufficient attenuation to manage run-off rates to greenfield run-off rates. The impact is considered to be of ***imperceptible*** significance with a ***neutral*** impact on water. All other developments are required during operation to meet legislative requirements in relation to water quality and mitigate for hardstand in terms of run-off rates. As such the cumulative impact is considered to be of ***imperceptible*** significance with a ***neutral*** impact on water

6.9 RESIDUAL IMPACTS

The residual impacts relate to those impacts that would occur after the mitigation measures, as outlined in Section 6.6 above, have taken effect. In the case of the proposed development, there is no evidence of any significant residual impacts on surface water. The residual impact is considered to be ***long term, imperceptible*** and ***neutral***.

6.10 REFERENCES

- EPA, (2017). *Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports* (August 2017); Environmental Protection Agency, Co. Wexford, Ireland

- EPA, (2015). Draft *EPA Advice Notes for Preparation of Environmental Impact Statements*; Environmental Protection Agency, Co. Wexford, Ireland.

- NRA, (2009). *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*; June 2009. National Roads Authority, Dublin.

- Enginenode Data Storage EIAR (2019);

- Strategic Flood Risk Assessment for County Meath; Meath County Development Plan 2013-2019 (2012).

APPENDIX 6.1

CRITERIA FOR RATING SITE ATTRIBUTES – ESTIMATION OF IMPORTANCE OF HYDROLOGY ATTRIBUTES

NATIONAL ROADS AUTHORITY (NRA, 2009)

Table 1 Criteria for rating Site Attributes - Estimation of Importance of Hydrology Attributes (NRA)

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2- 3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding Amenity site used by small numbers of local people

7.0 LAND, SOILS, GEOLOGY & HYDROGEOLOGY

7.1 INTRODUCTION

This chapter assesses and evaluates the potential impacts on the land, soils and geological and hydrogeological environment associated with the proposed grid connection (subsurface) and substation development at Bracetown, Co. Meath.

The Proposed Development is located in c. 1.8km north-east of Dunboyne and traverses the townlands of Bracetown, Gunnocks, Normanstown, Pace and Portmanna, in the Barony of Dunboyne and the Civil Parish of Dunboyne.

The development is described in Chapter 2 (Description of the Proposed Development). The impact on hydrology is addressed in Chapter 6.

7.2 METHODOLOGY

7.2.1 Guidelines

The Assessment has been carried out generally in accordance with the following guidelines:

- Environmental Protection Agency (EPA) Draft *'Guidelines on the Information to be contained in Environmental Impact Assessment Reports'* (2017);
- Institute of Geologists of Ireland (IGI) '*Guidelines for the preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements*' (2013); and
- National Roads Authority (NRA) '*Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes'* (2009).

The principal attributes (and impacts) to be assessed include the following:

- Geological heritage sites in the vicinity of the perimeter of the subject site;
- Landfills, industrial sites in the vicinity of the site and the potential risk of encountering contaminated ground;
- The quality, drainage characteristics and range of agricultural uses of soil around the site;
- Quarries or mines in the vicinity, the potential implications (if any) for existing activities and extractable reserves;
- The extent of topsoil and subsoil cover and the potential use of this material on site as well or requirement to remove it off-site as waste for recovery or disposal;
- High-yielding water supply springs/wells in the vicinity of the site to within a 2km radius and the potential for increased risk presented by the proposed development;
- Classification (regionally important, locally important etc.) and extent of aquifers underlying the site perimeter area and increased risks presented to them by the proposed development associated with aspects such as, for example, removal of subsoil cover, removal of aquifer (in whole or part), drawdown in water levels, alteration in established flow regimes, change in groundwater quality;
- Natural hydrogeological/ karst features in the area and potential for increased risk presented by the activities at the site;
- Groundwater-fed ecosystems and the increased risk presented by operations both spatially and temporally; and

- Vulnerability of the proposed development to major disasters from a geological and hydrogeological standpoint such as landslides & seismic activity.

7.2.2 Sources of Information

Desk-based geological and hydrogeological information on the substrata underlying the extent of the site and surrounding areas was obtained through accessing databases and other archives where available.

Data was sourced from the following:

- Geological Survey of Ireland (GSI) - online mapping, Geo-hazard Database, Geological Heritage Sites & Sites of Special Scientific Interest, Bedrock Memoirs and 1:100,000 mapping;
- Teagasc soil and subsoil database;
- Ordnance Survey Ireland - aerial photographs and historical mapping;
- Environmental Protection Agency (EPA) – website mapping and database information;
- National Parks and Wildlife Services (NPWS) – Protected Site Register; and
- Meath City Council - illegal landfill information.

Site specific data was derived from the following sources:

- Site Investigations carried out by IGSL (May 2019);
- Enginenode EIAR (2019); and
- Various design site plans and drawings.

7.3 RECEIVING ENVIRONMENT

The receiving environment is discussed in terms of land use, geomorphology; superficial and solid geology and site history including potential for contamination.

Figure 7.1 below presents the location of the Proposed Development. The substation will be located adjacent to the proposed data storage development (separate concurrent application under Meath County Council Reg. Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20).

The route of the 220 kV circuit comprises 2 no. underground cables, as follows:

- Gunnocks to Woodlands.
- Corduff to Gunnocks;

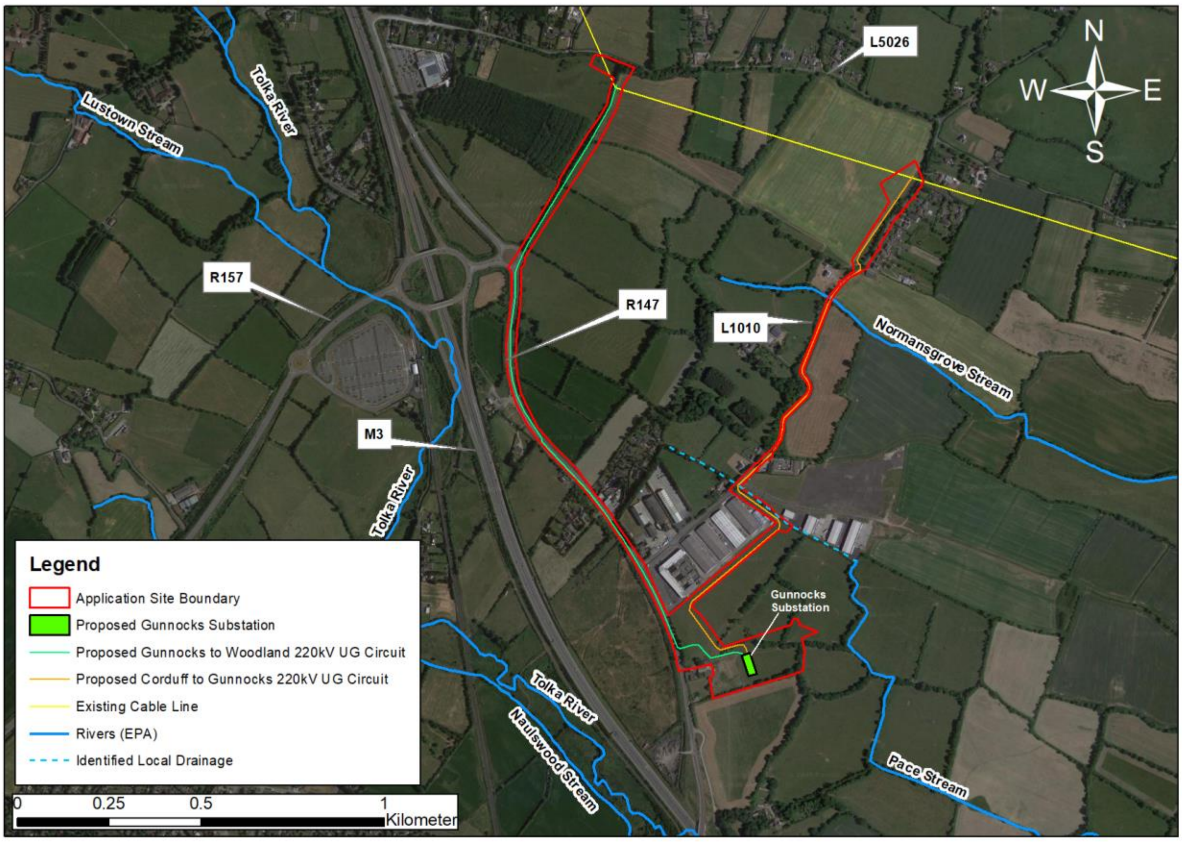


Figure 7.1 *Projected proposed development*

7.3.1 Topography & Setting

The substation will be located south of the planned datacentre development, all currently within large greenfield area located in Bracetown, Dunboyne, Co. Meath just off the M3 Motorway. The substation site is 1.7 hectares in area and is zoned as industrial/commercial (E2 - General Industry and Employment/E3 - Warehousing and Distribution as per the Meath County Development Plan 2013-2019 (MCDP)).

The site gradient varies between 71.75 metres Ordnance Datum (mOD) at its highest and 67 mOD at its lowest. The gradient is 1 in 175 west to east and 1 in 135, north to south. This is in line with the topography of the surrounding area which slopes gently to the southeast.

The Gunnocks-Woodland route will run (subsurface) along the R147 road from the proposed substation building c.1km to its junction with the R157 road. At this point, the route will cross agricultural land, where it continues to the NE c. 550m towards the existing overground 220kV line, located c.80m to the south of the L5026. The ground level along the route varies between 69-76mOD.

The Gunnocks- Corduff route is projected along the L1010 road from the proposed substation site c. 750m to the NE where it enters the planned datacentre development site prior to exiting to the L1010 route for c. 300m towards the existing overground 220kV line, located c.160m to the south of the L5026. The ground level along the route varies between 71-74mOD.

7.3.2 Drainage

The Enginenode site is drained by internal field drains and the Pace stream which crosses the site in open channel from north to south. The Pace is culverted which later joins the Pinkeen Stream c. 2.5km downstream to the southeast. The Pinkeen Stream joins the River Tolka c. 1 km further downstream. The River Tolka discharges to north Dublin bay over 30 km downstream (refer to Figure 7.1 above).

The proposed subsurface cable installation, specifically the Gunnocks- Corduff route crosses a local stream which flows to the Pace stream and the Normansgrove stream, which flows to the SE towards its junction with the Pinkeen river, which is located c 2km downstream of the route.

The hydrological environment is presented in detail in Chapter 7 – Hydrology.

7.3.3 Areas of Geological Interest & Historic Land-Use

The GSI online data base confirmed that no geological heritage site has been identified in the vicinity of the proposed development site. The closest County Geological Site is the Southeast Till Plain, located at Dunshaughlin, Ratoath c. 2.5km to the north of the Enginenode site.

Details of the site history and previous land use are included in Chapter 12 Archaeology, Architectural and Cultural Heritage.

7.3.4 Regional and Local Soils

The Teagasc soil mapping indicates that the soils crossed by the routes are composed primarily of fine loamy drift with limestones (BminDW and BminSW), Alluvium associated with local streams (AlluvMin) and Made Ground. The soil mapping for the site is presented below as Figure 7.2.

Figure 7.2 Soils map for the proposed route (Source: www.gsi.ie)

The Quaternary geological period extends from about 1.5 million years ago to the present day and can be sub-divided into the Pleistocene Epoch, which covers the Ice Age period, and which extended up to 10,000 years ago and the Holocene Epoch, which extends from that time to the present day.

The GSI / Teagasc mapping database of the subsoils in the area of the subject site indicates one principal soil type, as shown in Figure 7.3 below. The subsoil type present across the area is:

- Limestone till Carboniferous (TLs): This till is made up of glacial clays which are less permeable than alluvium subsoils.
- Gravels (GLs): Gravels derived from limestones.
- Alluvium (A).

Gravels are located to the west of the R147 road. Alluvium is associated with the Normansgrove stream.

Figure 7.3 Subsoils map for the proposed route (Source: www.gsi.ie)

Site investigations undertaken in 2019 within the development area confirmed the following subsoil structure in the area where the Substation is projected:

- Topsoil: Topsoil is generally 0.1-0.2m thick.
- Subsoil: Below the topsoil, the subsoil is primarily made up of:
  - Silt/Clay up to 0.5-0.8mbgl;
  - Sandy Gravel up to 2.2-2.5mbgl;
  - Sandy gravelly Clay up to 4.9-5.5mbgl
- Bedrock: Bedrock was encountered at depth between 4.9-5.5mbgl. in the Substation area.

The boulder clays generally exhibit very low permeability in the order of $1x10^{-7}$ to $1x10^{-9}$ m/s or lower. The glacial boulder clay provides protection to the underlying limestone bedrock (fracture dominated flow).

No indications of contamination were recorded during the site investigation works within the Enginenode or Substation site.

Along the the R147 and L1010 routes, made ground is expected.

The Site investigation report is included in the present chapter as Appendix 7.2.

7.3.5 Regional Geology

The bedrock of the greater Dublin region consists of Dinantian Upper Impure Limestone which is part of the Lucan Formation (refer to Figure 7.4 below). The limestone is known as Calp and is estimated to be up to 800m thick. The homogeneous sequence consists of dark grey massive limestones, shaley limestones and massive mudstones. The average bed thickness is less than 1m, but these normally thin-bedded lithologies can reach thicknesses of 2m or more.

There are no faults mapped in the vicinity of the site. The depth to bedrock is estimated as 4-6mbgl according to site-specific information at Enginenode route. The GSI GeoUrban viewer shows that bedrock is at least deeper than 6.7mbgl at Bracetown Business Park and the GSI Well Card Index presents bedrock at c.14mbgl in the zone of Pace-Ballymagillin i.e., along the L5026.

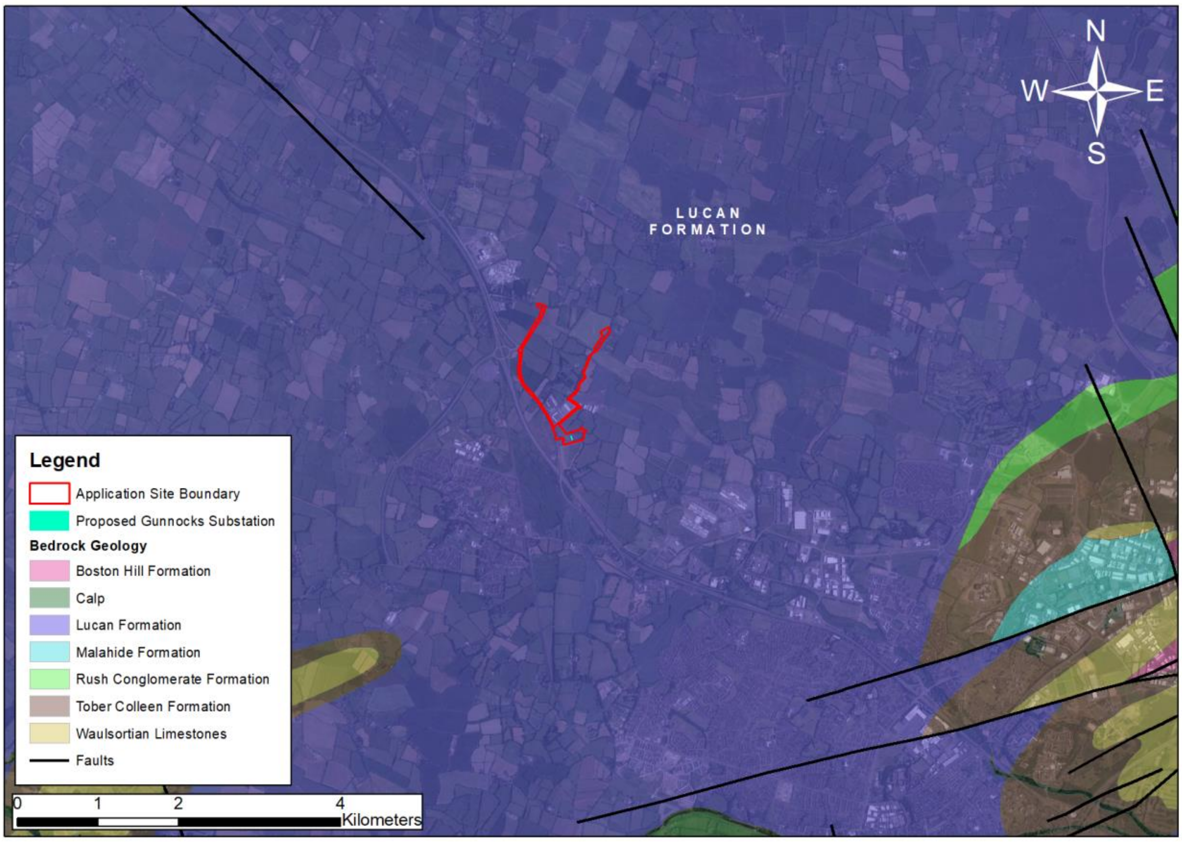


Figure 7.4 Bedrock geology map (Source: www.gsi.ie).

7.3.6 Regional and Local Hydrogeology

7.3.6.1 Description of Water Body

The GSI has devised a system for classifying the bedrock aquifers in Ireland. The aquifer classification for bedrock depends on a number of parameters including, the areal extent (km^2), well yield (m^3/d), specific capacity (m^3/d/m) and groundwater throughput (mm^3/d). There are three main classifications: regionally important, locally important and poor aquifers. Where an aquifer has been classified as regionally important, it is further subdivided according to the main groundwater flow regime within it. This sub-division includes regionally important fissured aquifers (Rf) and regionally important karstified aquifers (Rk). Locally important aquifers are subdivided into those that are generally moderately productive (Lm) and those that are generally moderately productive only in local zones (Ll). Similarly, poor aquifers are classed as either generally unproductive except for local zones (Pl) or generally unproductive (Pu).

The bedrock aquifer underlying the proposed route connection according to the GSI (www.gsi.ie/mapping) National Draft Bedrock Aquifer Map is classified as a Locally Important Aquifer (LI) which is described as *Bedrock which is Moderately Productive only in Local Zones* (refer to Figure 7.5 below). According to the GSI, the aquifer is not considered to have any primary porosity and flow will be primarily fracture controlled.

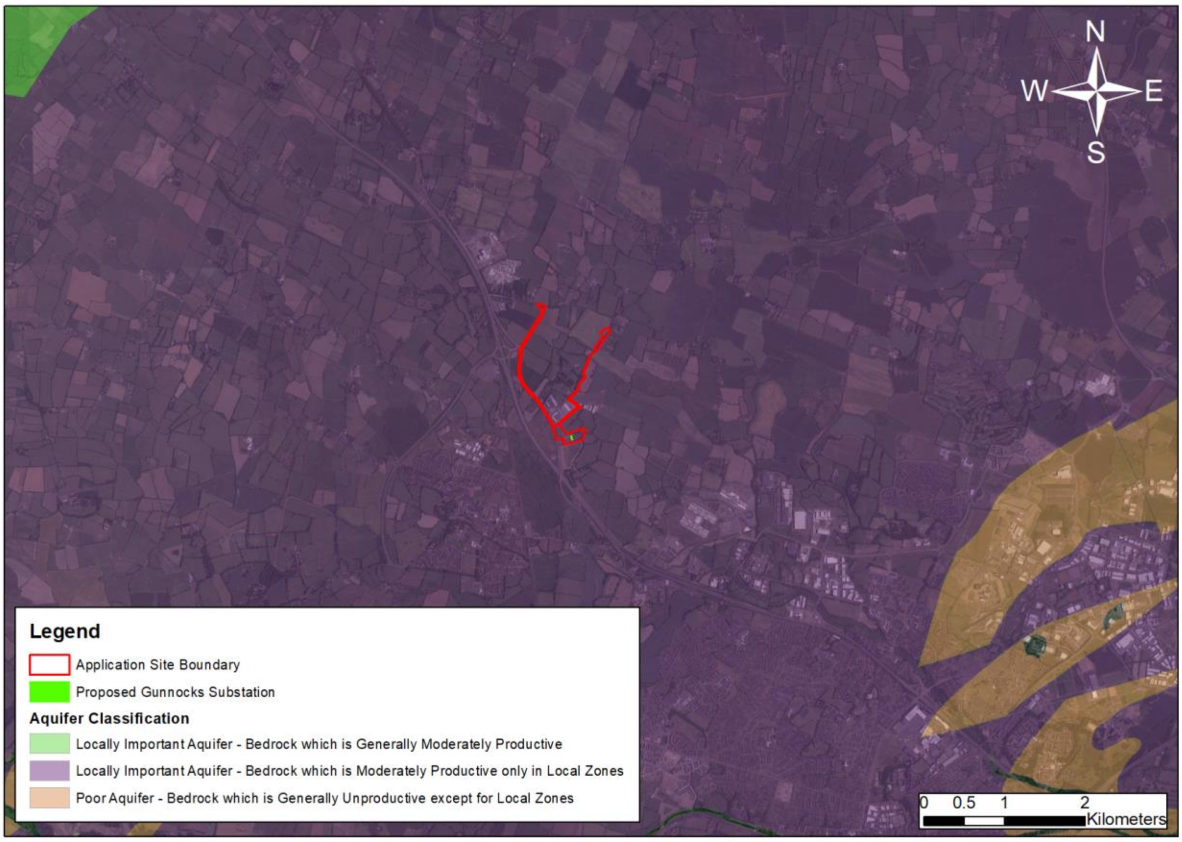


Figure 7.5 Aquifer Classification map (*Source: www.gsi.ie*)

The site is underlain by the Dublin Groundwater Body (EU code: IE_EA_G_008) which has been investigated by the GSI and is described as having a groundwater flow regime of PP which is poorly productive bedrock aquifer.

Aquifer vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated generally by human activities. Due to the nature of the flow of groundwater through bedrock in Ireland, which is almost completely through fissures/ fractures, the main feature that protects groundwater from contamination, and therefore the most important feature in the protection of groundwater, is the subsoil (which can consist solely/of mixtures of peat, sand, gravel, glacial till, clays or silts).

The GSI currently classifies the bedrock aquifer in the region of the subject site primarily as Moderate (M) to High (L) vulnerability status (indicating 3-10 m of low permeability soil) which is consistent with the site investigation carried out at

Enginenode site in 2019 (refer to Figure 7.6 below). The GSI Well Card Index shows 2 no. boreholes with depth to bedrock at 14mbgl in the area of Pace-Ballymagillin.

Figure 7.6 Aquifer Vulnerability map (*Source:* *www.gsi.ie*)

Based on the overburden thickness observed during the site investigation and the vulnerability presented above, it is likely that there would be an hydraulic connection between the local drainage network and with the bedrock aquifer.

The ‘Low’ vulnerability (indicative of >10 m of low permeability soil) observed to the end of the projected cables is consistent with the GSI Well Card Index data.

7.3.6.2 Groundwater Wells and Flow Direction

There is no licencing system for wells in Ireland at present and as such no complete data set. The GSI Well Card Index is a record of wells drilled in Ireland, water supply and site investigation boreholes kept by the Geological Survey of Ireland. It is noted that this record is not comprehensive as licensing of wells is not currently a requirement in ROI.

This current index, however, shows a number of groundwater monitoring and abstraction wells along the proposed cable routes. Table 7.2 below presents the main features of these boreholes (yield information and drill date of these boreholes is not provided by the GSI Well Card). Figure 7.7 below presents the GSI well search for the area surrounding the site.

GSI Code	Townland	Location [1] (app.)	Depth (mbgl)	Comments
2923NWW191	Pace	130m W of GW Circuit	23.8	Depth to rock: 13.7m
2923NWW192	Pace	40m W of GW Circuit	23.2	
2923NWW193	Ballymagillin	150m W of GW Circuit	45.7	Public supply. Depth to rock: 14m
2923NWW180	Dunboyne	130m W of GW Circuit	9.1	
2923NWW182	Dunboyne	70m SW of GW Circuit	12.0	
2923NWW183	Dunboyne	130m NE of GW Circuit	36.6	Depth to rock: 25.0m
2923NWW187	Dunboyne	15m NE of CG Circuit	6.7	
2923NWW186	Bracetown	40m NE of GW Circuit	57.9	
2923NWW185	Bracetown	Along the GW Circuit	7.9	

Note (1): GW Circuit = Gunnocks to Woodland Circuit. CG Circuit = Corduff to Gunnocks Circuit

Table 7.1 Summary of Boreholes in the vicinity of the routes

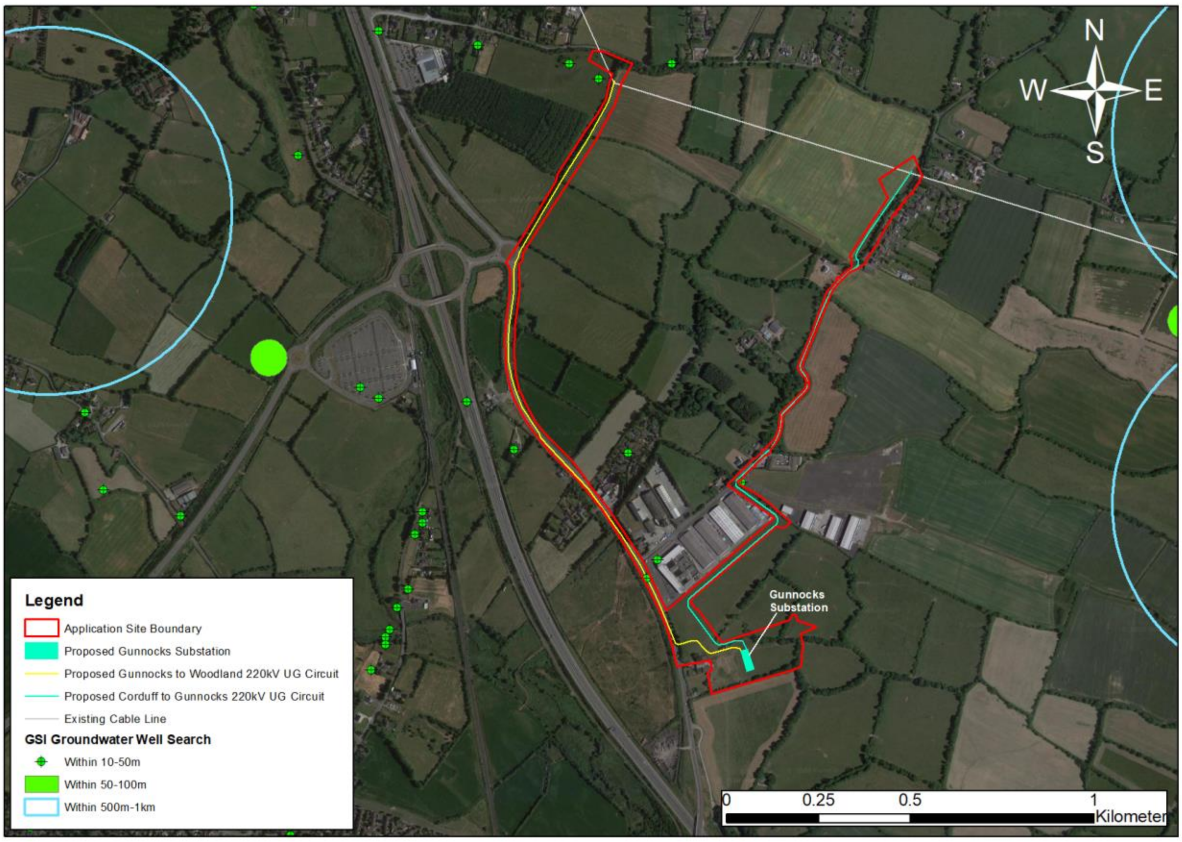


Figure 7.7 GSI Well Search (*Source: www.gsi.ie*)

During site investigations, localised perched water ingress was recorded at some trial pit locations mostly as seepage at depths between 1.2-2.8m below ground level. Two borehole locations were installed with standpipes and their standing water tables measured in May 2019 recorded levels of 0.7-1.1mbgl. These standpipes were screened into overburden subsoil therefore they are not representatives of bedrock aquifer conditions. There is no continuous water table within the overburden due to the clayey nature of the soil.

Project Runaways Expansion EIAR (submitted as part of MCC Planning Ref. RA150605) site investigations recorded groundwater levels in boreholes screened into bedrock and overburden. An assessment of this information indicates that groundwater flow within the bedrock unit is to south-southeast in line with the regional gradient.

7.3.6.3 Source Protection Areas

The public water supply for Dunboyne, Clonee and their surrounds is located c.350m to the west of the proposed Gunnocks to Woodland circuit across the M3 (i.e. upgradient of the site, refer to Figure 7.6 below). According to a technical report from 2004 (Dunboyne Water Supply – Groundwater Source Protection Zones, GSI, 2004), the supply consists of 4 no. boreholes and an infiltration gallery. Total abstraction rate of the system is c.900m^3/d. Figure 7.8 below shows the source protection area relative to the proposed development.

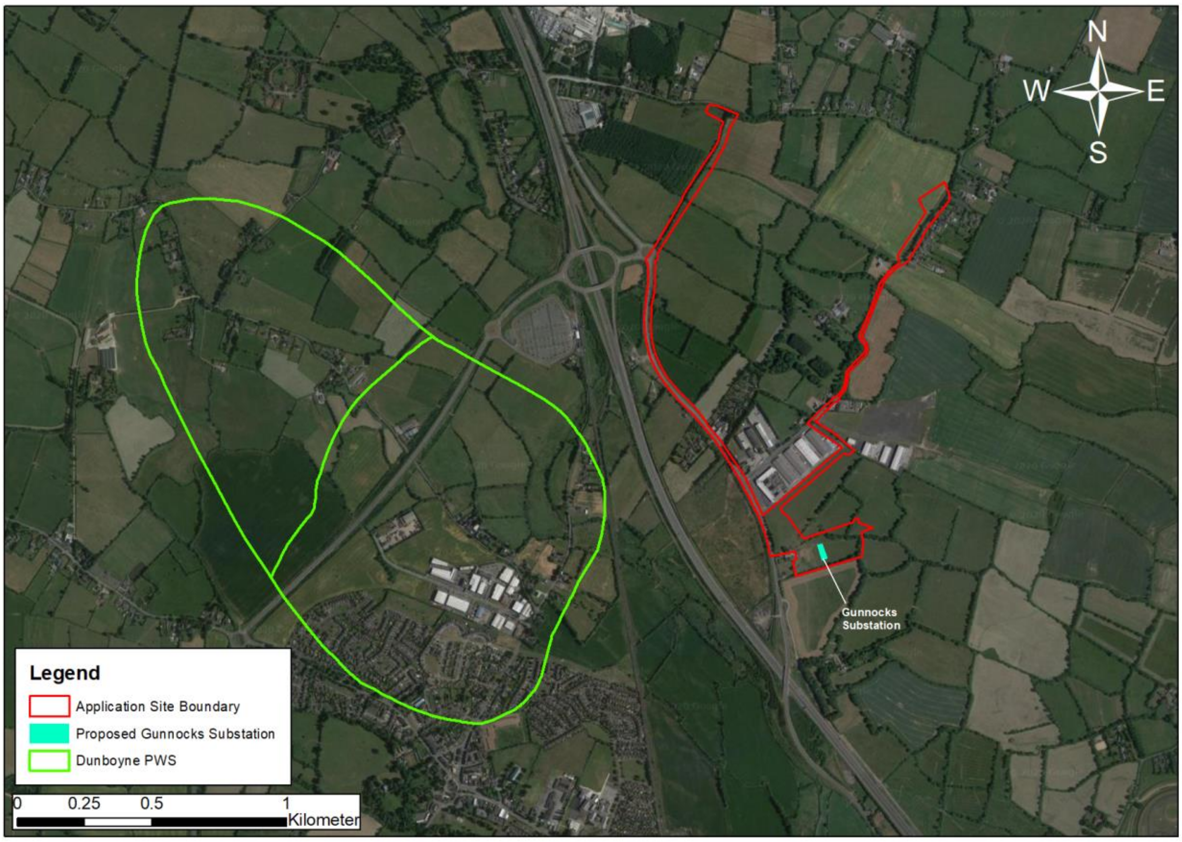


Figure 7.8 Groundwater Drinking Source Protection Area (shown in green)

7.3.6.4 Groundwater Quality

The European Communities Directive 2000/60/EC established a framework for community action in the field of water policy (commonly known as the Water Framework Directive [WFD]). The WFD required '*Good Water Status'* for all European water by 2015, to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both *'Good Ecological Status'* and *'Good Chemical Status'*.

The Groundwater Body (GWB) underlying the site is the Dublin GWB (EU Groundwater Body Code: IE_EA_G_008). Presently, the groundwater body in the region of the site (Dublin GWB) is classified under the WFD Risk Score system (EPA, 2020) as 'Good Status' and its risk as 'Not at Risk.

On a local scale, shallow soil quality along the R147 and L1010, would potentially have elevated hydrocarbons and heavy metals based on impact from road run-off. Soil testing (waste acceptance criteria testing) will be undertaken during initial works to determine a suitable licenced site for disposal.

7.3.6.5 Hydrogeological Features

There is no evidence of springs or karstification at the vicinity of the site according to the GSI Karst and well database.

7.3.6.6 Economic Geology

The EPA Extractive Industry Register and the GSI mineral database were consulted to determine whether there were/ are any mineral sites close to the subject site. One mineral site was identified in Bracetown, c.150m to the west of the proposed Gunnocks to Woodland circuit across the R147. The site is described as a gravel pit which contains unsorted sands and gravels (refer to Figure 7.9 below)..

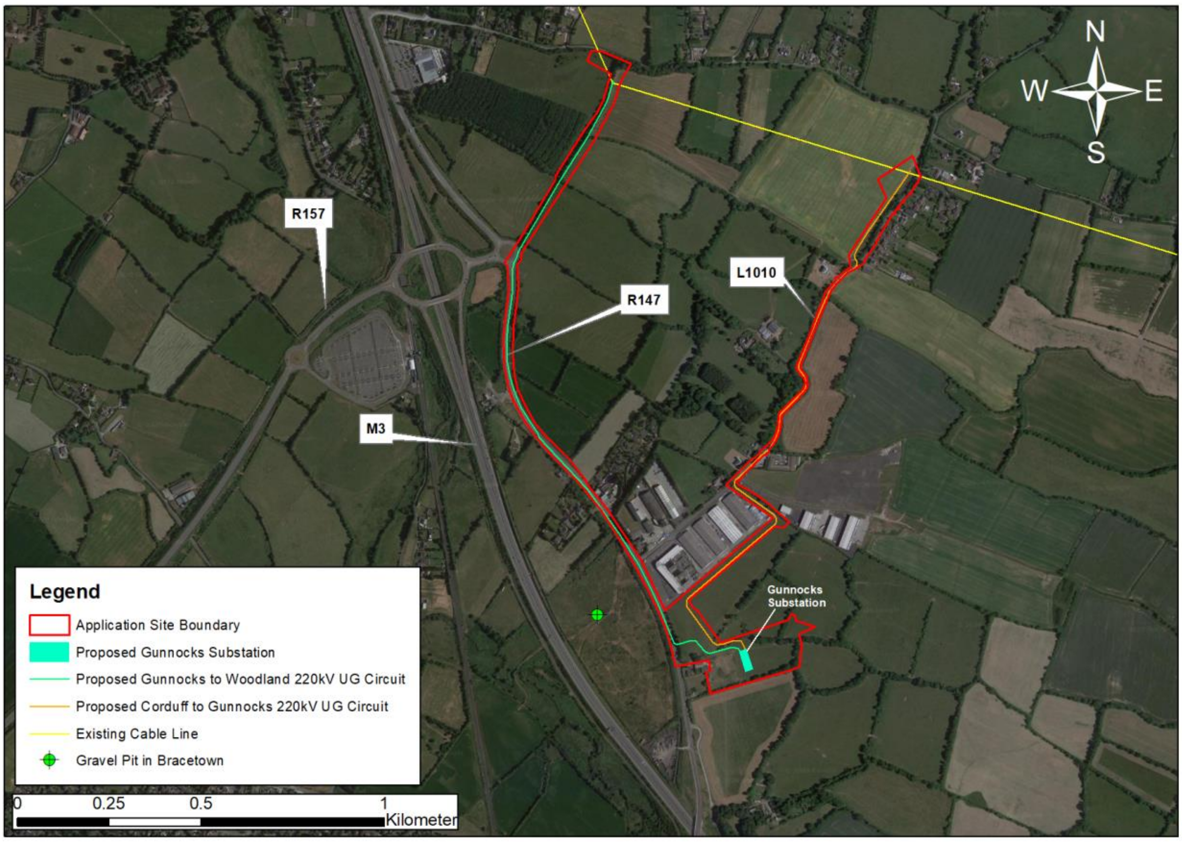


Figure 7.9 Mineral Activities in the Vicinity of the Site showing a gravel pit (green)

There are no active quarries at or adjacent to the proposed development site.

7.3.6.7 Areas of Conservation

There are no proposed Special Areas of Conservation (pSAC), Special Protection Areas (SPAs) or Natural Heritage area (NHA) within the immediate surrounds of the study area boundary.

According to the NPWS (2020) on-line database, the following area of conservation is located closest to the subject site:

- The Ryewater River SAC (001398) and National Heritage Area (NHA) – approximately 6.45km south of the site.

This SAC belongs to Ryewater catchment which drains towards the Liffey river. Therefore, there is no hydrological link between the development site and this SAC.

7.3.6.8 Cross Sections

Figure 7.10 below presents the location of representative cross sections through the site to provide a local hydrogeology conceptual site model (CSM).

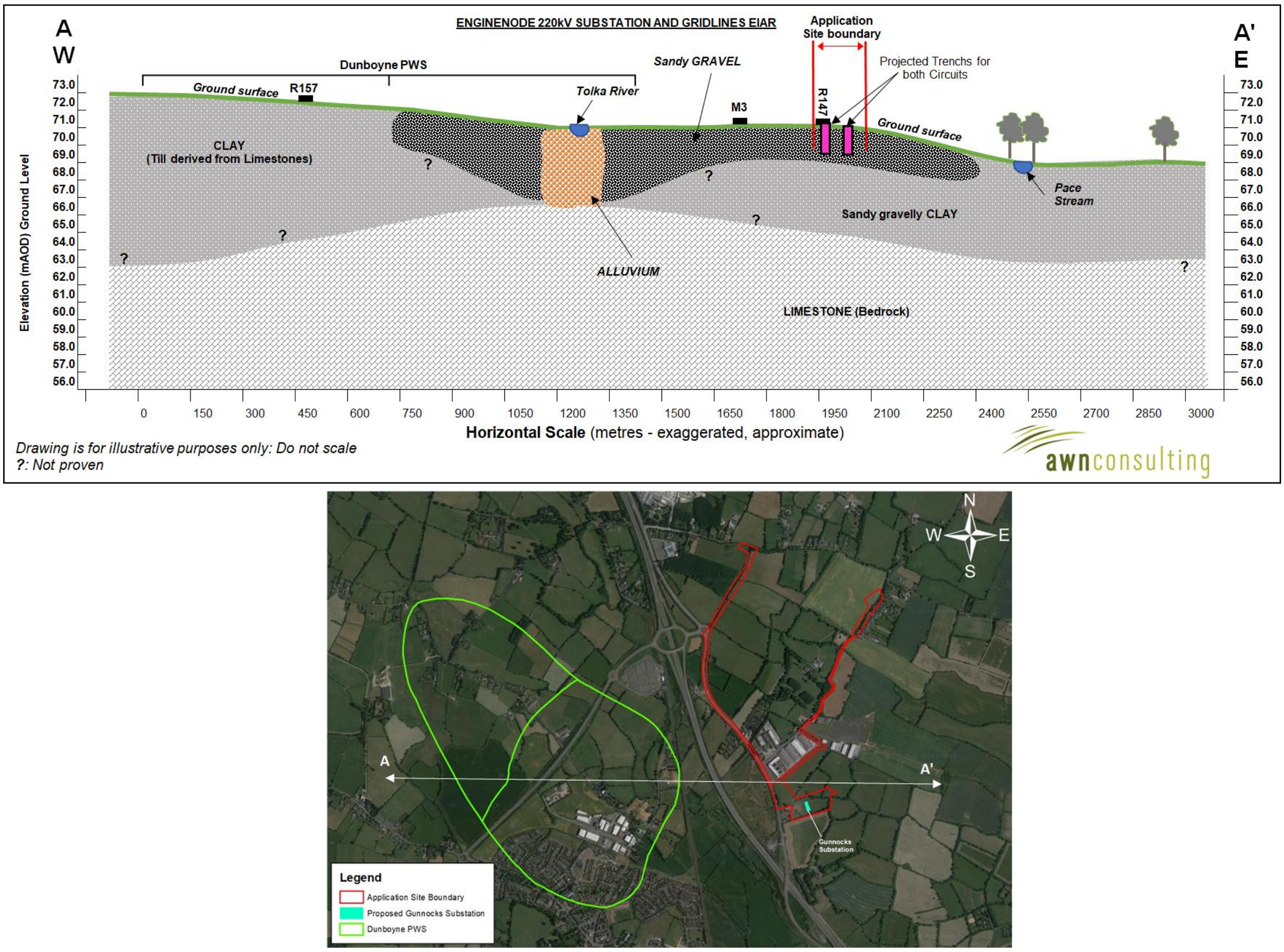


Figure 7.10 A-A’ cross section.

7.3.6.9 Rating of site importance of the geological and hydrogeological features

Based on the NRA methodology (2009) (refer to Appendix 6.2), criteria for rating site importance of geological features, the importance of the bedrock and soil features at this site is rated as ‘*Medium*’ importance with medium significance or value on a local scale, due to the presence of a small existing gravel pit in Bracetown, c. 150m to the west of the proposed Gunnocks to Woodland circuit across the R147.

Based on the NRA/IGI criteria for rating the importance of hydrogeological features (refer to Appendix 6.2) the importance of the hydrogeological features at this site is rated as ‘*High*’. This is based on the assessment that the aquifer beneath the site is a Locally Important (LI) bedrock aquifer which is Moderately Productive. This aquifer includes a supply for Dunboyne, Clones and their surrounds; its source protection area is located c.350m to the west of the proposed Gunnocks to Woodland circuit across the M3 (i.e. upgradient of the site).

7.3.7 Radon

According to the EPA (now incorporating the Radiological Protection Institute of Ireland) the site location is a Very Low Radon Area where is it estimated that less than 1% of dwellings will exceed the Reference Level of 200 Bq/m3. This is the lowest of the five radon categories which are assessed by the EPA.

7.3.8 Geohazards

Much of the Earth’s surface is covered by unconsolidated sediments which can be especially prone to instability. Water often plays a key role in lubricating the slope failure. Instability is often significantly increased by man’s activities in building houses, roads, drainage and agricultural changes. Landslides, mud flows, bog bursts (in Ireland) and debris flows are a result. In general, Ireland suffers few landslides. Landslides are more common in unconsolidated material than in bedrock, and where the sea constantly erodes the material at the base of a cliff landslides and falls lead to recession of the cliffs. Landslides have also occurred in Ireland in recent years in upland peat areas due to disturbance of peat associated with construction activities. The GSI landslide database was consulted and the nearest landslide to the proposed development was 11.6km to the west, referred to as the Diswellstown event which occurred on 24th December 1999. There have been no recorded landslide events at the site. Due to the local topography and the underlying strata there is a negligible risk of a landslide event occurring at the site.

In Ireland, seismic activity is recorded by the Irish National Seismic Network. The Geophysics Section of the School of Cosmic Physics at the Dublin Institute for Advanced Studies (DIAS) has been recording seismic events in Ireland since 1978. The station configuration has varied over the years. However, currently there are five permanent broadband seismic recording stations in Ireland and operated by DIAS. The seismic data from the stations comes into DIAS in real-time and are studied for local and regional events. Records since 1980 show that the nearest seismic activity to the proposed location was in the Irish sea (1.0 – 2.0 M_l magnitude) and ~55 km to the south in the Wicklow Mountains. There is a very low risk of seismic activity to the proposed development site.

There are no active volcanoes in Ireland so there is no risk from volcanic activity.

7.3.9 Land Take

The proposed substation and grid lines are located partially in lands currently used for agriculture and along roadways. However the lands are zoned for development of this nature.

There will be a narrow land take along (c. 10 m) the proposed grid routes due to the liner nature of this proposed development.

7.3.10 Summary & Type of Geological/Hydrogeological Environment

Based on the regional and site-specific information available the type of Geological/Hydrogeological Environment as per the IGI Guidelines is:

Type A – Passive geological/hydrogeological environment.

A summary of the site geology and hydrogeology is outlined thus:

- The proposed development will comprise the laying of 2 no. underground 220kV circuit transmission cable installation between the aforementioned substation and existing 220kV line. The projected substation and the existing line are located c. 1,5km apart, and are separated by industrial buildings, greenfield lands, parklands, local drainage (including the Normansgrove stream) and roadways;
- Apart from a the projected stretch within greenfield area, the proposed transmission cable installation route would be generally underlain by made ground belonging to the R147 and L1010 stretches. The greenfield area and the subsoil below the made ground would comprise glacial till with variable thickness along the routes, which is considered to have low permeability;
- In the vicinity of the local streams crossed by the Corduff to Gunnocks grid line (a tributary of the Pace stream and the Normansgrove) it is expected to encounter alluvium sediments (i.e., medium to high permeability);
- The majority of the proposed transmission cable route is underlain by the Lucan Formation comprising dark shaley limestone known as Calp. This formation is made up of calcareous shale, limestone conglomerate and is a *locally important* aquifer. The glacial till generally have discontinuous perched water tables with low inflow. A shallow perched water table may exist within the tills; and
- Made ground along the R147 and L1010 is assumed to have some contamination due to road run-off. No contamination is anticipated in greenfield areas.

7.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

There are a number of minor elements associated with the construction of the proposed development which have the potential to impact on the environment with respect to land, soils, geology and hydrogeology. There are no potential impacts associated with the operational phase of the proposed development.

A detailed description of the proposed development is provided in Chapter 2 of this EIA Report. The activities associated with the proposed development which are relevant to the land, soils, geology and hydrogeological environment are detailed in Table 7.2 below.

Table 7.2 Site Activities Summary

Phase	Activity	Description
Construction	Discharge to Ground	Surface water Run-off percolating to ground during construction of the shallow trenchs.
	Earthworks: Excavation of Superficial Deposits	Cut and fill will be required to facilitate construction, installation of the transmission cable from the Gunnocks substation to the existing line, and ancillary works. Topsoil/subsoil stripping and localised stockpiling of soil will be required for short periods of time during construction.
	Storage of hazardous Material	Fuel and chemical storage will be stored in the contractors compound at the Applicant's site for the datacentre development during construction phase.
	Import/export of Materials	It is envisaged that all excavated material will be removed as a waste off site. Any material re-used offsite for beneficial use on other sites with appropriate planning/waste permissions/derogations (e.g. in accordance with Article 27 of the European Communities (Waste Directive) Regulations 2011) or will be recovered and/or disposed off-site at appropriately authorised waste facilities. The removal of waste from the site will be carried out in accordance with Waste Regulations, Regional Waste Plan and Waste Hierarchy/Circular Economy Principals. Refer to Chapter 14 Waste Management for further detail. The importation of clean engineered fill will be required to facilitate construction. In the event of any soils/stones being imported onto the site from another construction site as a by-product, this will also be done in accordance with Article 27. (EPA agreement should be obtained before use of soils/stones as a by-product.)
Operation	There is no requirement for hazardous storage at the proposed facility, no direct discharge to ground and no soil disturbance.	

As outlined in Table 7.2 the activities required for the construction phase of the proposed development represents the greatest risk of potential impact on the geological environment. These activities primarily pertain to the site preparation, excavation, levelling and infilling activities required to facilitate construction of the shallow trenches for the installation of the proposed underground double circuit 110kV underground transmission cable.

7.5 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

The potential geological and hydrogeological impacts during the construction and operations are presented below. Mitigation measures to address these potential impacts are presented in Section 7.6.

7.5.1 Construction Phase

- As with all construction projects there is potential for water (rainfall and/or discontinuous perched groundwater) to become contaminated with pollutants associated with construction activity. Contaminated water which arises from construction sites can pose a significant short-term risk to groundwater quality for the duration of the construction if contaminated water is allowed percolate to the aquifer. It is noted that there is no bulk hydrocarbon storage along the proposed route and refuelling will occur within the construction compound within the adjacent Enginenode data centre site. The potential main contaminants include:

  - Suspended solids (muddy water with increase turbidity) – arising from excavation and ground disturbance;
  - Cement/concrete (increase turbidity and pH) – arising from construction materials; and,
  - Hydrocarbons– accidental spillages from construction plant.

- There is minimal loss of agricultural land which has not been zoned for development as a result of this development and minimal change to recharge to the aquifer.

7.5.2 Operational Phase

There are no potential land, geological and hydrogeological impacts during the operational phase of this proposed development. The potential for any accidental loss to ground is very low as no bulk chemical storage required and minimal risk for localised losses from vehicle due to low traffic requirement. The cable generally only requires inspection every three years, and there will be no impact as a result of this inspection.

7.5.3 Do Nothing Scenario

The proposed substation and transmission cable installation route crosses planned datacentre development lands, agricultural lands and roadways. Should the proposed development not take place, lands will remain in their current use. The substation is located in lands which are zoned for development and as such the area is likely to incur a loss of agricultural land.

7.6 REMEDIAL AND MITIGATION MEASURES

This section describes appropriate mitigation measures designed to avoid, reduce or offset any potential adverse geological and hydrogeological impacts identified.

7.6.1 Construction Phase

In order to reduce impacts on the land, soils and geology environment a number of mitigation measures will be adopted as part of the construction works on site. The measures will address the main activities of potential impact which include:

- Control of soil excavation and export from site;
- Sources of fill and aggregates for the proposed development;
- Fuel and chemical handling, transport and storage during the construction period; and
- Control of water during construction, if encountered during the construction of the proposed transmission cable route.

Construction Environment Management Plan
In advance of work starting on site the works Contractor will author a Construction Methodology document taking into account their approach and any additional requirements of the Design Team or Planning Regulator. The Contractor will also prepare a Construction Environment Management Plan (CEMP) which will include the schedule of mitigation measures included with this EIAR. The CEMP will set out the overarching vision of how the construction of the proposed development will be managed in a safe and organised manner by the Contractor as per client requirements. The CEMP will be a live document and it will go through a number of

iterations before works commence and during the works. It will set out requirements and standards which must be met during the construction stage and will include the relevant mitigation measures outlined in the EIA Report and any subsequent conditions relevant to the proposed development.

Control of Soil Excavation and Export of Material from Site
It is envisaged that all of the spoil generated during site preparation/levelling for the substation will be reused on site (see Chapter 14) while excavated material for the grid lines along roadways will be removed for licenced disposal.

The volume and nature of material to be excavated are estimated a follows:-

Material	**Volume (m^3)**
Tarmacadam	3,892
Soil/Gravel under Roads	9,127
Soil (Greenfield)	3,744
Trees / Shrubbery	101

Soil tested and classified as hazardous or non-hazardous in accordance with the EPA *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* publication, HazWasteOnline tool or similar approved method. The material will then need to be classified as inert, non-hazardous, stable non-reactive hazardous or hazardous in accordance with *EC Decision 2003/33/EC*.

Dust suppression measures (e.g. damping down during dry periods), vehicle wheel washes, road sweeping and general housekeeping will ensure that the surrounding environment are free of nuisance dust and dirt on roads.

Sources of Fill and Aggregates
All fill and aggregate for the proposed development will be sourced from reputable suppliers as per the project Contract and Procurement Procedures. All suppliers will be vetted for:

- Aggregate compliance certificates/declarations of conformity for the classes of material specified for the proposed development;
- Environmental Management status; and
- Regulatory and Legal Compliance status of the Company.

Fuel and Chemical Handling During Construction
All storage of fuel and refuelling will occur on the construction compound within the proposed data storage development site. Where mobile fuel bowsers are used the following measures will be taken:

  - Any flexible pipe, tap or valve will be fitted with a lock and will be secured when not in use;
  - The pump or valve will be fitted with a lock and will be secured when not in use;
  - All bowsers to carry a spill kit and operatives must have spill response training; and
  - Portable generators or similar fuel containing equipment will be placed on suitable drip trays.

The aforementioned list of measures is non-exhaustive and will be included in the CEMP.

Control of Water during Construction
Run-off into excavations/earthworks cannot be prevented entirely and is largely a function of prevailing weather conditions. Earthwork operations will be carried out such that surfaces, as they are being raised, shall be designed with adequate drainage, falls and profile to control run-off and prevent ponding and flowing. Correct management will ensure that there will be minimal inflow of shallow/perched groundwater into any excavation. Due to the very low permeability of the expected Tills and the relative shallow nature for excavations, infiltration to the underlying aquifer is not anticipated.

Care will be taken to ensure that exposed soil surfaces are stable to minimise erosion. All exposed soil surfaces will be within the main excavation site which limits the potential for any offsite impacts. All run-off will be prevented from directly entering into any water courses as no construction will be undertaken directly adjacent to open water.

No significant dewatering will be required during the construction phase which would result in the localised lowering of the water table. No discharge of construction water is anticipated during the construction of the proposed underground double circuit 220kV underground transmission cable installation. There may be localised pumping of surface run-off from the shallow excavations during and after heavy rainfall events to ensure that the trenches are kept relatively dry.

7.6.2 Operational Phase

During the operational phase of the proposed development site there is limited potential for site activities to impact on the geological and hydrogeological environment of the area due to the type of development. There will be no direct emissions to ground or potential for indirect emission from operational activities which only include maintenance.

7.7 PREDICTED IMPACT OF THE PROPOSED DEVELOPMENT

This section describes the predicted impact of the proposed development with and without the implementation of the remedial and mitigation measures described above.

7.7.1 Construction Phase

The predicted impacts on the geological and hydrogeological environment even without mitigation measures during the construction phase are considered as ***temporary, imperceptible*** *significance with a* ***neutral*** *impact on quality* (following EPA, 2017)*.* Following the NRA criteria for rating the magnitude and significance of impacts on the geological and hydrogeological related attributes, the magnitude of impact is considered ***Negligible****.*

The implementation of mitigation measures outlined in Section 6.6.1 will ensure that the predicted impacts on the geological and hydrogeological environment do not occur during the construction phase and that the residual impact will be ***temporary-imperceptible-neutral****.* Following the NRA criteria for rating the magnitude and significance of impacts on the geological and hydrogeological related attributes, the magnitude of impact is considered ***Negligible****.*

7.7.2 Operational Phase

The predicted impacts on the geological and hydrogeological environment during the operational phase will be ***long-term imperceptible*** *significance with a* ***neutral*** *impact on quality* (following EPA, 2017). Following the NRA criteria for rating the magnitude and significance of impacts on the geological and hydrogeological related attributes, the magnitude of impact is considered ***Negligible**.*

7.8 CUMULATIVE IMPACT OF THE PROPOSED DEVELOPMENT

The cumulative impact of the proposed development with any/all relevant other planned or permitted developments (including the concurrent datacentre developments (described in Chapter 2)) are discussed in Sections 6.8.1 and 6.8.2 below.

7.8.1 Construction Phase

The potential for impact on land, soils and groundwater during construction primarily arises from accidental leaks and spills to ground or dewatering. The proposed development does not require dewatering and with standard mitigation in place for management of accidental discharges, the effect due to construction in this area is considered to be a ***neutral*** on quality and an ***imperceptible*** significance. Contractors for the proposed development will be contractually required to operate in compliance with a CEMP which will include the mitigation measures outlined in this EIA report. Other developments will also have to incorporate measures to protect soil and water quality in compliance with legislative standards for receiving water quality. As a result, there will be no cumulative potential for change in soil quality or the natural groundwater regime. The cumulative impact is considered to be ***neutral*** *and* ***imperceptible***.

7.8.2 Operational Phase

Overall there will be a local change in recharge pattern due to the increase in hardstand from these proposed and planned developments. However, based on the overall size of the underlying aquifer and measures to protect soil and water quality there will be no overall change on the groundwater body status. The operation of the proposed development is concluded to have a ***long-term, imperceptible*** significance *with a* ***neutral*** impact on soil and water quality.

The proposed development includes measures to protect against any accidental discharges to ground e.g. adequate containment measures for oil storage, use of hardstand in loading areas and drainage through oil interceptors. As such the impact will be ***neutral*** and ***imperceptible*** in relation to soil and water*.* All developments will be required to manage sites in compliance with legislative standards for receiving water quality. Therefore, the cumulative impact is concluded to be ***neutral*** and ***imperceptible*** in relation to soil and water*.*

Overall there will be a loss of agricultural land which is in line with the zoning of the area and the Masterplan therefore the cumulative impact on land is considered to be ***neutral*** and ***not significant**.*

7.9 RESIDUAL IMPACTS

There are no likely significant impacts on the land, geological or hydrogeological environment associated with the proposed operational development of the site. As such the impact is considered to have a ***long-term, imperceptible*** significance with a ***neutral*** impact on quality.

7.10 REFERENCES

- Dublin Institute of Advanced Studies (DIAS) Catalogue of Local Earthquakes (mapping) https://www.insn.ie/confirmed/ (accessed 07th February 2018);
- Environmental Protection Agency (EPA) (2012); Guidance to Licensees on Surrender, Cessation and Closure of Licenced Sites;
- Environmental Protection Agency (EPA, 2020) – website mapping and database information (see: http://gis.epa.ie);
- Geological Survey of Ireland (GSI, 2020) - on-line mapping, Geo-hazard Database, Geological Heritage Sites & Sites of Special Scientific Interest, Bedrock Memoirs and 1:100,000 mapping (see http://www.gsi.ie/mapping);
- Long, M., Brannigan, C., Menkiti, C.O., Looby, M., Casey,P. (2012) Retaining Walls in Dublin Boulder Clay. *Proceedings of the ICE – Geotechnical Engineering,* 165 (4): 247-266;
- Enginenode Data Centre EIAR (2019);
- Ordnance Survey Ireland (OSI) - aerial photographs and historical mapping; and
- Teagasc soil and subsoil database.

APPENDIX 7.1

NRA CRITERIA FOR RATING THE MAGNITUDE AND SIGNIFICANCE OF IMPACTS AT EIA STAGE

NATIONAL ROADS AUTHORITY (NRA, 2009)

Table 1 Criteria for rating site importance of Geological Features (NRA)

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale Degree or extent of soil contamination is significant on a national or regional scale Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (NHA) Large existing quarry or pit Proven economically extractable mineral resource
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and/or soft organic soil underlying route is significant on a local scale.	Contaminated soil on site with previous heavy industrial usage Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site) Well drained and/or high fertility soils Moderately sized existing quarry or pit Marginally economic extractable mineral resource
Medium	Attribute has a medium quality, significance or value on a local scale Degree or extent of soil contamination is moderate on a local scale Volume of peat and/or soft organic soil underlying route is moderate on a local scale	Contaminated soil on site with previous light industrial usage Small recent landfill site for mixed wastes Moderately drained and/or moderate fertility soils Small existing quarry or pit Sub-economic extractable mineral resource
Low	Attribute has a low quality, significance or value on a local scale Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying route is small on a local scale	Large historical and/or recent site for construction and demolition wastes. Small historical and/or recent landfill site for construction and demolition wastes. Poorly drained and/or low fertility soils. Uneconomically extractable mineral resource.

Table 2 Criteria for rating impact magnitude at EIS stage – Estimation of magnitude of impact on soil / geology attribute (NRA)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Loss of moderate proportion of future quarry or pit reserves
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of	Loss of small proportion of future quarry or pit
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes
Minor Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage
Major Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature

Table 3 Criteria for rating Site Attributes - Estimation of Importance of Hydrogeology Attributes (NRA)

Magnitude of Impact	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple well fields Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers Locally important potable water source supplying >1000 homes Outer source protection area for regionally important water source
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes Outer source protection area for locally important water source
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes

Table 4 Criteria for Rating Impact Significance at EIS Stage – Estimation of Magnitude of Impact on Hydrogeology Attribute (NRA)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Removal of large proportion of aquifer. Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems. Potential high risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >2% annually.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Removal of moderate proportion of aquifer. Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. Potential medium risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >1% annually.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Removal of small proportion of aquifer. Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. Potential low risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >0.5% annually.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Calculated risk of serious pollution incident <0.5% annually.

Table 5: Rating of Significant Environmental Impacts at EIS Stage (NRA)

Importance of Attribute	**Magnitude of Importance**			
	Neglible	**Small Adverse**	**Moderate Adverse**	**Large Adverse**
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant/moderate	Profound/Significant	Profound
High	Imperceptible	Moderate/Slight	Significant/moderate	Profound/Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight/Moderate

APPENDIX 7.2

IGSL INVESTIGATION REPORT

IGSL Ltd.

IGSL Limited

Clifton Scannell Emerson Associates
Consulting Engineers

EngineNode Data Centre
Clonee
Co. Meath

Geotechnical Report

Report No. 21674

May 2019

Report

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Appendices

FOREWORD

The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards

The ground investigation works for this project (EngineNode Data Centre, Clonee) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as BS 5930 (1999), BS 1377 (Parts 1 to 9) and Engineers Ireland Specification & Related Documents for Ground Investigation in Ireland (2006). A new National Annex for use in the Republic of Ireland is currently in circulation for comment and will be adopted in the near future. In the mean time, the following Irish (IS) and European Standards or Norms are referenced:

- IS EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- IS EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- IS EN ISO 14688-1:2002 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- IS EN ISO 14688-2:2004 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Classification Principles
- IS EN ISO 14689-1:2004 Geotechnical Investigation and Testing - Identification & Classification of Rock, Part 1: Identification & Description

Reporting

Recommendations made and opinions expressed in this report are based on the strata observed in the exploratory holes, together with the results of in-situ and laboratory tests. No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations.

The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points.

This report has been prepared for CSEA Consulting Engineers and the information should not be used without prior written permission. The recommendations developed in this report specifically relate to the proposed development. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

Boring Procedures

Unless otherwise stated, 'shell and auger' or cable percussive boring technique has been employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing complies with the recommendations of IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variations is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Rotary Drilling Procedures

Rotary drilling methods have been used to recover bedrock samples in line with Section 3.5 of IS EN 1997-2:2007 and IS EN ISO 22475-1. Where cable percussive boreholes terminated prematurely on an obstruction within overburden, open hole drilling methods (odex or symmetrix) were utilized to advance the drillholes through the superficial deposits with coring in bedrock. The key objectives of the rock sampling were to obtain high core recovery (TCR), minimize sample disturbance and facilitate accurate identification of strength, weathering and discontinuity characteristics.

In-Situ Testing

Standard penetration tests were conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio (E_r). A calibration certificate is available upon request. The E_r is defined as the ratio of the actual energy E_{meas} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Groundwater

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

Engineering Logging

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2002 and IS EN ISO 14689-1:2004. Rock weathering classification conforms to IS EN ISO 14689-1:2003 while discontinuities (bedding planes, joints, cleavages, faults etc) are classified in accordance with 4.3.3 of IS EN ISO 14689-1:2003. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Retention of Samples

Samples shall be retained for a period of 60 days following approval of the final factual report, as detailed in the Scope of Works.

1.0 Introduction and Objectives

It is proposed to construct a data centre at a large site in Clonee, Co. Meath.

The site location is as shown on Figure 1 with the approximate site outline shown in red.

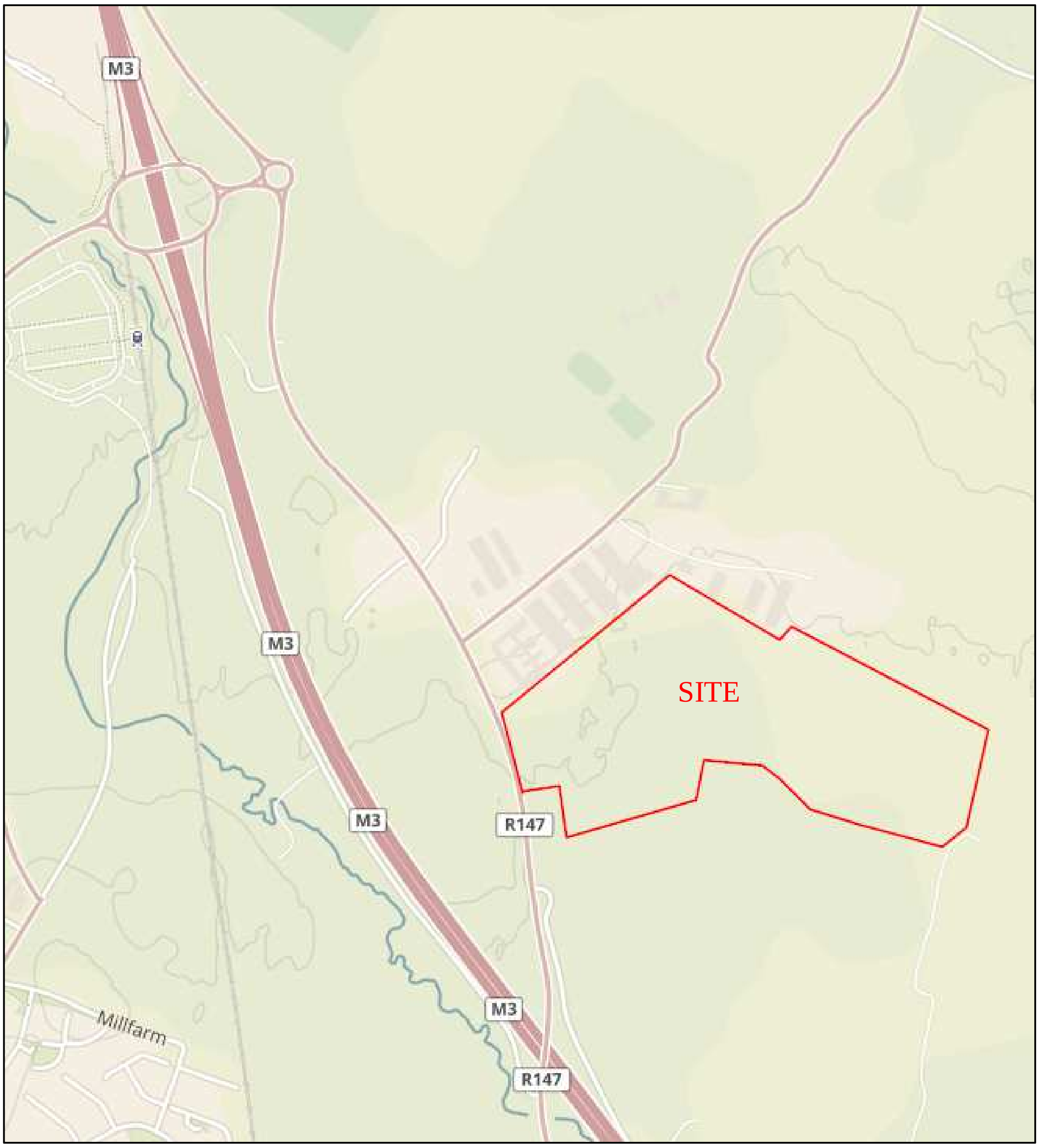


Figure 1 – Site Location

IGSL Limited were appointed by Clifton Scannell Emerson and Associates (CSEA) to conduct a ground investigation at the site. The objectives of the investigation were to ascertain the ground and groundwater conditions, and to produce a report which will form part of a due diligence.

Fieldworks were undertaken during March / April 2019.

2.0 Scope of Works

The programme of exploratory works included the following:

- 5 no. cable percussive boreholes
- 3 no. rotary coreholes
- 10 no. mechanically excavated trial pits
- 10 no. dynamic cone penetrometer (DCP) tests
- 4 no. infiltration tests
- Groundwater monitoring at borehole locations
- A programme of geotechnical and chemical laboratory testing

The exploratory hole locations are shown on the as-surveyed site plan in Appendix 7 of this report.

2.1 Cable Percussive Boreholes

Boreholes were constructed in 5 locations (BH01 to BH03, BHSP01 and BHSP02), using a Dando 2000 rig equipped with 200 mm casing.

A hand dug inspection pit was excavated at each location prior to commencing drilling works and the locations were scanned for services using a CAT detection tool.

During the course of boring, in-situ Standard Penetration Tests (SPT) were undertaken at regular intervals. Samples were also recovered to assist in the visual description of recovered soils and to provide specimens for laboratory testing.

Instances of groundwater ingress were recorded and monitored for a further 20 minutes to permit the water to rise. Standpipes were installed in two boreholes (BHSP01 and BHSP02) in order to permit long term groundwater monitoring.

The boreholes encountered Topsoil overlying soft clayey subsoil to depths of between 0.5 and 1.0 metres below existing ground level (m BGL).

Within the western portion of the site, boreholes BH01, BH02 and BHSP02 encountered granular deposits (clayey sandy gravel) directly below the Topsoil / subsoil. These deposits extended to depths of between 1.8 and 2.2 m BGL. In-situ Standard Penetration Tests (SPT) within the gravel deposits produced "N" values in the range 15 to 42, indicating medium dense and dense soils.

Within the eastern portion of the site, boreholes BH03 and BHSP01 encountered deposits of stiff brown sandy gravelly clay below the Topsoil / subsoil layer. These soils were present to depths of 2.1 and 2.0 m BGL respectively and were characterised by an SPT "N" value of 17 in both boreholes, indicating a stiff consistency.

All boreholes encountered basal deposits of grey-black sandy very gravelly clay with a cobble content. These were typically high strength (very stiff consistency) and were characterised by "N" values in the range 25 to 48. All boreholes terminated within these deposits, recording "Refusal" ("N" value > 50) in the final SPTs.

Groundwater was encountered in all boreholes in the form of seepage or slow ingress. Water strike depths were in the range 1.4 to 4.2 m BGL. During the subsequent 20 minute monitoring period, water levels rose to a shallowest depth of 1.2 m BGL (at BH SP02).

The borehole records are presented in Appendix 1 of this report.

2.2 Rotary Coreholes

Rotary coring was undertaken at 3 no. locations (RC01 to RC03). Symmetrix "open hole" techniques were used to advance through the overburden soils, reverting to coring techniques on encountering the first indications of bedrock.

The recovered rock core was inspected by a qualified engineering geologist and logged in detail at IGSL's laboratory. Records detailing the Total Core Recovery (TCR), Solid Core Recovery (SCR) and Rock Quality Designation (RQD) were produced. Core records also include a fracture log (spacing between successive core joints measured from the cores) of the core recovered.

All cores were labelled and photographed for inclusion in the report. Photographs are presented digitally for ease of browsing and to permit close examination at high resolution.

The rotary coreholes identified the weathered bedrock horizon at depths of between 4.5 and 5.5 m BGL and coring was advanced to depths of between 10.9 and 12.7 m BGL.

The bedrock was described as slightly to locally moderately weathered, medium strong to strong fine grained argillaceous LIMESTONE with zones of mudstone and shale.

Total Core Recovery (TCR) was excellent throughout (100%), with Solid Core Recovery (SCR) within the upper two metres was variable, dipping below 30% within weathered mudstone / shale zones. The SCR improved with depth, with values in the range 70 to 90% measured. RQD values were generally in the range 25 to 60%, locally reducing to 0% within non-intact (highly weathered) zones.

Typical core recovery is shown in Figure 2.

Figure 2 – Core recovery at RC01 (5.5 - 8.3 m BGL)

Uniaxial Compressive Strength (UCS) tests on intact sections of core yielded UCS values in the range 66 to 88 MPa. Point load tests undertaken on rock core samples yielded Is_{50} values typically in the range 3 to 6 MPa. These suggest equivalent UCS values of the order of 60 to 120 MPa. The results of UCS and point load tests therefore indicate that the limestone bedrock is predominately Strong in accordance with BS EN ISO 14689-1.

Corehole records and photographs are included in Appendix 2 of this report.

2.3 Trial Pits

Trial pitting was performed at 10 locations (TP01 to TP10) using a wheeled JCB excavator. The trial pits were logged and sampled by an IGSL geotechnical engineer in accordance with BS 5930 (1999+A2:2010).

Pit sidewalls were assessed in terms of their short term stability and any instances of groundwater ingress were recorded. Bulk soil samples were also recovered to provide specimens for laboratory testing.

The samples were placed in heavy duty polyethene bags and sealed before being transported to Naas for laboratory testing. For this project, environmental samples were obtained and placed in appropriate containers.

The trial pits were backfilled with the as-dug arisings and reinstated to the satisfaction of IGSL's site geotechnical engineer. The trial pit logs in Appendix 3 include descriptions of the soils encountered, groundwater conditions and stability of the pit sidewalls.

The ground conditions in the trial pits generally reflected those in the cable percussive boreholes. Topsoil was encountered in all locations and this was underlain by subsoil, which was organic (rooty) in places. The subsoil was generally in a soft or firm condition, and typically extended to a depth of up to 0.6 m BGL. At TP08 and TP10, soft and soft to firm soils were present to depths of 1.1 and 0.9 m BGL respectively.

Within the western portion of the site, trial pits TP02 to TP06 encountered clayey sandy gravel with cobbles below the Topsoil / subsoil layers. These were present to depths of between 1.5 and 2.5 m BGL, although it is noted that trial pit TP03 terminated within gravel soils at a depth of 2.5 m BGL. The exception to this occurred at TP01 (north-west corner of the site), where no gravel soils were encountered.

Within the eastern portion of the site (TP07 to TP10), the Topsoil / subsoil layers were underlain by further deposits of brown sandy gravelly clay. These were described as being in a predominately firm condition and were present to depths of between 1.1 and 1.8 m BGL.

Similar to the boreholes, all trial pits terminated in stiff or very stiff grey / black sandy gravelly clay, which also contained cobbles. A depth of 3.0 m BGL was achieved in all cases. The exception to this was the aforementioned trial pit TP03, where the gravel soils collapsed during excavation and prevented excavation below 2.5 m BGL.

Groundwater was encountered in most trial pits in the form of seepage or slow flow at depths of between 1.2 and 2.8 m BGL. It is noted that higher flow rates occurred within gravel soils.

2.4 TRL Dynamic Cone Penetrometer

DCP testing was undertaken at all trial pit locations (DCP-TP01 to DCP-TP10) in order to estimate the in-situ CBR values for the subgrade soils. Tests commenced at a depth of 0.5 m BGL, ensuring prior removal of the topsoil layer.

The Dynamic Cone Penetrometer (DCP) apparatus was designed by TRL for the rapid in-situ measurement of the structural properties of existing road pavements. However, the apparatus is also widely used to obtain measurements of the CBR values of the sub-grade, particularly in granular soils which are too coarse for laboratory testing where the maximum particle size is limited to 20mm. The DCP-CBR relationship stipulated in TRRL Road Note 8 is based on publications by Kleyn and Van Heerden.

The results of each test are presented in terms of the DCP blow-count (mm/blow) against depth of penetration and the depth range for calculation purposes is generally related to a specific soil layer.

The DCP test records are included in Appendix 4. It is noted that the most onerous (weakest) depth range has generally been selected for the purpose of CBR calculation. However, alternative depth ranges can be selected and the equivalent CBR calculated using the equation provided on the record.

2.5 Infiltration Tests

Infiltration testing was performed in four locations (SA01 to SA04) to ascertain the suitability of the sub-soils for soakaway purposes. Testing was performed in accordance with BRE Digest 365 ‘Soakaway Design’.

To obtain a measure of the infiltration rate of the sub-soils, water was poured into each test pit to ensure total saturation of the sub-soils. This procedure was repeated twice more, and records were taken of the fall in water level against time. The results for the final stages of testing, following the saturation periods, are enclosed in Appendix 5.

The infiltration rate is the volume of water dispersed per unit exposed area per unit of time, and is generally expressed as metres/minute or metres/second.
Three test pits exhibited negligible infiltration. However, test SA02 encountered a stratum of gravel between 0.4 and 1.6 m BGL, which yielded an infiltration rate of 0.005 m/min.

2.6 Groundwater Monitoring

Standpipes were installed in boreholes BHSP01 and BHSP02 in order to permit long term monitoring of groundwater levels.

The site was re-visited post-fieldwork and readings taken of the groundwater levels in the standpipes. The standpipe installation details and groundwater monitoring results are summarised on Table 1.

Location	Hole Depth (m BGL)	Top of Response Zone (m BGL)	Base of Response Zone (m BGL)	Groundwater Level (07/05/2019)
BHSP01	4.3	1.0	4.3	0.70
BHSP02	4.9	1.0	4.9	1.10

Table 1 – Summary of Groundwater Monitoring

2.7 As-Built Survey

On completion of fieldworks, the location (x,y) and elevation (z) of each exploratory location was determined by detailed survey using GPS Realtime Kinetic survey instrument.

The National Grid survey co-ordinates and ground levels related to Malin Head Datum are presented on the exploratory hole records and these were used to plot the as-built locations on the Site Plan in Appendix 8 of this report.

3.0 Laboratory Testing

Laboratory testing was performed on selected samples to assist in soil classification. Laboratory test results are segregated and presented as follows:

- Appendix 6 – Geotechnical Laboratory Testing
- Appendix 7 – Chemical Test Reports (Chemtest Laboratory)

Geotechnical Tests were undertaken in the IGSL laboratory and comprised:

- Moisture Content
- Atterberg Limits (Plasticity Index)
- Particle Size Distribution (PSD)
- Moisture Condition Value (MCV)
- Dry Density / Moisture Content Relationship (Compaction Test)

Chemical and environmental tests included:

- Sulphate and pH Analysis of soils (Chemtest Laboratory)

3.1 Particle Size Distributions

Grading curves for show marked variations in soil composition, highlighting the presence of both cohesive (silt/clay) and granular (gravel) soils. The PSD results indicate that the gravelly clay soils are well-graded, exhibiting typical “straight line” grading curves.

The grading curves for granular soils were generally dominated by the gravel fraction, with low fines (silt/clay) contents (typically less than 10%).

For practical reasons cobbles and boulders were omitted from test specimens.

3.2 Index Properties (Atterberg Limits)

Moisture contents for the upper soils were variable, with some values of between 20 and 30% measured for the near-surface soils.

Within the underlying gravelly clay soils, moisture contents were more consistent and generally lower, with typical values of 10 to 11%.

The results of plastic and liquid limit tests classify the test specimens as predominantly low to intermediate plasticity clay (CL to CI), and locally non-plastic silt.

3.3 Moisture Condition Value (MCV)

MCV tests provide a rapid indication of the potential for soil reusability at the current moisture content. For the purposes of preliminary assessment, an MCV of 8 or greater is a typical requirement of earthworks specifications for soils to be reused as engineering fill.

A total of seven samples were tested. The results illustrated the variability in the upper soils, as shown on Table 2.

Location	Depth (m BGL)	Moisture Content (%)	Soil Type	MCV
BHSP01	1.0	18	Sandy gravelly CLAY	8.4
BH03	1.0	27	Sandy gravelly CLAY	4.0
TP01	1.0	12	Sandy gravelly CLAY	9.2
TP02	0.5	34	Sandy gravelly CLAY	<1
TP06	2.0	12	Sandy gravelly CLAY	2.4
TP08	0.5	14	Sandy gravelly CLAY	2.2
TP10	0.5	28	Sandy gravelly CLAY	7.6

Table 2 – Summary of MCV results

Table 2 shows that 3 of the 7 samples were in the range 7 to 9, indicating potential suitability for reuse as engineering fill. However, the remaining 4 tests yielded considerably lower MCV values.

Where MCV values were low, these either related to near-surface samples (TP02) or where the moisture contents were exceptionally high (BH03, TP02). It is also noted that the lowest results relate to soils that were classified as either low plasticity clay or non-plastic silt. These soils are generally sensitive to disturbance and can soften dramatically with small increases in moisture content.

3.4 Compaction Test (Dry Density / Moisture Content Relationship)

Compaction testing was undertaken to determine the dry density of soil when it is compacted in a specific manner over a range of moisture content values. The results are plotted as a graph of moisture content against dry density to determine the optimum moisture content (OMC) i.e. the moisture content at which the maximum dry density is achieved.

Testing was performed in accordance with method 3.3 of BS 1377: Part 4: 1990. In this test, soil passing the 20 mm sieve is compacted into a one litre compaction mould, in three layers, with a vibrating hammer.

The results are summarised in Table 3, which also shows the dry density and moisture content values for the sample in its “as-received” condition. The dry density of the as-received sample is expressed as a percentage of the optimum.

Location	Depth (m BGL)	As Sampled Moisture Content (%)	Soil Type	Dry Density at Natural Moisture Content (Mg/m^3)	Maximum Dry Density (Mg/m^3)	NDD/ MDD (%)	Optimum Moisture Content (%)
TP01	0.5	11	Sandy gravelly CLAY	2.02	2.02	100	11
TP06	2.0	28	Sandy gravelly CLAY	1.51	1.65	92	18
TP08	0.5	16	Sandy gravelly CLAY	1.90	2.00	95	8

Table 3 – Summary of Compaction Test Results

Table 3 shows that the Optimum Moisture Content (OMC) was in the range 8 to 11% for two samples. At TP06, the achieved density was comparatively low and the as-received moisture content exceptionally high. It is though that this material had been influenced by water ingress originating within the overlying gravel soils and is likely to be misrepresentative of the indigenous gravelly clay soils as a whole.

Optimum moisture contents of the order of 11% would be considered more typical of the gravelly clay soils encountered at this site.

3.5 Sulphate and pH Analysis

The results of chemical testing showed very low concentrations of soluble sulphates. In addition, the pH values indicated near neutral conditions.

Since the soluble sulphate concentrations were significantly below 0.5 g/l, and pH values were above 2.5, a Design Sulphate Class of DS-1 may be assumed in accordance with Table C1 of BRE Special Digest 1 Concrete in Aggressive Ground: 2005.

Assuming a static groundwater table, an ACEC (Aggressive Chemical Environment for Concrete) Classification of AC-1s is applicable.

4.0 Discussion and Recommendations

4.1 General

The investigation showed the surface soils to comprise Topsoil and organic (rooty) subsoil. These were in a generally soft / firm condition and extended to depths of typically 0.5 to 0.6 m BGL (locally up to 1.1 m BGL).

The boreholes and trial pits within the western and central portions of the site showed the presence of gravel soils, which extended to depths of up to 2.5 m BGL. Within the eastern portion of the site, no gravel soils were in evidence and instead, firm and stiff gravelly clay soils were present.

The underlying main body of soil comprised stiff and very stiff deposits of grey-black gravelly clay with cobbles. This is glacial till, commonly referred to as the Dublin “boulder clay”. The high strength of these deposits is due to over-consolidation during the glaciation period of the ice age.

Groundwater was observed in the form of seepage or slow flow in the majority of trial pits and boreholes. However, inflow was more substantial within gravel soils. Monitoring of standpipes has shown water to be present within the upper metre.

The trial pits remained generally stable when excavating through firm/stiff gravelly clay soils. However, some instability occurred within gravel soils, particularly where groundwater was present.

4.2 Structural Foundations

The Topsoil and near-surface soft or soft to firm subsoils should be discounted as suitable foundation bearing strata. Consideration could instead be given to the construction of shallow foundations on the underlying firm to stiff gravelly clay soils or medium dense sandy gravels, which are generally present within 1.0 to 1.2 metres of existing ground level.

An allowable bearing pressure of the order of 125 to 150 kPa may be assumed for the firm to stiff clay or medium dense gravel soils. It is expected that the foundation excavations within the western and central portion of the site will encounter predominately gravel soils within the upper 1 to 2 metres, while those in the eastern portion will encounter mainly gravelly clay.

If higher bearing pressures are required, the underlying stiff to very stiff grey-black gravelly clay (glacial till) would be expected to support pressures of the order of 200 to 250 kPa at their horizon (typically 1.8 to 2.5 m BGL). These soils become stiffer with depth and bearing pressures in excess of 300 kPa could be assumed within the deeper very stiff glacial tills (c. 3 to 4 m BGL).

Limestone bedrock was confirmed to be present in three locations at depths of between 4.5 and 5.5 m BGL. Considerably higher bearing pressures could be presumed for foundations constructed on the medium strong to strong bedrock, which would be expected to readily support bearing pressures of the order of 1000 to 1500 kPa.

It is noted that while the majority of trial pits remained stable during excavation (typically 45 minutes), pits formed within gravel soils were prone to collapse. Therefore, provision should be made for temporary trench control measures when excavating for foundations.

4.3 Groundwater

During the investigation, water ingress occurred in the trial pits. While these were limited to slow flow or seepage with clay soils, more rapid inflows occurred within the gravel deposits. Groundwater monitoring post-fieldwork has recorded standing water levels as shallow as 0.7 m BGL. Therefore, groundwater ingress should be expected within foundation excavations and dewatering measures will be required, particularly within gravel soils.

Where groundwater ingress occurs in gravelly clay soils, it is recommended that foundation excavations are blinded immediately in order to minimise water-softening of the base. Foundation trenches that contain water should be pumped dry and any water-softened material over-excavated prior to pouring foundations or lean mix concrete.

4.4 Pavements and Hard Standings

The results of in-situ DCP tests indicated variable CBR values at the test depth of 0.5 m BGL. Lowest values of 3.5% were obtained in two locations.

Sub base and capping thicknesses should be designed in accordance with NRA HD 25-26/10. In accordance with the standards, the lowest CBR value should be adopted. Therefore, a CBR of no higher than 3.5% should be provisionally considered for this site. It will also be imperative that any soft or organic soils are removed prior to placing the capping layer. Road construction should only commence on sandy gravelly clay or sandy gravel soils that are free from organics and are in a dry (drained) condition.

Prior to construction, it is strongly recommended that plate bearing tests are conducted on the prepared subgrade in order to confirm the design CBR value prior to placement of the capping layer.

Laboratory testing (Atterberg Limits) has classified the fine grained soils as low to intermediate plasticity clays. Groundwater has been shown to be present within the upper metre in the standpipes. It is noted that groundwater can have a catastrophic softening effect on exposed subgrade, particularly in low plasticity soils. It will be imperative to maintain a dry subgrade before construction of the capping layer. Adequate drainage measures should be implemented before construction so that the groundwater table is kept below (ideally 0.5 metres below) subgrade level. Stripped subgrade should also be protected from surface water ingress or disturbance from unnecessary pedestrian or vehicular traffic. The time between stripping to formation level and placement of the capping layer should be minimised.

Low plasticity soils are particularly susceptible to dilation and rapid weakening as a result of dynamic compaction. Where groundwater is present at or near proposed subgrade, any proof rolling of the subgrade soils should be performed statically using a smooth roller in order to avoid vibratory disturbance. Initial placement of the capping layer should also be carried out using a static roller for the same reason.

Any residual zones of soft subgrade should be removed and replaced with 6F capping or starter layer material (Class 6A / 6B). Plate bearing tests should be considered during construction to verify or validate the stiffness / density of the formation soils.

It is important that argillaceous sedimentary rocks (i.e. muddy limestone, calcareous mudstone, shale, etc.) are not used in sub-base, capping or as a starter layer. These have high potential to give rise to degradation (i.e. poor durability and soundness) and slaking and therefore would not be suitable. All granular fills (particularly Series 600 and 800 material) should be thoroughly examined, tested and approved in advance of being used in the pavement construction.

4.5 Chemical Attack on Buried Concrete

The results of Sulphate and pH testing showed low sulphate levels (< 0.5 g/l) with near-neutral pH levels.

With reference to Table C1 of BRE Special Digest 1: 2005, the level of Sulphate suggests a design Sulphate Class of DS-1. Assuming a static groundwater table, an ACEC (Aggressive Chemical Environment for Concrete) Classification of AC-1s is applicable, since the pH levels are greater than 5.5. In terms of concrete to I.S. EN 206-1:2013, the chemical testing demonstrates that concrete could be manufactured to Class XA1.

4.6 Soil Infiltration

Infiltration testing was performed in four locations to ascertain the suitability of the sub-soils for soakaway purposes. Testing was performed in accordance with BRE Digest 365 ‘Soakaway Design’.

The soils exhibited no infiltration in three of the four tests. However, test SA02 (north-western portion of the site) recorded steady infiltration within the gravel soils.

Since no infiltration was recorded within the gravelly clay soils, it will important to utilise the higher infiltration rates of the gravel deposits if constructing conventional soakaways. Soakaways are therefore most likely to be located within the western portion of the site where the gravel deposits were most extensive.

5.0 References

1. BS 5930:1999 +A2:2010 Code of Practice for Site Investigations; British Standards Institute
2. Manual of Contract Documents for Highway Works, Volume 5, Section 3, Ground Investigation, Part 4: Specification
3. BRE Special Digest 1: 2005 – Concrete in aggressive ground
4. EN 1997-3; Eurocode 7: Geotechnical Design – Part 3: Design assisted by field testing; 1997
5. BS1377; British Standard Methods of Test for Soils for Civil Engineering Purposes; British Standards Institute;1990.
6. BRE Digest 365, September 1991, British Research Establishment
7. Manual of Contract Documents for Road Works, Volume 1: Specification for Road Works (March 2007)
8. Manual of Soil Laboratory Testing, Volume 3; K.H. Head
9. ISRM – Suggested Methods for Determining Point Load Strength
10. ISRM – Suggested Methods for Determining the Uniaxial Compressive Strength and Deformability of Rock Materials
11. TRL Report 447- Sulfate specification for structural backfills
12. CIRIA C580
13. Specification for Roadworks Series 600 – Specification for Roadworks

Appendix 1

Cable Percussive Boreholes

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**BOREHOLE NO.**	**BH01**
		SHEET	Sheet 1 of 1
CO-ORDINATES	702,622.29 E 743,247.36 N	**RIG TYPE**	DANDO 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)	70.47	**BOREHOLE DEPTH (m)**	4.90
		DATE COMMENCED	29/03/2019
		DATE COMPLETED	29/03/2019
CLIENT	EngineNode	**SPT HAMMER REF. NO.**	
ENGINEER	Clifton Scannell Emerson Associates	**ENERGY RATIO (%)**	
BORED BY	P.THOMAS	**PROCESSED BY**	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		70.37	0.10						
	Soft brown very sandy SILT/CLAY with occasional fine gravel		69.97	0.50						
	Dense grey/brown fine to coarse clayey sandy GRAVEL with cobbles									
1					AA111607	B	1.00		N = 42 (5, 9, 10, 10, 10, 12)	
			68.67	1.80						
	Very stiff black sandy gravelly CLAY with cobbles									
2					AA111608	B	2.00		N = 50 (3, 12, 15, 17, 12, 6)	
3					AA111609	B	3.00		N = 44 (3, 5, 5, 14, 17, 8)	
4					AA111610	B	4.00		N = 41 (5, 6, 7, 9, 11, 14)	
			65.57	4.90					N = 50/150 mm (8, 12, 22, 28)	
5	Obstruction End of Borehole at 4.90 m									
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.1	4.3	0.5	
4.7	4.9	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.60	2.60	No	2.00	20	Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21674

CONTRACT EngineNode Data Centre

BOREHOLE NO. BH02
SHEET Sheet 1 of 1

CO-ORDINATES 702,778.50 E
743,277.44 N
GROUND LEVEL (m AOD) 69.86

RIG TYPE DANDO 2000
BOREHOLE DIAMETER (mm) 200
BOREHOLE DEPTH (m) 5.10

DATE COMMENCED 01/04/2019
DATE COMPLETED 01/04/2019

CLIENT EngineNode
ENGINEER Clifton Scannell Emerson Associates

SPT HAMMER REF. NO.
ENERGY RATIO (%)

BORED BY P.THOMAS
PROCESSED BY F.C

Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
TOPSOIL		69.76	0.10						
Soft grey/brown sandy SILT/CLAY with occasional gravel		68.86	1.00	AA111611	B	1.00		N = 15 (2, 2, 2, 3, 3, 7)	
Medium dense grey/brown fine to coarse silty sandy GRAVEL		67.66	2.20	AA111612	B	2.00		N = 20 (1, 2, 2, 4, 5, 9)	
Stiff dark grey very gravelly very sandy SILT/CLAY with occasional cobbles		66.06	3.80	AA111613	B	3.00		N = 25 (3, 5, 8, 6, 6, 5)	
Very stiff to hard black sandy gravelly CLAY with some cobbles		64.76	5.10	AA111614	B	4.00		N = 37 (8, 7, 10, 10, 8, 9)	
				AA111615	B	5.00		N = 50/150 mm (9, 14, 25, 25)	
Obstruction End of Borehole at 5.10 m									

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4	4.2	1	
4.9	5.1	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.50	1.50	No	No	20	Seepage

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

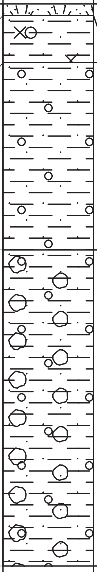
REMARKS Hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**BOREHOLE NO.**	**BH03**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,092.68 E 743,136.36 N	**RIG TYPE**	DANDO 2000
GROUND LEVEL (m AOD)	68.75	**BOREHOLE DIAMETER (mm)**	200
		BOREHOLE DEPTH (m)	4.80
DATE COMMENCED	02/04/2019	**DATE COMPLETED**	02/04/2019
CLIENT	EngineNode	**SPT HAMMER REF. NO.**	
ENGINEER	Clifton Scannell Emerson Associates	**ENERGY RATIO (%)**	
BORED BY	P.THOMAS	**PROCESSED BY**	F.C



Description	Elevation	Depth (m)
TOPSOIL	68.65	0.10
Soft grey/brown sandy SILT/CLAY with some fine gravel	68.25	0.50
Stiff brown sandy gravelly CLAY	66.65	2.10
Stiff to very stiff black sandy gravelly CLAY with occasional cobbles	63.95	4.80
Obstruction End of Borehole at 4.80 m		

Samples Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
AA111616	B	1.00		N = 17 (3, 4, 5, 6, 4, 2)	
AA111617	B	2.00		N = 26 (2, 4, 5, 5, 7, 9)	
AA111618	B	3.00		N = 25 (3, 4, 6, 5, 6, 8)	
AA111619	B	4.00		N = 35 (5, 6, 8, 11, 9, 7)	
				N = 50/150 mm (6, 12, 15, 35)	

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
3.7	3.9	0.5	
4.6	4.8	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.40	1.40	No	No	20	Seepage

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**BOREHOLE NO.**	**BHSP01**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,214.01 E 743,023.68 N	**RIG TYPE**	DANDO 2000
GROUND LEVEL (m AOD)	68.14	**BOREHOLE DIAMETER (mm)**	200
		BOREHOLE DEPTH (m)	4.30
		DATE COMMENCED	02/04/2019
		DATE COMPLETED	03/04/2019
CLIENT	EngineNode	**SPT HAMMER REF. NO.**	
ENGINEER	Clifton Scannell Emerson Associates	**ENERGY RATIO (%)**	
		BORED BY	P.THOMAS
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		68.04	0.10						
	Soft grey/brown sandy SILT/CLAY with occasional gravel		67.44	0.70						
1	Stiff dark brown sandy gravelly SILT/CLAY				AA111620	B	1.00		N = 17 (2, 4, 3, 5, 5, 4)	
			66.14	2.00						
2	Very stiff grey/black gravelly CLAY with cobbles				AA111621	B	2.00		N = 31 (3, 5, 5, 5, 9, 12)	
3					AA111622	B	3.00		N = 48 (6, 7, 10, 10, 12, 16)	
4			63.84	4.30	AA111623	B	4.00		N = 50/225 mm (11, 14, 19, 23, 8)	
	Obstruction End of Borehole at 4.30 m									
5										
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
3.6	3.9	1	
4.1	4.3	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.20	4.20	No	3.90	20	Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
03-04-19	4.30	1.00	4.30	50mm SP

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

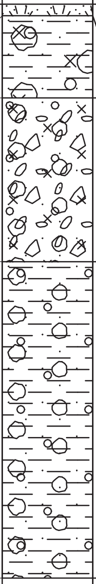
REMARKS Hand dug inspection pit carried out.

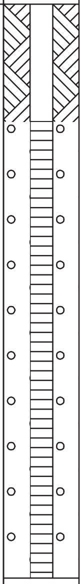
Sample Legend

D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

GEOTECHNICAL BORING RECORD

REPORT NUMBER	21674		
CONTRACT	EngineNode Data Centre	**BOREHOLE NO.**	**BHSP02**
		SHEET	Sheet 1 of 1
CO-ORDINATES	702,663.41 E 743,009.21 N	**RIG TYPE**	DANDO 2000
GROUND LEVEL (m AOD)	69.64	**BOREHOLE DIAMETER (mm)**	200
		BOREHOLE DEPTH (m)	4.90
DATE COMMENCED	03/04/2019	**DATE COMPLETED**	03/04/2019
CLIENT	EngineNode	**SPT HAMMER REF. NO.**	
ENGINEER	Clifton Scannell Emerson Associates	**ENERGY RATIO (%)**	
BORED BY	P.THOMAS	**PROCESSED BY**	F.C





Depth (m)	Description	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results
0	TOPSOIL	69.54	0.10					
	Brown very sandy SILT/CLAY with gravel and occasional cobbles	68.84	0.80					
1	Medium dense grey fine to coarse silty sandy GRAVEL with occasional cobbles			AA111624	B	1.00		N = 21 (6, 5, 5, 5, 4, 7)
2		67.44	2.20	AA111625	B	2.00		N = 33 (3, 4, 5, 7, 7, 14)
	Very stiff to hard black sandy gravelly CLAY with some cobbles							
3				AA111626	B	3.00		N = 41 (5, 7, 8, 9, 12, 12)
4				AA111627	B	4.00		N = 42 (6, 6, 5, 10, 11, 16)
		64.74	4.90					
5	Obstruction End of Borehole at 4.90 m			AA111628	B	4.90		N = 50/150 mm (8, 14, 23, 27)
6								
7								
8								
9								

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
1.4	1.6	0.75	
4.7	4.9	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.50	1.50	1.70	1.20	20	Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
03-04-19	4.90	1.00	4.90	50mm SP

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

Appendix 2

Rotary Corehole Records

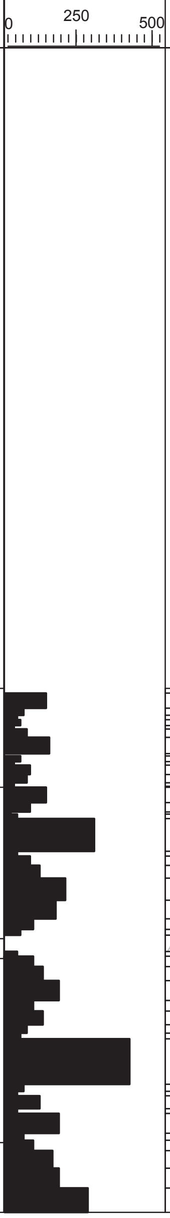
GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**DRILLHOLE NO**	**RC01**
		SHEET	Sheet 1 of 2
CO-ORDINATES		**DATE DRILLED**	07/05/2019
GROUND LEVEL (mOD)		**DATE LOGGED**	07/05/2019
RIG TYPE	Knebel		
FLUSH	Air/Mist		
CLIENT	EngineNode	**DRILLED BY**	IGSL
ENGINEER	Clifton Scannell Emerson Associates	**LOGGED BY**	D.O'Shea
INCLINATION (deg)	-90		
CORE DIAMETER (mm)	78		

Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Description	Depth (m)
0.00-5.50				SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown sandy gravelly CLAY	2.00
				SYMMETRIX DRILLING: No recovery, observed by driller as returns of black sandy gravelly CLAY	5.50
5.50-6.35	100	95	34	Very strong to medium strong, medium to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.35m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, moderately weathered at fissile mudstone/shale zones at (5.50-5.54m & 6.06-6.08m). Many incipient fractures throughout. Discontinuities are medium to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally open, locally clay-smeared, locally calcite-veined (1-30mm thick). Dips are 10°-20° & locally 70-80°.	
6.35-7.65	100	95	52		
7.65-7.80	100	67	0		
7.80-9.40	100	93	55		

Fracture Spacing Log (mm)



REMARKS

Hole cased 0.0-5.50m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
5.40	5.40	N/S			Seepage

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21674

CONTRACT EngineNode Data Centre

DRILLHOLE NO **RC01**
SHEET Sheet 2 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Knebel
FLUSH Air/Mist
INCLINATION (deg) -90
CORE DIAMETER (mm) 78

DATE DRILLED 07/05/2019
DATE LOGGED 07/05/2019

CLIENT EngineNode
ENGINEER Clifton Scannell Emerson Associates

DRILLED BY IGSL
LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.90	100	95	95					10.90			
								End of Borehole at 10.90 m				
11												
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.0-5.50m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
5.40	5.40	N/S			Seepage

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

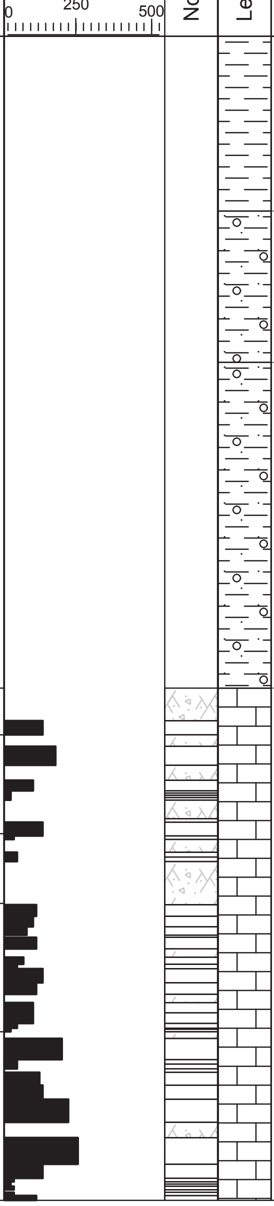
GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
08-05-19	10.90	5.50	5.00	Water level recorded 5 mins after end of drilling.

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**DRILLHOLE NO**	**RC02**
		SHEET	Sheet 1 of 2
CO-ORDINATES		**DATE DRILLED**	08/05/2019
GROUND LEVEL (mOD)		**DATE LOGGED**	08/05/2019
RIG TYPE	Knebel		
FLUSH	Air/Mist		
CLIENT	EngineNode	**DRILLED BY**	IGSL
ENGINEER	Clifton Scannell Emerson Associates	**LOGGED BY**	D.O'Shea
INCLINATION (deg)	-90		
CORE DIAMETER (mm)	78		



Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
				SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown CLAY	1.50			
				SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown sandy gravelly CLAY	2.80			
5.60				SYMMETRIX DRILLING: No recovery, observed by driller as returns of black sandy gravelly CLAY	5.60			
6.00	100	48	25	Very strong to medium strong, medium to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.35m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, moderately weathered at fissile mudstone/shale zones at (6.72-6.75m, 6.90-7.01m, 7.72-7.74m, 7.84-7.91m, 8.23-8.30m, 8.55-8.61m, 8.87-8.90m, 9.91-9.93m, 10.96-11.00m, 11.07-11.19m, 11.58-11.60m & 11.97-12.11m). Many incipient fractures throughout. Discontinuities are medium to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally open, locally clay-smeared, locally calcite-veined (1-10mm thick). Dips are 10°-20° & locally 70-80°.				
6.85	100	56	36					
7.45	100	27	0					
8.55	100	77	29					
	100	76	54					

Downhole Depth (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

REMARKS

Hole cased 0.0-5.60m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.50	2.50	N/S			Seepage

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

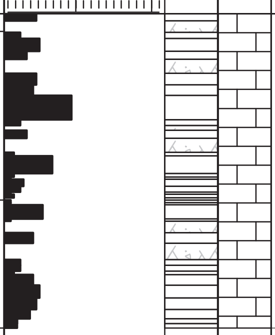
INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**DRILLHOLE NO**	**RC02**
		SHEET	Sheet 2 of 2
CO-ORDINATES		**DATE DRILLED**	08/05/2019
GROUND LEVEL (mOD)		**DATE LOGGED**	08/05/2019
RIG TYPE	Knebel		
FLUSH	Air/Mist		
CLIENT	EngineNode	**DRILLED BY**	IGSL
ENGINEER	Clifton Scannell Emerson Associates	**LOGGED BY**	D.O'Shea
INCLINATION (deg)	-90		
CORE DIAMETER (mm)	78		



Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.15								
11		100	83	34					
	11.60								
12		109	79	43					
	12.70					12.70			
					End of Borehole at 12.70 m				
13									
14									
15									
16									
17									
18									
19									

REMARKS

Hole cased 0.0-5.60m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.50	2.50	N/S			Seepage

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

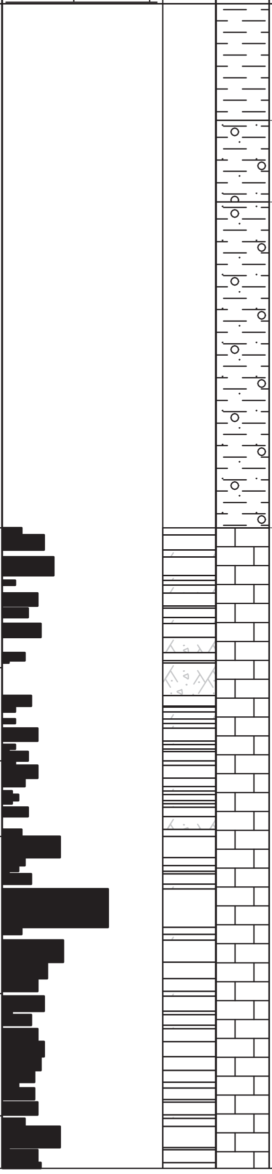
Date	Hole Depth	Casing Depth	Depth to Water	Comments
08-05-19	12.70	5.60	2.50	Water level recorded 5 mins after end of drilling.

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**DRILLHOLE NO**	**RC03**
		SHEET	Sheet 1 of 2
CO-ORDINATES		**DATE DRILLED**	09/05/2019
GROUND LEVEL (mOD)		**DATE LOGGED**	10/05/2019
CLIENT	EngineNode	**DRILLED BY**	IGSL
ENGINEER	Clifton Scannell Emerson Associates	**LOGGED BY**	D.O'Shea

RIG TYPE	Knebel
FLUSH	Air/Mist
INCLINATION (deg)	-90
CORE DIAMETER (mm)	78



Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
				SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown CLAY	1.00			
				SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown sandy gravelly CLAY	1.70			
4.50				SYMMETRIX DRILLING: No recovery, observed by driller as returns of black sandy gravelly CLAY	4.50			
5.70	100	55	34	Very strong to medium strong, medium to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.35m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, moderately weathered at fissile mudstone/shale zones at (4.69-4.75m, 4.99-5.06m, 5.17-5.19m, 5.44-5.57m, 6.08-6.14m, 6.18-6.22m, 6.33-6.36m, 6.72-6.76m, 6.87-6.90m, 6.98-7.09m, 7.56-7.60m, 7.99-8.04m, 8.48-8.52m, 8.77-8.80m, 9.41-9.43m, 9.54-9.57m, 10.46-10.48m, 10.67-10.69m, 10.85-10.94m & 11.28-11.31m). Many incipient fractures throughout. Discontinuities are medium to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally open, locally clay-smeared, locally calcite-veined (1-15mm thick). Dips are 10°-20° & locally 70-80°.				
6.50	100	50	26					
7.15	100	42	0					
8.50	100	86	66					
9.55	100	89	63					
	100	97	50					

REMARKS

Hole cased 0.0-4.50m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

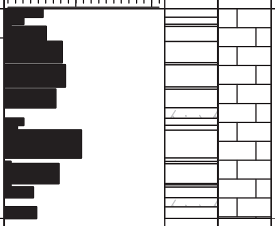
Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER	21674
CONTRACT	EngineNode Data Centre
DRILLHOLE NO	**RC03**
SHEET	Sheet 2 of 2
CO-ORDINATES	
GROUND LEVEL (mOD)	
RIG TYPE	Knebel
FLUSH	Air/Mist
INCLINATION (deg)	-90
CORE DIAMETER (mm)	78
DATE DRILLED	09/05/2019
DATE LOGGED	10/05/2019
CLIENT	EngineNode
ENGINEER	Clifton Scannell Emerson Associates
DRILLED BY	IGSL
LOGGED BY	D.O'Shea



Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.25											
11		100	72	53								
	11.80								11.80			
								End of Borehole at 11.80 m				
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.0-4.50m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
09-05-19	11.80	4.50	3.85	Water level recorded 5 mins after end of drilling.

RC01 Box 1 of 2 – 5.50-8.30m

RC01 Box 2 of 2 – 8.30-10.90m

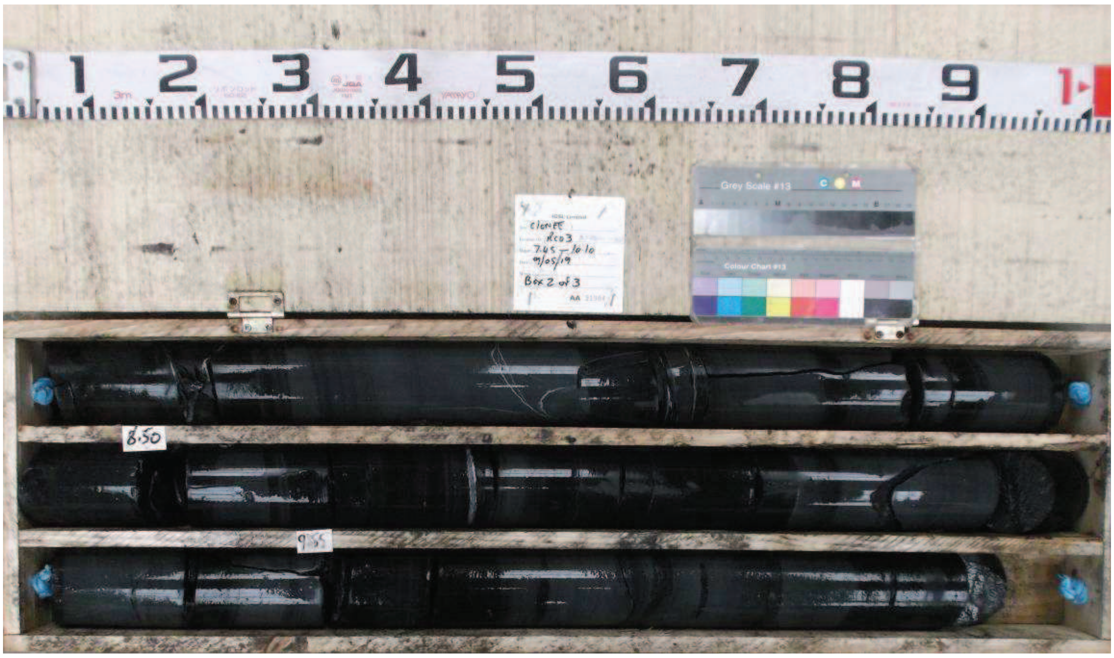
RC02 Box 1 of 3 – 5.60-8.55m

RC02 Box 2 of 3 – 8.55-11.15m

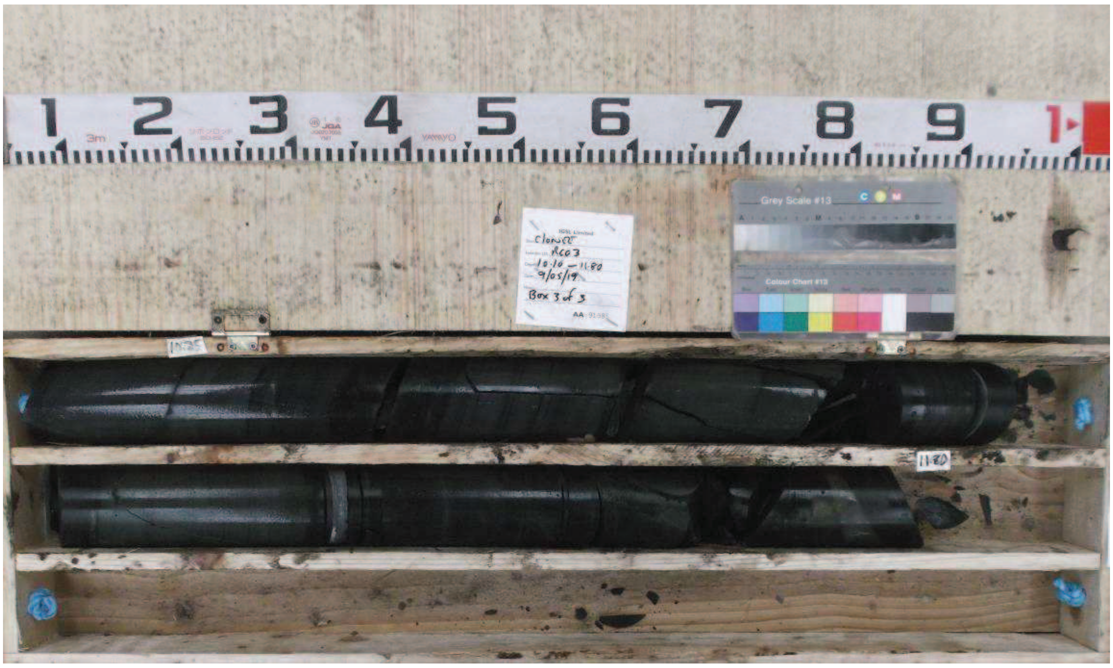
RC02 Box 3 of 3 – 11.15-12.70m

RC03 Box 1 of 3 – 4.50-7.45m

RC03 Box 2 of 3 – 7.45-10.10m



RC03 Box 3 of 3 – 10.10-11.80m



Appendix 3

Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER	21674		
CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP01**
		SHEET	Sheet 1 of 1
LOGGED BY	DW	**DATE STARTED**	28/03/2019
CO-ORDINATES	702,718.91 E 743,365.80 N	**DATE COMPLETED**	28/03/2019
GROUND LEVEL (m)	70.68	**EXCAVATION METHOD**	JCB
CLIENT	EngineNode		
ENGINEER	Clifton Scannell Emerson Associates		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Firm light brown slightly gravelly silty CLAY with low cobble content. Gravel is fine to medium and subangular to subrounded.		0.20	70.48						
						112101	B	0.50-0.50		
1.0						112102	B	1.00-1.00		
	Stiff black sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded. Cobbles are subangular to subrounded.		1.30	69.38	1 (Seepage)					
2.0						112103	B	2.00-2.00		
3.0	End of Trial Pit at 3.00m		3.00	67.68		112104	B	3.00-3.00		
4.0										

Groundwater Conditions
Seepage @ 1.3m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT EngineNode Data Centre

TRIAL PIT NO. TP02
SHEET Sheet 1 of 1

LOGGED BY DW

CO-ORDINATES 702,602.78 E
743,238.23 N

GROUND LEVEL (m) 70.68

DATE STARTED 28/03/2019
DATE COMPLETED 28/03/2019

CLIENT EngineNode
ENGINEER Clifton Scannell Emerson Associates

EXCAVATION METHOD JCB

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.20	70.48						
	Firm light brown slightly gravelly silty CLAY. Sand is fine to medium. Gravel is fine to medium and subangular to subrounded.		0.70	69.98		112105	B	0.50-0.50		
1.0	Brown slightly clayey sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded. Cobbles are subangular to subrounded.		1.70	68.98		112106	B	1.00-1.00		
2.0	Stiff black sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded. Cobbles are subangular to subrounded.		2.70	67.98		112107	B	2.00-2.00		
3.0	Stiff to very stiff brown mottled black very sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded.		3.30	67.38	1 (Seepage)	112108	B	3.00-3.00		
4.0	End of Trial Pit at 3.30m									

Groundwater Conditions
Seepage @ 2.7m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT EngineNode Data Centre

TRIAL PIT NO. TP03

SHEET Sheet 1 of 1

LOGGED BY DW

CO-ORDINATES 702,455.01 E
743,069.41 N

GROUND LEVEL (m) 70.80

DATE STARTED 28/03/2019

DATE COMPLETED 28/03/2019

CLIENT EngineNode

ENGINEER Clifton Scannell Emerson Associates

EXCAVATION METHOD JCB

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.20	70.60						
	Firm brown silty slightly gravelly CLAY. Gravel is fine to coarse and subangular to subrounded. Sand is fine to coarse.		0.70	70.10		112109	B	0.50-0.50		
1.0	Greyish brown slightly clayey very sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded. Cobbles are subangular to subrounded.					112110	B	1.00-1.00		
2.0						112111	B	2.00-2.00		
			2.50	68.30						
	End of Trial Pit at 2.50m					112112	B	2.50-2.50		
3.0										
4.0										

Groundwater Conditions
Moderate @ 2.1m

Stability
Pit collapsed at 2.50m

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP04**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**DATE STARTED**	01/04/2019
CO-ORDINATES	702,621.44 E 743,092.34 N	**DATE COMPLETED**	01/04/2019
GROUND LEVEL (m)	70.32	**EXCAVATION METHOD**	JCB
CLIENT	EngineNode		
ENGINEER	Clifton Scannell Emerson Associates		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.10	70.22						
	Brown SILT/CLAY with roots		0.60	69.72		117170	B	0.50-0.50		
1.0	Grey brown silty sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to rounded. Cobbles are subrounded to rounded.		1.80	68.52		117171	B	1.00-1.00		
2.0	Stiff black slightly sandy gravelly CLAY with low cobble content. Sand is fine to medium. Gravel is fine to medium and subangular to rounded.		3.00	67.32		117172	B	2.00-2.00		
3.0	End of Trial Pit at 3.00m					117173	B	3.00-3.00		
4.0										

Groundwater Conditions

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	21674		
CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP05**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**DATE STARTED**	01/04/2019
CO-ORDINATES	702,629.87 E 742,977.92 N	**DATE COMPLETED**	01/04/2019
GROUND LEVEL (m)	69.64	**EXCAVATION METHOD**	JCB
CLIENT	EngineNode		
ENGINEER	Clifton Scannell Emerson Associates		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Soft brown SILT/CLAY with occasional fine gravel and roots		0.20	69.44						
	Grey brown silty very sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse and subangular to rounded.		0.50	69.14		117174	B	0.50-0.50		
1.0						117175	B	1.00-1.00		
	Light brown sandy very silty GRAVEL with medium cobble content		1.40	68.24						
2.0						117176	B	2.00-2.00		
	Stiff black very gravelly CLAY (Possibly claybound gravel)		2.50	67.14	▼ 1 (Moderate)					
3.0	End of Trial Pit at 3.00m		3.00	66.64		117177	B	3.00-3.00		
4.0										

Groundwater Conditions
Moderate @ 2.5m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP06**
		SHEET	Sheet 1 of 1
LOGGED BY	DW	**DATE STARTED**	28/03/2019
CO-ORDINATES	702,864.10 E 743,097.65 N	**DATE COMPLETED**	28/03/2019
GROUND LEVEL (m)	69.13	**EXCAVATION METHOD**	JCB
CLIENT	EngineNode		
ENGINEER	Clifton Scannell Emerson Associates		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Grey clayey very sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded. Cobbles are subangular to subrounded.		0.40	68.73		112117	B	0.50-0.50		
1.0					1 (Slow)	112118	B	1.00-1.00		
	Stiff to very stiff black sandy gravelly silty CLAY. Gravel is fine to coarse and subangular to subrounded. Sand is fine to coarse.		1.50	67.63						
2.0						112119	B	2.00-2.00		
	End of Trial Pit at 2.50m		2.50	66.63						
3.0										
4.0										

Groundwater Conditions
Slow @ 1.2m

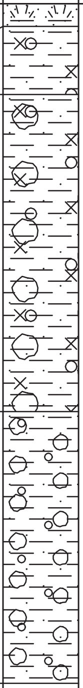
Stability
Pit collapsing from 0.50-1.50m in sandy gravel

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP07**
		SHEET	Sheet 1 of 1
LOGGED BY	FC	**DATE STARTED**	01/04/2019
CO-ORDINATES	703,032.89 E 742,999.34 N	**DATE COMPLETED**	01/04/2019
GROUND LEVEL (m)	68.45	**EXCAVATION METHOD**	JCB
CLIENT	EngineNode		
ENGINEER	Clifton Scannell Emerson Associates		



	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.10	68.35						
	Soft brown sandy SILT/CLAY with occasional gravel		0.40	68.05						
1.0	Firm brown/grey sandy SILT/CLAY with some gravel and occasional cobbles		1.80	66.65		AA117189 AA117190	B B	0.50 1.00		
2.0	Stiff to very stiff dark grey and black sandy gravelly CLAY with some cobbles		3.00	65.45		AA117191	B	2.00		
3.0	End of Trial Pit at 3.00m					AA117192	B	3.00		
4.0										

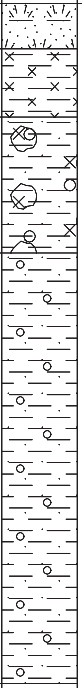
Groundwater Conditions
Pit was dry

Stability
Pit was stable.

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	21674		
CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP08**
		SHEET	Sheet 1 of 1
LOGGED BY	DW	**DATE STARTED**	28/03/2019
CO-ORDINATES	702,892.54 E 743,228.26 N	**DATE COMPLETED**	28/03/2019
GROUND LEVEL (m)	69.18	**EXCAVATION METHOD**	JCB
CLIENT	EngineNode		
ENGINEER	Clifton Scannell Emerson Associates		



	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples Sample Ref	Samples Type	Samples Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	TOPSOIL									
	Brown SILT/CLAY with roots		0.20	68.98						
	Soft to firm dark grey very sandy SILT/CLAY with occasional gravel and cobbles		0.50	68.68		112113	B	0.50-0.50		
1.0						112114	B	1.00-1.00		
	Stiff to very stiff black sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded.		1.10	68.08						
2.0						112115	B	2.00-2.00		
						112116	B	2.80-2.80		
3.0	End of Trial Pit at 3.00m		3.00	66.18						
4.0										

Groundwater Conditions
Seepage @ 1.2m

Stability
Unstable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT EngineNode Data Centre

TRIAL PIT NO. TP09

SHEET Sheet 1 of 1

LOGGED BY FC

CO-ORDINATES 702,977.97 E
743,193.68 N

GROUND LEVEL (m) 69.20

DATE STARTED 01/04/2019

DATE COMPLETED 01/04/2019

CLIENT EngineNode

ENGINEER Clifton Scannell Emerson Associates

EXCAVATION METHOD JCB

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.15	69.05						
	Soft brown sandy SILT/CLAY with occasional gravel		0.40	68.80						
	Firm dark grey very sandy SILT/CLAY with occasional gravel and cobbles					AA111709	B	0.50		
1.0						AA111710	B	1.00		
			1.70	67.50	1 (Seepage)					
	Firm to stiff grey very sandy gravelly SILT/CLAY with cobbles									
2.0						AA111711	B	2.00		
			3.00	66.20						
3.0	End of Trial Pit at 3.00m					AA111712	B	3.00		
4.0										

Groundwater Conditions
Slight water seepage noted 1.70-2.00m

Stability
Pit was stable .

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP10**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**DATE STARTED**	01/04/2019
CO-ORDINATES	703,205.08 E 743,114.10 N	**DATE COMPLETED**	01/04/2019
GROUND LEVEL (m)	68.82	**EXCAVATION METHOD**	JCB
CLIENT	EngineNode		
ENGINEER	Clifton Scannell Emerson Associates		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Soft light brown gravelly sandy SILT. Sand is fine to medium. Gravel is fine to coarse and angular to subangular.		0.40	68.42		117166	B	0.50-0.50		
1.0	Firm grey sandy very gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse and subangular to subrounded.		0.90	67.92		117167	B	1.00-1.00		
2.0	Stiff to very stiff black sandy very gravelly CLAY with low cobble content. Sand is fine to medium. Gravel is fine to coarse and subangular to rounded. Cobbles are subrounded to rounded.		1.80	67.02	1 (Seepage)	117168	B	2.00-2.00		
3.0	End of Trial Pit at 3.00m		3.00	65.82		117169	B	3.00-3.00		
4.0										

Groundwater Conditions
Seepage @ 2.8m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT EngineNode Data Centre

TRIAL PIT NO. SA01
SHEET Sheet 1 of 1

LOGGED BY SH

CO-ORDINATES 702,437.10 E
743,115.89 N

GROUND LEVEL (m) 71.33

DATE STARTED 29/03/2019
DATE COMPLETED 29/03/2019

CLIENT EngineNode
ENGINEER Clifton Scannell Emerson Associates

EXCAVATION METHOD JCB

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Brown silty very sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded.		0.40	70.93						
1.0						117101	B	0.90-0.90		
	Brown silty very sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded.		1.60	69.73	1 (Seepage)	117102	B	1.80-1.80		
2.0	End of Trial Pit at 2.00m		2.00	69.33						
3.0										
4.0										

Groundwater Conditions
Seepage @ 2.0m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	21674		
CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**SA02**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**DATE STARTED**	29/03/2019
CO-ORDINATES	703,243.96 E 742,958.84 N	**DATE COMPLETED**	29/03/2019
GROUND LEVEL (m)	67.58	**EXCAVATION METHOD**	JCB
CLIENT	EngineNode		
ENGINEER	Clifton Scannell Emerson Associates		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	TOPSOIL									
	Brown silty very sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded.		0.40	67.18						
1.0						117103	B	0.90-0.90		
	Firm to stiff grey slightly gravelly CLAY.		1.60	65.98						
						117104	B	1.80-1.80		
2.0	End of Trial Pit at 2.00m		2.00	65.58						
3.0										
4.0										

Groundwater Conditions

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER	21674		
CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**SA03**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**DATE STARTED**	29/03/2019
CO-ORDINATES	702,940.19 E 743,066.60 N	**DATE COMPLETED**	29/03/2019
GROUND LEVEL (m)	68.55	**EXCAVATION METHOD**	JCB
CLIENT	EngineNode		
ENGINEER	Clifton Scannell Emerson Associates		

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Firm grey / black sandy very gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse and subangular to rounded.		0.50	68.05						
1.0						112122	B	0.90-0.90		
	Stiff black gravelly CLAY with low cobble content. Gravel is fine to coarse and subangular to rounded. Cobbles are subrounded to rounded.		1.50	67.05		112123	B	1.80-1.80		
2.0	End of Trial Pit at 2.00m		2.00	66.55	1 (Seepage)					
3.0										
4.0										

Groundwater Conditions
Seepage @ 2.0m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT EngineNode Data Centre

TRIAL PIT NO. SA04
SHEET Sheet 1 of 1

LOGGED BY SH

CO-ORDINATES

GROUND LEVEL (m)

DATE STARTED 29/03/2019
DATE COMPLETED 29/03/2019

CLIENT EngineNode
ENGINEER Clifton Scannell Emerson Associates

EXCAVATION METHOD JCB

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.40							
1.0	Firm grey / black sandy very gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse and subangular to rounded.		1.50			117106	B	0.80-0.80		
	Stiff black gravelly CLAY with low cobble content. Gravel is fine to coarse and subangular to rounded. Cobbles are subrounded to rounded.		2.00		1 (Seepage)	117107	B	1.60-1.60		
2.0	End of Trial Pit at 2.00m									
3.0										
4.0										

Groundwater Conditions
Seepage @ 2.0m

Stability
Stable

General Remarks

Appendix 4

TRL DCP Probe Records

Dynamic Cone Penetrometer

Contract 21674
Ref No. DCP TP01
Client EngineNode

Date: 1/4/2019

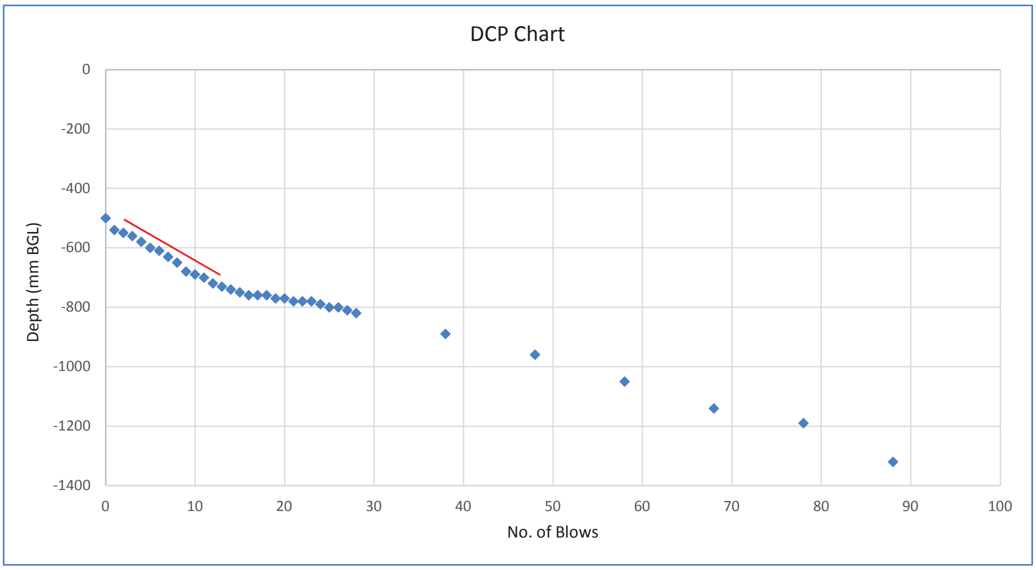
Test No. DCP TP01

DCP Zero Reading 100 mm

Location TP01
Direction
Soil Description Light brown gravelly silty CLAY

Start of Test at: 0.5 m BGL
Approximate Chainage N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	100	1	21	380			
1	1	140	1	22	380			
1	2	150	1	23	380			
1	3	160	1	24	390			
1	4	180	1	25	400			
1	5	200	1	26	400			
1	6	210	1	27	410			
1	7	230	1	28	420			
1	8	250	10	38	490			
1	9	280	10	48	560			
1	10	290	10	58	650			
1	11	300	10	68	740			
1	12	320	10	78	790			
1	13	330	10	88	920			
1	14	340						
1	15	350						
1	16	360						
1	17	360						
1	18	360						
1	19	370						
1	20	370						



	From	to	Penetration	mm / blow
Depth range (mm)	540	720	180	16.36
Blows	1	12	11	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

Log10(CBR) = 1.197

CBR = 15.737

Dynamic Cone Penetrometer

Contract 21674
Ref No. DCP TP02
Client EngineNode

Date: 1/4/2019

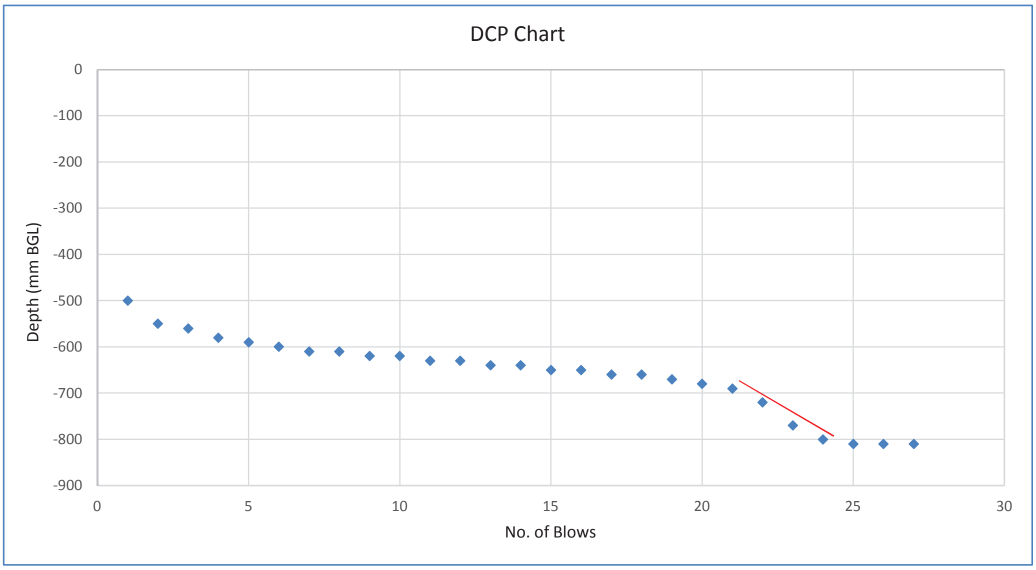
Test No. DCP TP02

DCP Zero Reading 140 mm

Location TP02
Direction
Soil Description Light brown slightly gravelly silty CLAY

Start of Test at: 0.5 m BGL
Approximate Chainage N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	140	10	30	360			
1	1	190	10	40	410			
1	2	200	10	50	440			
1	3	220	10	60	450			
1	4	230	5	65	450			
1	5	240	5	70	450			
1	6	250						
1	7	250						
1	8	260						
1	9	260						
1	10	270						
1	11	270						
1	12	280						
1	13	280						
1	14	290						
1	15	290						
1	16	300						
1	17	300						
1	18	310						
1	19	320						
1	20	330						



	From	to	Penetration	mm / blow
Depth range (mm)	690	800	110	36.67
Blows	21	24	3	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

Log10(CBR) = 0.827

CBR = 6.708

Dynamic Cone Penetrometer

Contract 21674
Ref No. DCP TP03
Client EngineNode

Date: 1/4/2019

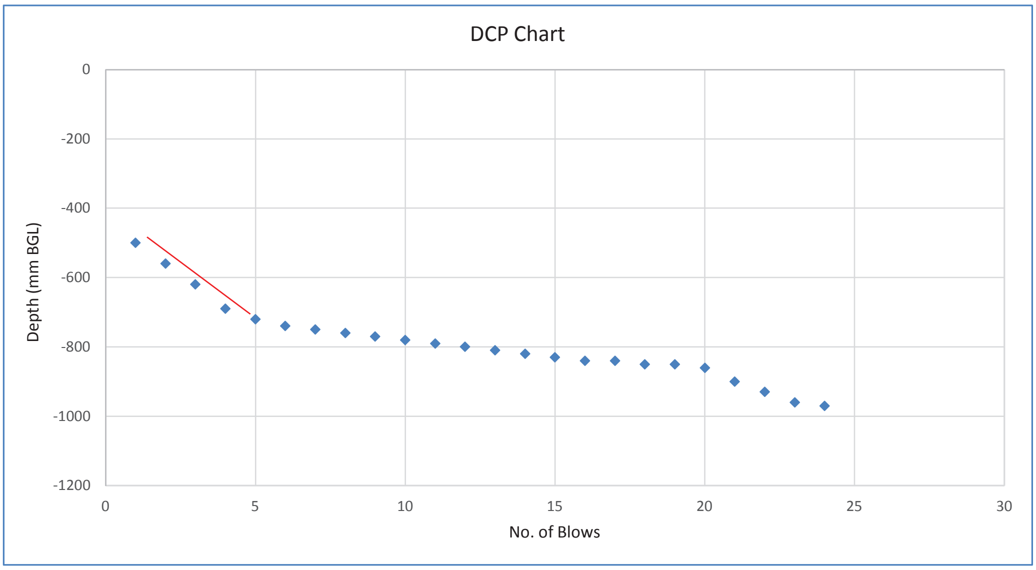
Test No. DCP TP03

DCP Zero Reading 140 mm

Location TP03
Direction
Soil Description Brown silty slightly gravelly CLAY

Start of Test at: 0.5 m BGL
Approximate Chainage N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	140	10	40	570			
1	1	200	10	50	600			
1	2	260	10	60	610			
1	3	330						
1	4	360						
1	5	380						
1	6	390						
1	7	400						
1	8	410						
1	9	420						
1	10	430						
1	11	440						
1	12	450						
1	13	460						
1	14	470						
1	15	480						
1	16	480						
1	17	490						
1	18	490						
2	20	500						
10	30	540						



	From	to	Penetration	mm / blow
Depth range (mm)	500	720	220	55.00
Blows	1	5	4	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

Log10(CBR) = 0.640

CBR = 4.370

Dynamic Cone Penetrometer

IGSL Ltd.

Contract 21674
Ref No. DCP TP04
Client EngineNode

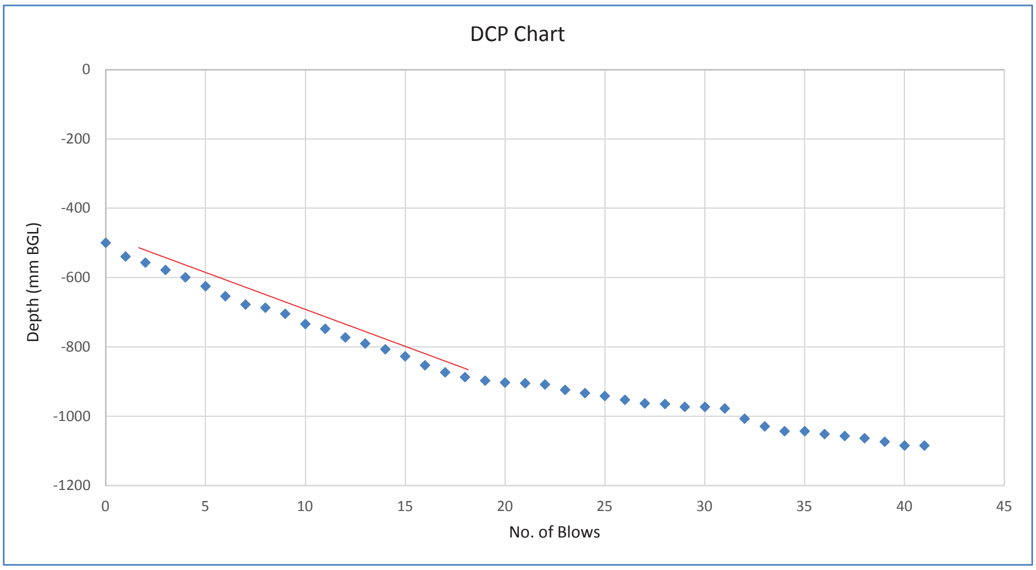
Date: 1/4/2019
Test No. DCP TP04

DCP Zero Reading 127 mm

Location TP04
Direction
Soil Description Grey brown silty sandy GRAVEL

Start of Test at: 0.5 m BGL
Approximate Chainage N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	127	1	21	532	1	42	712
1	1	166	1	22	535	1	43	712
1	2	184	1	23	551			
1	3	205	1	24	560			
1	4	226	1	25	569			
1	5	252	1	26	580			
1	6	281	1	27	590			
1	7	305	1	28	592			
1	8	314	1	29	600			
1	9	332	1	30	600			
1	10	361	1	31	605			
1	11	375	1	32	634			
1	12	400	1	33	656			
1	13	417	1	34	670			
1	14	434	1	35	670			
1	15	454	1	36	678			
1	16	480	1	37	684			
1	17	500	1	38	690			
1	18	514	1	39	701			
1	19	524	1	40	712			
1	20	530	1	41	712			



	From	to	Penetration	mm / blow
Depth range (mm)	539	887	348	20.47
Blows	1	18	17	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

Log10(CBR) = 1.094

CBR = 12.420

Dynamic Cone Penetrometer

Contract 21674
Ref No. DCP TP05
Client EngineNode

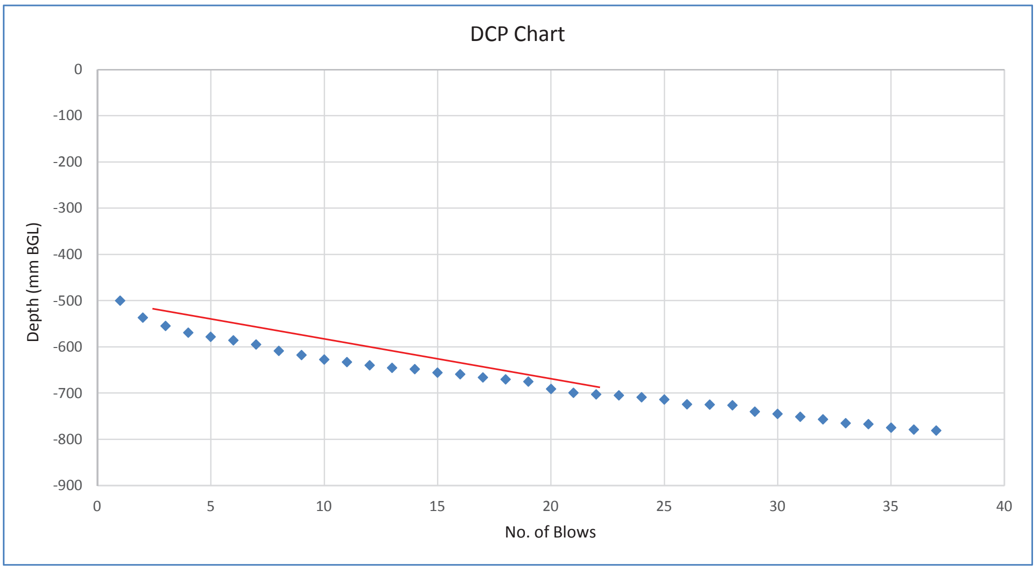
Date: 1/4/2019
Test No. DCP TP05

DCP Zero Reading 75 mm

Location TP05
Direction
Soil Description Grey brown silty very sandy GRAVEL

Start of Test at: 0.5 m BGL
Approximate Chainage N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	75	1	21	278			
1	1	112	1	22	280			
1	2	130	1	23	284			
1	3	144	1	24	289			
1	4	153	1	25	299			
1	5	161	1	26	300			
1	6	170	1	27	301			
1	7	184	1	28	315			
1	8	193	1	29	320			
1	9	202	1	30	326			
1	10	208	1	31	332			
1	11	215	1	32	340			
1	12	220	1	33	342			
1	13	223	1	34	350			
1	14	231	1	35	354			
1	15	234	1	36	356			
1	16	241						
1	17	245						
1	18	250						
1	19	266						
1	20	274						



	From	to	Penetration	mm / blow
Depth range (mm)	537	703	166	8.30
Blows	2	22	20	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

Log10(CBR) = 1.509

CBR = 32.250

Dynamic Cone Penetrometer

Contract 21674
Ref No. DCP TP06
Client EngineNode

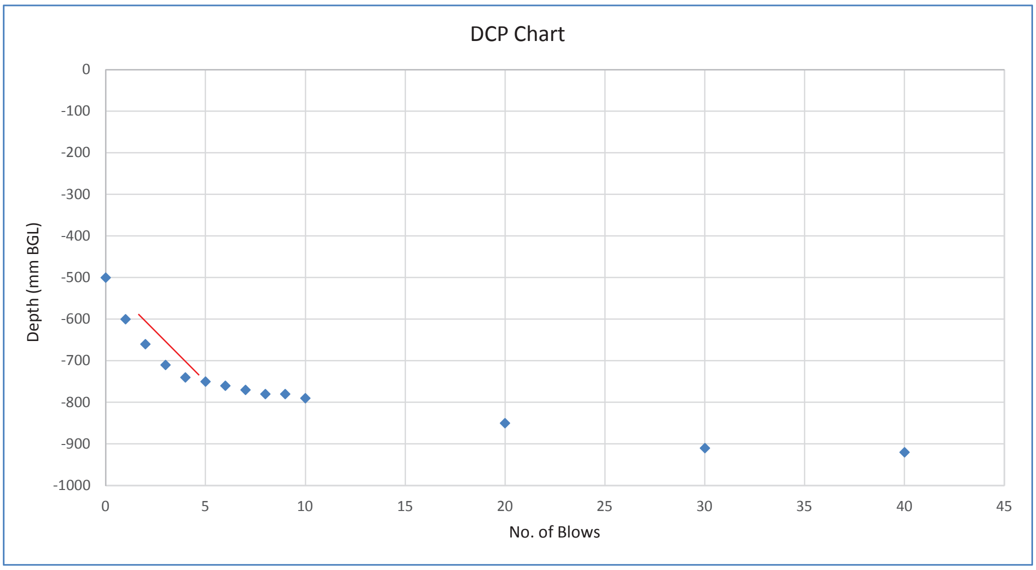
Date: 1/4/2019
Test No. DCP TP06

DCP Zero Reading 90 mm

Location TP06
Direction
Soil Description Grey clayey gravelly SAND

Start of Test at: 0.5 m BGL
Approximate Chainage N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	90						
1	1	190						
1	2	250						
1	3	300						
1	4	330						
1	5	340						
1	6	350						
1	7	360						
1	8	370						
1	9	370						
1	10	380						
10	20	440						
10	30	500						
10	40	510						



	From	to	Penetration	mm / blow
Depth range (mm)	600	740	140	46.67
Blows	1	4	3	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

Log10(CBR) = 0.716

CBR = 5.198

Dynamic Cone Penetrometer

Contract 21674
Ref No. DCP TP07
Client EngineNode

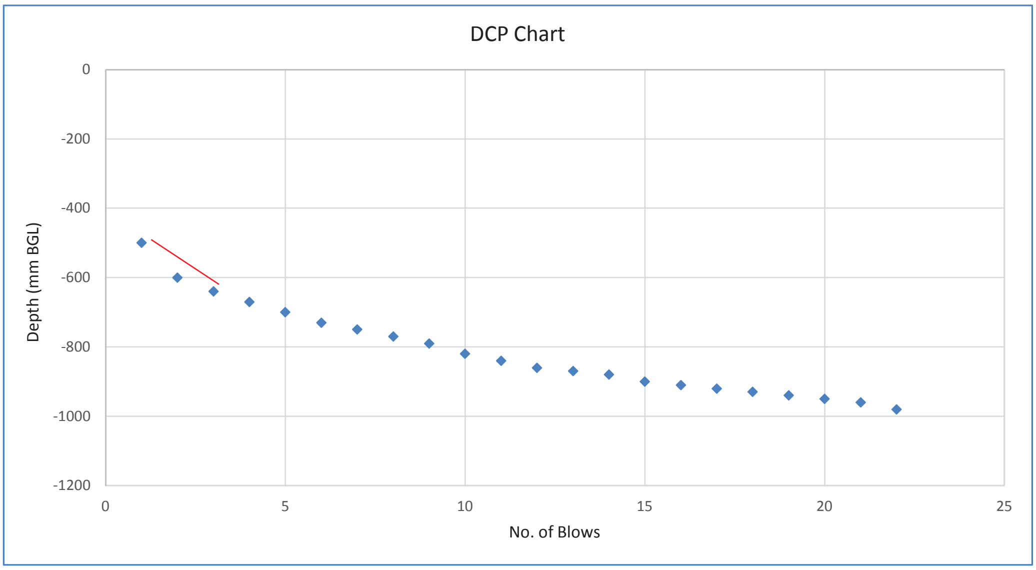
Date: 1/4/2019
Test No. DCP TP07

DCP Zero Reading 100 mm

Location TP07
Direction
Soil Description Light brown gravelly sandy CLAY

Start of Test at: 0.5 m BGL
Approximate Chainage N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	100	10	20	580			
1	1	200						
1	2	240						
1	3	270						
1	4	300						
1	5	330						
1	6	350						
1	7	370						
1	8	390						
1	9	420						
1	10	440						
1	11	460						
1	12	470						
1	13	480						
1	14	500						
1	15	510						
1	16	520						
1	17	530						
1	18	540						
1	19	550						
1	20	560						



	From	to	Penetration	mm / blow
Depth range (mm)	500	640	140	70.00
Blows	1	3	2	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

Log10(CBR) = 0.530

CBR = 3.386

Dynamic Cone Penetrometer

IGSL Ltd.

Contract 21674
Ref No. DCP TP08
Client EngineNode

Date: 1/4/2019

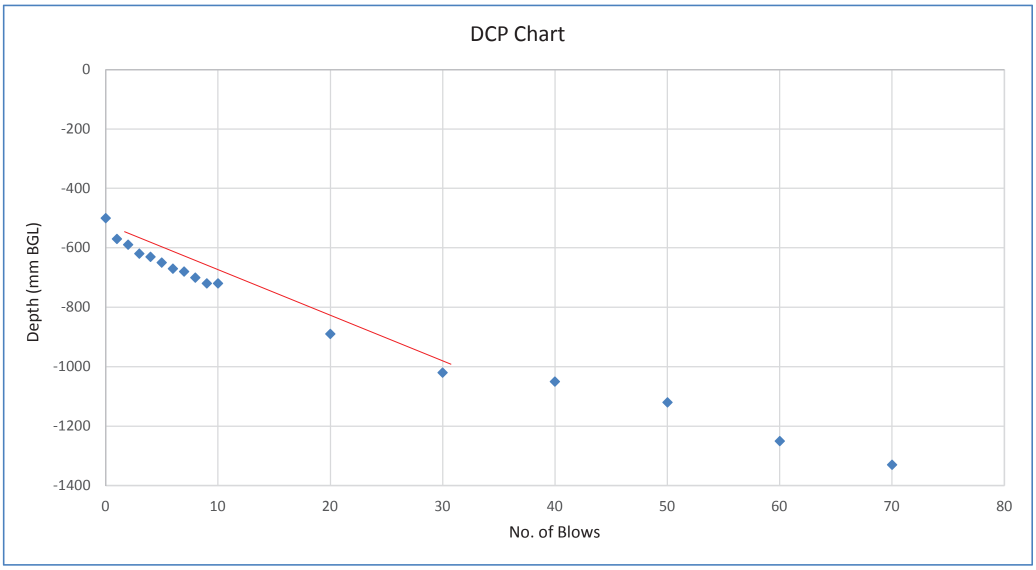
Test No. DCP TP08

DCP Zero Reading 130 mm

Location TP08
Direction
Soil Description Dark grey very sandy gravelly CLAY

Start of Test at: 0.5 m BGL
Approximate Chainage N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	130						
1	1	200						
1	2	220						
1	3	250						
1	4	260						
1	5	280						
1	6	300						
1	7	310						
1	8	330						
1	9	350						
1	10	350						
10	20	520						
10	30	650						
10	40	680						
10	50	750						
10	60	880						
10	70	960						



	From	to	Penetration	mm / blow
Depth range (mm)	570	1020	450	15.52
Blows	1	30	29	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

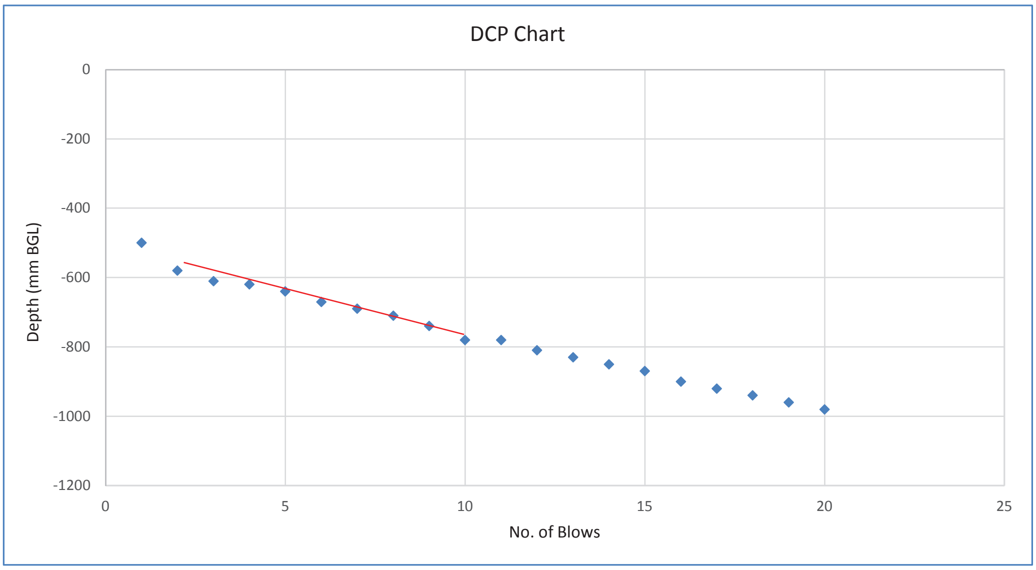
Log10(CBR) = 1.221

CBR = 16.646

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP09
Ref No.	DCP TP09		
Client	EngineNode		
		DCP Zero Reading	100 mm
Location	TP09		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Light brown gravelly sandy CLAY	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	170	10		580			
1	1	180						
1	2	210						
1	3	220						
1	4	240						
1	5	270						
1	6	290						
1	7	310						
1	8	340						
1	9	380						
1	10	380						
1	11	410						
1	12	430						
1	13	450						
1	14	470						
1	15	500						
1	16	520						
1	17	540						
1	18	560						
1	19	580						



	From	to	Penetration	mm / blow
Depth range (mm)	580	780	200	25.00
Blows	2	10	8	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

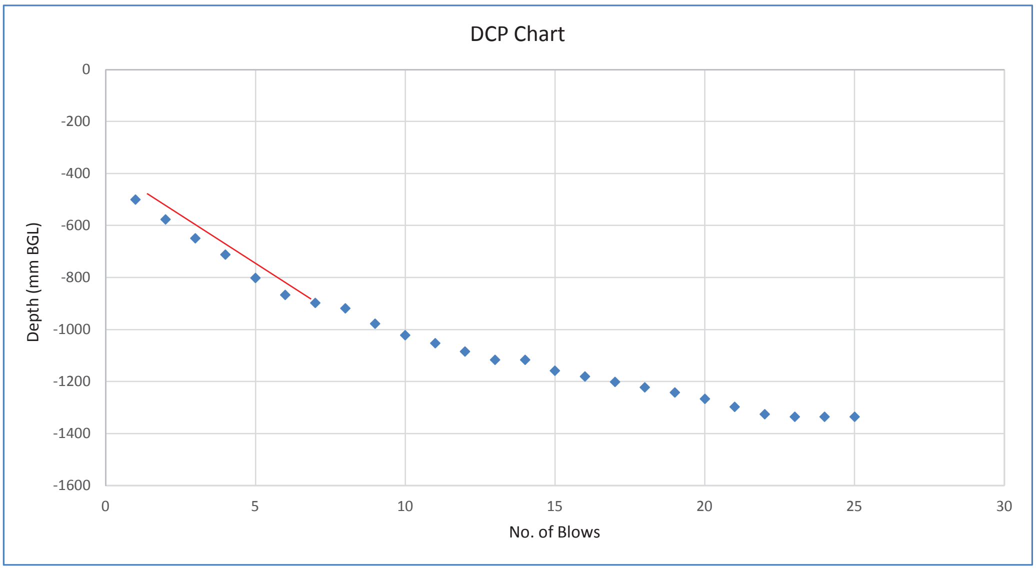
Log10(CBR) = 1.002

CBR = 10.055

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP10
Ref No.	DCP TP10		
Client	EngineNode	**DCP Zero Reading**	124 mm
Location	TP10		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Light brown gravelly sandy SILT	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	124	1	21	950			
1	1	200	1	22	960			
1	2	273	1	23	960			
1	3	336	1	24	960			
1	4	426						
1	5	491						
1	6	521						
1	7	542						
1	8	602						
1	9	646						
1	10	677						
1	11	708						
1	12	740						
1	13	741						
1	14	782						
1	15	804						
1	16	825						
1	17	846						
1	18	866						
1	19	890						
1	20	921						



	From	to	Penetration	mm / blow
Depth range (mm)	500	897	397	66.17
Blows	1	7	6	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

Log10(CBR) = 0.556

CBR = 3.594

Appendix 5

Infiltration Test Records

Soakaway Design f -value from field tests (F2C) IGSL

Contract: EngineNode Data Centre Contract No.: 21675
Test No.: SA01
Client: Clifton Scannell Emerson Associates
Date: ##########

Summary of ground conditions

from	to	Description	Ground water
0.00	0.40	TOPSOIL	Not Encountered
0.40	1.60	Brown silty very sandy GRAVEL.	
1.60	2.00	Brown silty very sandy GRAVEL with low cobble content.	

Notes:

Field Data

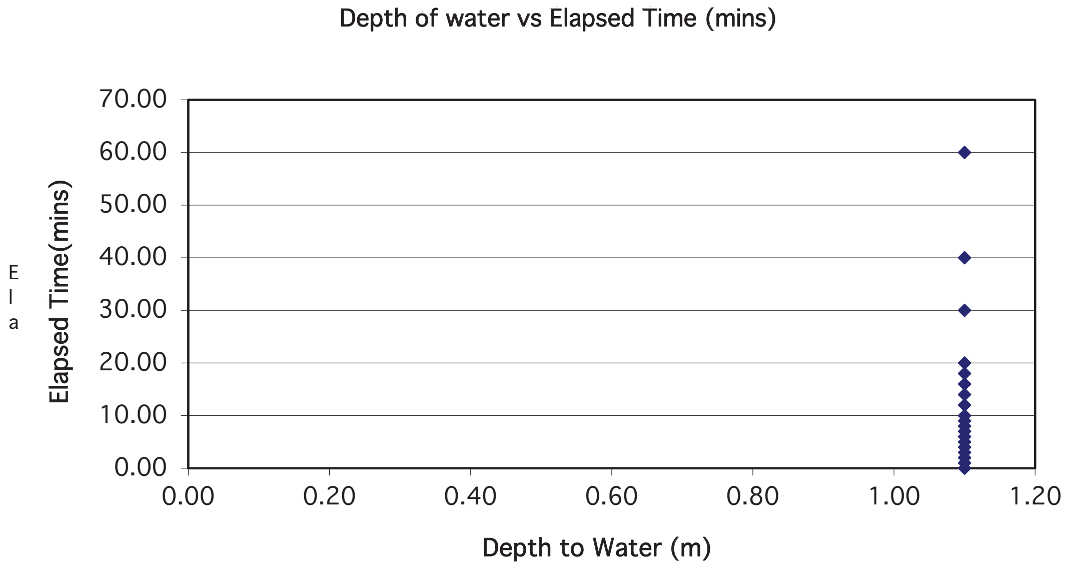
Depth to Water (m)	Elapsed Time (min)
1.10	0.00
1.10	1.00
1.10	2.00
1.10	3.00
1.10	4.00
1.10	5.00
1.10	6.00
1.10	7.00
1.10	8.00
1.10	9.00
1.10	10.00
1.10	12.00
1.10	14.00
1.10	16.00
1.10	18.00
1.10	20.00
1.10	30.00
1.10	40.00
1.10	60.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.30	m
Length of Pit (L)	1.00	m
Initial depth to Water =	1.10	m
Final depth to water =	1.10	m
Elapsed time (mins)=	60.00	
Top of permeable soil	0.00	m
Base of permeable soil	2.00	m
Base area=	0.3	m2
*Av. side area of permeable stratum over test perioc	2.34	m2
Total Exposed area =	2.64	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: EngineNode Data Centre Contract No.: 21675
Test No.: SA02
Client: Clifton Scannell Emerson Associates
Date: #########

Summary of ground conditions

from	to	Description	Ground water
0.00	0.40	TOPSOIL	Not Encountered
0.40	1.60	Brown silty very sandy GRAVEL.	
1.60	2.00	Firm to stiff grey slightly gravelly CLAY.	

Notes:

Field Data

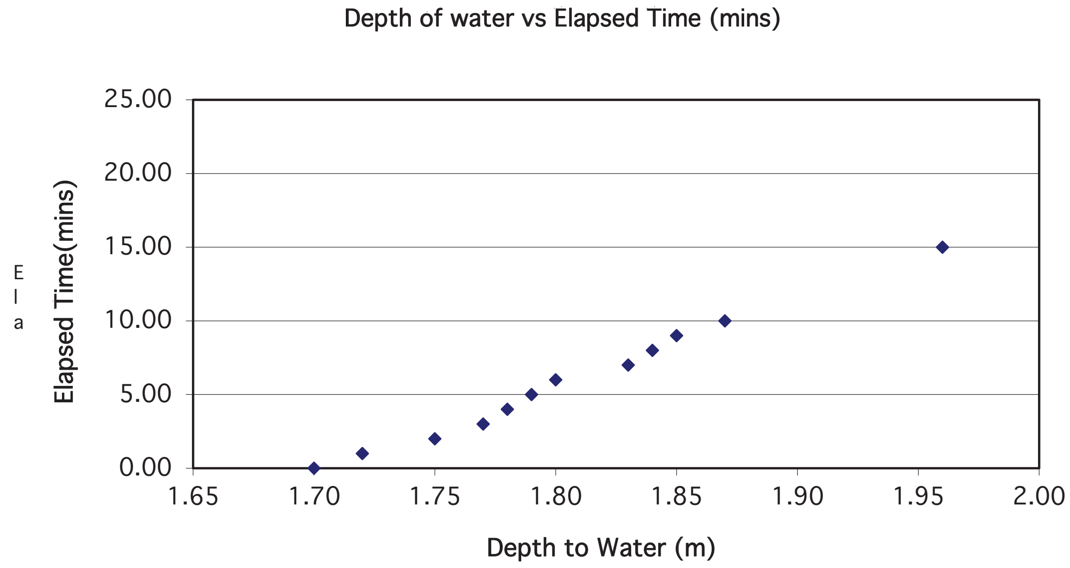
Depth to Water (m)	Elapsed Time (min)
1.70	0.00
1.70	1.00
1.72	2.00
1.75	3.00
1.77	4.00
1.78	5.00
1.79	6.00
1.80	7.00
1.83	8.00
1.84	9.00
1.85	10.00
1.87	15.00
1.96	20.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.30	m
Length of Pit (L)	1.00	m
Initial depth to Water =	1.70	m
Final depth to water =	1.96	m
Elapsed time (mins)=	20.00	
Top of permeable soil	0.00	m
Base of permeable soil	2.00	m
Base area=	0.3	m2
*Av. side area of permeable stratum over test period	0.442	m2
Total Exposed area =	0.742	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00526 m/min or 8.76E-05 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: EngineNode Data Centre
Contract No.: 21675
Test No.: SA03
Client: Clifton Scannell Emerson Associates
Date: #########

Summary of ground conditions

from	to	Description	Ground water
0.00	0.50	TOPSOIL	Seepage @ 2.0m
0.50	1.50	Firm grey / black sandy very gravelly CLAY.	
1.50	2.00	Firm to stiff black gravelly CLAY with low cobble content.	

Notes:

Field Data

Depth to Water (m)	Elapsed Time (min)
1.07	0.00
1.07	1.00
1.07	2.00
1.07	3.00
1.07	4.00
1.07	5.00
1.07	6.00
1.07	7.00
1.07	8.00
1.07	9.00
1.07	10.00
1.07	15.00
1.07	20.00
1.07	30.00
1.07	40.00
1.07	50.00
1.07	60.00

Field Test

Depth of Pit (D) 2.00 m
Width of Pit (B) 0.30 m
Length of Pit (L) 1.00 m

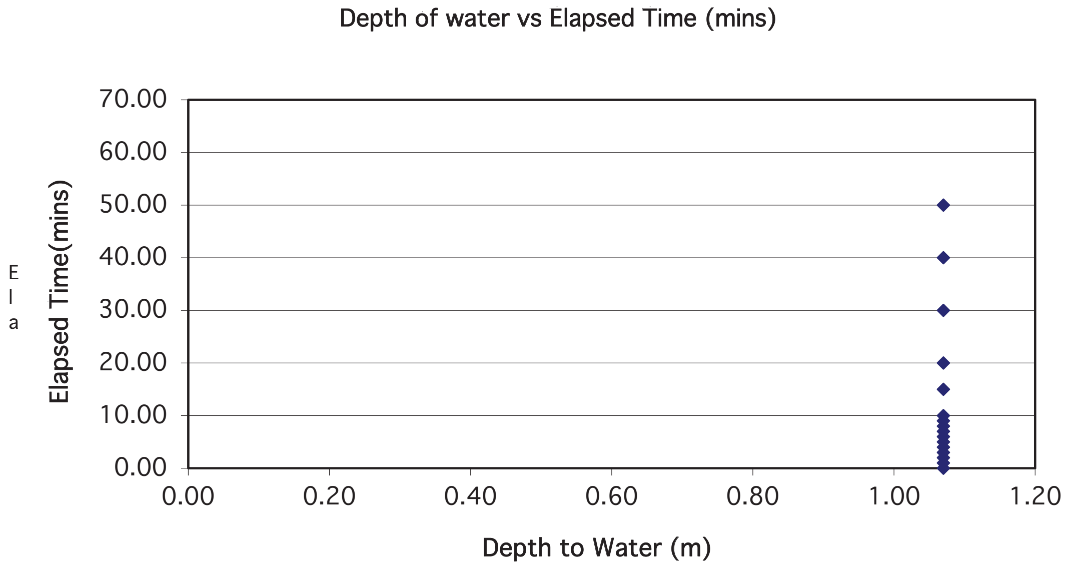
Initial depth to Water = 1.07 m
Final depth to water = 1.07 m
Elapsed time (mins)= 60.00

Top of permeable soil m
Base of permeable soil m

Base area= 0.3 m2
*Av. side area of permeable stratum over test perioc 2.418 m2
Total Exposed area = 2.718 m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: EngineNode Data Centre Contract No.: 21675
Test No.: SA04
Client: Clifton Scannell Emerson Associates
Date: #########

Summary of ground conditions

from	to	Description	Ground water
0.00	0.40	TOPSOIL	Seepage @ 2.0m
0.40	1.50	Firm grey / black sandy gravelly CLAY.	
1.50	2.00	Firm to stiff black gravelly CLAY with low cobble content.	

Notes:

Field Data

Depth to Water (m)	Elapsed Time (min)
1.30	0.00
1.30	1.00
1.30	2.00
1.30	3.00
1.30	4.00
1.30	5.00
1.30	6.00
1.30	7.00
1.30	8.00
1.30	9.00
1.30	10.00
1.30	15.00
1.30	20.00
1.30	30.00
1.30	40.00
1.30	50.00
1.30	60.00

Field Test

Depth of Pit (D) 2.00 m
Width of Pit (B) 0.30 m
Length of Pit (L) 1.00 m

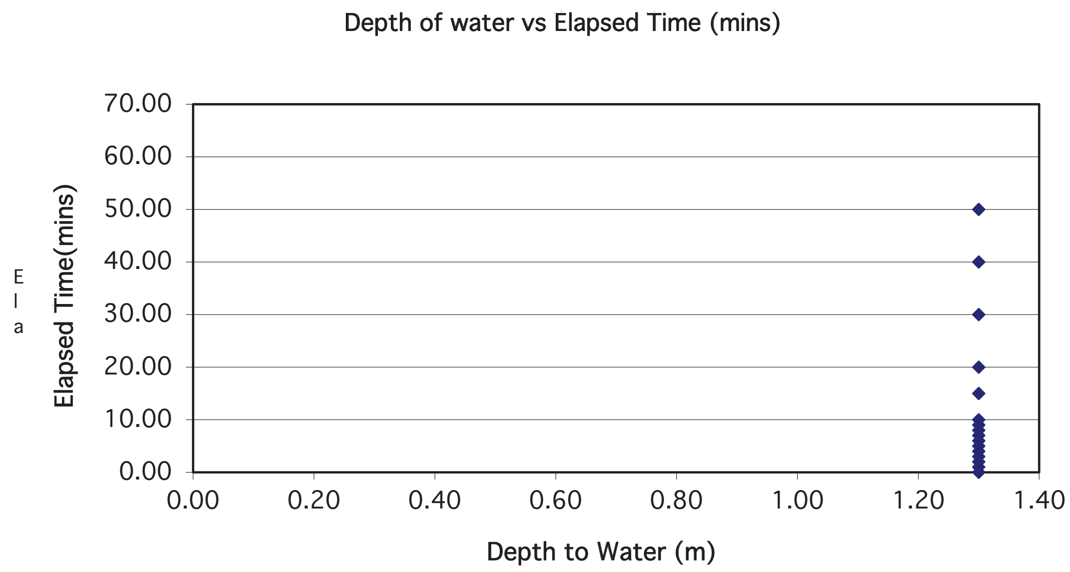
Initial depth to Water = 1.30 m
Final depth to water = 1.30 m
Elapsed time (mins)= 60.00

Top of permeable soil m
Base of permeable soil m

Base area= 0.3 m2
*Av. side area of permeable stratum over test period 1.82 m2
Total Exposed area = 2.12 m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Appendix 6

Geotechnical Laboratory Testing

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3

ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.133T

Report No. **R100734** Contract No. 21674 Contract Name: Engine Node Data Centre , Clonee,Co.Meath

Customer CSEA

Samples Received: 19/04/09 Date Tested: 10/04/19

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
BH02	AA11613	3.0	A19/1607	B	8.9	27	15	12	45	WS	4.4	C L	Dark brown/black sandy gravelly CLAY
BH03	AA111616	1.0	A19/1609	B	10	49	23	26	78	WS	4.4	C I	Black sandy slightly gravelly CLAY
BH03	AA111618	3.0	A19/1608	B	17	31	15	16	57	WS	4.4	C L	Black slightly sandy, gravelly, CLAY
BH SP01	AA111620	1.0	A19/1610	B	18	38	18	20	60	WS	4.4	C I	Mottled brown slightly sandy gravelly CLAY
BH SP02	AA111627	4.0	A19/1612	B	22	45	28	17	46	WS	4.4	M I	Mottled grey/brown slightly sandy, gravelly, SILT
TP01	AA112101/2	1.0	A19/1613	B	10	37	20	17	41	WS	4.4	C I	Black slightly sandy, gravelly, CLAY
TP02	AA112105	0.5	A19/1614	B	31	48	29	19	47	WS	4.4	M I	Brown sandy gravelly CLAY
TP04	AA117172	2.0	A19/1618	B	11	31	15	16	51	WS	4.4	C L	Dark brown/black slightly sandy, slightly gravelly, CLAY
TP06	AA112119	2.0	A19/1621	B	11	26	15	11	53	WS	4.4	C L	Dark brown/black slightly sandy, slightly gravelly, CLAY
TP08	AA112113/4	0.5	A19/1622	B	15	34	21	13	37	WS	4.4	C L	Mottled brown sandy gravelly CLAY
TP08	AA112115	2.0	A19/1623	B	11	32	17	15	48	WS	4.4	C L	Grey/brown slightly sandy, slightly gravelly, CLAY
TP10	AA117166	0.5	A19/1624	B	27	55	28	27	74	WS	4.4	C H	Brown sandy gravelly CLAY
SA03	AA112122	1.0	A19/1627	B	11	33	18	15	47	WS	4.4	C L	Mottled dark brown sandy gravelly CLAY
SA04	AA117106	1.0	A19/1628	B	16	39	20	19	59	WS	4.4	C I	Black slightly gravelly sndy CLAY

Notes: Preparation: WS - Wet sieved
AR - As received
NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method
4.4 Cone Penetrometer one point method

Sample Type: B - Bulk Disturbed
U - Undisturbed

Remarks:

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory	Persons authorized to approve reports	Approved by	Date	Page
	H Byrne (Laboratory Manager)	H Byrne	30/4/19	1 of 1

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing
75	100
63	100
50	88
37.5	80
28	72
20	67
14	61
10	57
6.3	51
5	49
3.35	47
2	43
1.18	40
0.6	37
0.425	35
0.3	33
0.15	29
0.063	24

COBBLES

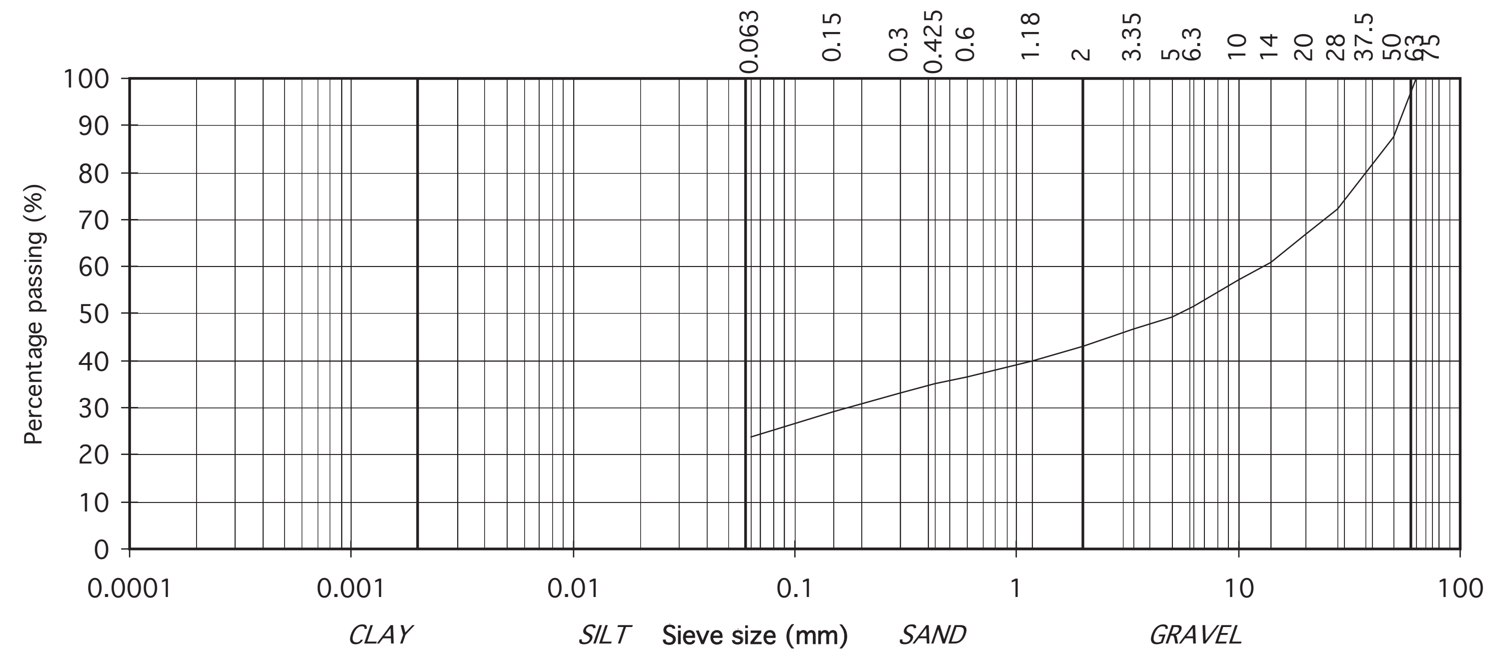
GRAVEL

SAND

SILT/CLAY

Contract No:	21674	Report No.	R100822
Contract:	Engine Node Data Center , Clonee , Co.Meat		
BH/TP :	BH01		
Sample No.	AAA111608	Lab. Sample No.	A19/1606
Sample Type:	B		
Depth (m)	2.00	Customer:	CSEA
Date Received	09/04/2019	Date Testing started	10/04/2019
Description:	Mottled brown slightly sandy, gravelly, SILT/CLAY		

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	30/04/19	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

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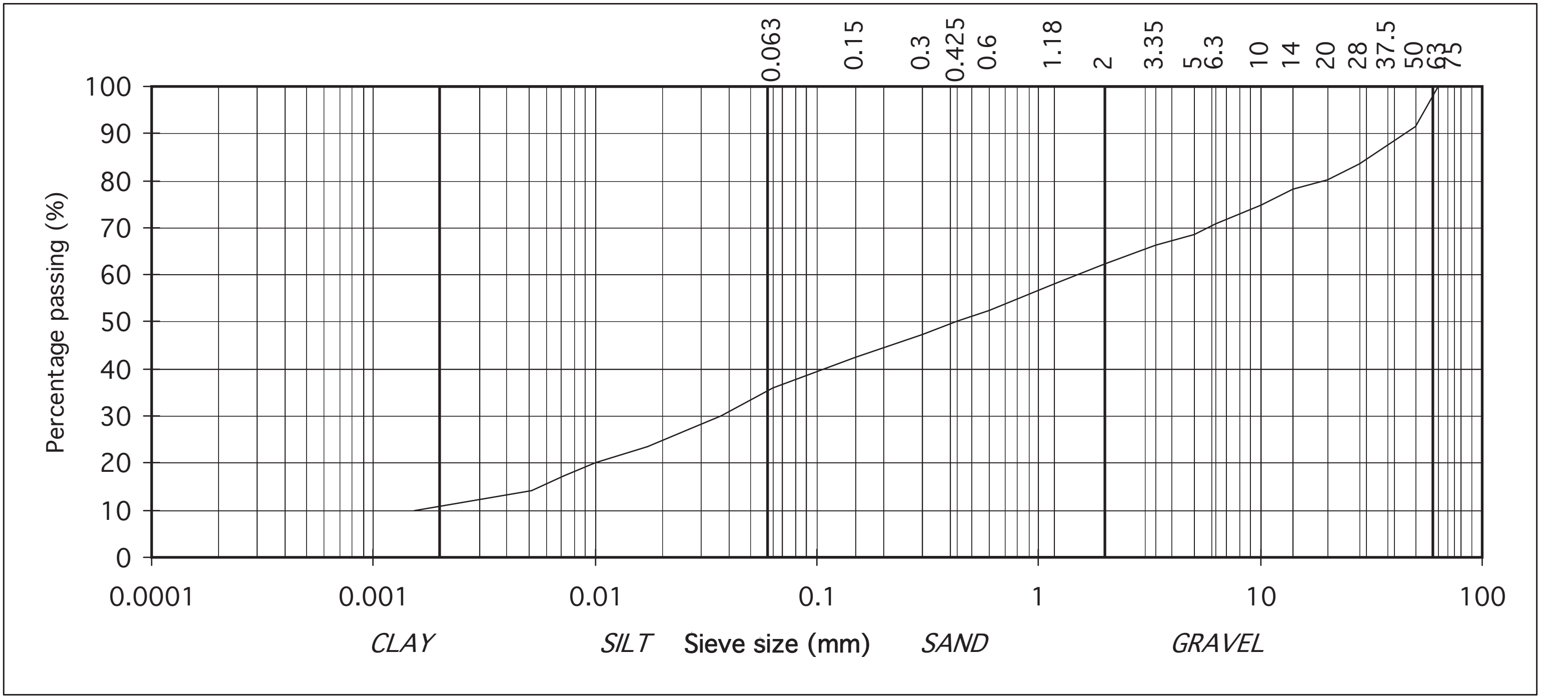
Contract No: 21674 Report No. R100823
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : BH03
Sample No. AA111618 Lab. Sample No. A19/1609
Sample Type: B
Depth (m) 3.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 10/04/2019
Description: Black slightly sandy, gravelly, CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

particle size	% passing	
75	100	COBBLES
63	100	
50	91	GRAVEL
37.5	88	
28	84	
20	80	
14	78	
10	75	
6.3	71	
5	69	
3.35	66	
2	62	
1.18	58	SAND
0.6	52	
0.425	50	
0.3	47	
0.15	42	
0.063	36	SILT/CLAY
0.037	30	
0.027	27	
0.017	24	
0.010	20	
0.007	17	
0.005	14	
0.002	10	



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	17/04/19	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Contract No: 21674 Report No. R100910

Contract: Engine Node Data Center , Clonee , Co.Meatl

BH/TP : BH SP02

Sample No. AA111627 Lab. Sample No. A19/1612

Sample Type: B

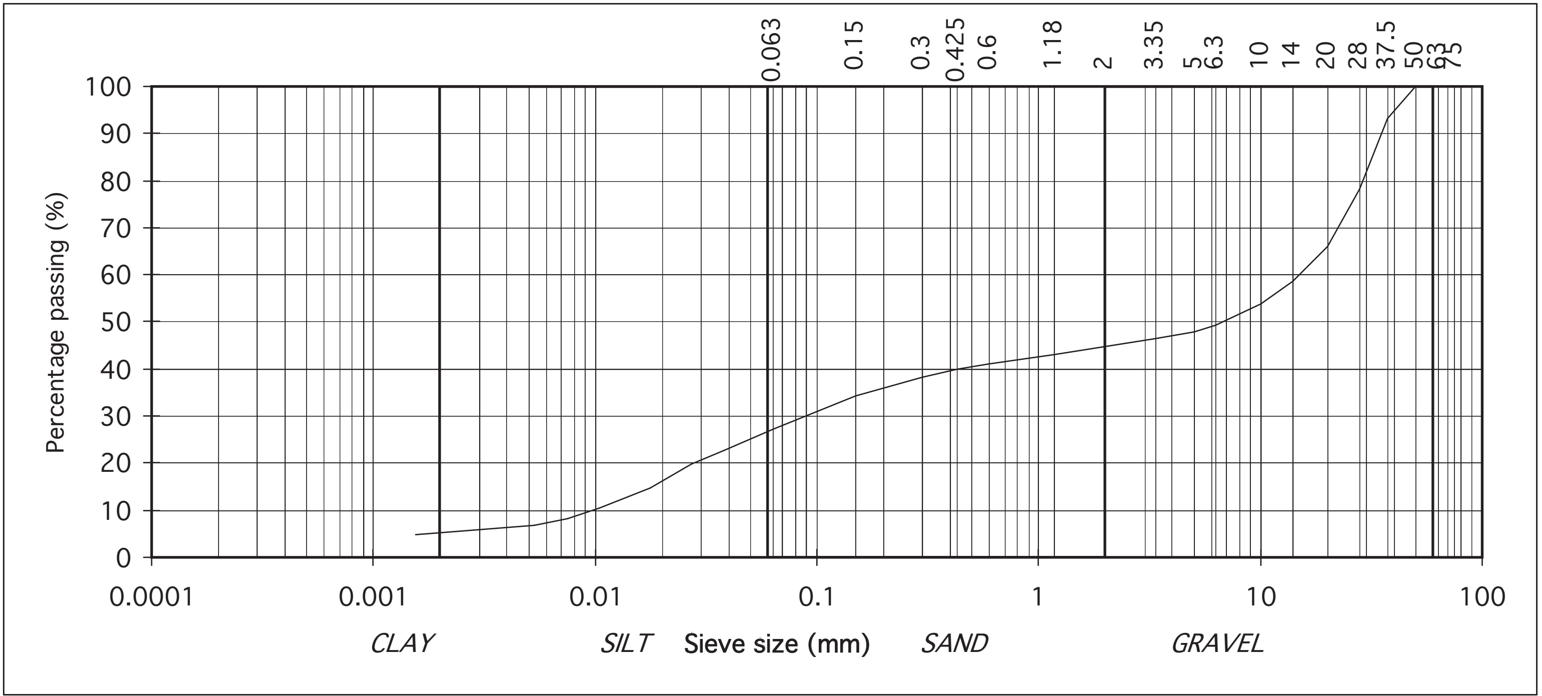
Depth (m) 4.00 Customer: CSEA

Date Received 09/04/2019 Date Testing started 11/04/2019

Description: Mottled grey/brown slightly sandy, gravelly, SILT

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	93	
28	78	
20	66	
14	59	
10	54	
6.3	49	
5	48	
3.35	47	
2	45	
1.18	43	SAND
0.6	41	
0.425	40	
0.3	38	
0.15	34	
0.063	27	SILT/CLAY
0.038	23	
0.027	20	
0.018	15	
0.010	11	
0.007	8	
0.005	7	
0.002	5	



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	18/04/19	1 of 1

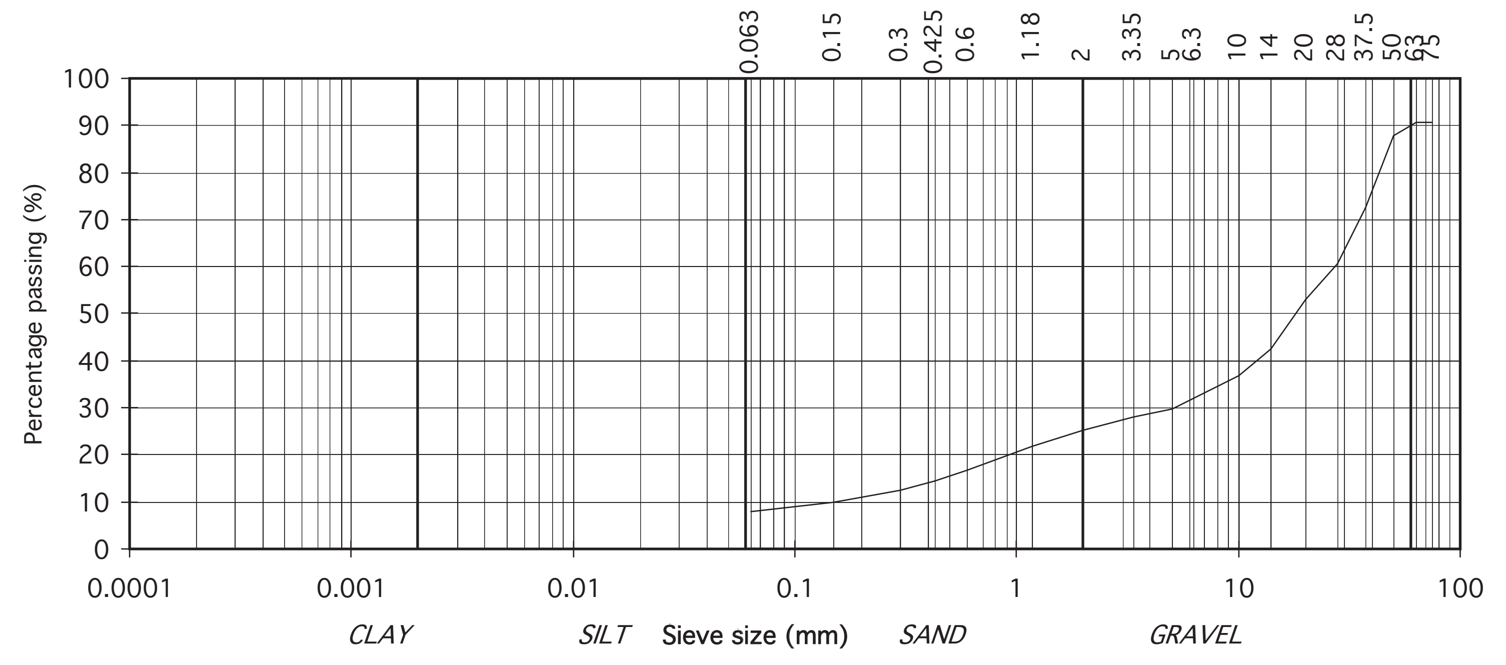
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

Contract No: 21674 Report No. R100909
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : BH SP02
Sample No. AA111625 Lab. Sample No. A19/1611
Sample Type: B
Depth (m) 2.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 10/04/2019
Description: Brown clayey/silty, sandy, GRAVEL with some cobbles

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

particle size	% passing	
75	91	COBBLES
63	91	
50	88	GRAVEL
37.5	72	
28	61	
20	53	
14	43	
10	37	
6.3	32	
5	30	
3.35	28	
2	25	
1.18	22	SAND
0.6	17	
0.425	14	
0.3	12	
0.15	10	
0.063	8	SILT/CLAY



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

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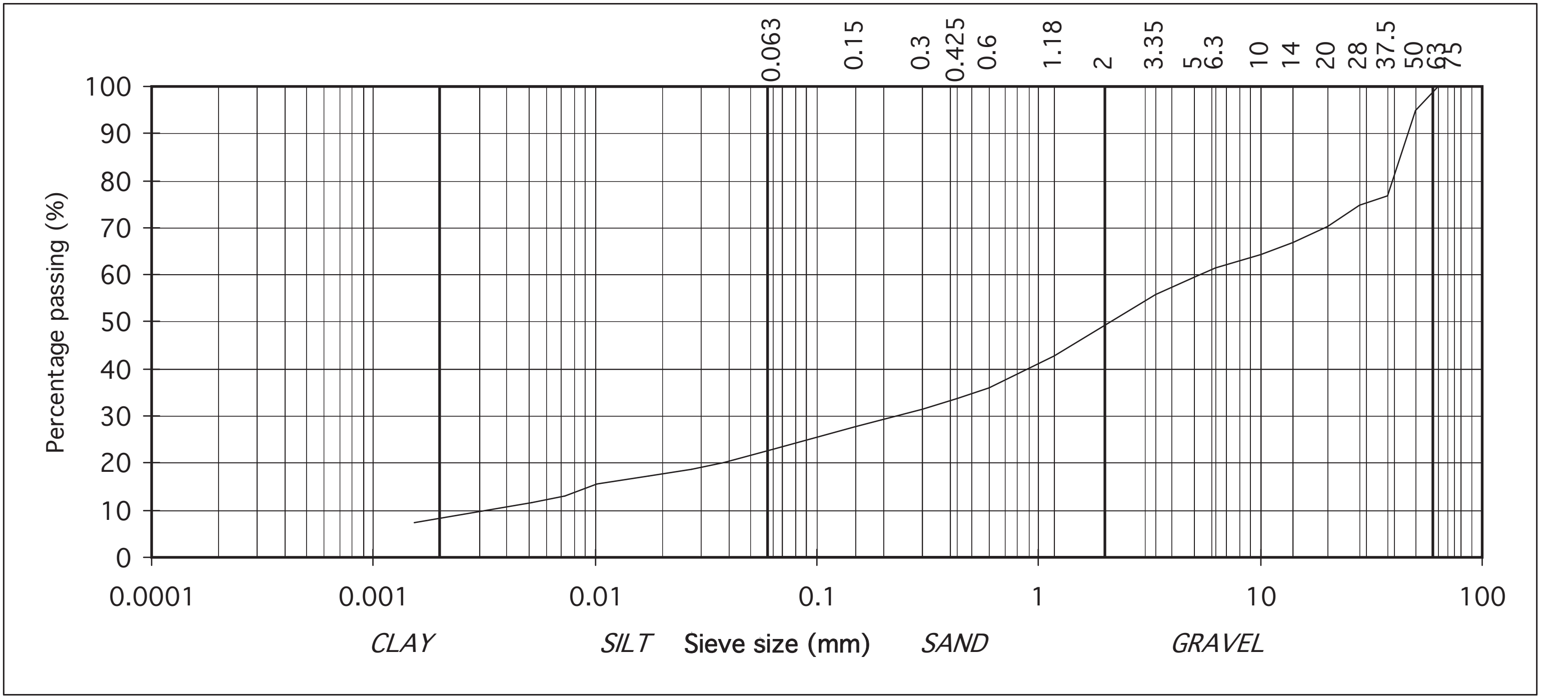
TESTING
DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	95	GRAVEL
37.5	77	
28	75	
20	70	
14	67	
10	64	
6.3	61	
5	59	
3.35	56	
2	49	
1.18	43	SAND
0.6	36	
0.425	34	
0.3	32	
0.15	28	
0.063	23	SILT/CLAY
0.038	20	
0.027	19	
0.017	17	
0.010	16	
0.007	13	
0.005	12	
0.002	7	

Contract No: 21674 Report No. R100824
Contract: Engine Node Data Center , Clonee , Co.Meatł
BH/TP : TP01
Sample No. AA112101/2 Lab. Sample No. A19/1613
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 10/04/2019
Description: Black slightly sandy, gravelly, CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



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Approved by:	Date:	Page no:
H Byrne	30/04/19	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

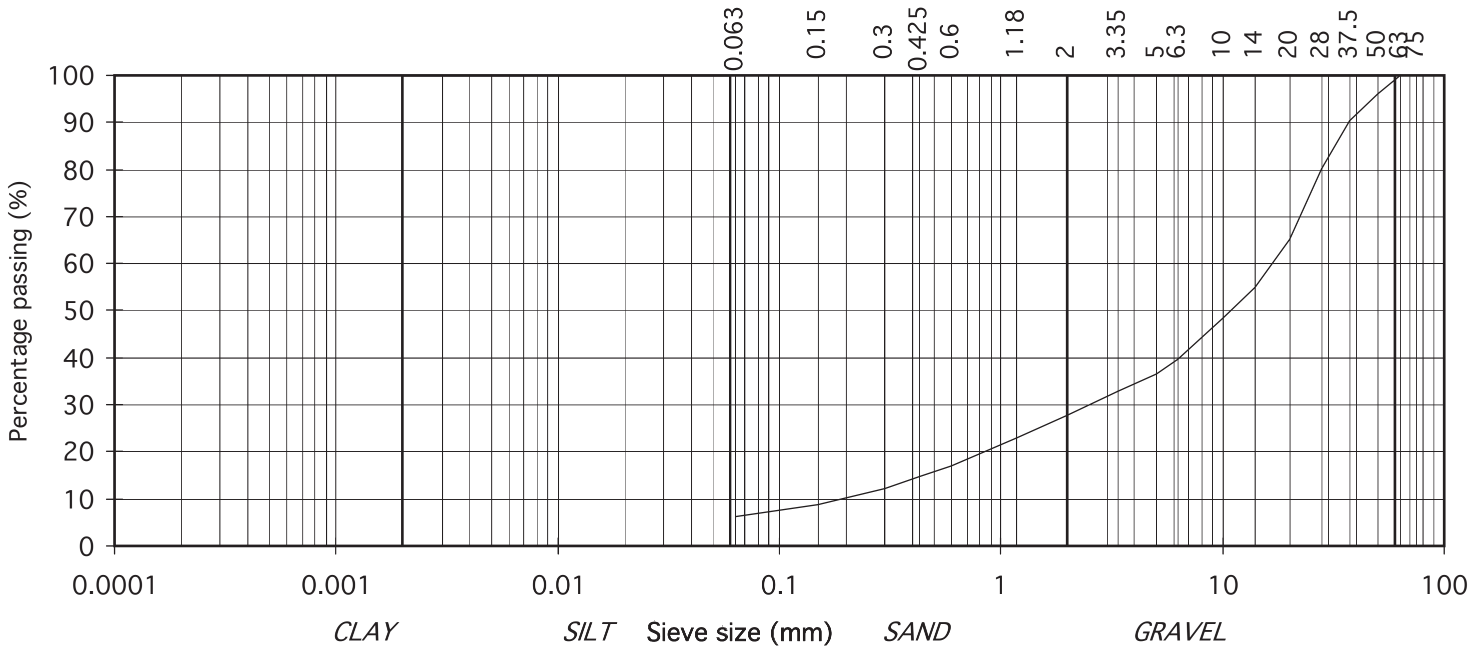
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Contract No: 21674 Report No. R100906
Contract: Engine Node Data Center , Clonee , Co.Meatl
BH/TP : TP02
Sample No. AA112106 Lab. Sample No. A19/1615
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 10/04/2019
Description: Grey/brown clayey/silty, very sandy, GRAVEL

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

particle size	% passing	
75	100	COBBLES
63	100	
50	96	GRAVEL
37.5	90	
28	80	
20	65	
14	55	
10	48	
6.3	40	
5	36	
3.35	33	
2	28	
1.18	23	SAND
0.6	17	
0.425	15	
0.3	12	
0.15	9	
0.063	6	SILT/CLAY



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

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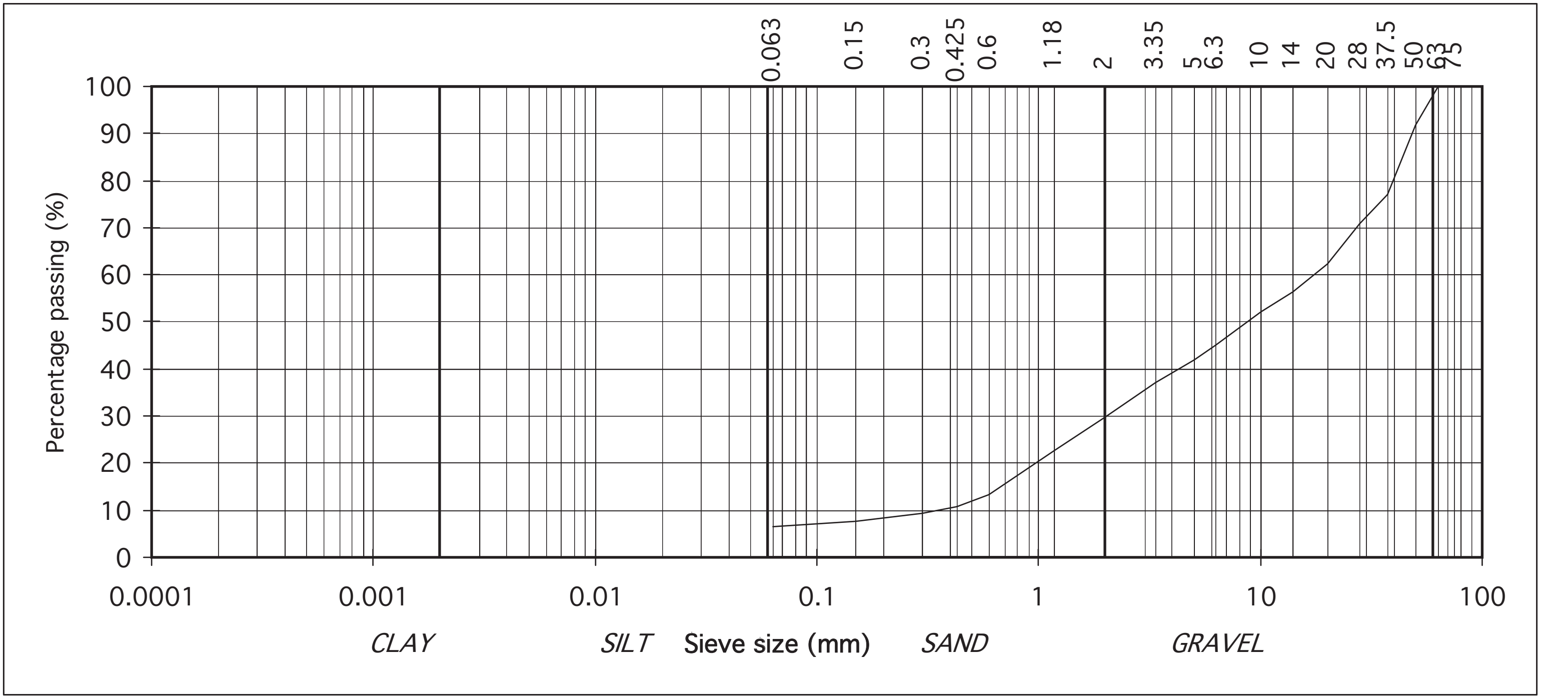
DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	92	GRAVEL
37.5	77	
28	71	
20	62	
14	56	
10	52	
6.3	45	
5	42	
3.35	37	
2	30	
1.18	23	SAND
0.6	13	
0.425	11	
0.3	9	
0.15	8	
0.063	7	SILT/CLAY

Contract No: 21674 Report No. R100825
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : TP03
Sample No. AA112110 Lab. Sample No. A19/1616
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 11/04/2019
Description: Brown clayey/silty, very sandy, GRAVEL

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

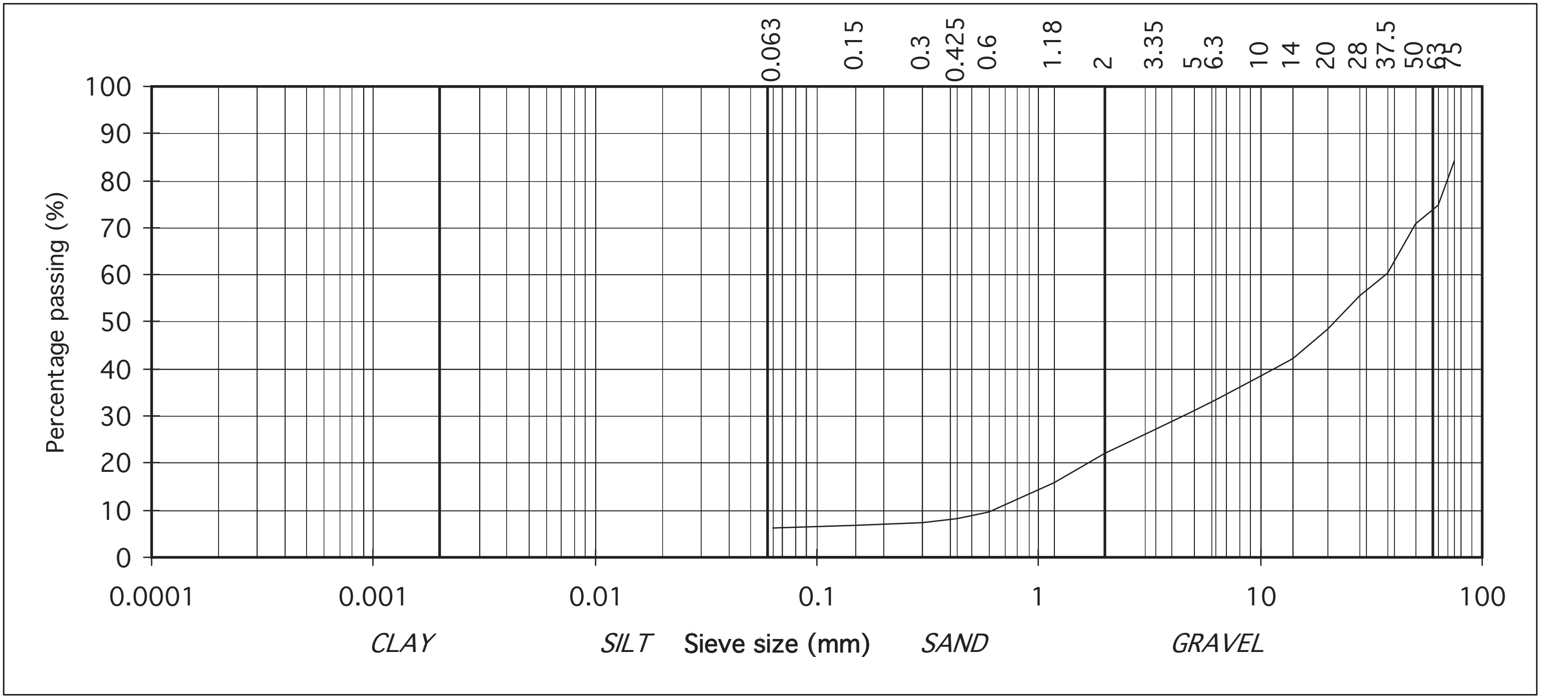
TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Contract No: 21674 Report No. R100911
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : TP04
Sample No. AA117171 Lab. Sample No. A19/1617
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 11/04/2019
Description: Dark brown clayey/silty, sandy, GRAVEL with many cobbles

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 Sample size did not meet the requirements of BS1377

particle size	% passing	
75	84	COBBLES
63	75	
50	71	GRAVEL
37.5	60	
28	55	
20	48	
14	42	
10	38	
6.3	33	
5	31	
3.35	27	
2	22	
1.18	16	SAND
0.6	10	
0.425	8	
0.3	7	
0.15	7	
0.063	6	SILT/CLAY



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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

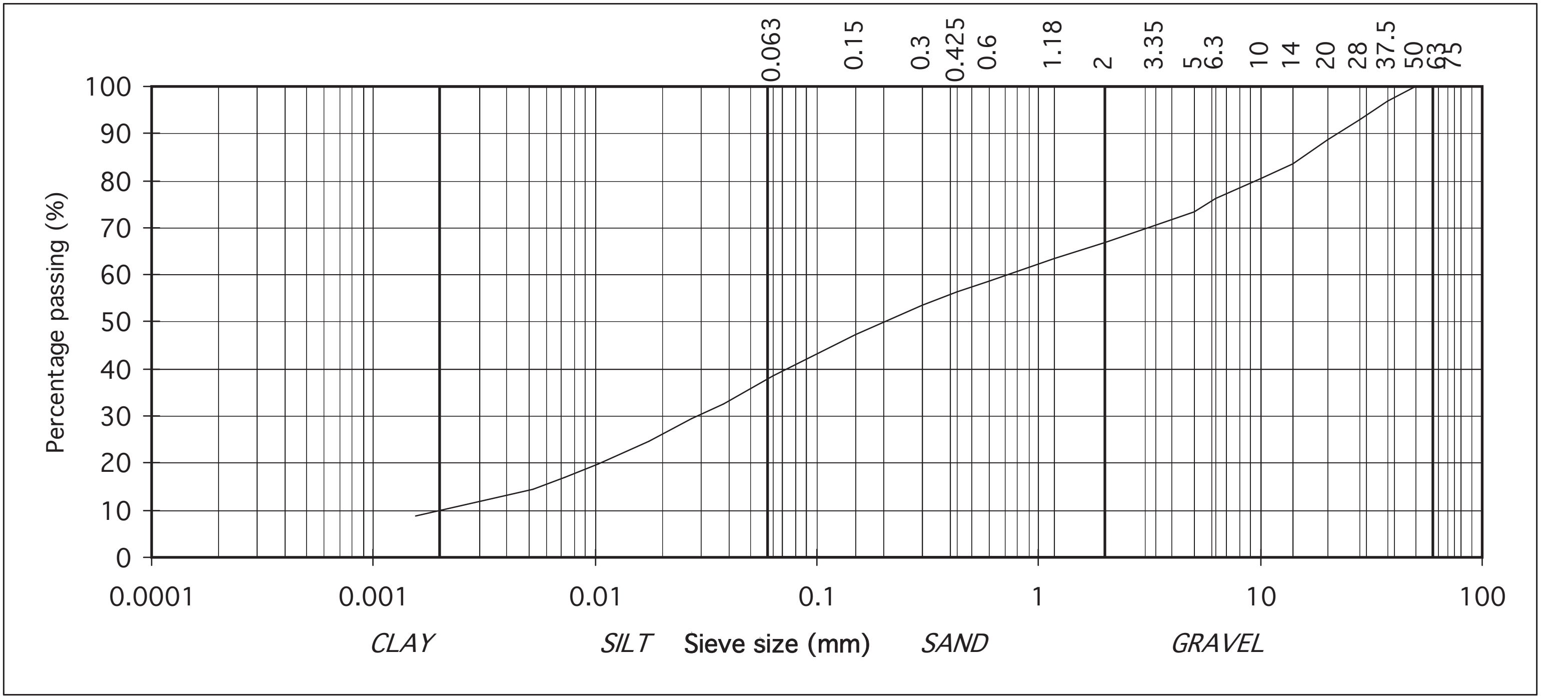
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	97	
28	93	
20	89	
14	83	
10	80	
6.3	76	
5	73	
3.35	71	
2	67	
1.18	63	SAND
0.6	59	
0.425	56	
0.3	54	
0.15	47	
0.063	39	SILT/CLAY
0.038	33	
0.027	29	
0.017	25	
0.010	20	
0.007	17	
0.005	14	
0.002	9	

Contract No: 21674 Report No. R100907
Contract: Engine Node Data Center , Clonee , Co.Meatl
BH/TP : TP04
Sample No. AA117172 Lab. Sample No. A19/1618
Sample Type: B
Depth (m) 2.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 11/04/2019
Description: Dark brown/black slightly sandy, slightly gravelly, CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

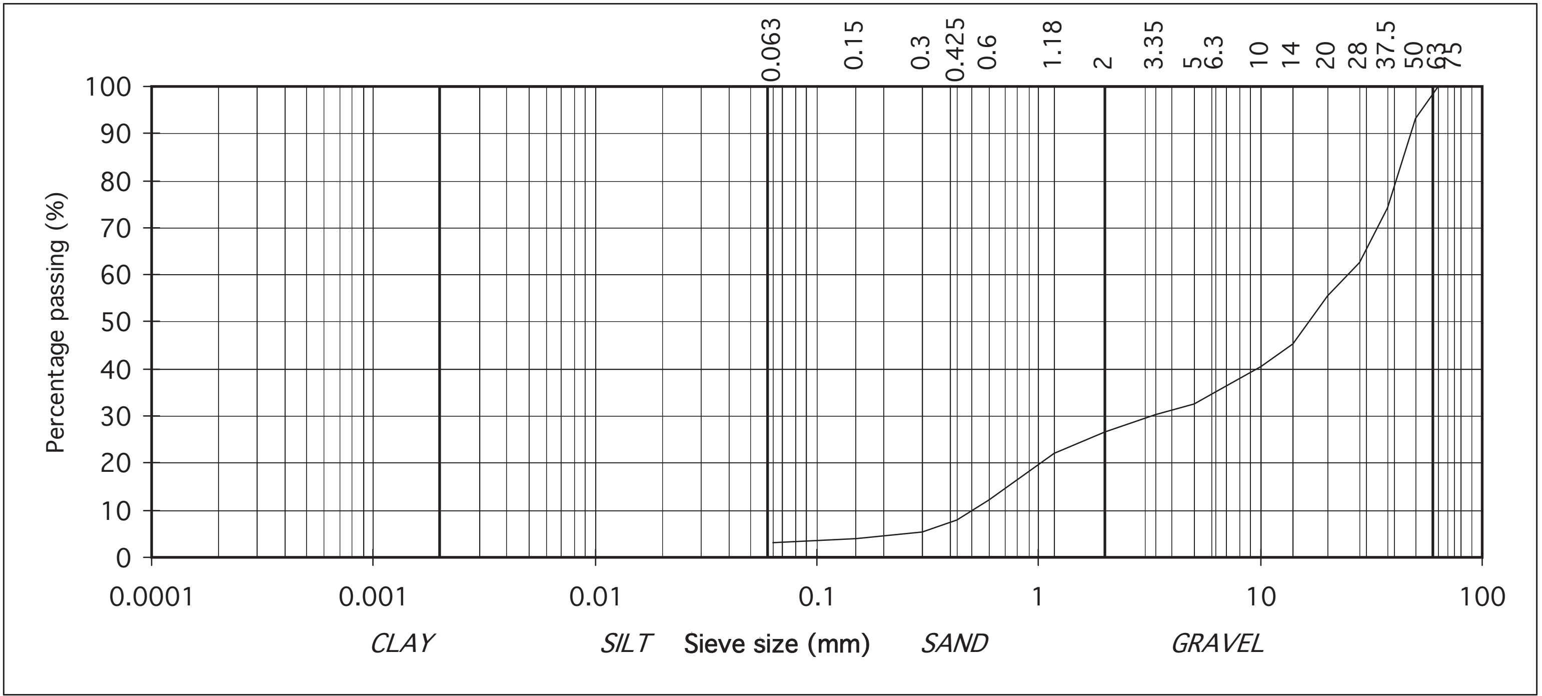
TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	93	GRAVEL
37.5	74	
28	63	
20	56	
14	45	
10	41	
6.3	35	
5	33	
3.35	30	
2	27	
1.18	22	SAND
0.6	12	
0.425	8	
0.3	5	
0.15	4	
0.063	3	
		SILT/CLAY

Contract No: 21674 Report No. R100826
Contract: Engine Node Data Center , Clonee , Co.Meatł
BH/TP : TP06
Sample No. AA112118 Lab. Sample No. A19/1620
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 11/04/2019
Description: Black slightly clayey/silty, very sandy, GRAVEL

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



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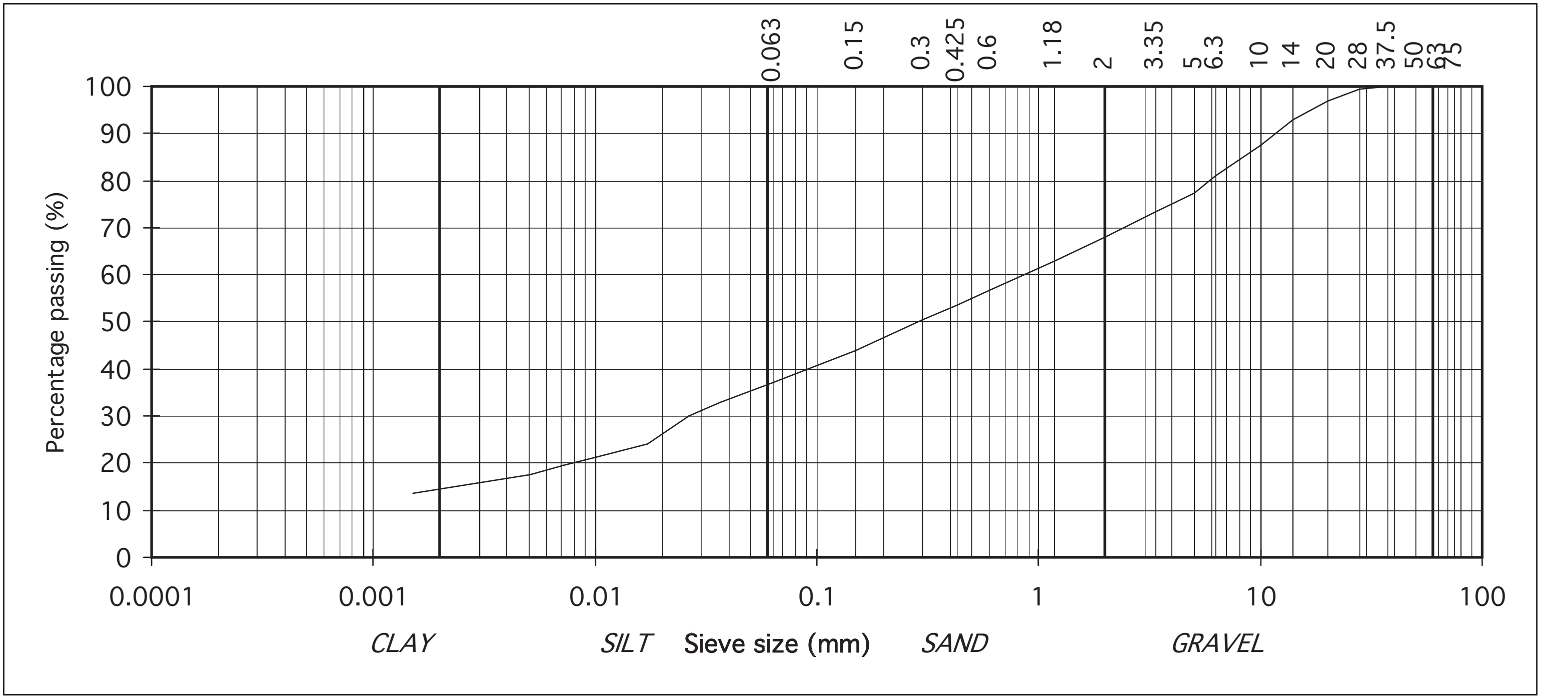
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

Contract No: 21674 Report No. R100908
Contract: Engine Node Data Center , Clonee , Co.Meatl
BH/TP : TP06
Sample No. AA112119 Lab. Sample No. A19/1621
Sample Type: B
Depth (m) 2.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 11/04/2019
Description: Dark brown/black slightly sandy, slightly gravelly, CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	99	
20	97	
14	93	
10	88	
6.3	81	
5	77	
3.35	73	
2	68	
1.18	63	SAND
0.6	57	
0.425	54	
0.3	50	
0.15	44	
0.063	37	SILT/CLAY
0.037	33	
0.026	30	
0.017	24	
0.010	21	
0.007	19	
0.005	17	
0.002	13	



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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

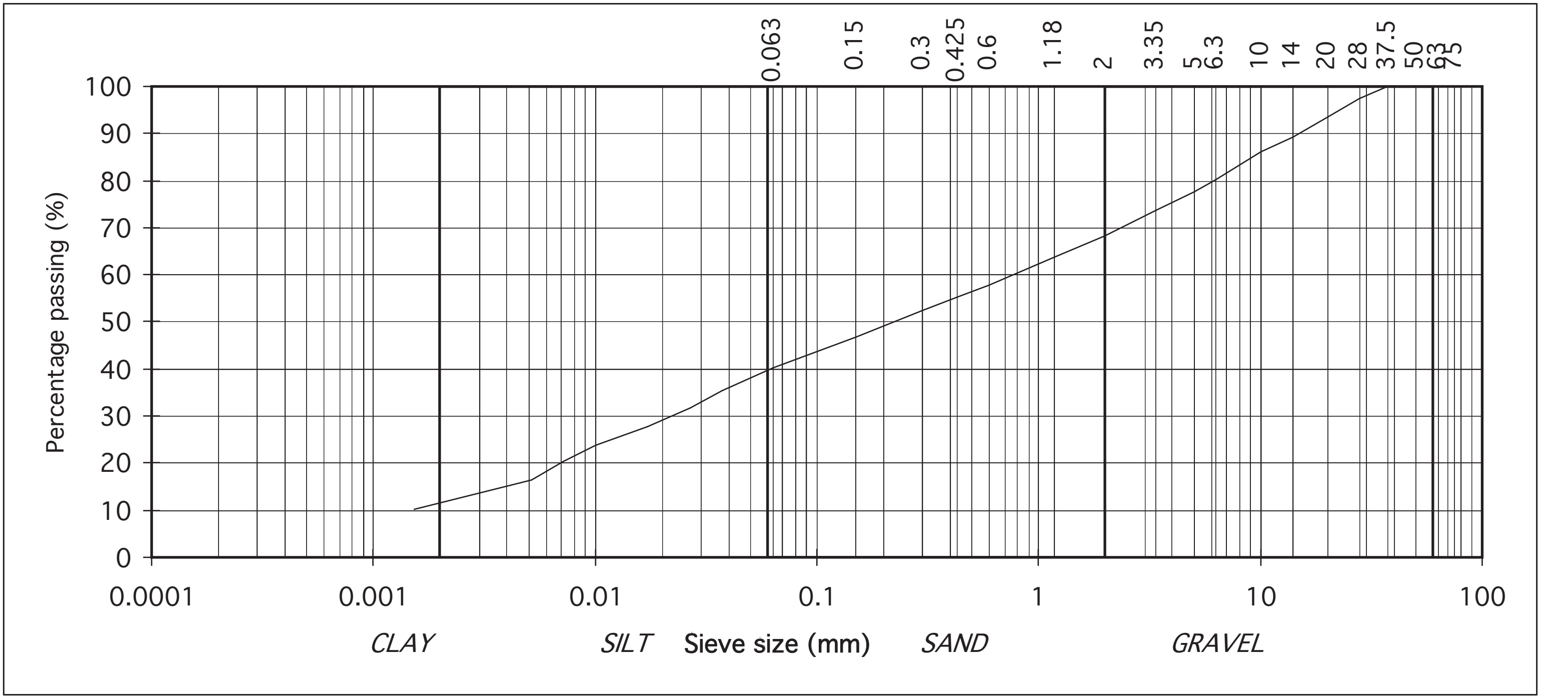
particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	97	
20	93	
14	89	
10	86	
6.3	80	
5	78	
3.35	74	
2	68	
1.18	64	SAND
0.6	58	
0.425	55	
0.3	52	
0.15	47	
0.063	40	SILT/CLAY
0.037	35	
0.027	32	
0.017	28	
0.010	24	
0.007	20	
0.005	16	
0.002	10	

Contract No:	21674	Report No.	R101194
Contract:	Engine Node Data Center , Clonee , Co.Meath		
BH/TP :	TP08		
Sample No.	AA112115	Lab. Sample No.	A19/1623
Sample Type:	B		
Depth (m)	1.00	Customer:	CSEA
Date Received	09/04/2019	Date Testing started	10/04/2019
Description:	Grey/brown slightly sandy, slightly gravelly, CLAY		

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

Sample size did not meet the requirements of BS1377



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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

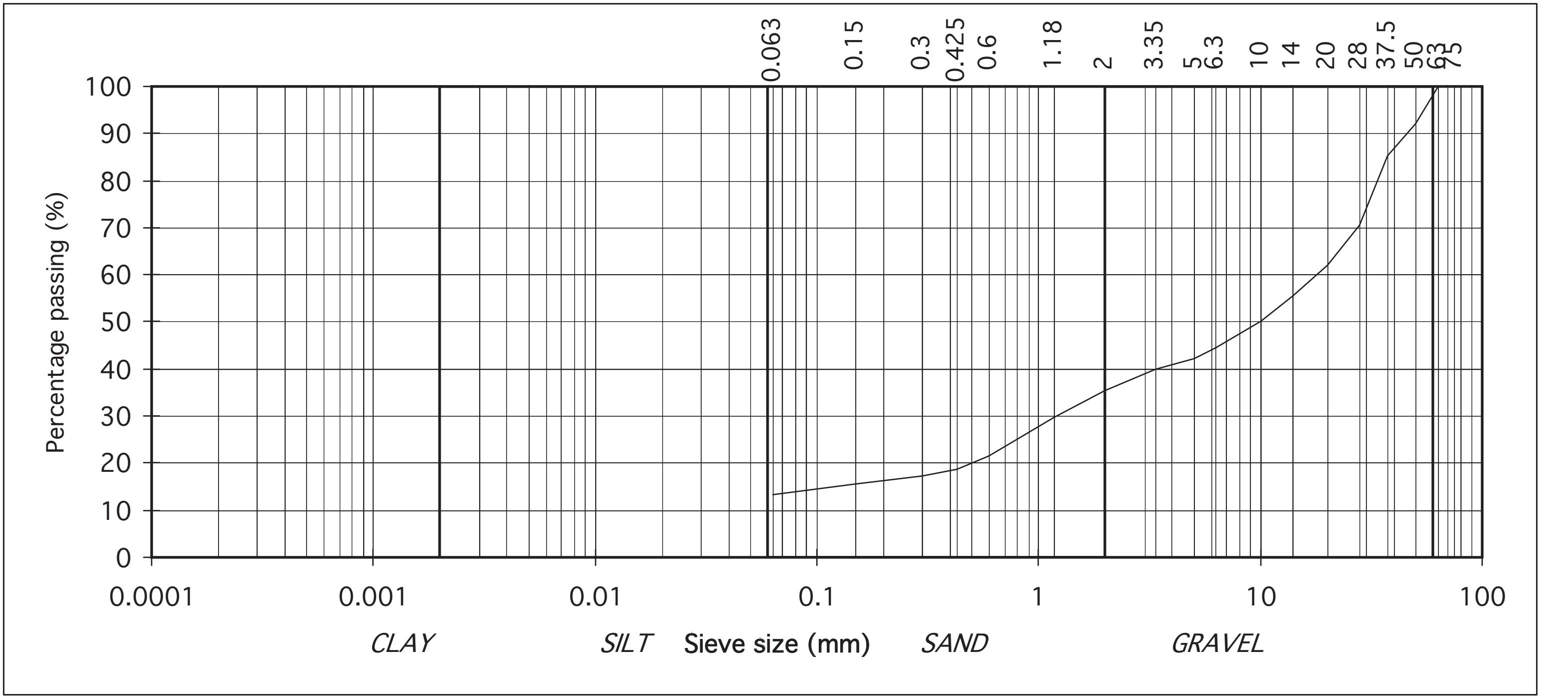
ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO. 133T

particle size	% passing
75	100
63	100
50	92
37.5	85
28	71
20	62
14	56
10	50
6.3	45
5	42
3.35	40
2	35
1.18	30
0.6	22
0.425	19
0.3	17
0.15	16
0.063	13

COBBLES
GRAVEL
SAND
SILT/CLAY

Contract No: 21674 Report No. R100827
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : SA01
Sample No. AA117101 Lab. Sample No. A19/1625
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 10/04/2019
Description: Brown clayey/silty, very sandy, GRAVEL

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



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TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

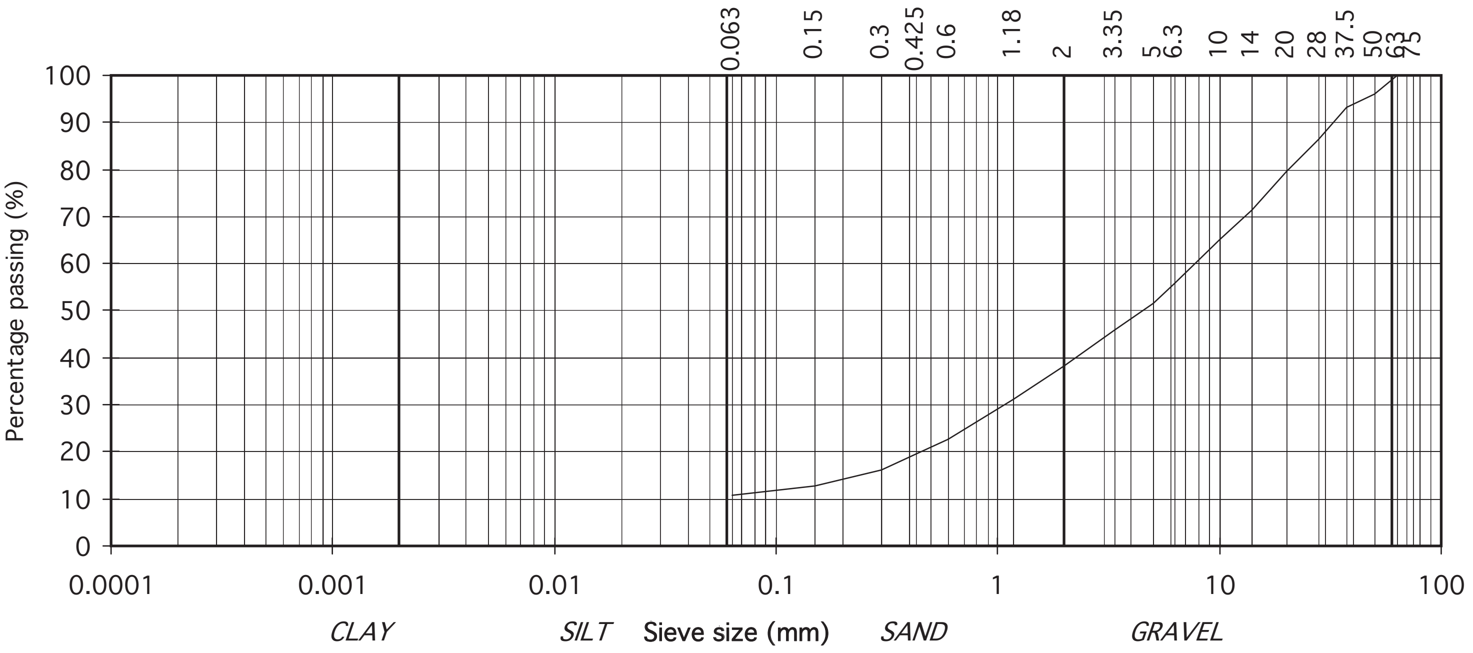
ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Contract No: 21674 Report No. R100828
Contract: Engine Node Data Center , Clonee , Co.Meatl
BH/TP : SA02
Sample No. AA117103 Lab. Sample No. A19/1626
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 11/04/2019
Description: Brown clayey/silty, very sandy, GRAVEL

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016

particle size	% passing
75	100
63	100
50	96
37.5	93
28	86
20	80
14	72
10	65
6.3	56
5	51
3.35	46
2	38
1.18	31
0.6	23
0.425	20
0.3	16
0.15	13
0.063	11

COBBLES
GRAVEL
SAND
SILT/CLAY



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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

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Materials Laboratory
Unit J5,M7 Business Park
Naas
Co. Kildare
045 899324

Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025
INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.133T

Report No.	**R100830**
Contract No.	21674
Contract Name:	Engine Node Data Center , Clonee , Co.Meath
Customer:	CSEA
BH/TP	BHSP01
Sample No.	AA111620
Depth (m)	1.00
Sample Type:	B
Lab Sample No.	A19/1610
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	19/04/19
Date Tested:	16/04/19
Sample Cert:	N/A
Moisture Content (%):	18
% Particles > 20mm (By dry mass):	0
MCV:	8.4
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Mottled brown slightly sandy gravelly CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory	Approved by	Date	Page
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Materials Laboratory
Unit J5,M7 Business Park
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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025
INAB ACCREDITED
TESTING
DETAILED IN SCOPE REG NO.1331

Report No.	**R100754**
Contract No.	21674
Contract Name:	Engine Node Data Centre Clonee Meath
Customer:	CSEA
BH/TP	BH03
Sample No.	AA111616
Depth (m)	1.00
Sample Type:	B
Lab Sample No.	A19/1609
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	09/04/19
Date Tested:	10/04/19
Sample Cert:	N/A
Moisture Content (%):	27
% Particles > 20mm (By dry mass):	0
MCV:	4
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Black sandy slightly gravelly CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Materials Laboratory
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Co. Kildare
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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025
INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.133T

Report No.	**R100829**
Contract No.	21674
Contract Name:	Clonee, Co.Meath
Customer:	CSEA
BH/TP	TP01
Sample No.	AA112101/2
Depth (m)	1.00
Sample Type:	B
Lab Sample No.	A19/1613
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	09/04/19
Date Tested:	16/04/19
Sample Cert:	N/A
Moisture Content (%):	12
% Particles > 20mm (By dry mass):	37
MCV:	9.2
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Black slightly sandy, gravelly, CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No.	**R100831**
Contract No.	21674
Contract Name:	Engine Node Data Center , Clonee , Co.Meath
Customer:	CSEA
BH/TP	TP02
Sample No.	AA112105
Depth (m)	0.50
Sample Type:	B
Lab Sample No.	A19/1614
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	19/04/19
Date Tested:	16/04/19
Sample Cert:	N/A
Moisture Content (%):	34
% Particles > 20mm (By dry mass):	0
MCV:	>1
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
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H Byrne (Laboratory Manager)

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

Report No.	**R100832**
Contract No.	21674
Contract Name:	Engine Node Data Center , Clonee , Co.Meath
Customer:	CSEA
BH/TP	TP06
Sample No.	AA112119
Depth (m)	2.00
Sample Type:	B
Lab Sample No.	A19/1621
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	10/04/19
Date Tested:	16/04/19
Sample Cert:	N/A
Moisture Content (%):	12
% Particles > 20mm (By dry mass):	0
MCV:	2.4
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Dark brown/black slightly sandy, slightly gravelly, CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No.	**R100833**
Contract No.	21674
Contract Name:	Engine Node Data Centre Clonee Meath
Customer:	CSEA
BH/TP	TP08
Sample No.	AA112113/4
Depth (m)	0.50
Sample Type:	B
Lab Sample No.	A19/1622
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	09/04/19
Date Tested:	16/04/19
Sample Cert:	N/A
Moisture Content (%):	14
% Particles > 20mm (By dry mass):	0
MCV:	2.2
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Mottled brown very sandy gravelly CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.1337

Report No.	**R100753**
Contract No.	21674
Contract Name:	Engine Node Data Center , Clonee , Co.Meath
Customer:	CSEA
BH/TP	TP10
Sample No.	AA117166
Depth (m)	0.50
Sample Type:	B
Lab Sample No.	A19/1624
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	09/04/19
Date Tested:	10/04/19
Sample Cert:	N/A
Moisture Content (%):	28
% Particles > 20mm (By dry mass):	1.4
MCV:	7.6
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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M7 Business Park
Naas
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Test Report

Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990

ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.133T

Report No. R101193 Contract No. 21674

Contract Name: Engine Node Data Centre Clonee Meath

Lab Contract No. 21674 Location: TP01

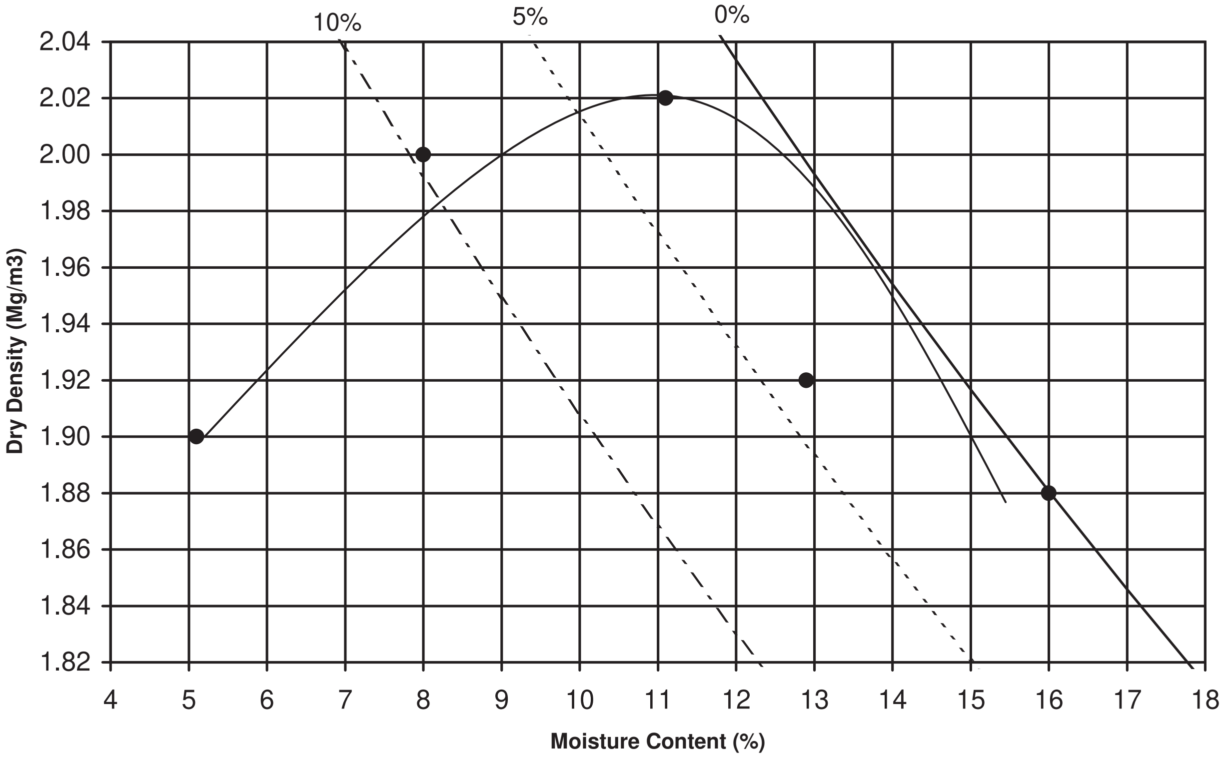
Sample No. AA112101/2 Depth (m) 0.5 Material Type B

Lab sample no. A19/1613 Customer: CSEA

Date Received: 09/04/2019 Test Method: 2.5 KG Rammer

Date Tested: 26/04/2019 BS1377:Part 4:1990 3.3

Dry Density (Mg/m^3)	2.02	1.90	2.00	1.92	1.88	0.00	
Moisture Content (%)	11	5.1	8.0	13	16	0	



Maximum Dry Density (Mg/m^3): 2.02 Optimum Moisture Content (%): 11

Description: Mottled brown sandy, slightly gravelly, CLAY

Sample Preparation: Material passing 20mm ~~Single~~ / Separate samples used

Particle Density (Mg/m^3): 2.69 Particle Density: Assumed

% retained on 20/37.5mm sieve: 6.8

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

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Test Report

Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No. R101192 Contract No. 21674

Contract Name: Engine Node Data Centre Clonee Meath

Lab Contract No. 21674 Location: TP06

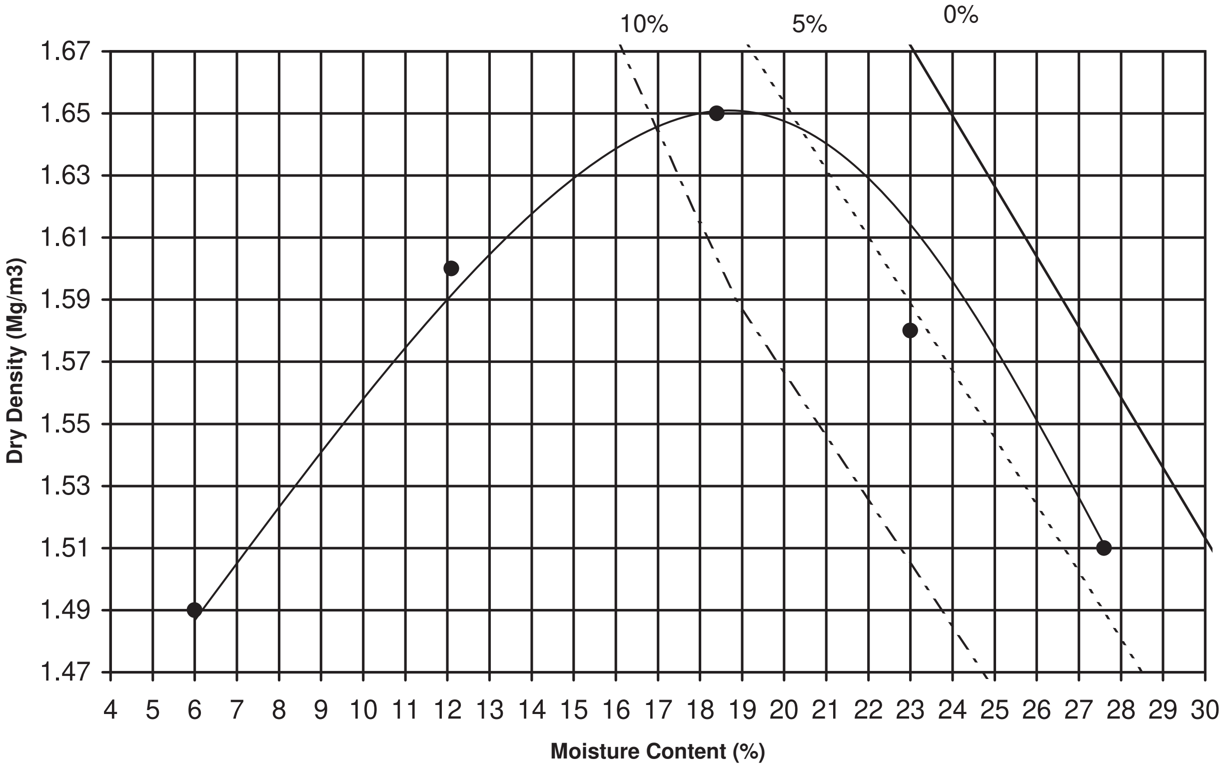
Sample No. AA112119 Depth (m) 2 Material Type B

Lab sample no. A19/1621 Customer: CSEA

Date Received: 09/04/2019 Test Method: 2.5 KG Rammer

Date Tested: 26/04/2019 BS1377:Part 4:1990 3.3

Dry Density (Mg/m^3)	1.51	1.49	1.60	1.65	1.58	0.00	
Moisture Content (%)	28	6.0	12	18	23	0	



Maximum Dry Density (Mg/m^3): 1.65 Optimum Moisture Content (%): 18

Description: Dark brown/black slightly sandy, slightly gravelly, CLAY

Sample Preparation: Material passing 20mm ~~Single~~ / Separate samples used

Particle Density (Mg/m^3): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 6.3

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	30/04/19	1 of 1

IGSL Ltd
Materials Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No. R101191 Contract No. 21674

Contract Name: Engine Node Data Centre Clonee Meath

Lab Contract No. 21674 Location: TP08

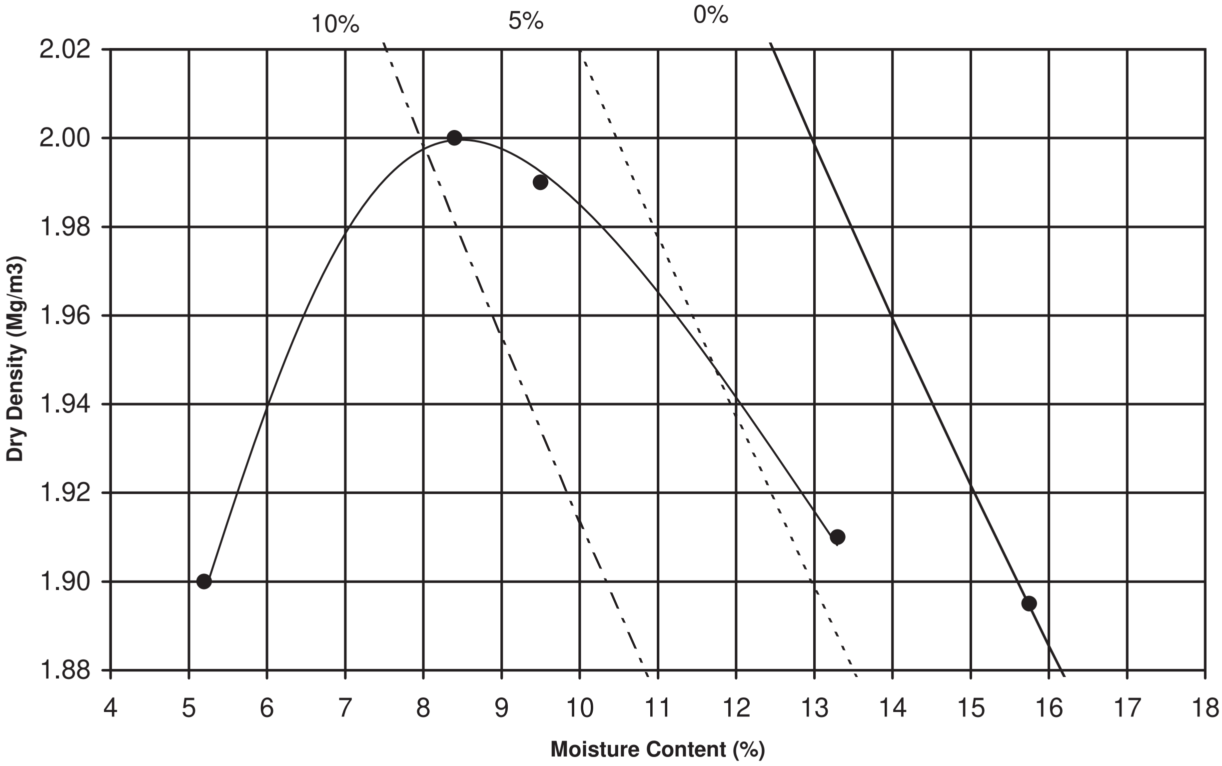
Sample No. AA112113 Depth (m) 0.5 Material Type B

Lab sample no. A19/1622 Customer: CSEA

Date Received: 09/04/2019 Test Method: 2.5 KG Rammer

Date Tested: 26/04/2019 BS1377:Part 4:1990 3.3

Dry Density (Mg/m^3)	1.90	1.91	1.99	2.00	1.90	0.00	
Moisture Content (%)	16	13	10	8.4	5.2	0	



Maximum Dry Density (Mg/m^3): 2.00 Optimum Moisture Content (%): 8

Description: Mottled brown sandy gravelly CLAY

Sample Preparation: Material passing 20mm ~~Single~~ / Separate samples used

Particle Density (Mg/m^3): 2.70 Particle Density: Assumed

% retained on 20/37.5mm sieve: 25

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	30/04/19	1 of 1

(Diametrial) POINT LOAD STRENGTH INDEX TEST DATA

IGSL

Contract: EngineNode Data Centre
Contract no. 21674
Date of test: 24/5/19

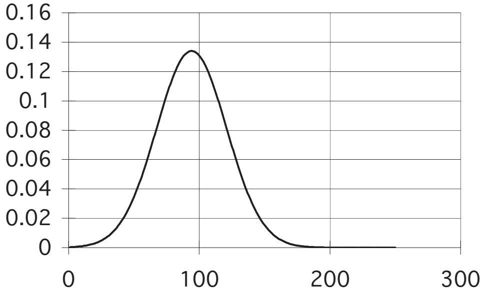
Sample Type: Core

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orienation
RC01	6.2	78	28.0	1.222	4.60	5.62	112	d	//
	8.1	78	26.0	1.222	4.27	5.22	104	d	//
	10.7	78	16.0	1.222	2.63	3.21	64	d	//
RC02	6.7	78	11.0	1.222	1.81	2.21	44	d	//
	9.2	78	28.0	1.222	4.60	5.62	112	d	//
	11.7	78	19.0	1.222	3.12	3.81	76	d	//
RC03	4.6	78	31.0	1.222	5.10	6.22	124	d	//
	9.7	78	24.0	1.222	3.94	4.82	96	d	//
	9.9	78	28.0	1.222	4.60	5.62	112	d	//

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	9	9
Minimum	2.21	44
Average	4.71	94
Maximum	6.22	124
Standard Dev.	1.34	27
Upper 95% Confidence Limit	7.33	146.66
Lower 95% Confidence Limit	2.08	41.62

Comments:
*UCS taken as k x Point Load Is(50):   k=   20

*UCS Normal Distribution Curve



Abbreviations

i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name:	EngineNode Data Centre
Job Number:	21674
Hole No:	RC01
Depth (m):	10.20m

Sample Description

Colour:	Grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

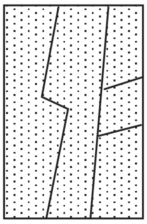
Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Length	202	
Diameter (Ø)	78.1	mm

Sketch of Failure Surfaces



Testing

Load Rate	4.3	kN/min
Load at Failure (P)	319	kN

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{319000}{4788.19385}$

$= \dfrac{1000 \times P}{\Pi \times (Ø/2)^2}$

$=$ 66.59 (Mpa)

Bulk Density $=$ 2.65 (Mg/m^3)

Notes:

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name:	EngineNode Data Centre
Job Number:	21674
Hole No:	RC02
Depth (m):	9.60m

Sample Description

Colour:	Grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

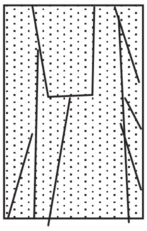
Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Length	199	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

Load Rate	4.3	kN/min
Load at Failure (P)	422	kN

Strength Calculations

Uniaxial Compressive Strength = $\frac{422000}{4775.94}$

= $\frac{1000 \times P}{\pi \times (Ø/2)^2}$

= 88.31 (Mpa)

Bulk Density = 2.67 (Mg/m^3)

Notes:

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name:	EngineNode Data Centre
Job Number:	21674
Hole No:	RC03
Depth (m):	7.80m

Sample Description

Colour:	Grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

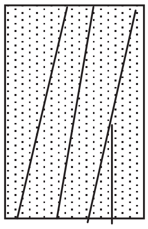
Sample Measurements

Length	200	
Diameter (Ø)	78.1	mm

Testing

Load Rate	4.3	kN/min
Load at Failure (P)	383	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength = $\frac{383000}{4788.19385}$

= $\frac{1000 \times P}{\Pi \times (Ø/2)^2}$

= 79.95 (Mpa)

Bulk Density = 2.66 (Mg/m^3)

Notes:

Appendix 7

Chemical Laboratory Testing

UKAS
TESTING
2183

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	19-12730-1		
Initial Date of Issue:	23-Apr-2019		
Client	IGSL		
Client Address:	M7 Business Park Naas County Kildare Ireland		
Contact(s):	Darren Keogh		
Project	21674 Engine Node Data Centre Clonee Meath		
Quotation No.:		**Date Received:**	11-Apr-2019
Order No.:		**Date Instructed:**	12-Apr-2019
No. of Samples:	5		
Turnaround (Wkdays):	7	**Results Due:**	24-Apr-2019
Date Approved:	23-Apr-2019		
Approved By:			
Details:	Robert Monk, Technical Manager		

Results - Soil

Project: 21674 Engine Node Data Centre Clonee Meath

Client: IGSL	**Chemtest Job No.:**				19-12730	19-12730	19-12730	19-12730	19-12730
Quotation No.:	**Chemtest Sample ID.:**				810274	810275	810276	810277	810278
	Sample Location:				BH-SP1	BH2	TP4	TP6	Sample X
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.00	3.00	2.00	1.00	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Moisture	N	2030	%	0.020	12	9.0	11	6.3	23
pH	U	2010		N/A	[A] 8.6	[A] 8.5	[A] 8.3	[A] 8.7	[A] 8.5
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	0.020	0.059	< 0.010	< 0.010

Chemtest
The right chemistry to deliver results

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
810274			BH-SP1		A	Amber Glass 250ml
810275			BH2		A	Amber Glass 250ml
810276			TP4		A	Amber Glass 250ml
810277			TP6		A	Amber Glass 250ml
810278			Sample X		A	Amber Glass 250ml

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

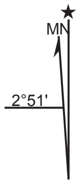
Appendix 8

As-Surveyed Site Plan

ExpertGPS

Engine Node Date Centre

Scale: 1 : 4000.



8.0 BIODIVERSITY; FLORA & FAUNA

8.1 INTRODUCTION

This chapter provides an assessment of the impacts of the proposed development on the ecological environment, i.e. flora and fauna. It has been compiled in compliance with EIA Directive (2011/92/EU) as amended by Directive 2014/52/EU, the Planning and Development Act 2000 as amended, and the European Commission's guidance on the preparation of the EIA Report, and follows the *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2017).

The development site comprises farmland of relatively low local ecological value.

8.2 METHODOLOGY

This chapter of the EIAR concentrates on ecological features within the development area of particular significance, primarily designated habitats and species. This includes habitats/species listed in Annex I, II and IV of the EU Habitats Directive, rare plants listed in the Flora Protection Order and other semi-natural habitats of conservation value.

The obligation to undertake appropriate assessment derives from Article 6(3) and 6(4) of the Habitats Directive. The first test is to establish whether, in relation to a particular plan or project, appropriate assessment is required. This is termed AA screening. Its purpose is to determine, on the basis of a preliminary assessment and objective criteria, whether a plan or project, alone and in combination with other plans or projects, could have significant effects on a Natura 2000 site in view of the site's conservation objectives..

The Appropriate Assessment process was commenced by Moore Group for the proposed development and a Report for AA Screening prepared, which is presented as Appendix 8.1 to this chapter.

8.2.1 Policy & Guidance

8.2.1.1 EU Habitats Directive

The "Habitats Directive" (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna) is the main legislative instrument for the protection and conservation of biodiversity within the European Union and lists certain habitats and species that must be protected within wildlife conservation areas, considered to be important at a European as well as at a national level. A "Special Conservation Area" or SAC is a designation under the Habitats Directive. The Habitats Directive sets out the protocol for the protection and management of SACs.

The Directive sets out key elements of the system of protection including the requirement for "Appropriate Assessment" of plans and projects.

8.2.1.2 EU Birds Directive

The "Birds Directive" (Council Directive 79/409/EEC amended by Council Directive 2009/147/EC on the Conservation of Wild Birds) provides for a network of sites in all member states to protect birds at their breeding, feeding, roosting and wintering areas. This Birds Directive identifies species that are rare, in danger of extinction or vulnerable to changes in habitat and which need protection (Annex I species). Appendix I indicates Annex I bird species as listed on the Birds Directive. A "Special Protection Area" or SPA, is a designation under The Birds Directive.

Special Areas of Conservation and Special Protection Areas form a pan-European network of protected sites known as Natura 2000 sites and any plan or project that has the potential to impact upon a Natura 2000 site requires appropriate assessment.

8.2.1.3 Wildlife Acts (1976 - 2012)

The primary domestic legislation providing for the protection of wildlife in general, and the control of some activities adversely impacting upon wildlife is the Wildlife Act of 1976. The aims of the wildlife act according to the National Parks and Wildlife Service are "... to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources and to regulate their exploitation, and to provide the services necessary to accomplish such aims." All bird species are protected under the Wildlife Act 1976. The Wildlife (Amendment) Act of 2000 amended the original Wildlife Act 1976 to improve the effectiveness of the Wildlife Act 1976 to achieve its aims.

Both the Habitats Directive and the Birds Directive have been transposed into Irish law by one set of regulations (i.e. The European Communities (Birds and Natural Habitats) Regulations 2011 to 2015 as amended).

8.2.2 Habitat Survey

The habitat survey was carried out in three stages, firstly through desktop research to determine existing records in relation to habitats and species present in the study area as defined by the area of the proposed development, site boundaries and surrounding buffer zones up to 150 m away. This included research on the National Parks and Wildlife Service (NPWS) metadata website, the National Biodiversity Data Centre (NBDC) database and a literature review of published information on flora and fauna occurring in the proposed development area.

Other environmental information for the area was reviewed, e.g. in relation to soils, geology, hydrogeology and hydrology. Interactions in terms of the Chapters on these topics presented in this EIAR were important in the determination of source vector pathways and links with potentially hydrologically connected areas outside the proposed development site.

The second phase of the survey involved site visits to establish the existing environment in the footprint of the proposed development area. Areas which were highlighted during desktop assessment were investigated in closer detail according to the Heritage Council Best Practice Guidance for Habitat Survey and Mapping (Smith et al., 2011). Habitats in the proposed development area were classified according to the Heritage Council publication "A Guide to Habitats in Ireland" (Fossitt, 2000). This publication sets out a standard scheme for identifying, describing and classifying wildlife habitats in Ireland. This form of classification uses codes to classify different habitats based on the plant species present. Species recorded in this report are given in both their Latin and English names. Latin names for plant species follow the nomenclature of "An Irish Flora" (Parnell & Curtis, 2012).

Habitats were surveyed on the 25 June 2020 by conducting a study area walkover covering the main ecological areas identified in the desktop assessment. The survey date is within the optimal survey periods for botanical species. A photographic record was made of features of interest.

Signs of mammals such as badgers and otters were searched for while surveying the study area noting any sights, signs or any activity in the vicinity especially along adjacent boundaries. Signs of otter were search for on and adjacent to all drainage ditches on the site.

Birds were surveyed using standard transect methodology and signs were recorded where encountered during the field walkover surveys.

Following desktop assessment an evaluation of the development area and determination of the potential impacts on the flora and fauna of the area is based on the following guidelines and publications:

- EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports 2017;
- European Commission Guidance on the Preparation of the EIA Report (2017) as well as the European Commission Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (2013);
- Assessment of plans and projects significantly affecting Natura 2000 sites (EC, 2002);
- Managing Natura 2000 Sites (EC, 2000) Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (EC, 2000);
- Managing Natura 2000 Sites (EC, 2018) Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (EC, 2018);
- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG, Rev. Feb. 2010); and
- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2019).

The following resources assisted in the production of this chapter of the report:

- Ordnance Survey Ireland maps;
- OSI, Google and Bing Aerial photography (1995 – 2020);
- NPWS Mapviewer: http://www.npws.ie/en/MapsData/;
- Designated sites (SACs, SPAs, NHAs);
- Records of protected species from 10km squares; and
- National Biodiversity Data Centre Records and Maps.

Other environmental information for the area was reviewed, e.g. in relation to soils, geology, hydrogeology and hydrology. Interactions in terms of the chapters on these topics presented in this EIA Report were important in the determination of source vector pathways and links with potentially hydrologically connected areas outside the proposed development site.

8.3 RECEIVING ENVIRONMENT

The site is comprises an area of heavily grazed farmland. The field systems are relatively big with intervening outgrown hedgerows and wide drainage ditches.

With the exception of the crossing of the proposed western grid route into a neighbouring and landowners field, the routes can be facilitated taking advantage of existing gates and gaps in field boundaries.

The majority of the grid routes will be placed in the road carriage which is considered as built environment (BL3).

The following is a description of the flora and fauna of the existing environment in the study area.

8.3.1 Designated Conservation Areas

Department of Environment, Heritage and Local Government (2009) Guidance on Appropriate Assessment recommends an assessment of European sites within a zone of impact of 15 km. This distance is a guidance only and the zone of impact has been identified taking consideration of the nature and location of the proposed Project to ensure all European sites with connectivity to it are considered in terms of a catchment-based assessment.

The zone of impact may be determined by connectivity to the proposed Project in terms of:

- Nature, scale, timing and duration of works and possible impacts, nature and size of excavations, storage of materials, flat/sloping sites;
- Distance and nature of pathways (dilution and dispersion; intervening 'buffer' lands, roads etc.); and
- Sensitivity and location of ecological features.

The guidance provides that, at the screening stage, it is necessary to identify the relevant Natura 2000 sites and compile information on their qualifying interests and conservation objectives. In preparation for this, the potential for source – pathway – receptor connectivity is firstly identified and detailed information is then provided on sites with connectivity.

European sites that are located within 15 km of the Project are listed in Table 1 and presented in Figure 8.1 below. Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on the 24 June 2020.

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project. A review of the Environmental Protection Agency's (EPA) Water Framework Directive (WFD) catchment data indicates that the proposed Project is located in the River Tolka catchment. Downstream within this catchment are the Dublin Bay European sites, including South Dublin Bay and River Tolka Estuary SPA (Site Code 004024), North Dublin Bay SAC (Site Code 000206) and North Bull island SPA (Site Code 004006), which are located over 23 river km downstream.

There are no predicted effects on any European sites given the distance between the proposed Project and any downstream European Sites over 23 river km.

Having considered the above, significant effects on any European sites as a result of the proposed Project can be ruled out and potential significant effects on European sites can be excluded at a preliminary screening stage.

Table 8.1 *European Sites located within the potential zone of impact[1] of the Project.*

Site Code	Site name	Distance (km)[2]
001398	Rye Water Valley/Carton SAC	6.45
000206	North Dublin Bay SAC	19.02
000210	South Dublin Bay SAC	18.52
004024	South Dublin Bay and River Tolka Estuary SPA	16.25
004006	North Bull Island SPA	19.02

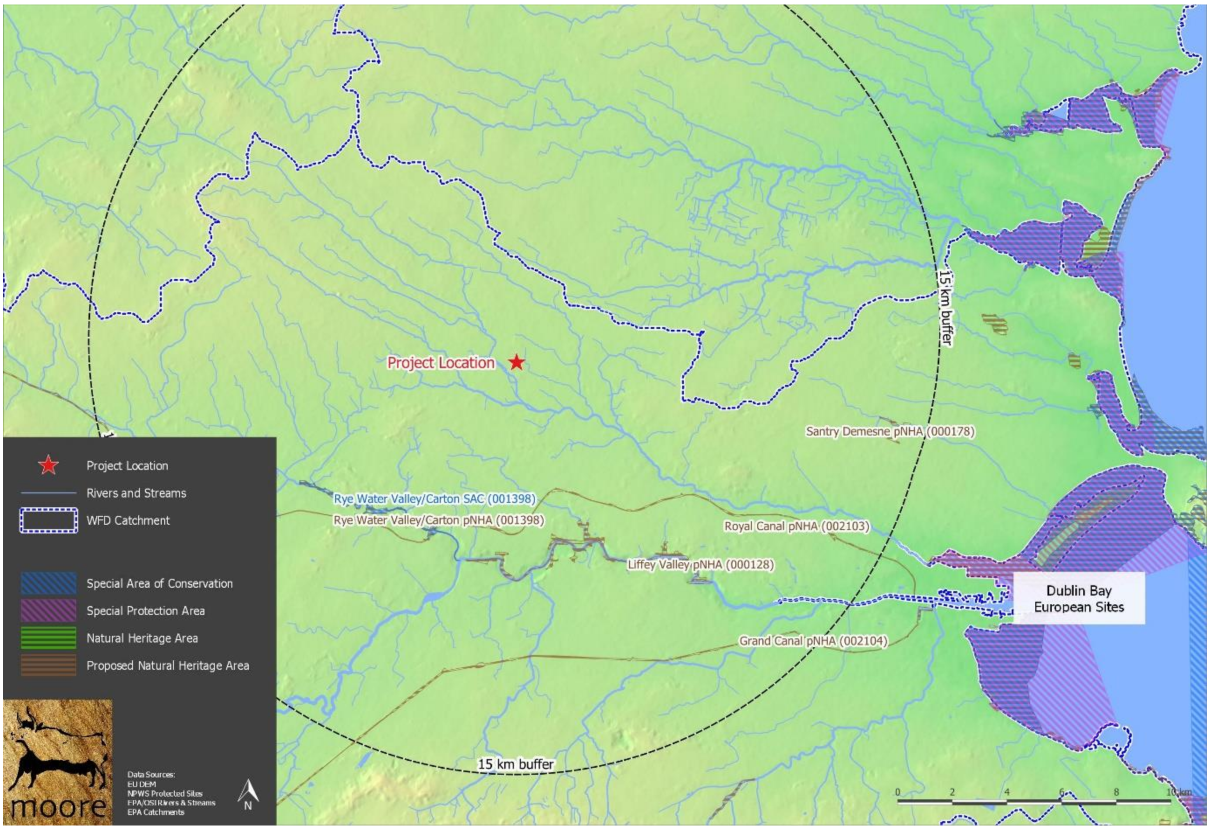


Figure 8.1 *Showing European sites and NHAs/pNHAs in the vicinity of the proposed Project.*

---

[1] All European sites potentially connected irrespective of the nature or scale of the proposed Project.

[2] Distances indicated are the closest geographical distance between the proposed Project and the European site boundary, as made available by the NPWS. Connectivity along hydrological pathways may be significantly greater.

8.3.2 Non-Designated Habitats

The proposed development area is improved farmland with open grassland fields, the eastern fields being heavily grazed by cattle. There are internal treelines and associated drainage ditches and surrounding outgrown hedgerows.

The main habitats are presented on the recent aerial photography in Figure 8.2. A list of habitats recorded and their corresponding Fossitt codes is presented in Table 8.2.

Table 8.2 *Details of habitats recorded and their corresponding Fossitt codes.*

Habitat	Habitat Category	Habitat Type
(F) Freshwater	(FW) Watercourses	(FW4) Drainage ditches
(G) Grassland	(GA) Improved grassland	(GA1) Improved agricultural grassland
(W) Woodland and Scrub	(WS) Scrub and transitional woodland	(WS1) Scrub
	(WL) Linear woodland	(WL1) Hedgerows

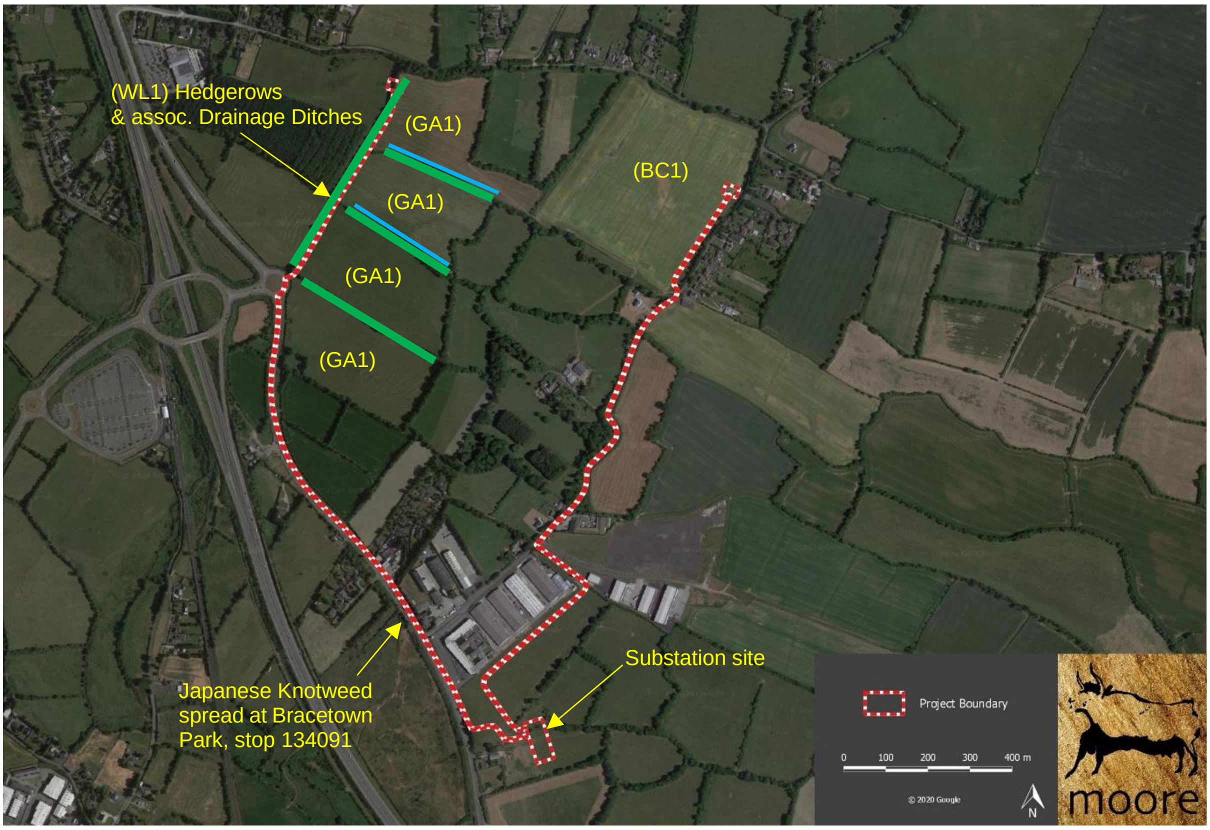


Figure 8.2 *Habitats recorded at the proposed development site.*

8.3.2.1 (FW4) Drainage ditches

This habitat classification applies to drainage ditches within the site associated with outgrown hedgerows. Draining ditches are generally shallow and slow flowing and choked with abundant Fools Water-cress (*Apium nodiflorum*).

Species present include Great willowherb (*Epilobium hirsutum*), Meadowsweet (*Filipendula ulmaria*), Horsetail (*Equisetum arvense*), Buttercup (*Ranunculus acris*) and Nettle (*Urtica dioica*). Stagnant sections also contain Duckweed (*Lemna minor*).

8.3.2.2 (GA1) Improved agricultural grassland

This habitat refers to those grassland areas which comprise the heavily grazed fields on the site. Species present include Cocks foot (*Dactylis glomerata*), Bent (*Agrostis* spp.), and Meadow grass (*Poa* spp.). Ribwort plantain (*Plantago lanceolata*), Buttercup (*Ranunculus acris*), Daisy (*Bellis perennis*), and Nettle (*Urtica dioica*) are common along with Dandelion (*Taraxacum* spp.). The open grassland areas are heavily sheep grazed.

8.3.2.3 (WL1) Hedgerows

This habitat refers the site boundaries and internal dividing field boundaries. The predominant species present is Hawthorn (*Crataegus monogyna*) and Ash (Fraxinus excelsior) along with Alder (*Alnus glutinosa*) Blackthorn (*Prunus spinosa*) and Willow (*Salix* spp.).

The filed boundary hedgerows are generally poorly maintained and have large gaps and are undermined by grazing. Sections that have understorey flora includes Nettle stands and Bramble scrub.

8.3.3 Invasive Species

The sites were surveyed for invasive alien species during the habitat walkover. However, none were recorded on site.

There is a patch of Japanese Knotweed which was noted by the author for Irish Water during surveys of the R147 at the Bracetown Park, stop 134091 travelling N. The spread is c. 10m in length and will not affect the proposed grid connection as it is on the opposite side of the road but should be noted by the contractor for avoidance.

8.3.4 Fauna

8.3.4.1 Otters

There were no signs of otters in the site or along the central drainage ditches.

8.3.4.2 Badgers

There were no badger paw prints identified, no badger latrines or snuffle holes.

8.3.4.3 Bats

Trees on site were also examined for potential to house bat roosts. Only those trees at the crossing point from the new pylon on the western route into the adjacent field will be required to be felled. Given these are regularly maintained under the existing powerline, none were suitable.

8.3.4.4 Other mammals

There were signs of fox recorded along with rabbits. These species are of low ecological concern and are not protected.

8.3.4.5 Birds

All birds are protected under the Wildlife Acts. Species recorded included regular passerines such as Chaffinch (*Fringilla coelebs*), Blackbird (*Turdus merula*), Wren (*Troglodytes troglodytes*).

A list of breeding bird species recorded during fieldwork is presented in Table 8.3 below.

Table 8.3 *Details of birds encountered during fieldwork.*

Birds	Scientific name	BWI Status	Habitat Type
Blackbird	*Turdus merula*	Green	Dense woodland to open moorland, common in gardens
Chaffinch	*Fringilla coelebs*	Green	Hedgerows, gardens and farmland
Woodpigeon	*Columba palumbus*	Green	Gardens, woods, hedges
Wren	*Troglodytes troglodytes*	Green	Low cover anywhere, especially woodlands

8.3.5 Habitat Evaluation

The ecological value of the site was assessed following the guidelines set out in the Institute of Ecology and Environmental Management’s Guidelines for Ecological Impact Assessment (2019) and according to the Natura Scheme for evaluating ecological sites (after Nairn & Fossitt, 2004). Additionally, the TII Guidelines (formerly NRA) for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009) outlines the methodology for evaluating ecological impacts Judgements on the evaluation were made using geographic frames of reference, e.g. European, National, Regional or Local.

Due cognisance of features of the landscape which are of major importance for wild flora and fauna, such as those with a “*stepping stone*” and ecological corridors function, as referenced in Article 10 of the Habitats Directive were considered in this assessment.

There will be no significant effects on any of the European sites considered and therefore potential effects on European sites were excluded at a preliminary screening stage.

There are no rare or protected habitats recorded in the study areas.

The development area is of Low Local Ecological Value.

8.4 CHARACTERISTICS OF THE DEVELOPMENT

The proposed development works will include the construction n of a substation(Gunnocks) and two new pylons to facilitate the connection of underground cables on two routes one to the west linking to the M3 5 Interchange roundabout on the R157 and in the carriage of the R157 to the substation on site. A second route to the east linking to the Bracetown Road and in the carriage of the Bracetown Road to the substation on site and a rural connection.

A detailed description of the proposed development and a site layout is presented in Chapter 2 (Description of Development) and the included planning documentation.

8.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

8.5.1 Impacts on Habitats

There will be a minor loss of hedgerow and modified grassland habitats. The potential effects on local ecology are ***neutral*** and ***imperceptible*** for the construction and operational phases.

Deterioration in water quality as a result of elevated suspended solids or from chemical pollution is highly unlikely given the distance from the drainage ditches to the surrounding stream networks.

8.5.2 Impacts on Fauna

8.5.2.1 Otters

There are no predicted impacts on Otters as a result of the proposed development. There will be no direct impacts on otters as the drainage ditches on site have no fisheries value.

8.5.2.2 Badgers

There are no predicted impacts on badgers as there are no setts in the area and commuting routes will not be disturbed.

8.5.2.3 Bats

There are no predicted impacts on bats as the section of hedgerow to be remove is of low value and relatively short and commuting routes will not be disturbed.

8.5.2.4 Other Mammals

Foxes and rabbits are not legally protected and will move to adjacent suitable habitats.

8.5.2.5 Birds

All birds are protected under the Wildlife Acts. Potential impacts could occur if vegetation was removed during the bird nesting season.

8.6 REMEDIAL AND MITIGATION MEASURES

8.6.1 Mitigation for Fauna

8.6.1.1 Birds

Potential impacts on birds will be avoided by cutting of vegetation outside the bird nesting season March 1st to August 31st.

8.7 PREDICTED IMPACTS OF THE DEVELOPMENT

The proposed development will have a ***neutral imperceptible*** effect on the biodiversity of the development site.

There will be a loss of relatively low value local habitats including a short section of hedgerow and stagnant overgrown drainage ditches. The overall effect is considered ***neutral, imperceptible, and long-term.***

8.8 CUMULATIVE IMPACT ASSESSMENT

The cumulative impact of the proposed development with any/all relevant other planned or permitted developments as outlined in Chapter 3 (Planning and Development Context), including the concurrent data storage development proposal outlined in Chapter 2.

The Screening for an Appropriate Assessment, (provided in Appendix 8.1), considered the in-combination effects with the proposed substation development and subsurface grid connection options and consented developments. The Report for AA screening concluded that: there will be no in-combination effects and that can be excluded, on the basis of objective information, and in view of best scientific knowledge, that the proposed Project, either individually or in combination with other plans or projects, will have a significant effect on the relevant European sites, and therefore cumulative impacts, can be ruled out.

Cumulative operational phase impacts are not predicted as the grid connection will be buried underground once operational and the substation development will have no ongoing biodiversity impacts.

8.9 RESIDUAL IMPACTS

Specific local mitigation measures include the avoidance of cutting of vegetation during the bird nesting season with regard to the construction phase.

With the employment of appropriate mitigation measures with regard to local biodiversity, the Proposed Development will have a ***neutral imperceptible*** **and long-term effect** on biodiversity.

8.10 REFERENCES

- CIEEM (2019) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine; September 2018; Version 1.1 - Updated September 2019. Institute of Ecology and Environmental Management.
- Department of the Environment, Heritage and Local Government (2010) Guidance on Appropriate Assessment of Plans and Projects in Ireland (as amended February 2010).
- EC (2000) Managing Natura 2000 sites: the provisions of Article 6 of the ‘Habitats’ Directive 92/43/EEC.
- EC (2018) Managing Natura 2000 sites: the provisions of Article 6 of the ‘Habitats’ Directive 92/43/EEC.
- EC (2001) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43EEC. European Commission, Brussels.

- EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive '92/43/EEC: Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interests, compensatory measures, overall coherence and opinion of the Commission. European Commission, Brussels.
- EPA (2017) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. EPA, May 2017.
- Fossitt, J. (2000) A Guide to Habitats in Ireland. The Heritage Council.
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- Parnell, J. and T. Curtis (2012) Webb's An Irish Flora. Cork University Press.
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APPENDIX 8.1

Report for the purposes of Appropriate Assessment Screening

Moore Group (June, 2020)

Report for the purposes of Appropriate Assessment Screening

as required under Article 6(3) of the Habitats Directive
(Council Directive 92/43/EEC)

Proposed Substation and Grid Connection to Data Storage Facilities at Bracetown, Co. Meath

Prepared by: Moore Group – Environmental Services

26 June 2020

On behalf of EngineNode Ltd.
& Meath County Council

Project Proponent	EngineNode Ltd.
Project	Proposed Substation and Grid Connection Data Storage Facilities at Bracetown, Co. Meath
Title	Report for the purposes of Appropriate Assessment Screening Proposed Substation and Grid Connection Data Storage Facilities at Bracetown, Co. Meath

Project Number	19117	**Document Ref**	19117 EngineNode DSF GC AAS1 Rev0.docx
Revision	**Description**	**Author**	**Date**
Rev0	Issued for client review	G. O'Donohoe	26 June 2020
Moore Archaeological and Environmental Services Limited			

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Abbreviations

AA	Appropriate Assessment
EEC	European Economic Community
EPA	Environmental Protection Agency
EU	European Union
GIS	Geographical Information System
kV	Kilovolt
IW	Irish Water
LAP	Local Area Plan
NHA	Natural Heritage Area
NIS	Natura Impact Statement
NPWS	National Parks and Wildlife Service
OSI	Ordnance Survey Ireland
pNHA	proposed Natural Heritage Area
SAC	Special Area of Conservation
SPA	Special Protection Area
SUDS	Sustainable Urban Drainage System
WWTP	Waste Water Treatment Plant

1. Introduction

1.1. General Introduction

This Appropriate Assessment screening report has been prepared to support an application for planning permission for the proposed Project. The report contains information required for the competent authority to undertake screening for Appropriate Assessment (AA) on the potential for the substation and construction grid connection and rural/domestic supply to proposed Data Storage Facilities at Bracetown, Co. Meath (hereafter referred to as the proposed Project) to significantly affect European sites.

Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3) of Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) (referred to as the Habitats Directive):

I). whether a plan or project is directly connected to or necessary for the management of the site, and

II). whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site in view of its conservation objectives.

Having regard to the provisions of the Planning and Development Act 2000 (section 177U and 177V), the purpose of a screening exercise under section 177U of the PDA 2000 is to determine whether it is necessary to carry out an “appropriate assessment” of the implications for a European site of the proposed project. The trigger for the requirement for an “appropriate assessment” is that the project, either individually or in combination with other plans or projects, is “likely to have a significant effect” on the European site.

If the effects are deemed to be significant, potentially significant, or uncertain, or the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA). Screening should be undertaken without the inclusion of mitigation. If potential impacts clearly can be avoided through the modification or redesign of the plan or project, then the screening process is repeated on the altered plan or project.

When screening the project, there are two possible outcomes:

- the project poses no risk of a significant effect and as such requires no further assessment; and
- the project has potential to have a significant effect (or this is uncertain) and AA of the project is necessary.

This desktop report has been prepared by Moore Group - Environmental Services for Enginenode and Meath County Council and assesses the potential for the proposed Project to impact on sites of European-scale ecological importance in accordance with Articles 6(3) and 6(4) of the Habitats Directive. The report was compiled by Ger O’Donohoe (B.Sc. Applied Aquatic Sciences (GMIT, 1993) & M.Sc. Environmental Sciences (TCD, 1999)) who has 25 years' experience in environmental impact assessment and has completed numerous Appropriate Assessment Screening Reports and Natura Impact Statements on terrestrial and aquatic habitats.

1.2. Legislative Background - The Habitats and Birds Directives

It is necessary that the proposed Project has regard to Article 6 of the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) (referred to as the Habitats Directive). This is transposed into Irish Law by the European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. 477) (referred to as the Habitats Regulations).

The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) is the main legislative instrument for the protection and conservation of biodiversity in the European Union (EU). Under the Directive, Member States are obliged to designate Special Areas of Conservation (SACs) which contain habitats or species considered important for protection and conservation in a EU context.

The Birds Directive (Council Directive 79/409/EEC and Council Directive 2009/147/EC on the Conservation of Wild Birds), is concerned with the long-term protection and management of all wild bird species and their habitats in the EU. Among other things, the Directive requires that Special Protection Areas (SPAs) be established to protect migratory species and species which are rare, vulnerable, in danger of extinction, or otherwise require special attention.

Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas, designated under the Birds Directive, form a pan-European network of protected sites known as Natura 2000. The Habitats Directive sets out a unified system for the protection and management of SACs and SPAs. These sites are also referred to as European sites.

Articles 6(3) and 6(4) of the Habitats Directive set out the requirement for an assessment of proposed plans and projects likely to affect Natura 2000 sites.

Article 6(3) establishes the requirement to screen all plans and projects and to carry out a further assessment if required (Appropriate Assessment (AA)):

> ***Article 6(3):*** *"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to an appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."*

> ***Article 6(4):*** *"If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of the Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and/or a priority species the only considerations which may be raised are those relating to human health or public safety, to the beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest."*

2. Methodology

The Commission's methodological guidance (EC, 2002) promotes a four-stage process to complete the AA and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

Stages 1 and 2 deal with the main requirements for assessment under Article 6(3). Stage 3 may be part of Article 6(3) or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

Stage 1 Screening: This stage examines the likely effects of a project either alone or in combination with other projects upon a Natura 2000 site and considers whether it can be objectively concluded that there are not likely to be significant effects on a Natura 2000 site. Mitigation measures (i.e., measures intended to avoid or reduce the harmful effects of the project on the site concerned) cannot be taken into account at this stage.

Stage 2 Appropriate Assessment: In this stage, there is a consideration of the impact of the project with a view to ascertain whether there will be any adverse effect on the integrity of the Natura 2000 site either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are predicted impacts, an assessment of the potential mitigation of those impacts is considered.

Stage 3 Assessment of Alternative Solutions: This stage examines alternative ways of implementing the project that, where possible, avoid any adverse impacts on the integrity of the Natura 2000 site.

Stage 4 Assessment where no alternative solutions exist and where adverse impacts remain: Where imperative reasons of overriding public interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the sites will be necessary.

To ensure that the proposed Project complies fully with the requirements of Article 6 of the Habitats Directive and all relevant Irish transposing legislation, Moore Group compiled this report to inform the screening for AA of the proposed Project to be undertaken by the competent authority to determine if the next stage (Stage 2) of the AA process is required.

2.1. Guidance

This report has been compiled in accordance with guidance contained in the following documents:

- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities. (Department of Environment, Heritage and Local Government, 2010 rev.).
- Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPWS 1/10 & PSSP 2/10.
- Assessment of Plans and Projects Significantly Affecting Natura 2000 sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission Environment Directorate-General, 2001); hereafter referred to as the EC Article Guidance Document.
- Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC (EC Environment Directorate-General, 2000); hereafter referred to as MN2000.
- Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC (EC, 2018).

2.2. Data Sources

Sources of information that were used to collect data on the Natura 2000 network of sites, and the environment within which they are located, are listed below:

- The following mapping and Geographical Information Systems (GIS) data sources, as required:
    - National Parks & Wildlife (NPWS) protected site boundary data;
    - Ordnance Survey of Ireland (OSI) mapping and aerial photography;
    - OSI/Environmental Protection Agency (EPA) rivers and streams, and catchments;
    - Open Street Maps;
    - Digital Elevation Model over Europe (EU-DEM);
    - Google Earth and Bing aerial photography 1995-2019;
- Online data available on Natura 2000 sites as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie including:
    - Natura 2000 - Standard Data Form;
    - Conservation Objectives;
    - Site Synopses;
- National Biodiversity Data storage facility records;
    - Online database of rare, threatened and protected species;
    - Publicly accessible biodiversity datasets.
- Status of EU Protected Habitats in Ireland. (National Parks & Wildlife Service, 2019); and

- Relevant Development Plans in neighbouring areas;
    - Meath County Development Plan 2013 - 2019

3. Description of the proposed Project

This report presents a screening assessment for the proposed development works will include the construction of a substation (Gunnocks) , two new pylons to facilitate the connection of underground cables on two routes one to the west linking to the M3 5 Interchange roundabout on the R157 and in the carriage of the R157 to the substation on site. A second route to the east linking to the Bracetown Road and in the carriage of the Bracetown Road to the planned substation on site and a local rural/domestic supply.

The project location is presented on Figure 1 and the locations of the proposed substation, new pylons and routes of the proposed grid connections are presented in Figure 2.

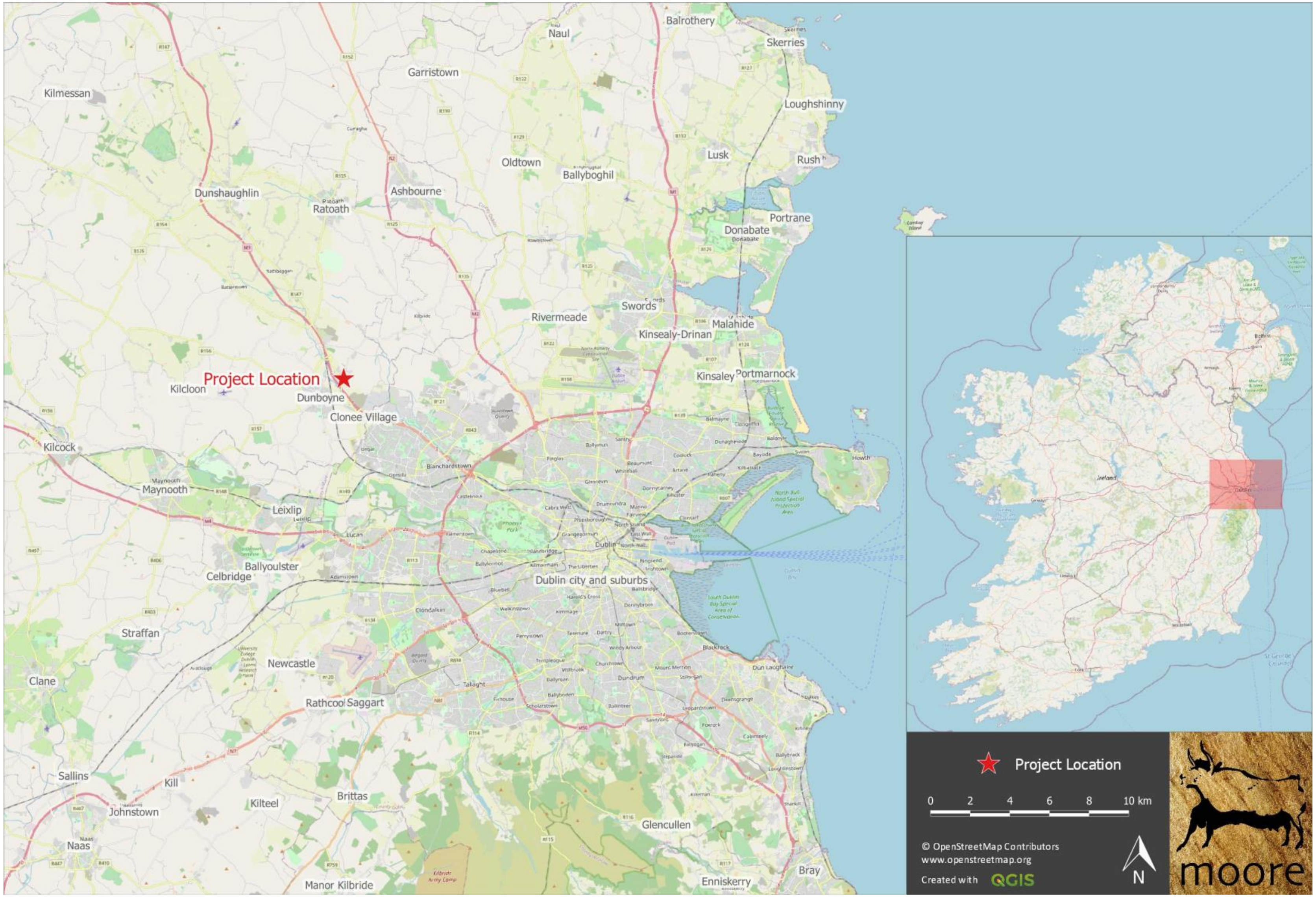

Figure 1. Showing the proposed Project location near Bracetown, Co. Meath.

Figure 2. Showing the proposed Project on recent aerial photography.

4. Identification of Natura 2000 Sites

4.1. Description of Natura Sites Potentially Affected

Department of Environment, Heritage and Local Government (2009) Guidance on Appropriate Assessment recommends an assessment of European sites within a zone of impact of 15 km. This distance is a guidance only and the zone of impact has been identified taking consideration of the nature and location of the proposed Project to ensure all European sites with connectivity to it are considered in terms of a catchment-based assessment.

The zone of impact may be determined by connectivity to the proposed Project in terms of:

- Nature, scale, timing and duration of works and possible impacts, nature and size of excavations, storage of materials, flat/sloping sites;
- Distance and nature of pathways (dilution and dispersion; intervening 'buffer' lands, roads etc.); and
- Sensitivity and location of ecological features.

The guidance provides that, at the screening stage, it is necessary to identify the sites and compile information on their qualifying interests and conservation objectives. In preparation for this, the potential for source pathway receptor connectivity is firstly identified and detailed information is then provided on sites with connectivity. European sites that are located within 15 km of the proposed Project are listed in Table 1 and presented in Figure 4, below. Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on the 20th November 2019.

Table 1 European Sites located within 15km or the potential zone of impact[1] of the Project site.

Site Code	Site name	Distance (km)[2]
001398	Rye Water Valley/Carton SAC	6.54
000206	North Dublin Bay SAC	19.60
000210	South Dublin Bay SAC	19.10
004024	South Dublin Bay and River Tolka Estuary SPA	16.80
004006	North Bull Island SPA	19.60

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project site. A review of the Environmental Protection Agency's (EPA) Water Framework Directive (WFD) catchment data indicates that the proposed Project is located in the River Tolka catchment. Downstream within this catchment are the Dublin Bay European sites, including South Dublin Bay and River Tolka Estuary SPA (Site Code 004024), North

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[1] All European sites potentially connected irrespective of the nature or scale of the proposed Project.

[2] Distances indicated are the closest geographical distance between the proposed Project and the European site boundary, as made available by the NPWS. Connectivity along hydrological pathways may be significantly greater.

Dublin Bay SAC (Site Code 000206) and North Bull island SPA (Site Code 004006), which are located over 23 river km downstream.

There are no predicted effects on any European sites in Dublin Bay given the distance between the proposed Project and any downstream European Sites at over 23 river km.

Having considered the above, significant effects on any European sites as a result of the proposed Project can be ruled out and potential significant effects on European sites can be excluded at a preliminary screening stage.

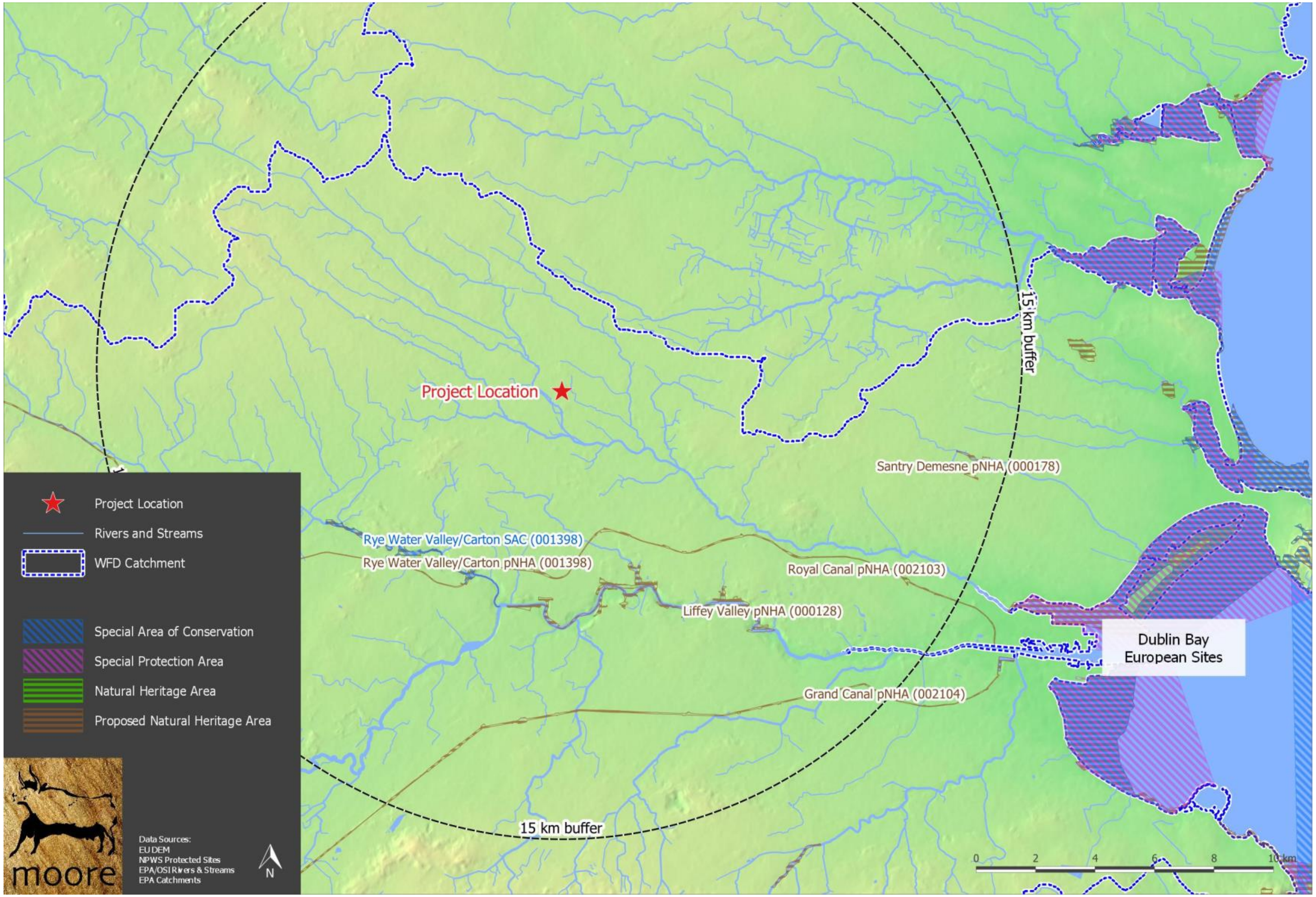

Figure 3. Showing European sites and NHAs/pNHAs within 15 km of the proposed Project.

4.2. Ecological Network Supporting Natura 2000 Sites

An analysis of the proposed Natural Heritage Areas (pNHA) and designated Natural Heritage Areas (NHA) in terms of their role in supporting the species using Natura 2000 sites was undertaken. It was assumed that these supporting roles mainly related to mobile fauna such as mammals and birds which may use pNHAs and NHAs as "stepping stones" between Natura 2000 sites.

Article 10 of the Habitats Directive and the Habitats Regulations 2011 place a high degree of importance on such non-Natura 2000 areas as features that connect the Natura 2000 network. Features such as ponds, woodlands and important hedgerows were taken into account during the rest of the AA process.

There are proposed Natural Heritage Areas associated with Dublin Bay, however, for the purposes of this AA screening report these areas are dealt with under their higher conservation status designations as European Sites.

5. Identification of Potential Impacts & Assessment of Significance

The proposed Project is not directly connected with or necessary to the management of the sites considered in the assessment and therefore potential impacts must be identified and considered.

5.1. Potential Impacts

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project.

There are no predicted effects on any European sites given the distance between the proposed Project and any downstream European Sites, over 23 river km downstream.

Having considered the above, significant effects on any European sites as a result of the proposed Project have been ruled out and potential significant effects on European sites have been excluded at a preliminary screening stage.

5.2. Assessment of Potential In-Combination Effects

Cumulative impacts or effects are changes in the environment that result from numerous human-induced, small-scale alterations. Cumulative impacts can be thought of as occurring through two main pathways: first, through persistent additions or losses of the same materials or resource, and second, through the compounding effects as a result of the coming together of two or more effects.

As part of the Screening for an Appropriate Assessment, in addition to the proposed Project, other relevant plans and projects in the area must also be considered at this stage. This step aims to identify at this early stage any possible significant in-combination effects of the proposed development with other such plans and projects on European sites.

A review of data made available through the planning section of the Meath County Council website indicates that, within the last three years, there have been 5 applications for planning granted permission in the vicinity of Bracetown and 8 for the townland of Gunnocks relating to the Runways Information Services Limited data storage facility, details below.

File Number	**Applicant Name**	**Development Address**	**Development Description**
FS18050	Axial Properties Ltd,	Bracetown Business Park, Clonee, Co Meath	proposed three storey extension to the existing office building, to be known as Block C.
RA170114	Axial Properties Ltd.	Block 4 (Unit 15), Bracetown Business Park, Clonee, Co. Meath	a single storey pitched roof structure and dock leveller with associated ramp and ancillary site works.
RA170586	Axial Properties Ltd	Bracetown Business Park, Bracetown, Clonee, Co. Meath	the proposed development will consist of an extension to existing office accommodation.
RA181060	Three Ireland (Hutchison) Ltd	Bracetown Business Park, Bracetown, Clonee, Co. Meath	the construction of a 45m high telecommunications support structure.
RA181241	Conor Delaney, Delpin Enterprises Ltd	Bracetown, Dunboyne, Co. Meath	the importation of clay only for land reclamation and reinstatement purposes. The development also consist of the construction of a temporary entrance to facilitate access off main road.

The majority of these Projects are small scale or as in the case of the last listed have been assessed in terms of AA Screening and a determination made that there would be no significant impacts on European sites considered or in combination effects on European sites considered.

FS18127	Runways Information Services Limited (RISL),	lands within the townlands of Portan, Gunnocks, Loughsallagh and Clonee, Co Meath	construction of a single storey data storage facility building of approximately 63,000m2 containing two main data halls bars each connected by a central administration building.
FS18128	Runways Information Services Limited (RISL),	lands within the townlands of Portan, Gunnocks, Loughsallagh and Clonee, Co Meath	construction of a security guard house with area of circa 60m2 serving a new data storage facility building.
FS19004	Electricity Supply Board (ESB),	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Eirgrid Control Building.
FS19005	Electricity Supply Board (ESB),	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Eirgrid Diesel Generator Building.

FS19006	Runways Information Services Limited,	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Customer Control Building.
RA160937	Runways Information Services Limited	Portan, Gunnocks and Clonee, County Meath	The development will consist of the minor alteration to the previously approved road layout as part of Data storage facility Campus.
RA180048	Runways Information Services Limited	Lands at Portan, Gunnocks & Clonee, County Meath - bounded to the south by the R147, to the west by the Kilbride Road, to the north by The Mayne and to the east by lands at Damastown Industrial Park.	the development will consist of alterations to a previously approved Data storage facility Campus.
RA180671	Runways Information Services Limited (RISL)	Portan, Gunnocks, Loughsallagh & Clonee, Co. Meath	the proposed development will consist of an expansion of the existing approved Data storage facility Campus.

These applications have been assessed under the Habitats Directive legislation where required and a finding of no significant effects was determined in each case. There are no predicted impacts from the proposed Project on European sites and therefore there are no predicted in-combination or cumulative effects.

The Meath County Development Plan in complying with the requirements of the Habitats Directive requires that all Projects and Plans that could affect the Natura 2000 sites in the same zone of impact of the Project site would be initially screened for Appropriate Assessment and if requiring Stage 2 AA, that appropriate employable mitigation measures would be put in place to avoid, reduce or ameliorate negative impacts. In this way any, in-combination impacts with Plans or Projects for the development area and surrounding townlands in which the development site is located, would be avoided.

Any new applications for the Project area will be assessed on a case by case basis by Meath County Council which will determine the requirement for AA Screening as per the requirements of Article 6(3) of the Habitats Directive.

6. Conclusion

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project.

There are no predicted effects on any European sites given the distance between the proposed Project and any downstream European Sites, over 23 river km downstream.

Having considered the above, significant effects on any European sites as a result of the proposed Project have been ruled out and potential significant effects on European sites have been excluded at a preliminary screening stage.

It has been objectively concluded by Moore Group Environmental Services that:

1. The proposed Project is not directly connected with, or necessary to the conservation management of the European sites considered in this assessment.
2. The proposed Project is unlikely to indirectly significantly affect the Qualifying interests or Conservation Objectives of the European sites considered in this assessment.
3. The proposed Project, alone or in combination with other projects, is not likely to have significant effects on the European sites considered in this assessment in view of their conservation objectives.
4. It is possible to conclude that significant effects can be excluded at the screening stage.

It can be excluded, on the basis of objective information, and in view of best scientific knowledge, that the proposed Project, either individually or in combination with other plans or projects, will have a significant effect on the relevant European sites.

It is the view of Moore Group Environmental Services that it is not necessary to undertake any further stage of the Appropriate Assessment process.

A finding of no significant effects report is presented in Appendix A in accordance with the EU Commission’s methodological guidance (European Commission, 2002).

7. References

Department of the Environment, Heritage and Local Government (2010) Guidance on Appropriate Assessment of Plans and Projects in Ireland (as amended February 2010).

European Commission (2000) Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.

European Commission Environment DG (2002) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43EEC. European Commission, Brussels.

European Commission (2007) Guidance document on Article 6(4) of the 'Habitats Directive '92/43/EEC: Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interests, compensatory measures, overall coherence and opinion of the Commission. European Commission, Brussels.

European Commission (2018) Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.

NPWS (2020) The Status of EU Protected Habitats and Species in Ireland. National Parks and Wildlife Service, Department of the Culture, Heritage and Local Government, Dublin.

NPWS (2020) National Parks and Wildlife Service Metadata available online at https://www.npws.ie/maps-and-data

Appendix A

FINDING OF NO SIGNIFICANT EFFECTS REPORT

Finding no significant effects report matrix

Name of project or plan

Grid Connection to Data storage facilities at Bracetown, Co. Meath

Name and location of the Natura 2000 site(s)

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project. A review of the Environmental Protection Agency's (EPA) Water Framework Directive (WFD) catchment data indicates that the proposed Project is located in the River Tolka catchment. Downstream within this catchment are the Dublin Bay European sites, including South Dublin Bay and River Tolka Estuary SPA (Site Code 004024), North Dublin Bay SAC (Site Code 000206) and North Bull island SPA (Site Code 004006), which are located over 23 river km downstream and given the employment of SuDS systems in the design of the Data Storage Facility.

Description of the project or plan

This report presents a screening assessment for the construction of two new pylons to facilitate the connection of underground cables on two routes one to the west linking to the M3 5 Interchange roundabout on the R157 and in the carriage of the R157 to the substation on site. A second route to the east linking to the Bracetown Road and in the carriage of the Bracetown Road to the substation on site.

Is the project or plan directly connected with or necessary to the management of the site(s)

No

Are there other projects or plans that together with the projects or plan being assessed could affect the site

A review of data made available through the planning section of the Meath County Council website indicates that, within the last three years, there have been 5 applications for planning granted permission in the vicinity of Bracetown and 8 for the townland of Gunnocks relating to the Runways Information Services Limited data storage facility, details below.

File Number	Applicant Name	Development Address	Development Description
FS18050	Axial Properties Ltd,	Bracetown Business Park, Clonee, Co Meath	proposed three storey extension to the existing office building, to be known as Block C.
RA170114	Axial Properties Ltd.	Block 4 (Unit 15), Bracetown Business Park, Clonee, Co. Meath	a single storey pitched roof structure and dock leveller with associated ramp and ancillary site works.
RA170586	Axial Properties Ltd	Bracetown Business Park, Bracetown, Clonee, Co. Meath	the proposed development will consist of an extension to existing office accommodation.

RA181060	Three Ireland (Hutchison) Ltd	Bracetown Business Park, Bracetown, Clonee, Co. Meath	the construction of a 45m high telecommunications support structure.
RA181241	Conor Delaney, Delpin Enterprises Ltd	Bracetown, Dunboyne, Co. Meath	the importation of clay only for land reclamation and reinstatement purposes. The development also consist of the construction of a temporary entrance to facilitate access off main road.

The majority of these Projects are small scale or as in the case of the last listed have been assessed in terms of AA Screening and a determination made that there would be no significant impacts on European sites considered or in combination effects on European sites considered.

FS18127	Runways Information Services Limited (RISL),	lands within the townlands of Portan, Gunnocks, Loughsallagh and Clonee, Co Meath	construction of a single storey data storage facility building of approximately 63,000m2 containing two main data halls bars each connected by a central administration building.
FS18128	Runways Information Services Limited (RISL),	lands within the townlands of Portan, Gunnocks, Loughsallagh and Clonee, Co Meath	construction of a security guard house with area of circa 60m2 serving a new data storage facility building.
FS19004	Electricity Supply Board (ESB),	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Eirgrid Control Building.
FS19005	Electricity Supply Board (ESB),	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Eirgrid Diesel Generator Building.

FS19006	Runways Information Services Limited,	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Customer Control Building.
RA160937	Runways Information Services Limited	Portan, Gunnocks and Clonee, County Meath	The development will consist of the minor alteration to the previously approved road layout as part of Data storage facility Campus.
RA180048	Runways Information Services Limited	Lands at Portan, Gunnocks & Clonee, County Meath - bounded to the south by the R147, to the west by the Kilbride Road, to the north by The Mayne and to the east by lands at Damastown Industrial Park.	the development will consist of alterations to a previously approved Data storage facility Campus.
RA180671	Runways Information Services Limited (RISL)	Portan, Gunnocks, Loughsallagh & Clonee, Co. Meath	the proposed development will consist of an expansion of the existing approved Data storage facility Campus.

These applications have been assessed under the Habitats Directive legislation where required and a finding of no significant effects was determined in each case. There are no predicted impacts from the proposed Project on European sites and therefore there are no predicted in-combination or cumulative effects

The Meath County Development Plan in complying with the requirements of the Habitats Directive requires that all Projects and Plans that could affect the Natura 2000 sites in the same zone of impact of the Project site would be initially screened for Appropriate Assessment and if requiring Stage 2 AA, that appropriate employable mitigation measures would be put in place to avoid, reduce or ameliorate negative impacts. In this way any, in-combination impacts with Plans or Projects for the development area and surrounding townlands in which the development site is located, would be avoided.

Any new applications for the Project area will be assessed on a case by case basis by Meath County Council which will determine the requirement for AA Screening as per the requirements of Article 6(3) of the Habitats Directive.

THE ASSESSMENT OF SIGNIFICANCE OF EFFECTS

Describe how the project or plan (alone or in combination) is likely to affect the Natura 2000 site.

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project.

There are no predicted effects on any European sites given the distance between the proposed Project and any downstream European Sites, over 23 river km downstream.

Having considered the above, significant effects on any European sites as a result of the proposed Project have been ruled out and potential significant effects on European sites have been excluded at a preliminary screening stage.

Explain why these effects are not considered significant.

See above

List of agencies consulted: provide contact name and telephone or e-mail address

The requirement for Appropriate Assessment Screening was determined during pre-planning discussions with Meath County Council.

Response to consultation

N/A.

DATA COLLECTED TO CARRY OUT THE ASSESSMENT

Who carried out the assessment

Moore Group Environmental Services.

Sources of data

NPWS database of designated sites at www.npws.ie

National Biodiversity Data storage facility database http://maps.biodiversityireland.ie

Level of assessment completed

Desktop Assessment.

Where can the full results of the assessment be accessed and viewed

Meath County Council Planning Section.

OVERALL CONCLUSIONS

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project.

There are no predicted effects on any European sites given the distance between the proposed Project and any downstream European Sites, over 23 river km downstream.

Having considered the above, significant effects on any European sites as a result of the proposed Project have been ruled out and potential significant effects on European sites have been excluded at a preliminary screening stage.

It has been objectively concluded by Moore Group Environmental Services that:

1. The proposed Project is not directly connected with, or necessary to the conservation management of the European sites considered in this assessment.
2. The proposed Project is unlikely to indirectly significantly affect the Qualifying interests or Conservation Objectives of the European sites considered in this assessment.
3. The proposed Project, alone or in combination with other projects, is not likely to have significant effects on the European sites considered in this assessment in view of their conservation objectives.

4. It is possible to conclude that significant effects can be excluded at the screening stage.

It is the view of Moore Group Environmental Services that it is not necessary to undertake any further stage of the Appropriate Assessment process.

It can be excluded, on the basis of objective information, and in view of best scientific knowledge, that the proposed Project, either individually or in combination with other plans or projects, will have a significant effect on the relevant European sites.

9.0 AIR QUALITY & CLIMATE

9.1 INTRODUCTION

This chapter assesses the likely air quality and climate related impacts, if any, associated with the proposed grid connection and substation development associated with a data storage development at Bracetown, Co. Meath. The proposed development will involve the installation of underground cables and construction of a substation building.

9.2 METHODOLOGY

9.2.1 Criteria for Rating of Impacts

9.2.1.1 Ambient 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. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set.

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 SO_2, NO_2, PM_{10}, $PM_{2.5}$, benzene and CO, with those for NO_2, PM_{10} and $PM_{2.5}$ being applicable for this assessment (see Table 9.1).

Table 9.1 Air Quality Standards Regulations

Pollutant	Regulation Note 1	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
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
Dust Deposition	TA Luft (German VDI 2002)	Annual average limit for nuisance dust	350 mg/(m^2*day)

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

9.2.1.2 Dust Deposition Guidelines

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 9.1 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 immission level for dust deposition of 350 mg/(m^2*day) averaged over a one year period at any receptors outside the site boundary. Recommendations from the Department of the Environment, Health & Local Government (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.

9.2.1.3 Gothenburg Protocol

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. In 2012, the Gothenburg Protocol was revised to include national emission reduction commitments for the main air pollutants to be achieved in 2020 and beyond and to include emission reduction commitments for $PM_{2.5}$.

European Commission Directive 2001/81/EC and the National Emissions Ceiling Directive (NECD), prescribes the same emission limits as the 1999 Gothenburg Protocol. A National Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005. The data available from the EPA in 2020 (EPA, 2020a) indicated that Ireland complied with the emissions ceilings all pollutants. Directive (EU) 2016/2284 "*On the Reduction of National Emissions of Certain Atmospheric Pollutants and Amending Directive 2003/35/EC and Repealing Directive 2001/81/EC*" was published in December 2016. The Directive will apply the 2010 NECD limits until 2020 and establish new national emission reduction commitments which will be applicable from 2020 and 2030 for SO_2, NO_X, NMVOC, NH_3, $PM_{2.5}$ and CH_4. In relation to Ireland, 2020 emission targets are 25.5 kt for SO_2 (65% on 2005 levels), 66.9 kt for NO_X (49% reduction on 2005 levels), 56.9 kt for NMVOCs (25% reduction on 2005 levels), 112 kt for NH_3 (1% reduction on 2005 levels) and 15.6 kt for $PM_{2.5}$ (18% reduction on 2005 levels). In relation to 2030, Ireland's emission targets are 10.9 kt (85% below 2005 levels) for SO_2, 40.7 kt (69% reduction) for NO_x, 51.6 kt (32% reduction) for NMVOCs, 107.5 kt (5% reduction) for NH_3 and 11.2 kt (41% reduction) for $PM_{2.5}$.

9.2.1.4 Climate Agreements & Legislation

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). The UNFCCC is continuing detailed negotiations in relation to GHGs 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) took place in Madrid, Spain from the 2nd to 13th December 2019 and focussed on advancing the implementation of the Paris Agreement. The Paris Agreement was established at COP21 in Paris in 2015 and is an important milestone in terms of international climate change agreements. The Paris Agreement is currently ratified by 187 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 greenhouse gas emissions will be based on Intended Nationally Determined Contributions (INDCs) which 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, in October 2014, agreed the “2030 Climate and Energy Policy Framework” (EU, 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 target will be delivered collectively by the EU in the most cost-effective manner possible, with the reductions in the ETS and non-ETS sectors amounting to 43% and 30% by 2030 compared to 2005, respectively. Secondly, it was agreed that all Member States will participate in this effort, balancing considerations of fairness and solidarity. The policy also outlines, under “Renewables and Energy Efficiency”, an EU binding target of at least 27% for the share of renewable energy consumed in the EU in 2030.

The “*Draft National Energy and Climate Plan (NECP) 2021-2030*” (Government of Ireland, 2018) was published in December 2018 and was 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.

In order to meet the objectives of the Paris Agreement and to reduce Ireland’s GHG emissions the Irish government is establishing several policies at a national level. The Climate Action and Low Carbon Development Act 2015 (Government of Ireland, 2015) was developed to provide for the approval of plans by the government in relation to climate change and to enable achievement of the national transition objective of achieving decarbonisation by 2050. Under this Act the National Mitigation Plan (DCCAE, 2017) and the National Adaptation Framework (DCCAE, 2018) were established. The National Mitigation Plan sets out objectives for achieving a reduction in GHG emissions and transitioning the four key sectors (power generation, built environment, transport and agriculture) to decarbonisation, while the National Adaptation Framework aims to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts. Under the National Adaptation Framework each local authority was obligated to produce a Climate Adaptation Strategy for their functional area detailing the risks and challenges posed by climate change and the measures that will be put in place to adapt to those climatic changes.

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.

9.2.2 Construction Phase

9.2.2.1 Air Quality

The Institute of Air Quality Management in the UK (IAQM) guidelines (2014) outline an assessment method for predicting the impact of dust emissions from demolition, earthworks, construction and haulage activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this development in order to predict the likely magnitude of the dust impacts in the absence of mitigation measures.

Construction phase traffic also has the potential to impact air quality and climate. The UK Highways Agency guidance *LA 150* (2019a) states the following scoping criteria shall be used to determine whether the air quality impacts of a project can be scoped out or require an assessment based on the changes between the do something traffic (with the project) compared to the do minimum traffic (without the project). The TII guidance (2011) was based on the previous version of the UK DMRB guidance (UK Highways Agency, 2007) and notes that the TII guidance should be adapted for updates to the DMRB (see Section 1.1 of *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, 2011)* .

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- A change in speed band;
- A change in carriageway alignment by 5m or greater.

In addition, the impact of construction activities on vehicle movements shall be assessed where construction activities are programmed to last for more than 2 years (UK Highways Agency, 2019). None of the impacted road links meet the above scoping criteria and the construction phase will be less than 2 years, therefore, a detailed assessment has been scoped out as impacts are not considered to be significant.

9.2.2.2 Climate

The impact of the construction phase of the development on climate was determined by a qualitative assessment of the nature and scale of greenhouse gas generating construction activities associated with the proposed development.

9.2.3 Operational Phase

9.2.3.1 Air Quality

The air quality assessment has been carried out following procedures described in the publications by the EPA (2015; 2017) and using the methodology outlined in the guidance documents published by the UK Highways Agency (2019a) and UK Department of Environment Food and Rural Affairs (DEFRA) (2016; 2018). Transport Infrastructure Ireland (TII) reference the use of the UK Highways Agency and DEFRA guidance and methodology in their document Guidelines for the Treatment of Air

Quality During the Planning and Construction of National Road Schemes (2011). This approach is considered best practice in the absence of Irish guidance and can be applied to any development that causes a change in traffic.

In 2019 the UK Highways Agency DMRB air quality guidance was revised with *LA 105 Air Quality* replacing a number of key pieces of guidance (HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15). This revised document outlines a number of changes for air quality assessments in relation to road schemes but can be applied to any development that causes a change in traffic. Previously the DMRB air quality spreadsheet was used for the majority of assessments in Ireland with detailed modelling only required if this screening tool indicated compliance issues with the EU air quality standards. Guidance from Transport Infrastructure Ireland (TII, 2011) recommends the use of the UK Highways Agency DMRB spreadsheet tool for assessing the air quality impacts from road schemes. However, the DMRB spreadsheet tool was last revised in 2007 and accounts for modelled years up to 2025. Vehicle emission standards up to Euro V are included but since 2017, Euro 6d standards are applicable for the new fleet. In addition, the model does not account for electric or hybrid vehicle use. Therefore, this a somewhat outdated assessment tool. The LA 105 guidance document states that the DMRB spreadsheet tool may still be used for simple air quality assessments where there is unlikely to be a breach of the air quality standards. Due to its use of a “dirtier” fleet, vehicle emissions would be considered to be higher than more modern models and therefore any results will be conservative in nature and will provide a worst-case assessment.

The 2019 UK Highways Agency DMRB air quality revised guidance LA 105 Air Quality states that modelling should be conducted for NO_2 for the base, opening and design years for both the do minimum (do nothing) and do something scenarios. Modelling of PM_{10} is only required for the base year to demonstrate that the air quality limit values in relation to PM_{10} are not breached. Where the air quality modelling indicates exceedances of the PM_{10} air quality limits in the base year then PM_{10} should be included in the air quality model in the do minimum and do something scenarios. Modelling of $PM_{2.5}$ is not required as there are currently no issues with compliance with regard to this pollutant. The modelling of PM_{10} can be used to show that the project does not impact on the $PM_{2.5}$ limit value as if compliance with the PM_{10} limit is achieved then compliance with the $PM_{2.5}$ limit will also be achieved. Historically modelling of carbon monoxide (CO) and benzene (Bz) was required however, this is no longer needed as concentrations of these pollutants have been monitored to be significantly below their air quality limit values in recent years, even in urban centres (EPA, 2019a).

The UK Highways Agency guidance LA 150 (2019a) scoping criteria outlined in Section 9.2.2.1 was used to determine the road links required for inclusion in the modelling assessment. As there will be minimal vehicles required for the operational phase of the development no road links meet the scoping criteria. Therefore, a detailed assessment was not required as there is no potential for significant impacts to air quality during operation.

9.2.3.2 Climate

The UK Highways Agency has published an updated DMRB guidance document in relation to climate impact assessments *LA 114 Climate* (UK Highways Agency 2019b). The following scoping criteria are used to determine whether a detailed climate assessment is required for a proposed project during the operational stage:

a) a change of more than 10% in AADT;
b) a change of more than 10% to the number of heavy duty vehicles; and
c) a change in daily average speed of more than 20 km/hr.

If one or more road links meet the above criteria then further assessment is required. However, none of the road links impacted by the proposed development during operation meet the above scoping criteria and therefore a detailed assessment has been scoped out.

9.3 RECEIVING ENVIRONMENT

9.3.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (WHO, 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed.

The nearest representative weather station collating detailed weather records is Casement Aerodrome, which is located approximately 14 km south of the proposed development. Casement Aerodrome met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 9.1). For data collated during five representative years (2015 - 2019), the predominant wind direction is westerly to south-westerly with generally moderate wind speeds, averaging around 5.5 m/s.

Dust emissions are dramatically reduced where rainfall has occurred, due to the cohesion created between dust particles and water and the removal of suspended dust from the air. It is typical to assume no dust is generated under “wet day” conditions where rainfall greater than 0.2 mm has fallen. Information collected from Casement Meteorological Station (1981 - 2010) identified that typically 183 days per annum are “wet” (Met Eireann, 2020).

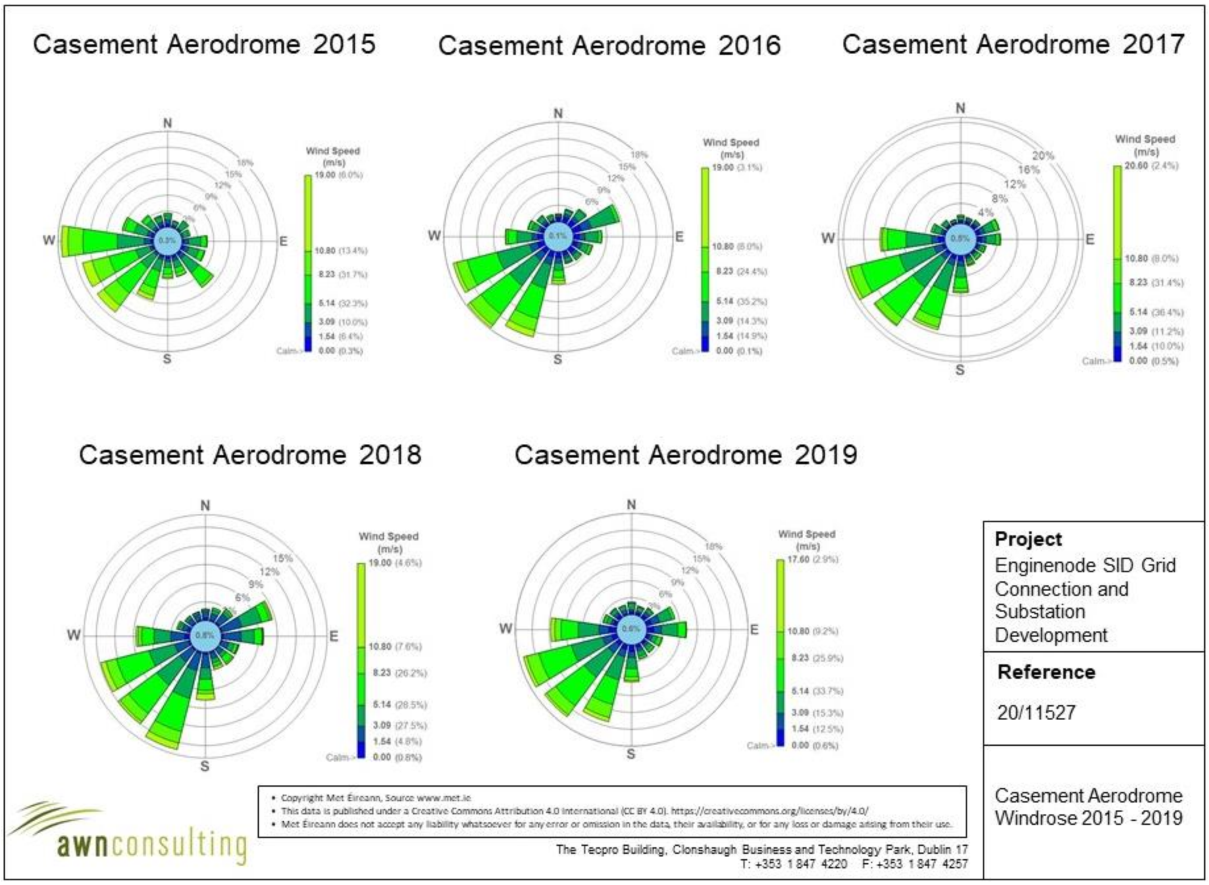

Figure 9.1 Casement Aerodrome Windrose 2015 - 2019

9.3.2 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, 2020b).

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, 2019a). 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 is within Zone D (EPA, 2019a). The long-term monitoring data has been used to determine background concentrations of NO_2 and particulate matter in the region of the proposed development site. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

NO_2 monitoring was carried out at two rural Zone D locations in recent years, Emo and Kilkitt and an urban area, Castlebar (EPA, 2019a). The NO_2 annual average in 2018 for both rural sites, Emo and Killkitt 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 ranging from 2 to 9 μg/m^3 (see Table 9.2). Based on the above information, a conservative estimate of the current background NO_2 concentration of 10 μg/m^3 has been used in the assessment.

Table 9.2 Trends In Zone D Air Quality - Nitrogen Dioxide (μg/m^3)

Station	**Averaging Period** Notes 1, 2	**Year**				
		2014	**2015**	**2016**	**2017**	**2018**
Castlebar	Annual Mean NO_2 (μg/m^3)	8	8	9	7	8
	99.8th %ile 1-hr NO_2 (μg/m^3)	71.2	-	65.6	59.8	60.2
Kilkitt	Annual Mean NO_2 (μg/m^3)	3	2	3	2	3
	99.8th %ile 1-hr NO_2 (μg/m^3)	26.9	-	26.1	17.0	22.3
Emo	Annual Mean NO_2 (μg/m^3)	3	3	4	3	3
	99.8th %ile 1-hr NO_2 (μg/m^3)	25.5	-	35.5	27.5	41.6

Note 1 Annual average limit value - 40 μg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 1-hour limit value - 200 μg/m^3 as a 98th%ile, i.e. not to be exceeded >18 times per year (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Long-term PM_{10} monitoring was carried out at the urban Zone D locations of Castlebar, and Claremorris in recent years. The average annual mean concentration measured at Castlebar and Claremorris in 2018 was 11 μg/m^3 and 12 μg/m^3 respectively (Table 9.3). Long-term PM_{10} measurements carried out at the rural Zone D location in Kilkitt in 2018 gave an average level of 9 μg/m^3 (EPA, 2019a). In addition, data from the Phoenix Park provides a good indication of urban background levels, with an annual average in 2018 of 11 μg/m^3 (EPA, 2019a). Based on the above information a conservative background concentration of 12 μg/m^3 has been used in this assessment.

Table 9.3 Trends In Zone D Air Quality - PM_{10}

Station	**Averaging Period** Notes 1, 2	**Year**				
		2014	**2015**	**2016**	**2017**	**2018**
Castlebar	Annual Mean PM_{10} (μg/m^3)	12	13	12	11	11
	24-hr Mean > 50 μg/m^3 (days)	2	2	1	1	0
Kilkitt	Annual Mean PM_{10} (μg/m^3)	9	9	8	8	9
	24-hr Mean > 50 μg/m^3 (days)	2	1	0	0	0
Claremorris	Annual Mean PM_{10} (μg/m^3)	10	10	10	11	12
	24-hr Mean > 50 μg/m^3 (days)	0	0	0	1	0

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).

The results of $PM_{2.5}$ monitoring at Claremorris for the period 2014 - 2018 indicated an average $PM_{2.5}/PM_{10}$ ratio ranging from 0.50 – 0.60. Based on this information, a conservative ratio of 0.65 was used to generate a current background $PM_{2.5}$ concentration of 7.8 μg/m^3.

9.3.3 Climate Baseline

Anthropogenic emissions of greenhouse gases in Ireland included in the EU 2020 strategy are outlined in the most recent review by the EPA which details emissions up to 2018 (EPA, 2020c). Agriculture is predicted to be the largest contributor in 2018 at 34% of the total, with the transport sector accounting for 20.2% of emissions of CO_2.

Greenhouse gas emissions from the transport sector increased by 1.6% or 0.20 Mt CO_2eq in 2018. This is the fifth year out of the last six with increased emissions in transport. Private diesel cars increased by 7.7% in 2018 while the number of passenger petrol cars decreased by 4.5%. Road transportation accounted for 11,677 kt CO_2eq which is 19.2% of the total 2018 emissions and an increase of 1.4% on 2017.

The data published in 2020 predicts that Ireland will exceed its 2018 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC1 by 5.17 Mt. For 2018, total national greenhouse gas emissions are estimated to be 60.51 million tonnes carbon dioxide equivalent (Mt CO_2eq). This is 0.2% lower (0.14 Mt CO_2eq) than emissions in 2017.

The EPA 2019 GHG Emissions Projections Report for 2018 – 2040 (EPA 2019b) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018. Implementation of these are classed as a "*With Additional Measures scenario*" for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the period 2013 – 2020 Ireland is projected to cumulatively exceed its compliance obligations with the EU's Effort Sharing Decision (Decision No. 406/2009/EC) 2020 targets by approximately 10 Mt CO_2eq under the With Existing Measures scenario and 9 Mt CO_2eq under the With Additional Measures scenario (EPA, 2019b).

9.3.4 Sensitivity of the Receiving Environment

In line with the IAQM guidance document (2014) prior to assessing the impact of dust from a proposed development the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time. Commercial properties and places of work are regarded as med ium sensitivity while low sensitivty receptors are places where people are present for short periods or do not expecet a high level of amenity.

In terms of receptor sensitivity to dust soiling, there are approximately 19 high sensitivity receptors located within 50 m of the proposed development site (see Figure 9.2). Based on the IAQM criteria outlined in Table 9.4, the worst case sensitivity of the area to dust soiling is considered to be **medium**.

Table 9.4 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	**Medium**	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM_{10} concentration, receptor sensitivity based on type and the number of receptors affected within various distance bands from the construction works. A conservative estimate of the current annual mean PM_{10} concentration in the vicinity of the proposed development is estimated to be 12 µg/m^3 and there are approximately 19 high sensitive receptors (residential properties) located less than 50 m from the proposed works (Figure 9.2). Based on the IAQM criteria outlined in Table 9.5, the worst case sensitivity of the area to human health is considered to be **low**.

Table 9.5 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<200
High	< 24 µg/m^3	>100	Medium	Low	Low	Low
		10-100	Low	**Low**	Low	Low
		1-10	Low	Low	Low	Low
Medium	< 24 µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	< 24 µg/m^3	>1	Low	Low	Low	Low

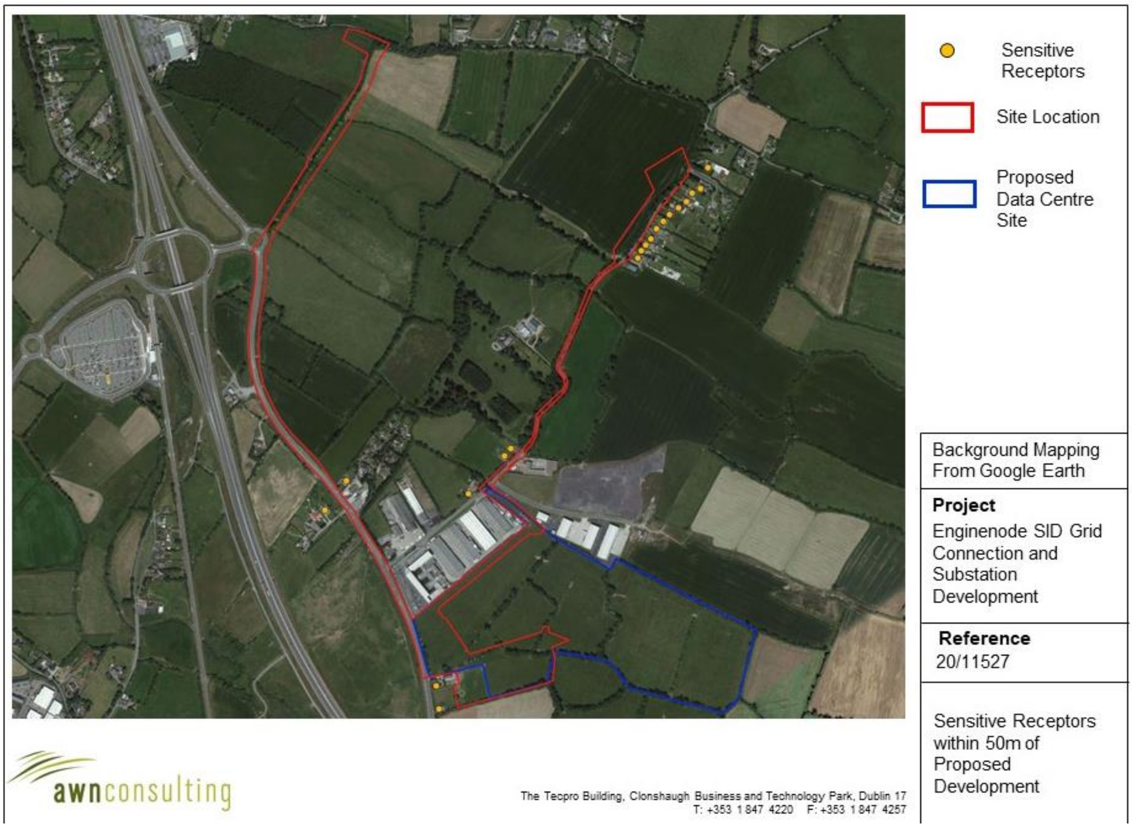

Figure 9.2 Sensitive Receptors within 50m of Proposed Development

9.4 CHARACTERISTICS OF THE DEVELOPMENT

9.4.1 Construction Phase

The development will involve 2 no. underground cables and an associated substation. Full details of the development are included in Chapter 2 (Description of the Proposed Development).

The key civil engineering works which will have a potential impact on air quality and climate during construction are summarised below:

(i) During construction, an amount of soil will be generated as part of the site preparation works and during excavation for installation of the cable installation;
(ii) Infilling and landscaping will be undertaken;
(iii) Temporary storage of construction materials; and
(iv) Construction traffic accessing the site will emit air pollutants and greenhouse gases during transport.

As outlined in Section 9.7, a dust minimisation plan will be formulated for the construction phase of the proposed development to ensure no dust nuisance occurs at nearby sensitive receptors.

9.4.2 Operational Phase

There are no works during the operational phase which have a potential to impact on air quality or climate as the cables will be underground. There is the potential for some imperceptible air pollutant emissions associated with maintenance vehicles accessing the substation site.

9.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

9.5.1 Construction Phase

9.5.1.1 Air Quality

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. While construction dust tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction.

It is important to note that the potential impacts associated with the construction phase of the proposed development are short-term in nature. When the dust minimisation measures detailed in Section 9.7 of this report are implemented, fugitive emissions of dust from the site will not be significant and will pose no nuisance at nearby receptors.

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 9.3.4). The major dust generating activities are divided into four types within the IAQM guidance to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (movement of heavy vehicles).

In terms of the proposed development, only the categories of earthworks, construction and trackout are relevant to this assessment as there are no demolition activities proposed.

Earthworks

Earthworks primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** Total site area > 10,000 m^2, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved >100,000 tonnes;

- **Medium:** Total site area 2,500 m^2 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8 m in height, total material moved 20,000 – 100,000 tonnes;

- **Small:** Total site area < 2,500 m^2, soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 20,000 tonnes, earthworks during wetter months.

The dust emission magnitude for the proposed earthwork activities can be classified as large as a worst case as the total site area is approximately 17,000 m^2 for the substation development and approximately 21,000 m^2 for the grid connection. However, in terms of the grid connection due to its linear nature sensitive receptors will only be exposed to dust emissions over a short period of time before the works stop and move on.

In addition, there will be substatially less than 100,000 tonnes of material excavated for both the substation and grid connection developments.

The sensitivity of the area, as determined in Section 9.3.4 (medium sensitivity to dust soiling and low sensitivity to human health impacts), is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 9.6, this results in an overall medium risk of dust soiling impacts and an overall low risk of human health impacts as a result of the proposed earthworks activities.

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 9.6 Risk of Dust Impacts – Earthworks

Construction

Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** Total building volume > 100,000 m^3, on-site concrete batching, sandblasting;
- **Medium:** Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), on-site concrete batching;
- **Small:** Total building volume < 25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

The dust emission magnitude for the proposed construction activities can be classified as small as a worst case as the total volume of the substation building will be less than 25,000 m^3.

The sensitivity of the area is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 9.7, this results in an overall low risk of dust soiling impacts and a negligible risk of human health impacts as a result of the proposed construction activities.

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 9.7 Risk of Dust Impacts – Construction

Trackout

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** > 50 HGV (> 3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100 m;
- **Medium:** 10 - 50 HGV (> 3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 - 100 m;

- **Small:** < 10 HGV (> 3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.

The dust emission magnitude for the proposed trackout can be classified as small there will be 10 or less outward HGV movements per day.

The sensitivity of the area is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 9.8, this results in an overall low risk of dust soiling impacts and a negligible risk of human health impacts as a result of the proposed trackout activities.

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 9.8 Risk of Dust Impacts – Trackout

Summary of Dust Emission Risk

The risk of dust impacts as a result of the proposed development are summarised in Table 9.9 for each activity. The magnitude of risk determined is used to prescribe the level of site specific mitigation required for each activity in order to prevent significant impacts occurring.

Overall, in order to ensure that no dust nuisance occurs during the earthworks, construction and trackout activities, a range of dust mitigation measures associated with a **medium risk** of dust impacts must be implemented. When the dust mitigation measures detailed in Section 9.7 are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors.

Potential Impact	Dust Emission Magnitude			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Medium Risk	Low Risk	Low Risk
Human Health	N/A	Low Risk	Negligible Risk	Negligible Risk

Table 9.9 Summary of Dust Impact Risk used to Define Site-Specific Mitigation

9.5.1.2 Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. The Institute of Air Quality Management document *Guidance on the Assessment of Dust from Demolition and Construction* (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate. Therefore, the impact on climate is considered to be imperceptible and short term.

9.5.2 Operational Phase

During operation, the cables will be buried underground and therefore there will be no emissions to atmosphere. There is the potential for maintenance vehicles accessing the substation site to result in emissions of NO_2, $PM_{10}/PM_{2.5}$ and CO_2. However, due to the infrequent nature of maintenance activities and the low number of vehicles involved emissions are not predicted to be significant. A detailed air quality and climate assessment was scoped out for the operational stage of the development as per the UK DMRB screening criteria outlined in Section 9.2.2.1. Operational stage impacts to air quality and climate are predicted to be imperceptible and long-term.

9.6 DO NOTHING SCENARIO

Under the Do-Nothing Scenario no construction works will take place and the previously identified impacts of fugitive dust and particulate matter emissions and emissions from equipment and machinery will not occur. The 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 new developments in the surrounding industrial estates, changes in road traffic, etc.). Therefore, this scenario can be considered neutral in terms of both air quality and climate.

9.7 REMEDIAL AND MITIGATION MEASURES

9.7.1 Construction Stage

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following measures should be put in place. These have been formulated by drawing on best practice guidance from Ireland, the UK (IAQM (2014), The Scottish Office (1996), UK ODPM (2002)) and BRE (2003) and the USA (1997).

Site Management

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies.

At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance. The closest receptors to the site are located to the west of the site boundary. Analysis of Casement Aerodrome meteorological station indicates that the prevailing wind in the area is likely westerly to south-westerly in direction. Therefore, storage piles and construction compounds should be located to the east of site which will be downwind of the closest sensitive receptors and will minimise the potential for dust nuisance to occur.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2 mm/day, dust generation is generally suppressed (UK ODMP, 2014; BRE, 2003). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Casement Aerodrome meteorological station is located approximately 14km south of the site and data from the last five years (2014 – 2018) shows that on average wind speeds are in the region of 5.5 m/s which is favourable to dust suppression. Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. There will be infrequent periods were care will be needed to ensure that dust nuisance does not occur. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details;
- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;
- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein; and
- At all times, the procedures put in place will be strictly monitored and assessed.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

Site Roads / Haulage Routes

Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK ODPM, 2002).

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;
- Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use;
- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.

Land Clearing / Earth Moving

Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust.

- During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust;
- During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.

Storage Piles

The location and moisture content of storage piles are important factors which determine their potential for dust emissions. Some minor temporary storage piles will be in place on site during the land reclamation activities, however, the majority of imported materials will be spread directly onto the land after arriving on site. The following measures should reduce dust impact from storage piles on site.

- Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors;
- Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK ODPM, 2002);
- Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.

Site Traffic on Public Roads

Spillage and blow-off of debris, aggregates and fine material onto public roads should be reduced to a minimum by employing the following measures:

- Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- At the main site traffic exits, a wheel wash facility shall be installed. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.

Summary of Dust Mitigation Measures

The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;
- The development of a documented system for managing site practices with regard to dust control;

- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and
- The specification of effective measures to deal with any complaints received.

9.7.2 Operational Stage

No mitigation is proposed for the operation phase of the grid connection development as it is predicted to have an imperceptible impact on air quality and climate.

Cumulatively, in relation to climate mitigation, the proposed data centre development has been designed to minimise the impact on climate. Waste heat will be reused within the building for heating purposes which will reduce the need to burn fuels to provide heat to the building. Additionally, electric car charging points will be provided on site to encourage the use of cleaner transport and reduce emissions from travel.

Data centres are typically 84% more efficient than on-premises servers and the GHG savings associated with this are not included in the GHG emissions total. In addition, in terms of total forecasted capacity, it is predicted that 1,700MW of data centres capacity will be operational by 2025. However, the carbon intensity of electricity is predicted to decrease from 331 gCO_2/kWh in 2019 to 100 gCO_2/kWh in 2030 as a result of the increase in renewables to 70% of the electricity market by 2030. Overall, it is predicted that data centres will peak at 2.2% of total GHG emissions in 2024 and will fall or level off after this date.[1]

9.8 CUMULATIVE IMPACT

9.8.1 Construction Phase

Should the construction phase of the proposed development coincide with the construction of any other permitted developments within 350m of the site then there is the potential for cumulative dust impacts to the nearby sensitive receptors (IAQM, 2014). The proposed data storage facility adjacent to the site is likely to be undergoing construction concurrently with the proposed development. Therefore, there is the potential for cumulative dust impacts. However, the dust mitigation measures outline in Section 9.7.1 will be applied throughout the construction phase of the proposed development which will avoid significant cumulative impacts on air quality.

The Facebook Clonee data storage development to the direct south of the proposed development is currently under construction. It is possible that the construction phases will overlap. However, as the Facebook Clonee development is currently at an advanced stage of construction it is predicted that the potential for cumulative dust impacts is low.

Due to the relatively small scale of the proposed development and the short-term construction stage significant cumulative impacts to climate are not predicted.

With appropriate mitigation measures in place, the predicted cumulative impacts on air quality and climate associated with the construction phase of the proposed development are deemed short-term and not significant.

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[1] Host In Ireland (May 2020) Ireland’s Data Hosting industry 2020 Q1 Update

9.8.2 Operational Phase

Operational phase direct impacts on air quality associated with the proposed development are predicted to be imperceptible. As there are no emissions to atmosphere associated with the cables once constructed as they will be buried underground there are no potential impacts associated with this aspect of the development. Cumulative traffic emissions associated with site maintenance vehicles and vehicles on the local road network have the potential to impact air quality. However, as the number of vehicles required for maintenance activities is low and infrequent in nature cumulative impacts are considered imperceptible and long-term.

Cumulative air impacts associated with the operational phase of the proposed development are related to emissions from the standby generators and gas engines in the proposed data centre development and the standby generators associated with the nearby Facebook Clonee data storage development. A cumulative assessment of the data centre was undertaken which involved modelling the emergency operation and scheduled testing of the 80 no. standby generators and 16 no. gas engines at the EngineNode campus in addition to the only other significant emission to air, within the vicinity of the proposed development i.e. emissions from the nearby data centre (Facebook Clonee data storage development, both operating and as shown in planning for the site under construction). The results indicate that the ambient ground level concentrations are below the relevant air quality standards for NO_2. For the worst-case year, emissions from the site lead to an ambient NO_2 concentration (including background) which is 64% of the maximum ambient 1-hour limit value (measured as a 99.8th percentile) and 82% of the annual limit value at the worst-case off-site receptor.

In addition, a review of industrial emissions licences (IED licences) issued by the EPA for the area surrounding the proposed development show that there are no licenced facilities with NO_x emissions to the atmosphere within 1km of the site boundary. For any future development with emissions to atmosphere which may occur within the vicinity of the site, the proposed facility would be required to apply for, and comply with, emissions limit values as stipulated in an IED licence.

In relation to climate, the cumulative CO_2 emissions from electricity to operate the data centre facility will not be significant in relation to Ireland's national annual CO_2 emissions. The proposed energy centre will supply electricity to site using gas powered engines. A Report titled '*Energy Related CO_2 Emissions In Ireland 2005 – 2016 (2018 Report)*' (SEAI, 2018) published by the Sustainable Energy Authority of Ireland (SEAI) states the average CO_2 emission factor for electricity generated in Ireland from natural gas was 209.2 gCO_2/kWh in 2016. This average CO_2 emission factor is based on the national power generating portfolio. On the basis that the proposed development will consume 180 MW of power, this equates to 1,577 GWh annually based on electricity generation from natural gas in the national fuel mix. This translates to approximately 330,497 tonnes of CO_2eq per year.

Latest Environmental Protection Agency (EPA) figures taken from '*Ireland's Final Greenhouse Gas Emissions 1990 – 2017*' (EPA, 2018) indicate that total CO_2 generation in Ireland was of the order of 60.74 million tonnes CO_2eq in 2017. The proposed development would contribute approximately 0.54% of Ireland's national annual CO_2 emissions assuming an energy supply from natural gas.

Cumulative climate impacts, including nearby developments, will occur as a result of the data centre energy requirements. The Facebook Clonee data storage development is supplied from the National Grid and a standard national fuel mix based on 2016 data has been used in this assessment. The CO_2 emissions from electricity to operate the facility will not be significant in relation to Ireland's national annual CO_2 emissions. Together, the proposed data centre development and the Facebook Clonee data storage development (including the operational site and recently permitted and under construction development) will consume 180MW of power each. This will result in a cumulative 3,154 GWh annually. This translates to approximately 1.1 Mt of CO_2eq per year. This equates to a cumulative impact that is approximately 1.8% of Ireland's national annual CO_2 emissions (60.74 million tonnes in 2017). If the proposed development was to be supplied from the National Grid rather than the on-site energy centre, the cumulative CO_2 emitted would increase to 1.5 Mt CO_2eq which would equate to approximately 2.5% of Ireland's national CO_2 emissions.

As both the proposed data centre and the nearby Facebook Clonee data storage development are over 20 MW, a greenhouse gas emission permit will be required for each facility which will be regulated under the EU-wide Emission Trading Scheme (ETS). Electricity providers form part of the ETS and thus greenhouse gas emissions from these electricity generators are not included when determining compliance with the targeted 30% reduction in the non-ETS sector i.e. electricity associated greenhouse gas emissions will not count towards the Effort Sharing Decision target. Thus, any necessary increase in electricity generation due to data centre demand will have no impact on Ireland's obligation to meet the EU Effort Sharing Decision. On a EU-wide basis, where the ETS market in 2018 is approximately 1,655 million tonnes CO_{2eq}, the impact of the emissions associated with the proposed data centre development will be less than 0.03% of the total EU-wide ETS market which is imperceptible.

Overall, the impact to air quality and climate as a result of the proposed cumulative development will be ***negative, long-term*** and ***imperceptible***.

9.9 RESIDUAL IMPACTS OF THE DEVELOPMENT

9.9.1 Construction Phase

9.9.1.1 Air Quality

When the dust mitigation measures detailed in the mitigation section (section 9.7.1) of this report are implemented, fugitive emissions of dust and particulate matter from the site will be short-term and not significant in nature, posing no nuisance at nearby receptors.

9.9.1.2 Climate

Based on the scale and short-term nature of the construction works and the intermittent use of equipment, the potential impact on climate change and transboundary pollution from the proposed development is deemed to be short-term and imperceptible in relation to Ireland's obligations under the EU 2020 target.

9.9.1.3 Human Health

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. In addition, the area is of low sensitivity to human health impacts as established in Section 9.3.4. Therefore, the impact of construction of the proposed development is likely to be short-term and imperceptible with respect to human health.

9.9.2 Operational Phase

9.9.2.1 Air Quality & Climate

Operational phase impacts associated with the proposed development are predicted to be long-term and imperceptible as the cables will be buried underground once constructed and there will be minimal emissions associated with maintenance vehicles accessing the substation site.

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UN Framework Convention on Climate Change (2012) Doha Amendment To The Kyoto Protocol

USEPA (1986) Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition (periodically updated)

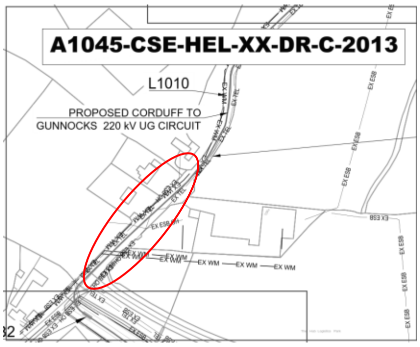
USEPA (1997) Fugitive Dust Technical Information Document for the Best Available Control Measures

World Health Organisation (2006) Air Quality Guidelines - Global Update 2005 (and previous Air Quality Guideline Reports 1999 & 2000)

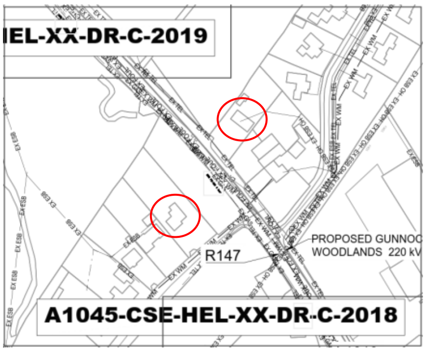
10.0 NOISE & VIBRATION

10.1 INTRODUCTION

As detailed in Chapter 1 Introduction, this EIAR has been prepared to accompany an application for the development a substation compound and grid connection associated with a data storage facility campus and associated energy centre development on lands at Bracetown, north east of a section of the R147. Chapter 2 provides a project description.



Corduff to Gunnocks. The nearest residential noise sensitive locations are located to the south west of the route, where three one-off private residences are located (as illustrated on the sketch to the right). To the north, a number of residential properties are located on a local road that runs north east from the R147. In addition, there are a number of commercial and industrial operations located on lands to the north. The closes residential properties in question are some 20m to the south west of the proposed route. Any other sensitive residential receptors along the route are located at a further distance from the proposed works that those identified above.



Gunnocks to Woodlands. The nearest residential noise sensitive locations are located along a section of the R147. The properties in question are some 40m to the south west of the proposed route and some 30m to the north east as illustrated in the graphic to the left. Any other sensitive residential receptors along the route are located at a further distance from the proposed works that those identified above.

Figure 10.1 Residential locations near grid lines.

The proposed development will consist of the construction of a substation compound (Gunnocks) and the construction of two underground grid connections and rural supply. In relation to the substation comment will also be presented in relation to cumulative impacts of these elements with the concurrent planning application for a data storage development.

This proposed development has been assessed and discussed in terms of potential noise and vibration impacts on the surrounding environment.

A glossary of the acoustic terminology used in this chapter is presented in Appendix 10.1.

10.2 METHODOLOGY

10.2.1 Proposed Approach

The following methodology has been adopted for this assessment:

- review appropriate guidance, typical local authority planning conditions, etc. in order to identify appropriate noise criteria for the site operations;
- carry out noise monitoring at a number of locations (e.g. in the vicinity of nearest sensitive properties/boundaries) to identify existing levels of noise in the vicinity of the development;
- construction noise calculations associated with the key construction activities to consider the potential noise impact of the proposed development; and
- comment on predicted levels against the appropriate criteria and existing noise levels and outline required mitigation measures (if any).

Appendix 10.1 of this document presents a glossary of the acoustic terminology used throughout this document. In the first instance it is considered appropriate to review some basic fundamentals of acoustics.

10.2.2 Fundamentals of Acoustics

In order to provide a broader understanding of some of the technical discussion in this report, this section provides a brief overview of the fundamentals of acoustics and the basis for the preparation of this noise assessment.

A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. In order to take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The audible range of sounds expressed in terms of Sound Pressure Levels is 0dB (for the threshold of hearing) to 120dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3dB.

The frequency of sound is the rate at which a sound wave oscillates and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. Several weighting mechanisms have been proposed but the ‘A-weighting’ system has been found to provide one of the best correlations with perceived loudness. SPL’s measured using ‘A-weighting’ are expressed in terms of dB(A). An indication of the level of some common sounds on the dB(A) scale is presented in Figure 10.2.

The ‘A’ subscript denotes that the sound levels have been A-weighted. The established prediction and measurement techniques for this parameter are well developed and widely applied. For a more detailed introduction to the basic principles of acoustics, reference should be made to an appropriate standard text.

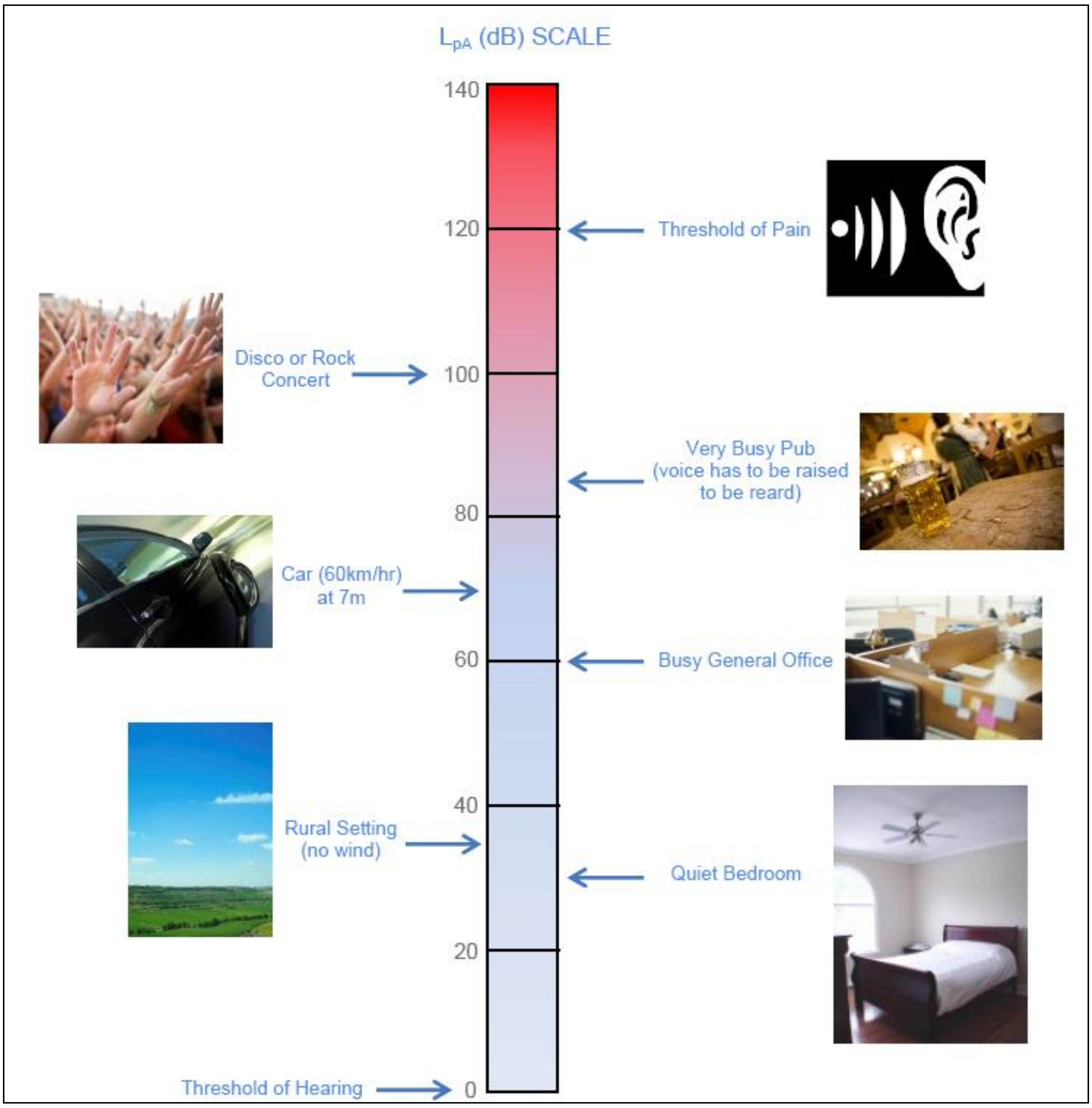


Figure 10.2 dB(A) Scale & Indicative Noise Levels – (EPA: Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 – 2016))

10.2.3 Significance of Impacts

The significance of noise and vibration impacts has been assessed in accordance with the EPA Draft EIA Report Guidelines 2017 and EPA Draft Advice Notes for EIS 2015 see Tables 10.1 to 10.3 below. As these guidelines do not quantify the impacts in decibel terms, further reference has been made to the '*Guidelines for Environmental Noise Impact Assessment*' produced by the Institute of Environmental Management and Assessment (IEMA) (2014).

With regard to the quality of the impact, ratings may have positive, neutral or negative applications where:

Table 10.1 Quality of Potential Effects

Quality of Effects	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 effect on the receiving environment are described as follows:

Table 10.2 Significance of Effects

Significance of Effects on the Receiving Environment	Description of Potential Effects
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.
Profound	An effect which obliterates sensitive characteristics.

The duration of effects as described in the Draft EPA Guidelines are:

Table 10.3 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

10.2.4 Construction Phase Guidance

Criteria for Rating Noise Impacts

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the British

Standard BS 5228 – 1: 2009+A1:2014*: Code of practice for noise and vibration control on construction and open sites – Noise*.

The approach adopted in BS 5228 – 1 calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities.

BS5228 – 1 sets out guidance on permissible noise levels relative to the existing noise environment. Table 10.4 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors as recommended by BS 5228 – 1. These are construction noise levels only and not the cumulative noise level due to construction plus existing ambient noise.

Table 10.4 Example Threshold of Significant Effect at Dwellings

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

Note A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
Note B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
Note C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
Note D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

It should be noted that this assessment method is only valid for residential properties.

For the appropriate periods (i.e. daytime, evening and night-time) the ambient noise level is determined and rounded to the nearest 5dB. Baseline monitoring carried out as part of this assessment, detailed in Section 10.3.2, indicate that the baseline categories summarised in Table 10.5 are appropriate in terms of the nearest noise sensitive locations being considered in this instance.

Table 10.5 Rounded Baseline Noise Levels and Associated Categories

Period	**Baseline Noise Category**	**Construction Noise Threshold Value $L_{Aeq,1hr}$ (dB)**
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	B	70
Evening (19:00 to 23:00hrs)	C	65
Night time (23:00 to 07:00hrs)	C	55

If the construction noise level exceeds the appropriate category value, then a significant effect is deemed to occur. See Section 10.5.1 for the construction noise assessment in relation to this site.

The assessment process outlined above determines if a significant construction noise impact is likely. Notwithstanding the outcome of this assessment, the overall acceptable levels of construction noise are set out in the Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in*

National Road Schemes[1], which should not be exceeded at noise sensitive locations during the construction phase of the development. Table 10.6 sets out these levels.

Table 10.6 Maximum Permissible Noise Levels at the Facade of Dwellings during Construction

Days and Times	**Noise Levels (dB re. 2x10^{-5} Pa)**	
	$L_{Aeq(1hr)}$	**L_{Amax}**
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 relevant local authority.

In exceptional circumstances there may be a requirement that certain construction works are carried out during evening and night-time periods. In these instances, the relevant evening (60dB L_{Aeq1hr}) and night time (50dB $L_{Aeq,1hr}$) will apply.

Therefore, based on the above the following construction noise criteria are proposed for the site in relation to day to day works during the stated construction hours:

70dB $L_{Aeq,1hr}$ at noise sensitive location
75dB $L_{Aeq,1hr}$ at commercial property

Criteria for Rating Vibration Impacts

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of road traffic, vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short duration. For example, rock breaking and piling, two of the primary sources of vibration during construction, are typically tolerated at vibration levels up 2.5mm/s. This guidance is applicable to the daytime only; it is unreasonable to expect people to be tolerant of such activities during the night.

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard BS 7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*, and;
- British Standard BS 5228-2: 2009+A1:2014: *Code of practice for noise and vibration control on construction and open sites – Vibration*.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

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[1] *Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1, 25 October 2004*, Transport Infrastructure Ireland

BS 5228 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. Below these values minor cosmetic damage is unlikely. Where continuous vibration is such as to give rise to dynamic magnification due to resonance, the guide values may need to be reduced by up to 50%. BS 5288-2 also comments that important buildings which are difficult to repair might require special consideration on a case by case basis.

The Transport Infrastructure Ireland (TII) document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* also contains information on the permissible construction vibration levels as follows:

Table 10.7 Allowable Vibration during Construction Phase

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	**10 to 50Hz**	**50 to 100Hz (and above)**
8 mm/s	12.5 mm/s	20 mm/s

10.2.5 Operational Phase – Noise Guidance

In the first instance the following extract from *the "EirGrid Evidence Based Environmental Studies Study 8: Noise – Literature review and evidence based field study on the noise effects of high voltage transmission development (May 2016)* states the following in relation to noise impacts associated with 220KvA transformer installations:

"The survey on the 220kv substation at Gorman indicated that measured noise levels (L_{Aeq}) were approximately 43dB(A) at 5m from the most affected boundary of the substation. This is marginally above the WHO night-time threshold limit for preventing disturbance to sleep (i.e. 42dB). Spectral analysis of the noise from the Gorman substation demonstrated that there are a number of distinct tonal elements to noise in the low to mid frequency range. To avoid any noise impacts from 220kV substations at sensitive receptors, it is recommended that a distance of 20m is maintained between the nearest site boundary and the nearest sensitive receptor."

Considering the distance between the 220kV substation and the nearest off-site locations of some 110m, noise from this installation is not predicted to be an issue off site.

There will be no noise emissions from the operation of the cable installations. Consequently, there is no requirement to assess any operational noise emissions.

Considering the above, it is concluded that there will be no significant noise emissions from the operation of the cable installations or 220kV substation and associated cable bays. The noise from the development will be associated with the datahalls and energy centre and associated plant that are permitted across the wider site.

In order to establish whether the noise sensitive locations in the vicinity of the site would be considered 'low background noise' areas as defined in the *EPA: Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 – 2016)*, the noise levels measured during the environmental noise survey need to satisfy the following criteria:

- Arithmetic Average of L_{A90} During Daytime Period ≤40dB L_{A90}, and;
- Arithmetic Average of L_{A90} During Evening Period ≤35dB L_{A90}, and;
- Arithmetic Average of L_{A90} During Night-time Period ≤30dB L_{A90}.

The arithmetic average L_{A90} results measured at each location compared against these criteria in the table below. (Full survey results are discussed in Section 10.3)

Table 10.7 Comparison of Measurement Results with Low Background Noise Criteria

Location	Period	Average L_{A90} (dB)	NG4 Criterion (dB L_{A90})	Criterion Satisfied?
A	Daytime	53	≤40	No
	Evening	42	≤35	No
	Night-time	38	≤30	No
B	Daytime	46	≤40	No
	Evening	39	≤35	No
	Night-time	39	≤30	No
C	Daytime	52	≤40	No
	Evening	45	≤35	No
	Night-time	44	≤30	No

As can be seen from the above comparison, none of the locations are considered an 'Area of Low Background Noise'.

Determining Appropriate Noise Criteria

The table below outlines the noise emission limit criteria detailed in the NG4 document.

Table 10.8 NG4 Approach for Determining Appropriate Noise Criteria

Scenario	Daytime Noise Criterion, dB $L_{Ar,T}$ (07:00 to 19:00hrs)	Evening Noise Criterion, dB $L_{Ar,T}$ (19:00 to 23:00hrs)	Night Noise Criterion, dB L_{Aeq} (23:00 to 07:00hrs)
Areas of Low Background Noise	45dB	40dB	35dB
All Other Areas	55dB	50dB	45dB

The EPA methodology has been used to determine the noise limits that are applicable at the nearest noise sensitive locations. The resultant applicable criteria are listed below.

Table 10.9 Established Noise Emission Limit Criteria

Location	Period	Established Criterion (dB $L_{Ar,T}$ or L_{Aeq})
All	Daytime (07:00hrs to 19:00hrs)	55dB $L_{Ar,T}$
	Evening (19:00hrs to 23:00hrs)	50dB $L_{Ar,T}$
	Night-time (23:00hrs to 07:00hrs)	45dB L_{Aeq}

Assessment of Significance

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 10.10 below 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 10.10 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 EIA Report'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 or halving of loudness	Moderate	Moderate – Significant
≥10	More than a doubling or halving 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.

Commercial Properties

A number of commercial / industrial properties are located in the vicinity of the site. In terms of noise emissions from the site it is considered that an appropriate noise criterion at these locations is 55dB $L_{Aeq,15min}$. This criterion has been derived with consideration of BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* which recommends that for *Study and work requiring concentrations* in an *Executive office* a design range of 35 to 40 dB L_{Aeq} is desirable internally. Arriving at an external noise level of 55dB $L_{Aeq,15min}$ would ensure that this range of noise levels internally will be achieved.

Emergency Operation

In order to provide continuity of service, a number of back-up generators are present on site and will be added to as part of the current proposal. These generators will only operate in a situation where there is a failure in the electricity supply from the national grid and for routine testing. Routine testing will be conducted during regular weekday daytime periods only. Section 4.4.1 of the Environmental Protection Agency (EPA) document "*Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities*" (NG4 - 2016) contains the following comments in relation to emergency plant items:

'In some instances, …sites will have certain items of emergency equipment (e.g. standby generators) that will only operate in urgent situations (e.g. grid power failure). Depending upon the context, it may be deemed permissible for such items of equipment to give rise to exceedances in the noise criteria/limits during limited testing and emergency operation only. If such equipment is in regular use for any purposes other than intermittent testing, it is subject to the standard limit values for the site'.

It is therefore considered that the proposed noise criterion of 55dB $L_{Aeq,T}$ on these emergency units is appropriate. Generators will be designed and mitigated in order to achieve this design goal at nearby residential noise sensitive locations.

Recommended Criteria

Following review of relevant guidance, the following noise criteria are proposed for the development:

Day to Day Operation (Noise Sensitive)
55dB $L_{Aeq,15min}$ (daytime),
50dB $L_{Aeq,15min}$ (evening) and;
45dB $L_{Aeq,15min}$ (night time)
(Ref. EPA: NG4)

Day to Day Operation (Commercial)
55dB $L_{Aeq,15min}$
Emergency Operation (Noise Sensitive)
55dB $L_{Aeq,15min}$
(Ref. EPA: NG4)

Note plant noise emissions are to be designed such that they are not tonal and do not have impulsive characteristics at the nearest noise sensitive locations.

10.2.6 Operational Phase – Vibration Guidance

There will be no vibration emissions from the operation of the cable installation. Consequently, there is no requirement to assess any vibration emissions.

10.2.7 Forecasting Methods

Construction noise calculations have been conducted generally in accordance with BS 5228: 2009+A1:2014: *Code of practice for noise control on construction and open sites - Noise.*

Prediction calculations for operational building services noise, car park activity and vehicle movements on site have been conducted generally in accordance with ISO 9613 (1996): *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.*

Changes in road traffic noise on the local road network have been considered using prediction guidance contained within *Calculation of Road Traffic Noise (CRTN)* issued by the Department of Transport in 1988.

10.3 RECEIVING ENVIRONMENT

A series of noise surveys have been undertaken as part of the Environmental Impact Assessment Report preparation for the proposed development. Tables 10.11 to 10.13 reviews the findings of these surveys. Full details of the noise monitoring campaign are presented in Appendix 10.3.

10.3.1 Survey & Review Locations

Figure 10.3 illustrates the noise sensitive locations in the vicinity of the proposed development site at which noise monitoring was undertaken as part of the current assessment.

Figure 10.3 Noise Sensitive Locations

Location A	Located in the vicinity of the nearest residential noise sensitive locations to the south of the proposed site. The location is considered to be representative of the existing noise levels in the vicinity of these properties.	
Location B	Located on IDA lands opposite a number of private residences located to the north west of the development lands. The meter was located an equivalent distance from the nearby road in order that an estimate of the existing noise climate at the houses on the opposite side of the road could be obtained.	
Location C	Located on a grass verge in front of a number of residential units on the opposite side of the R147 to the west of the proposed development lands. This location is considered to be representative of this cluster of properties and properties along the local road running to the north east along which the cable connection for the site is proposed.	

10.3.2 Comment on Noise Levels

Location A

The survey results for Location A are summarised in Table 10.11 below.

Table 10.11 Summary of Measured Noise Levels at Location A

Period	**Start Time**	**Measured Noise Levels (dB re. 2x10^{-5} Pa)**		
		L_{Aeq}	**L_{Amax}**	**L_{A90}**
Daytime	13:01	66	87	54
	14:01	64	81	52
	15:05	65	81	53
	Arithmetic Average of L_{A90} (dB):			**53**
Evening	22:09	64	82	42
	Arithmetic Average of L_{A90} (dB):			**42**
Night-time	23:39	59	80	38
	00:37	60	84	37
	Arithmetic Average of L_{A90} (dB):			**38**

Traffic movements on the nearby R147 dictated ambient noise levels measured at this location. Other sources of noise included aircraft noise overhead, distant noise from the M3 and birdsong. Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of

64 to 66dB and background (i.e. $L_{A90,15min}$) levels were in the range of 52 to 54dB with an average level of some 53dB.

During the evening period, road traffic noise from the R147 and distant M3 were noted along with a degree of aircraft noise. Ambient noise levels were of the order of 64dB $L_{Aeq,15min}$ with background noise levels of the order of 42dB $L_{A90,15min}$.

During the night period, again road traffic noise from the R147 and distant M3 were noted along with a degree of aircraft noise (during the initial monitoring period). Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of 59 to 60dB and background (i.e. $L_{A90,15min}$) levels were in the range of 37 to 38dB with an average level of some 38dB.

No significant source of vibration was noted during the survey periods.

Location B

The survey results for Location B are summarised in Table 10.12 below.

Table 10.12 Summary of Measured Noise Levels at Location B

Period	**Start Time**	**Measured Noise Levels (dB re. 2x10^{-5} Pa)**		
		L_{Aeq}	**L_{Amax}**	**L_{A90}**
Daytime	12:41	60	77	45
	13:42	61	77	47
	14:46	60	79	46
	Arithmetic Average of L_{A90} (dB):			**46**
Evening	21:49	57	74	39
	Arithmetic Average of L_{A90} (dB):			**39**
Night-time	23:19	59	76	41
	00:19	58	72	37
	Arithmetic Average of L_{A90} (dB):			**39**

Traffic movements on the M3 dictated ambient noise levels measured at this location. Other sources of noise included aircraft noise overhead, traffic on a nearby local road and birdsong. Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of 60 to 61dB and background (i.e. $L_{A90,15min}$) levels were in the range of 45 to 47dB with an average level of some 46dB.

During the evening period, road traffic noise from the M3 were noted along with a degree of aircraft noise. Ambient noise levels were of the order of 57dB $L_{Aeq,15min}$ with background noise levels of the order of 39dB $L_{A90,15min}$.

During the night period, again road traffic noise from the M3 were noted along with a degree of aircraft noise (during the initial monitoring period). Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of 58 to 59dB and background (i.e. $L_{A90,15min}$) levels were in the range of 37 to 41dB with an average level of some 39dB.

No significant source of vibration was noted during the survey periods.

Location C

The survey results for Location C are summarised in Table 10.13 below.

Table 10.13 Summary of Measured Noise Levels at Location C

Period	**Start Time**	**Measured Noise Levels (dB re. 2x10^{-5} Pa)**		
		L_{Aeq}	**L_{Amax}**	**L_{A90}**
Daytime	12:21	61	80	53
	13:21	60	83	54
	14:27	62	79	50
	Arithmetic Average of L_{A90} (dB):			**52**
Evening	21:30	54	74	45
	Arithmetic Average of L_{A90} (dB):			**45**
Night-time	23:00	58	73	46
	23:59	56	74	42
	Arithmetic Average of L_{A90} (dB):			**44**

Traffic movements on the M3 dictated ambient noise levels measured at this location. Other sources of noise included aircraft noise overhead, traffic on the nearby R147 and birdsong. Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of

60 to 62dB and background (i.e. $L_{A90,15min}$) levels were in the range of 50 to 54dB with an average level of some 52dB.

During the evening period, road traffic noise from the M3 were noted along with a degree of aircraft noise. Ambient noise levels were of the order of 54dB $L_{Aeq,15min}$ with background noise levels of the order of 45dB $L_{A90,15min}$.

During the night period, again road traffic noise from the M3 were noted along with a degree of aircraft noise (during the initial monitoring period). Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of 56 to 58dB and background (i.e. $L_{A90,15min}$) levels were in the range of 42 to 46dB with an average level of some 44dB.

No significant source of vibration was noted during the survey periods.

10.4 CHARACTERISTICS OF THE DEVELOPMENT

A variety of items of plant will be in use for the purposes of site preparation, construction and site works. There will be vehicular movements to and from the site that will make use of existing roads. Due to the nature of these activities, there is potential for generation of high levels of noise. The underground cable will be laid along a strip of land between the site along an existing public road running some 1.8km to the north east using a methodology similar to the one detailed below:

- The area where excavations are planned will be surveyed, prior to the commencement of works, with a cable avoiding tool and all existing underground services will be identified;
- A team consisting of a rubber tracked excavator, a dumper and a tractor and stone cart with side-shoot will dig the trench for and lay approximately 120m of the underground cabling per day;
- The excavators will open a trench, the trench will be a maximum of 600mm wide;
- Clay plugs will be installed at 50m intervals to prevent the trench becoming a conduit for surface water runoff;
- The excavated material will be loaded into the dumpers to be transported to a designated temporary stockpiling area to be reused as backfilling material where appropriate;
- Once the trench has been excavated, a base layer of blinding will be installed by the tractor and cart and compacted by the excavators;
- The ducting will then be placed in the trench as per relevant specifications;
- Blinding will be installed above the cable ducting and compacted.
- The remainder of the trench will be backfilled with granular material and compacted, and;
- The trench will be reinstated as per existing surfacing i.e. landscaped in greenfield area where appropriate.

Construction activities will mostly be carried out during normal daytime working hours. Normal construction hours will be specified by planning conditions of a grant of permission for the Proposed Development, or by the local authority.

Once operational, there will be no significant off-site noise emissions from the operation of the cable installations or 220kV substations and associated cable bays.

These issues are discussed in detailed in the following sections.

10.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

10.5.1 Construction Phase

Construction noise predictions have been carried out using guidance set out in British Standard *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise*.

Construction works associated with the underground cable will be temporary in duration. It is estimated that the civil works will take approximately 3 weeks, with a further 2 weeks estimated for cable installation, jointing and testing and reinstatement.

Table 10.14 outlines the noise levels associated with typical construction noise sources assessed in this instance along with typical sound pressure levels from *BS 5228 – 1: 2009+A1:2014* at various distances from these works.

Table 10.14 Indicative Noise Levels from Construction Plant at Various Distances from the cable installation Works

Item (BS 5228 Ref.)	**Highest Predicted Noise Level at Stated Distance from Edge of Works (dB $L_{Aeq,1hr}$)**			
	20m	**40m**	**60m**	**100m**
Pneumatic breaker (C.8.12)	66	60	56	52
Wheeled loader (C.3.51)*	62	56	52	48
Tracked excavator (C.3.43)*	63	57	53	49
Dozer (C.3.30)*	64	58	54	50
Dump truck (C.3.60)*	60	54	50	46
Asphalt Spread (C.8.24)	70	64	60	56
Compressor (C.7.27)	61	55	51	47
Road Roller (C.3.114)	65	59	55	51
HGV Movements (10 per hour)	53	50	49	46

Note * Assume noise control measures as outlined in Table B1 of BS 5228 – 1 (i.e. fit acoustic exhaust).

Construction works associated with cable works will be the dominant source of noise at the nearest noise sensitive locations when they occur. Other construction activity from the proposed development, is at sufficient distance from a significant proportion of the proposed cable works, so that when they occur at the same time, cumulative issues would not be a material issue.

The noise levels presented in Table 10.14 are within the weekday daytime construction noise limit values shown in Table 10.5, at distances of 20m or greater from the works. At distances greater than 20m from the works, the construction activities are predicted to be below the 70dB $L_{Aeq,1hr}$ construction noise criterion adopted. A significant effect is therefore not predicted in relation to the nearest noise sensitive locations at these distances in terms of this aspect of potential construction noise.

Where a noise sensitive location is closer than 20m from underground cable works, detailed consideration to potential construction noise impacts will be required and appropriate mitigation measures implemented in order to manage associated impacts. Typical mitigation measures that can be considered are outlined in Section 10.6.1 with further guidance contained within the BS 5228 standards.

Where this scenario occurs, it should be noted that at an assumed cable laying rate of 100m per day, the equipment associated with the cable works would be expected to be within 20 to 30m of a specific property for a maximum of some 6 hours if the construction works pass directly in front of the property. This limited time frame for construction works in the vicinity of a specific property results in a brief significant impact.

Where a property is within such proximity to the works and the noise criterion outlined here is expected to be exceeded for a brief period, the contractor shall be contractually obliged to advise the residents in advance of the works of date, time and duration of the expected works. The contractor will establish channels of communication between the contractor/developer, Local Authority and residents. Once sufficient notice of works and their timeframe are communicated to affected residents and suitable mitigation is implemented, the overall impact will be significantly reduced.

Considering the typical distance from works to noise sensitive locations, it is expected that the day and evening criteria for construction noise outlined here can be satisfied. Additional measures will need to be considered during periods where works are carried out during night-time periods to ensure night-time criterion are not exceeded. Specifically high impact activities will not be permitted during night-time hours. Various measures that can be considered are outlined in the mitigation section of this chapter.

In terms of noise associated with the construction activities for the grid lines the associated effect is stated to be ***negative*** and ***moderate***.

In the unlikely event that works are scheduled out of normal hours or at night, the range of calculated noise levels are also below a level that would lead to a significant impact. Given, however, the potential for cumulative noise impacts to occur if multiple items of plant operate at the same time, noise mitigation measures will need to be considered during these periods. As noted above, however, it is not anticipated that any works will be carried out at night time. Various measures relating to the control of noise from the works are outlined in the mitigation section of this assessment.

Construction Traffic

In terms of the additional construction traffic on local roads that will be generated as a result of this development the following comment is presented. In order to increase traffic noise levels by 1dB traffic volumes would need to increase by the order of 25% along the local road network. As outlined in the relevant sections of Chapter 12 relating to traffic, additional traffic introduced onto the local road network due to the construction phase of the Proposed Development will not result in a significant noise impact.

Review of Construction Impacts

In terms of noise associated with these construction activities the associated effect is stated to be:

Quality	*Significance*	*Duration*
Negative	Moderate	Temporary

In terms of vibration, due to the distance of activities from the site to the nearest sensitive locations and controlling vibration levels to those detailed in Table 9.3 the associated effect is stated to be:

Quality	*Significance*	*Duration*
Neutral	Imperceptible	Temporary

10.5.2 Operational Phase

In terms of the transformers the units the EIAR prepared previously of the overall development site considered noise impacts associated with the site including the proposed transformer units. Two scenarios have been developed to consider the noise impact of the proposed operations. These are as follows:

- Scenario A – Proposed Data Storage Facility – Day to Day
- Scenario B – Proposed Data Storage Facility – Emergency

Scenario A would be considered to be the most representative of the day to day operation including the transformers. Scenario B is representative of emergency situation when a power outage or issue with supply from the national grid has occurred. It should be noted that such an event is an extremely rare occurrence.

Figure 10.4 highlights the nearest noise sensitive locations at which predictions have been carried out. Various noise contours are also presented for scenarios A and C in order to demonstrate the noise impact of the proposed development over a wider area.

The results of the iterations of the noise model are presented in Table 10.15. Note all plant will be selected such that no tonal noise emissions are evident at noise sensitive locations.

Table 10.15 Predicted Plant Noise Levels for Various Scenarios

Location	**Predicted dB $L_{Aeq,T}$**			
	Scenario A		**Scenario B**	
	Day	**Evening/Night**	**Day**	**Evening/Night**
R01	41	39	51	51
R02	42	40	52	52
R03	42	41	51	51
R04	42	40	51	51
R05	39	38	49	49
R06	36	34	46	46
R07	32	30	40	40
R08	33	31	40	40
R09	33	31	40	40
R10	38	35	43	43
R11	38	35	43	43
R12	39	36	44	44
R13	42	40	48	48
R14	41	39	47	47
R15	43	42	46	46

The above predicted levels are based on a situation where the receiver is downwind of all noise sources. For the purposes of the assessment against the adopted criteria this is a robust worst-case assumption.

Comment on Adopted Noise Criteria Day to Day Operations

The predicted noise levels presented in Table 10.16 have been compared to the relevant daytime noise criteria as adopted for this assessment.

Table 10.16 Comparison of Predicted Noise Levels vs. Adopted Noise Criteria

Location	Period	Scenario A			Scenario B		
		Predicted dB $L_{Aeq,T}$	Criterion dB $L_{Aeq,T}$	Complies?	Predicted dB $L_{Aeq,T}$	Criterion dB $L_{Aeq,T}$	Complies?
R01	Day	41	55	✓	51	55	✓
	Evening	39	50	✓			✓
	Night	39	45	✓			✓
R02	Day	42	55	✓	52		✓
	Evening	40	50	✓			✓
	Night	40	45	✓			✓
R03	Day	42	55	✓	51		✓
	Evening	41	50	✓			✓
	Night	41	45	✓			✓
R04	Day	42	55	✓	51		✓
	Evening	40	50	✓			✓
	Night	40	45	✓			✓
R05	Day	39	55	✓	49		✓
	Evening	38	50	✓			✓
	Night	38	45	✓			✓
R06	Day	36	55	✓	46		✓
	Evening	34	50	✓			✓
	Night	34	45	✓			✓
R07	Day	32	55	✓	40		✓
	Evening	30	50	✓			✓
	Night	30	45	✓			✓
R08	Day	33	55	✓	40		✓
	Evening	31	50	✓			✓
	Night	31	45	✓			✓
R09	Day	33	55	✓	40		✓
	Evening	31	50	✓			✓
	Night	31	45	✓			✓

Location	Period	Scenario A			Scenario B		
		Predicted dB $L_{Aeq,T}$	Criterion dB $L_{Aeq,T}$	Complies?	Predicted dB $L_{Aeq,T}$	Criterion dB $L_{Aeq,T}$	Complies?
R10	Day	38	55	✓	43		✓
	Evening	35	50	✓			✓
	Night	35	45	✓			✓
R11	Day	38	55	✓	43		✓
	Evening	35	50	✓			✓
	Night	35	45	✓			✓
R12	Day	39	55	✓	44		✓
	Evening	36	50	✓			✓
	Night	36	45	✓			✓
R13	Day	42	55	✓	48		✓
	Evening	40	50	✓			✓
	Night	40	45	✓			✓
R14	Day	41	55	✓	47		✓
	Evening	39	50	✓			✓
	Night	39	45	✓			✓
R15	Day	43	55	✓	46		✓

Scenario A All locations are within the relevant adopted daytime, evening and night-time limits. All locations comply with the adopted criteria in relation to day to day operations. Figure 10.5 and 10.6 presents a noise contours for Scenario A.

Scenario B All locations are within the relevant adopted emergency operation limit in the rare event that a power loss to the site occurs. Figure 10.7 presents a noise contour for Scenario B.

Summary

Scenario A is representative of the typical day to day operations envisioned for the site. Review of the predicted noise levels and associated noise contours confirms that the site-specific levels comply with the noise criterion adopted for this assessment and are compliant with those typically espoused by the EPA.

Scenario B is representative of emergency situations such as a power outage on the national grid. Review of the predicted noise levels and associated noise contours confirm that the site-specific levels comply with the noise criterion that has been adopted for these situations following review of relevant guidance.

Review of Increases in Noise Level

Table 10.17, 10.18 and 10.19 presents the predicted changes in noise level associated with the development at the nearest noise sensitive locations to the site.

Table 10.17 Review of Predicted Changes in Existing Noise Levels – Day

Loc.	**Scenario A – Typical Operation Night-Time**				
	Predicted dB $L_{Aeq,T}$	**Background Level dB $L_{A90,T}$**	**Cumulative Noise Level (dB(A))**	**Change in Noise Level (dB)**	**EPA Glossary of Impacts**
R01	41	53	53	0	Imperceptible
R02	42	53	53	0	Imperceptible
R03	42	53	53	0	Imperceptible
R04	42	53	53	0	Imperceptible
R05	39	53	53	0	Imperceptible
R06	36	53	53	0	Imperceptible
R07	32	52	52	0	Imperceptible
R08	33	52	52	0	Imperceptible
R09	33	52	52	0	Imperceptible
R10	38	52	52	0	Imperceptible
R11	38	52	52	0	Imperceptible
R12	39	46	47	+1	Not Significant
R13	42	46	48	+2	Not Significant
R14	41	46	47	+1	Not Significant

Review of the predicted increases in noise level at the nearest noise sensitive locations conclude that the associated impact is '*Not Significant'* at all locations for Scenario A – Typical Operation daytime periods.

Table 10.18 Review of Predicted Changes in Existing Noise Levels – Evening

Loc.	Scenario A – Typical Operation Night-Time				
	Predicted dB $L_{Aeq,T}$	Background Level dB $L_{A90,T}$	Cumulative Noise Level (dB(A))	Change in Noise Level (dB)	EPA Glossary of Impacts
R01	39	42	44	+2	Not Significant
R02	40	42	44	+2	Not Significant
R03	41	42	45	+3	Moderate
R04	40	42	44	+2	Not Significant
R05	38	42	44	+2	Not Significant
R06	34	42	43	+1	Not Significant
R07	30	45	45	0	Imperceptible
R08	31	45	45	0	Imperceptible
R09	31	45	45	0	Imperceptible
R10	35	45	45	0	Imperceptible
R11	35	45	45	0	Imperceptible
R12	36	39	41	+2	Not Significant
R13	40	39	43	+4	Moderate
R14	39	39	42	+3	Moderate

Review of the predicted increases in noise level at the nearest noise sensitive locations conclude that the associated impact is '*Imperceptible*' or '*Not Significant'* all locations for Scenario A – Typical Operation evening periods expect for locations R03, R13 and R14 where 'Moderate' impacts are stated, but within the adopted limits.

Table 10.19 Review of Predicted Changes in Existing Noise Levels – Night

Loc.	Scenario A – Typical Operation Night-Time				
	Predicted dB $L_{Aeq,T}$	Background Level dB $L_{A90,T}$	Cumulative Noise Level (dB(A))	Change in Noise Level (dB)	EPA Glossary of Impacts
R01	39	38	42	+4	Moderate
R02	40	38	42	+4	Moderate
R03	41	38	43	+4	Moderate
R04	40	38	42	+4	Moderate
R05	38	38	41	+3	Moderate
R06	34	38	40	+2	Not Significant
R07	30	44	44	0	Imperceptible
R08	31	44	44	0	Imperceptible
R09	31	44	44	0	Imperceptible
R10	35	44	45	+1	Not Significant
R11	35	44	45	+1	Not Significant
R12	36	39	41	+2	Not Significant
R13	40	39	43	+4	Moderate
R14	39	39	42	+3	Moderate

Review of the predicted increases in noise level at the nearest noise sensitive locations conclude that the associated impact is '*Imperceptible*' or '*Not Significant'* at Locations R06, R07, R08, R09, R10, R11 and R12 for Scenario A – Typical Operation night periods. The impact is stated as '*Moderate*', but within the adopted limits, at all other locations.

In essence the existing soundscapes that are encountered at the nearest noise sensitive locations are predicted to remain unchanged in terms of ambient noise levels with the development of the data storage facility introducing a low level of plant noise which will increase the background noise environment.

In terms of noise associated with day to day activities of the overall site the associated effect is stated to be as follows:

Quality	*Significance*	*Duration*
Negative	*Imperceptible to Moderate*	*Long Term*

There will be no noise or vibration emissions from the operation of the cable installation or the 220Kv substation off-site. Consequently, the operational effects are stated to be:

Quality	*Significance*	*Duration*
Neutral	Imperceptible	*Long Term*

Figure 10.4 Sample Sensitive Locations Considered for Assessment

Figure 10.5 Scenario A Proposed Data Storage Facility (current planning application) – Day to Day Noise Contour – Daytime

Figure 10.6 Scenario A Proposed Data Storage Facility (current planning application) – Day to Day Noise Contour – Evening & Night

Figure 10.7 Scenario B Proposed Data Storage Facility (current planning application) – Emergency Noise Contour

10.6 REMEDIAL AND MITIGATION MEASURES

In order to sufficiently ameliorate the likely noise impact, a schedule of noise control measures has been formulated for the construction phase associated with the proposed development.

10.6.1 Construction Phase

With regard to construction activities, reference has been made to BS5228 Parts 1 and 2, which offer detailed guidance on the control of noise and vibration from demolition and construction activities. Various mitigation measures will be considered and applied during the construction of the proposed development. As an example, the following measures will be implemented on site:

- limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;
- establishing channels of communication between the contractor/developer, Local Authority and residents;
- appointing a site representative responsible for matters relating to noise and vibration;
- monitoring levels of noise and/or vibration during critical periods and at critical sensitive locations; and
- all site access roads will be kept even so as to mitigate the potential for vibration from lorries.

Furthermore, a variety of practicable noise control measures will be employed, such as:

- selection of plant with low inherent potential for generation of noise and/ or vibration;
- erection of barriers as necessary around items such as generators or high duty compressors;
- situate any noisy plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.

We would recommend that vibration from construction activities to off-site residences be limited to the values set out in Table 10.7. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution.

Note Appendix 10.5 presents an indicative construction noise and vibration management plan that will be implemented in terms of the day to day operation of the site. This will focus on opening up and maintaining lines of communication with the local community to address issues in relation to noise and/or vibration and to advise the community of periods where specific activities take place (e.g. rock breaking) that have an increased potential in giving rise to issues off site.

10.6.2 Operational Phase

Once operational, there are no noise or vibration mitigation measures required.

10.7 PREDICTED IMPACTS OF THE DEVELOPMENT

This section summarises the likely noise and vibration impact associated with the proposed development, taking into account the mitigation measures.

10.7.1 Construction Phase

During the construction phase of the proposed development there will be some impact on nearby noise sensitive properties due to noise emissions from construction site works. The application of noise limits and hours of operation (see Section 10.2.4), along with implementation of appropriate noise and vibration control measures (as summarised in Section 10.6.1), will ensure that noise and vibration impact is kept to a minimum. Also, it is reiterated that any construction noise impacts will be negative, ***moderate,*** and ***temporary*** in nature.

10.7.2 Operational Phase

Building Services Noise / Emergency Site Operation

Proprietary noise and vibration control measures will be employed in order to ensure that noise emissions from building services plant do not exceed the adopted criterion at the façade of any nearby noise sensitive locations. In addition, noise emissions should be broadband in nature and should not contain any tonal or impulsive elements. The resultant noise impact is ***negative***, ***moderate*** and ***long-term***.

Substation / Underground Cables

There will be no significant noise emissions from the operation of the underground cable or proposed substation compound. Consequently, there are no expected operational noise impacts.

There will be no vibration emissions from the operation of the underground cable or proposed substation compound. Consequently, there are no expected operational vibration impacts.

10.8 RESIDUAL IMPACTS

The construction noise assessment has shown that in accordance with the ‘significance’ thresholds presented in the *British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise* there is not a significant impact at residential locations, subject to the implementation of the mitigation measures outlined in Section 10.6.1.

There will be no significant noise and/or vibration emissions from the operation of the underground cable or proposed substation compound. Consequently, there are no expected residual operational noise impacts.

10.9 CUMULATIVE IMPACTS

The cumulative impact of the proposed development with any/all relevant other planned or permitted developments (including the main site with the proposed data storage and energy center) are discussed in Sections 10.9.1 and 10.9.2 below for construction and operational phases.

The environmental noise survey takes account of noise emissions from existing developments. It was noted that the existing ambient noise levels in the area were dominated primarily by road traffic on the surrounding road network.

10.9.1 Construction Phase

In assessing the noise impacts for construction of the grid lines, consideration of the noise impacts from a variety of items of plant has been used due to the nature of construction activities for sub surface works (including within roads). Construction activities will mostly be carried out during normal daytime working hours. Construction noise predictions have been carried out using guidance set out in British Standard *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise*.

Table 10.14 (Section 10.5.1) outlines the noise levels associated with typical construction noise sources assessed in this instance along with typical sound pressure levels and spectra from *BS 5228 – 1: 2009+A1:2014* at various distances from these works.

The EIAR prepared for the proposed data storage development site that the grid connection serves predicted construction noise levels associated with the main site development at the nearest residential locations to the proposed grid connection works. Figure 10.4 illustrates the locations assessed in this instance. The locations of interest in this instance relate to those identified as R13 and R14.

Table 10.20 Review of Potential Daytime Construction Noise Impact (Main Site)

Location	**Construction Phase (dB $L_{Aeq,1hr}$)**				
	Site Preparation	**Foundations**	**Steel Erection**	**General Construction**	**Landscaping**
R13	44	37	41	28	32
R14	45	39	42	30	34

Based on the above it is concluded that construction works associated with cable works will be the dominant source of noise at the nearest noise sensitive locations to the works when they occur. Other construction activity from the proposed development side, is sufficiently removed from a significant proportion of the proposed cable works, so that when they occur at the same time, cumulative issues would not be a material issue.

Construction being completed at other sites within the area, whilst potentially significant at locations in close proximity to these other sites, will effectively be masked by the existing traffic noise at the nearest noise sensitive locations identified in the assessment undertaken for the proposed development. Such works would not be expected to increase ambient noise levels in the vicinity of the noise sensitive locations that are in the proximity of the proposed development.

Once the mitigation measures outlined for the proposed development are implemented the cumulative impact with the substation, grid and other developments would be negligible. As such the overall impact during construction will be ***negative*** and ***moderate*** i.e. as assessed for the proposed development itself. Also, it is considered that as the proposed development progresses from initial ground works that construction noise impacts (and similarly the cumulative impacts including surrounding developments) will reduce from moderate to ***not significant.***

10.9.2 Operational Phase

In order to assess the potential cumulative noise, emissions from the proposed development, together with any other planed or permitted development (including proposed substation and grid lines) have been considered. As the full extents of permitted data storage facilities were not operational at the time the baseline noise survey was conducted, reference is made to the various EIS noise predictions for the Runways Information Services Limited site which presents noise predictions to nearby shared residential receptors. The closest shared receptors to the two neighboring sites are the receivers R05 and R06. Based on the predictions presented in the available EIAR for the Runways Information Services Limited site (at Location R14b) Table 10.21 presents the predicted cumulative noise levels to these receivers and comperes to the proposed noise criteria.

Table 10.21 Assessment of Predicted Cumulative Levels at Receptors for Day to Day Operations

Receiver Reference	**Period**	**Predicted Plant Noise Level (dB $L_{Aeq,T}$)**			**Criterion dB, $L_{Aeq,T}$**	**Complies?**
		EngineNode	**Runways Information Services Limited**	**Cumulative**		
R01 (Note A)	Day	41	38	**43**	55	✓
	Evening	39	38	**42**	50	✓
	Night	39	34	**40**	45	✓
R05 (Runways Information Services Limited EIS R14.b)	Day	39	41	**43**	55	✓
	Evening	38	41	**43**	50	✓
	Night	38	37	**41**	45	✓
R06 (Runways Information Services Limited EIS R14.b)	Day	36	41	**42**	55	✓
	Evening	34	41	**42**	50	✓
	Night	34	37	**39**	45	✓

Note A Levels at Location R01 have been extrapolated based on additional distance between the nearest prediction location presented in the Runways Information Services Limited EIAR (i.e. R14.b) and the location under consideration here.

Predicted cumulative plant noise emissions are therefore within the daytime, evening and night-time limit values.

The overall cumulative impact is therefore considered to be as determined for the proposed development i.e. ***moderate***, ***negative***, and ***long-term***.

10.10 REFERENCES

- EPA Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIA Reports) (2017) and draft revised Guidelines on information to be contained in Environmental Impact Statements; and Advice Notes for preparing EIS (2015).
- '*Guidelines for Environmental Noise Impact Assessment*' produced by the Institute of Environmental Management and Assessment (IEMA) (2014).
- *British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise*.
- Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes.*
- British Standard BS 7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*.
- British Standard BS 5228-2: 2009+A1:2014: *Code of practice for noise and vibration control on construction and open sites – Vibration*.
- BS 4142:2014: *Methods for rating and assessing industrial and commercial sound.*
- BS 8233:2014: *Guidance on sound insulation and noise reduction for buildings.*
- Environmental Protection Agencies *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)* (January 2016).
- ISO 1996-2:2017 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels.*
- British Standard *BS 6472 (1992): Guide to Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).*
- ISO 9613 (1996): *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation.*
- *Calculation of Road Traffic Noise (CRTN)* issued by the Department of Transport in 1988.
- BS EN 1793-1:1998: *Road traffic noise reducing devices – Test method for determining the acoustic performance – Part 1: Intrinsic characteristics of sound absorption*
- BS EN 1793-2:1998: *Road traffic noise reducing devices – Test method for determining the acoustic performance – Part 2: Intrinsic characteristics of airborne sound insulation.*
- BS EN 1794-1:2003: *Road traffic noise reducing devices. Non-acoustic performance. Mechanical performance and stability requirements*
- BS EN 1794-2:2003: *Road traffic noise reducing devices. Non-acoustic performance. General safety and environmental requirements.*

APPENDIX 10.1

GLOSSARY OF ACOUSTIC TERMINOLOGY

PREPARED BY AWN CONSULTING LIMITED

ambient noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.
background noise	The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).
broadband	Sounds that contain energy distributed across a wide range of frequencies.
dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μPa).
dB L_{pA}	An ‘A-weighted decibel’ - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. ‘A’–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Hertz (Hz)	The unit of sound frequency in cycles per second.
impulsive noise	A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background.
$L_{Aeq,T}$	This 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 (T). The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.
L_{AFN}	The A-weighted noise level exceeded for N% of the sampling interval. Measured using the “Fast” time weighting.
L_{AFmax}	is the instantaneous slow time weighted maximum sound level measured during the sample period (usually referred to in relation to construction noise levels).
$L_{Ar,T}$	The Rated Noise Level, equal to the L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and impulsiveness of the sound.
L_{AF90}	Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the “Fast” time weighting.
L_{AT}(DW)	equivalent continuous downwind sound pressure level.

L_{fT}(DW)	equivalent continuous downwind octave-band sound pressure level.
L_{day}	L_{day} is the average noise level during the daytime period of 07:00hrs to 19:00hrs
L_{night}	L_{night} is the average noise level during the night-time period of 23:00hrs to 07:00hrs.
low frequency noise	LFN - noise which is dominated by frequency components towards the lower end of the frequency spectrum.
noise	Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a person exposed to it, or any sound that could cause actual physiological harm to a person exposed to it, or physical damage to any structure exposed to it, is known as noise.
noise sensitive location	NSL – Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
octave band	A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.
rating level	See $L_{Ar,T}$.
sound power level	The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) per m^2 where: $Lw = 10Log\frac{P}{P_0}$ dB Where: p is the rms value of sound power in pascals; and P_0 is 1 pW.
sound pressure level	The sound pressure level at a point is defined as: $Lp = 20Log\frac{P}{P_0}$ dB
specific noise level	A component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source. In BS 4142, there is a more precise definition as follows: 'the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval ($L_{Aeq,\ T}$)'.
tonal	Sounds which cover a range of only a few Hz which contains a clearly audible tone i.e. distinguishable, discrete or continuous

	noise (whine, hiss, screech, or hum etc.) are referred to as being ‘tonal’.
$^1/_3$ octave analysis	Frequency analysis of sound such that the frequency spectrum is subdivided into bands of one–third of an octave each.

APPENDIX 10.2

BASELINE NOISE MONITORING SURVEY

PREPARED BY AWN CONSULTING LIMITED

An environmental noise survey has been conducted in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2007: *Acoustics – Description, measurement and assessment of environmental noise*. Specific details are set out below.

10.2.1 Survey Details

10.2.1.1 Dates & Times of Survey

Noise measurements were conducted during typical day, evening and night-time periods. The night survey represents the time of night that provides a measure of existing background noise levels during a period where people are attempting to go to sleep or are sleeping. Due to the fact that the units in question here will operate on a 24-hour basis their potential impact during night time periods is the critical issue. The survey was conducted during the following period:

- Daytime – 12:20 to 15:20hrs on 20 June 2019.
- Evening – 21:30 to 22:25hrs on 27 June 2019.
- Night-time – 23:00hrs on 27 June to 01:00hrs on 28 June 2019.

10.2.1.2 Personnel and Instrumentation

Donogh Casey (AWN) conducted the noise level measurements.

The noise measurements were performed using a Brüel & Kjær Type 2260 Sound Level Analyzer. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

10.2.1.3 Measurement Locations

Figure 10.2.1 details the approximate location of the measurement positions identified below.

Location A Located in the vicinity of the nearest residential noise sensitive locations to the south of the proposed site. The location is considered to be representative of the existing noise levels in the vicinity of these properties.

Location B Located on IDA lands opposite a number of private residences located to the north west of the development lands. The meter was located an equivalent distance from the nearby road in order that an estimate of the existing noise climate at the houses on the opposite side of the road could be obtained.

Location C Located on a grass verge in front of a number of residential units on the opposite side of the R147 to the west of the proposed development lands. This location is considered to be representative of this cluster of properties.

Figure 10.2.1 Noise Survey Locations (Source: Google Maps)

10.2.1.4 Methodology

Measurements were conducted at the boundary location noted above. Sample periods for the noise measurements were typically 15 minutes. The results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis if required. Survey personnel noted the primary noise sources contributing to noise build-up.

10.2.3 Survey Results

Location A

The survey results for Location A are summarised in Table 10.2.1 below.

Table 10.2.1 Summary of Measured Noise Levels at Location A

Period	Start Time	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
Daytime	13:01	66	87	54
	14:01	64	81	52
	15:05	65	81	53
			Arithmetic Average of L_{A90} (dB):	**53**
Evening	22:09	64	82	42
			Arithmetic Average of L_{A90} (dB):	**42**
Night-time	23:39	59	80	38
	00:37	60	84	37
			Arithmetic Average of L_{A90} (dB):	**38**

Traffic movements on the nearby R147 dictated ambient noise levels measured at this location. Other sources of noise included aircraft noise overhead, distant noise from the M3 and birdsong. Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of 64 to 66dB and background (i.e. $L_{A90,15min}$) levels were in the range of 52 to 54dB with an average level of some 53dB.

During the evening period, road traffic noise from the R147 and distant M3 were noted along with a degree of aircraft noise. Ambient noise levels were of the order of 64dB $L_{Aeq,15min}$ with background noise levels of the order of 42dB $L_{A90,15min}$.

During the night period, again road traffic noise from the R147 and distant M3 were noted along with a degree of aircraft noise (during the initial monitoring period). Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of 59 to 60dB and background (i.e. $L_{A90,15min}$) levels were in the range of 37 to 38dB with an average level of some 38dB.

No significant source of vibration was noted during the survey periods.

Location B

The survey results for Location B are summarised in Table 10.2.2 below.

Table 10.2.2 Summary of Measured Noise Levels at Location B

Period	Start Time	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
Daytime	12:41	60	77	45
	13:42	61	77	47
	14:46	60	79	46
			Arithmetic Average of L_{A90} (dB):	**46**
Evening	21:49	57	74	39
			Arithmetic Average of L_{A90} (dB):	**39**
Night-time	23:19	59	76	41
	00:19	58	72	37
			Arithmetic Average of L_{A90} (dB):	**39**

Traffic movements on the M3 dictated ambient noise levels measured at this location. Other sources of noise included aircraft noise overhead, traffic on a nearby local road and birdsong. Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of 60 to 61dB and background (i.e. $L_{A90,15min}$) levels were in the range of 45 to 47dB with an average level of some 46dB.

During the evening period, road traffic noise from the M3 were noted along with a degree of aircraft noise. Ambient noise levels were of the order of 57dB $L_{Aeq,15min}$ with background noise levels of the order of 39dB $L_{A90,15min}$.

During the night period, again road traffic noise from the M3 were noted along with a degree of aircraft noise (during the initial monitoring period). Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of 58 to 59dB and background (i.e. $L_{A90,15min}$) levels were in the range of 37 to 41dB with an average level of some 39dB.

No significant source of vibration was noted during the survey periods.

Location C

The survey results for Location C are summarised in Table 10.2.3 below.

Table 10.2.3 Summary of Measured Noise Levels at Location C

Period	Start Time	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
Daytime	12:21	61	80	53
	13:21	60	83	54
	14:27	62	79	50
	Arithmetic Average of L_{A90} (dB):			**52**
Evening	21:30	54	74	45
	Arithmetic Average of L_{A90} (dB):			**45**
Night-time	23:00	58	73	46
	23:59	56	74	42
	Arithmetic Average of L_{A90} (dB):			**44**

Traffic movements on the M3 dictated ambient noise levels measured at this location. Other sources of noise included aircraft noise overhead, traffic on a nearby R147 and birdsong. Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of 60 to 62dB and background (i.e. $L_{A90,15min}$) levels were in the range of 50 to 54dB with an average level of some 52dB.

During the evening period, road traffic noise from the M3 were noted along with a degree of aircraft noise. Ambient noise levels were of the order of 54dB $L_{Aeq,15min}$ with background noise levels of the order of 45dB $L_{A90,15min}$.

During the night period, again road traffic noise from the M3 were noted along with a degree of aircraft noise (during the initial monitoring period). Ambient noise levels (i.e. $L_{Aeq,15min}$) were in the range of 56 to 58dB and background (i.e. $L_{A90,15min}$) levels were in the range of 42 to 46dB with an average level of some 44dB.

No significant source of vibration was noted during the survey periods.

APPENDIX 10.3

NOISE MODELLING DETAILS & ASSUMPTIONS

PREPARED BY AWN CONSULTING LIMITED

Noise Model

A 3D computer-based prediction model has been prepared in order to quantify the noise level associated with the proposed building. This section discusses the methodology behind the noise modelling process.

Brüel & Kjær Type 7810 Predictor

Proprietary noise calculation software has been used for the purposes of this modelling exercise. The selected software, Brüel & Kjær Type 7810 Predictor, calculates noise levels in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 1996*.

Brüel & Kjær Type 7810 Predictor is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. Predictor calculates noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of A weighted sound power levels (L_{WA});
- 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 (these have significant impact at distances greater than approximately 400m).

Brief Description of ISO9613-2: 1996

ISO9613-2:1996 calculates the noise level based on each of the factors discussed previously. However, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level, L_{AT}(DW), for the following conditions:

- wind direction at an angle of ±45° to the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and;
- wind speed between approximately $1ms^{-1}$ and $5ms^{-1}$, measured at a height of 3m to 11m above the ground.

The equations and calculations also hold for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear calm nights.

The basic formula for calculating L_{AT}(DW) from any point source at any receiver location is given by:

$$L_{fT}(DW) = LW + Dc - A \qquad \textbf{Eqn. A}$$

Where:

L_{fT}(DW) is an octave band centre frequency component of L_{AT}(DW) in dB relative to $2x10^{-5}$Pa;

L_W is the octave band sound power of the point source;

D_c is the directivity correction for the point source;

A is the octave band attenuation that occurs during propagation, namely attenuation due to geometric divergence, atmospheric absorption, ground effect, barriers and miscellaneous other effects.

The estimated accuracy associated with this methodology is shown in Table 10.4.1 below:

Table 10.3.1 Estimated Accuracy for Broadband Noise of L_{AT}(DW)

Height, h*	Distance, d†	
	0 < d < 100m	100m < d < 1,000m
0<h<5m	±3dB	±3dB
5m<h<30m	±1dB	±3dB

* h is the mean height of the source and receiver. † d is the mean distance between the source and receiver.
N.B. These estimates have been made from situations where there are no effects due to reflections or attenuation due to screening.

Input Data and Assumptions

The noise model has been constructed using data from various source as follows:

Site Layout	The general site layout has been obtained from the drawings forwarded by Kavanagh Tuite Architects.
Local Area	The location of noise sensitive locations has been obtained from a combination of site drawings provided by Kavanagh Tuite Architects and others obtained from Ordinance Survey Ireland (OSI).
Heights	The heights of buildings on site have been obtained from site drawings forwarded by Kavanagh Tuite Architects. Off-site buildings have been assumed to be 8m high for houses and 16m for apartments with the exception of industrial buildings where a default height of 15m has been assumed.
Contours	Site ground contours/heights have been obtained from site drawings forwarded by Kavanagh Tuite Architects where available.

The final critical aspect of the noise model development is the inclusion of the various plant noise sources. Details are presented in the following section.

Source Sound Power Data

The noise modelling competed indicates the following limits in relation to various items of plant associated with the overall site development. Plant items will be selected in order to achieve the stated noise levels and or appropriate attenuation will be incorporated into the design of the plant/building in order that the plant noise emission levels are achieved on site (including any system regenerated noise).

Table 10.3.2 presents the noise data assumed for the various buildings. Data has been supplied by O’Callaghan Engineering unless otherwise stated.

Building	Source	No. per building	L_{wA} - Octave Band Centre Frequency								dB (A)
			63	125	250	500	1k	2k	4k	8k	
Data Centre	Roof AHU Exhaust Note A,B	48	50	64	67	69	63	65	68	68	75
	AHU Intake Note B.C		35	46	55	55	38	38	31	27	57
	Condenser Note D	48	47	66	71	76	79	77	71	64	83
	CRAH Intake Note B	40	53	54	70	75	75	72	67	64	80
	CRAH Exhaust Note B		52	64	70	74	72	69	58	52	78
Standby Generators Note E	Front	18	69	78	75	82	82	84	77	75	89
	Rear		74	84	78	69	63	63	69	86	87
	Sides		77	87	83	87	87	88	83	87	95
	Roof		84	91	91	89	90	90	86	86	98
	Roof (Grille)		84	96	80	66	65	66	66	75	96
	Stack		76	70	67	72	70	67	60	53	79
Energy Centre	Intakes Note F	1	60	68	69	56	44	56	68	58	74
	Façades Note G	4	35	46	55	55	38	38	32	27	53
	Roof Note H	1	35	46	55	55	38	38	32	27	53
	Radiators Note I	48	66	77	80	82	83	79	74	64	88
	Flues Note J	4	--	--	--	80	--	--	--	--	80
	Exhausts Note K	16	87	86	88	87	74	80	80	70	94
Sub Station & Transformers Note L		9	64	66	69	74	72	68	63	53	78

Table 10.3.2 L_{wA} levels Utilised in Noise Model

Note A L_{wA} per $1m^2$ of louvre. The level has been estimated considering the following:

Source	L_{wA} - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
AHU Exhaust	62	79	86	92	92	90	90	89	98

Table A AHU Exhaust Sound Power Level

The volume of an AHU plant room is assumed to be some $630m^3$ with 6 AHU's per room. Reverberation time within the plant room is 1.5s and the louvre is formed from a standard 50% free area 600mm deep acoustic louvre that offers the following sound reduction index (SRI).

Item	Sound reduction Index (dB) - Octave Band Centre Frequency								dB R_w
	63	125	250	500	1k	2k	4k	8k	
50% Free Area 600mm Deep Acoustic Louvre	5	8	12	16	22	18	15	14	19

Table B Kingspan SRI Data Assumed for Façade & Roof

Note B This plant is assumed to be operating at 75% duty. The following corrections to the supplied noise spectra have been applied as relevant:

Source	Attenuation due to Reduced Duty – Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
Intake	1	8	6	8	8	8	8	7	7
Exhaust	1	11	7	7	7	7	7	7	7

Table C Reductions Assumed for 75% Duty

Note C L_{wA} per 1m^2 of louvre. The level has been estimated considering the following:

Source	L_{wA} - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
AHU Supply	81	85	90	84	75	70	60	57	92

Table D AHU Supply Sound Power Level

The volume of an AHU plant room is assumed to be some 2,000m^3 with 6 AHU's per room. Reverberation time within the plant room is 1.5s and the louvre is formed from a 50% free area 600mm deep acoustic louvre that offers the sound reduction index (SRI) detailed in Table B.

Note D Plant screen assumed to be 0.5m higher than top of these units. Spectrum shape assumed from AWN database. Note it is assumed that all roof plant is screen by either a parapet or plant screen that is some 0.5m higher that the plant items they are screening. Note it is assumed that the condenser units do not operate during evening or nighttime periods.

Note E Data derived from CAT datasheet forwarded by Callaghan Engineering.

Note F L_{wA} per 1m^2 of louvre. The level has been estimated considering the following:

Source	L_{wA} - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
Gas Engine Casing	109	112	115	110	107	104	104	93	113

Table E Energy Centre Supply Sound Power Level

The volume of an AHU plant room is assumed to be some 25,000m^3 with 16 gas engines in the room. Reverberation time within the room is 2.5s and the louvre is formed from a bank of acoustic splitter attenuators that offer the sound reduction index (SRI) detailed in Table F.

Item	Sound reduction Index (dB) - Octave Band Centre Frequency								dB R_w
	63	125	250	500	1k	2k	4k	8k	
Splitter Attenuator	5	10	19	32	44	31	18	15	29

Table F Energy Centre Gas Engine Exhausts – Attenuator

Note G Façade noise levels are associated with the Energy Centre are stated as L_{wA} per m^2. Table G details the noise data assumed for 16 generators and associated boilers.

Source	L_w - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
Gas Engine Casing	109	112	115	110	107	104	104	93	113

Table G Energy Centre Internal Noise Sources

The volume of an energy centre hall is assumed to be some 170,000m^3 with 16 generators and boilers in the space. Reverberation time within the space is assumed to be the SRI offered by the installed façade / roof is assumed to be as per offered by a Kingspan AWP/60 + F build up as detailed in Table H.

Item	Sound reduction Index (dB) - Octave Band Centre Frequency								dB R_w
	63	125	250	500	1k	2k	4k	8k	
AWP/60+F	12	19	32	42	50	52	60	60	43

Table H Kingspan SRI Data Assumed for Façade & Roof

Note H As per Note G.

Note I 3 units assumed per generator unit.

Note J External flues assumed to incorporate sufficient attenuation such that the L_{wA} of these element (per 4 clustered flues) does not exceed 80dB(A) per m^2.

Note K Generator engine exhaust noise associated with the Energy Centre are stated are as per Table I.

Source	L_w - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
Gas Engine Exhaust	128	127	125	125	112	114	107	96	124

Table I Energy Centre Gas Engine Exhausts

It is assumed that two inline attenuators which each offer the stated performances detailed in Table J are provided.

Item	Sound reduction Index (dB) - Octave Band Centre Frequency								dB R_w
	63	125	250	500	1k	2k	4k	8k	
Attenuator	15	25	28	35	38	35	28	25	35

Table J Energy Centre Gas Engine Exhausts – Attenuator

Note L Data assumed from AWN database. The following extract from *the "EirGrid Evidence Based Environmental Studies Study 8: Noise – Literature review and evidence based field study on the noise effects of high voltage transmission development (May 2016)* states the following in relation to noise impacts associated with 220KvA transformer installations:

"The survey on the 220kv substation at Gorman indicated that measured noise levels (L_{Aeq}) were approximately 43dB(A) at 5m from the most affected boundary of the substation. This is marginally above the WHO night-time threshold limit for preventing disturbance to sleep (i.e. 42dB). Spectral analysis of the noise from the Gorman substation demonstrated that there are a number of distinct tonal elements to noise in the low to mid frequency range. To avoid any noise impacts from 220kV substations at sensitive receptors, it is recommended that a distance of 20m is maintained between the nearest site boundary and the nearest sensitive receptor."

Considering the distance between the 220kV substation and the nearest off site locations of some 110m noise from this installation is not predicted to be an issue off site.

Considering the above, it is concluded that there will be no significant noise emissions from the operation of the cable installations or 220kV substation and associated cable bays.

It is assumed that the plantroom parapet will be at least 0.5m higher than the highest dimension of the roof mounted plant.

Figure 10.3.1 presents a 3D render of the developed site noise model for the current proposals.

Three scenarios have been developed to consider the noise impact of the proposed operations. These are as follows:

- Scenario A – Proposed Data Storage Facility – Day to Day
- Scenario B – Proposed Data Storage Facility – Emergency
- Scenario C – Proposed Data Storage Facility – Generator Testing

Figure 10.3.1 Images of Developed Noise Model – View of Site

Table 10.3.3 Predicted Plant Noise Levels for Various Scenarios

Location	Predicted dB $L_{Aeq,T}$				
	Scenario A		Scenario B		Scenario C
	Day	Evening/Night	Day	Evening/Night	Day
R01	41	39	51	51	42
R02	42	40	52	52	44
R03	42	41	51	51	44
R04	42	40	51	51	43
R05	39	38	49	49	41
R06	36	34	46	46	37
R07	32	30	40	40	33
R08	33	31	40	40	34
R09	33	31	40	40	33
R10	38	35	43	43	38
R11	38	35	43	43	38
R12	39	36	44	44	39
R13	42	40	48	48	42
R14	41	39	47	47	41
R15	43	42	46	46	43

Modelling Calculation Parameters[2]

Prediction calculations for plant noise have been conducted in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 1996*.

Ground attenuation factors of 1.0 have been assumed. No metrological corrections were assumed for the calculations. The atmospheric attenuation outlined in Table 10.3.4 has been assumed for all calculations.

Table 10.3.4 Atmospheric Attenuation Assumed for Noise Calculations (dB per km)

Temp (ºC)	% Humidity	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10	70	0.12	0.41	1.04	1.92	3.66	9.70	33.06	118.4

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[2] See Appendix 10.5 for further discussion of calculation parameters.

APPENDIX 10.4

INDICATIVE CONSTRUCTION NOISE & VIBRATION MANAGEMENT PLAN

PREPARED BY AWN CONSULTING LIMITED

This Noise and Vibration Management Plan (NVMP) details a *'Best Practice'* approach to dealing with potential noise and vibration emissions during the construction phase of the development. The Plan should be adopted by all contractors and sub-contractors involved in construction activities on the site. The Site Manager should ensure that adequate instruction is provided to contractors regarding the noise and vibration control measures contained within this document.

The environmental impact assessment (EIA) Report conducted for the construction activity has highlighted that the construction noise and vibration levels can be controlled to within the adopted criteria. However, mitigation measures should be implemented, where necessary, in order to control impacts to nearby sensitive areas within acceptable levels.

Nearby sensitive properties in the vicinity of the proposed development are summarised in Figure 10.4.1 below:

Figure 10.4.1 Sensitive Receptors

Construction Noise Criteria

As referenced in the EIA Report prepared for the proposed development, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[3] which indicates the following criteria and hours of operation.

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[3] *Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1, 25 October 2004*, Transport Infrastructure Ireland

Table 10.5.1 Construction Noise Limit Values

Days and Times	Noise Levels (dB re. 2x10-5 Pa)	
	$L_{Aeq(1hr)}$	L_{Amax}
Monday to Friday 07:00hrs to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60*	65*
Saturdays 08:00hrs to 13:00hrs	65	75

Note * Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.

Construction Vibration Criteria

It is recommended in this EIA Report that vibration from construction activities to off-site residences be limited to the values set out in Table 10.5.2. It should be noted that these limits are not absolute, but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.

Table 10.5.2 Construction Vibration Limit Values

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Hours of Work

The proposed general construction hours are 07:00 to 18:00hrs, Monday to Friday and 08:00 to 14:00 on Saturdays. However, weekday evening works may also be required from time to time.

Weekday evening activities should be significantly reduced and generally only involve internal activities and concrete pouring which will be required during certain phases of the development. As a result, noise emissions from evening activities are expected to be significantly lower than for other general daytime activities.

Best Practice Guidelines for the Control of Noise & Vibration

BS5228 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- selection of quiet plant;
- control of noise sources;
- screening;
- hours of work;
- liaison with the public, and;
- monitoring.

Detailed comment is offered on these items in the following paragraphs. Noise and vibration control measures that will be considered include the selection of suitable plant, enclosures and screens around noise sources, limiting the hours of work and monitoring.

Selection of Quiet Plant

This practice is recommended in relation to sites with static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures where possible. 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 should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

General Comments on Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration should 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. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

BS5228 states that *"as far as reasonably practicable sources of significant noise should be enclosed"*. In applying this guidance, constraints such as mobility, ventilation, access and safety must be taken into account. Items suitable for enclosure include pumps and generators. Demountable enclosures will also be used to screen operatives using hand tools and will be moved around site as necessary.

In practice, a balance may need to be struck between the use of all available techniques and the resulting costs of doing so. As with Ireland's Environmental Protection Act legislation, we propose that the concept of *"best available techniques not entailing excessive cost "*(BATNEEC) be adopted. Furthermore, proposed noise control techniques should be evaluated in light of their potential effect on occupational safety etc.

BS5228 makes a number of recommendations in relation to "use and siting of equipment". These are all directly relevant and hence are reproduced in full. These recommendations will be adopted on site.

> *"Plant should always be used in accordance with manufacturers' instructions. Care should be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading should also be carried out away from such areas. Special care will be necessary when work has to be carried out at night.*
>
> *Circumstances can arise when night-time working is unavoidable. Bearing in mind the special constraints under which such work has to be carried out, steps should be taken to minimise disturbance to occupants of nearby premises.*
>
> *Machines such as cranes that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and waste energy.*
>
> *Plant known to emit noise strongly in one direction should, when possible, be orientated so that the noise is directed away from noise-sensitive areas. Attendant operators of the plant can also benefit from this acoustical phenomenon by sheltering, when possible, in the area with reduced noise levels.*
>
> *Acoustic covers to engines should be kept closed when the engines are in use and idling. The use of compressors that have effective acoustic enclosures and are designed to operate when their access panels are closed is recommended.*

> *Materials should be lowered whenever practicable and should not be dropped. The surfaces on to which the materials are being moved could be covered by resilient material."*

All items of plant should 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.

Screening

Typically, screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen and its position relative to both the source and receiver.

The length of the screen should in practice be at least five times the height, however, if shorter sections are necessary then the ends of the screen should be bent around the source. The height of any screen should be such that there is no direct line of sight between the source and the receiver.

BS5228 states that on level sites the screen should be placed as close as possible to either the source or the receiver. The construction of the barrier should be such that there are no gaps or openings at joints in the screen material. In most practical situations the effectiveness of the screen is limited by the sound transmission over the top of the barrier rather than the transmission through the barrier itself. In practice screens constructed of materials with a mass per unit of surface area greater than 7 kg/m^2 will give adequate sound insulation performance.

In addition, careful planning of the site layout should also be considered. The placement of site buildings such as offices and stores and in some instances, materials such as topsoil or aggregate can provide a degree of noise screening if placed between the source and the receiver.

Vibration

The vibration from construction activities will be limited to the values set out in Table 2. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage, these limits may need to be reduced by up to 50%.

Liaison with the Public

The Contractor will provide proactive community relations and will notify the public and sensitive premises before the commencement of any works forecast to generate appreciable levels of noise or vibration, explaining the nature and duration of the works. The Contractor will distribute information circulars informing people of the progress of works and any likely periods of significant noise and vibration.

A designated noise liaison should be appointed to site during construction works. Any complaints should be logged and followed up in a prompt fashion. In addition, prior to particularly noisy construction activity, e.g. rock breaking, piling, etc., the site contact should inform the nearest noise sensitive locations of the time and expected duration of the works.

Noise Monitoring

During the construction phase consideration should be given to noise monitoring at the nearest sensitive locations.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise* and be located a distance of greater than 3.5m away from any reflective surfaces, e.g. walls, in order to ensure a free-field measurement without any influence from reflected noise sources.

Vibration Monitoring

During the construction phase consideration should be given to vibration monitoring at the nearest sensitive locations.

Vibration monitoring should be conducted in accordance with BS7385-1 (1990) *Evaluation and measurement for vibration in buildings — Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings* or BS6841 (1987) *Guide to measurement and evaluation of human exposure to whole-body mechanical vibration and repeated shock*.

The mounting of the transducer to the vibrating structure should comply with BS ISO 5348:1998 *Mechanical vibration and shock – Mechanical mounting of accelerometers*. In summary, the following ideal mounting conditions apply:

- the transducer and its mountings are as rigid as possible;
- the mounting surfaces should be as clean and flat as possible;
- simple symmetric mountings are best, and;
- the mass of the mounting should be small in comparison to that of the structure under test.

In general, the transducer will be fixed to the floor of a building or concrete base on the ground using expansion bolts. In instances where the vibration monitor will be placed outside of a building a flat and level concrete base with dimensions of approximately 1m x 1m x 0.1m will be required.

APPENDIX 10.5

NOISE MODEL PARAMETERS

PREPARED BY AWN CONSULTING LIMITED

Prediction calculations for noise emissions have been conducted in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 1996*. The following are the main aspects that have been considered in terms of the noise predictions presented in this instance.

Directivity Factor: The directivity factor (D) allows for an adjustment to be made where the sound radiated in the direction of interest is higher than that for which the sound power level is specified. In this case the sound power level is measures in a down wind direction, corresponding to the worst-case propagation conditions and needs no further adjustment.

Ground Effect: Ground effect is the result of sound reflected by the ground interfering with the sound propagating directly from source to receiver. The prediction of ground effects is inherently complex and depend on source height receiver height propagation height between the source and receiver and the ground conditions. The ground conditions are described according to a variable defined as G, which varies between 0.0 for hard ground (including paving, ice concrete) and 1.0 for soft ground (includes ground covered by grass trees or other vegetation) Our predictions have been carried out using various source height specific to each plant item, a receiver heights of 1.6m for single storey properties and 4m for double. An assumed ground factor of G = 1.0 has been applied off site. Noise contours presented in the assessment have been predicted to a height of 4m in all instances. For construction noise predictions have been made at a level of 1.6m as these activities will not occur at night.

Geometrical Divergence This term relates to the spherical spreading in the free-field from a point sound source resulting in attenuation depending on distance according to the following equation:

$$A_{geo} = 20 \text{ x } \log \text{ (distance from source in meters)} + 11$$

Atmospheric Absorption Sound propagation through the atmosphere is attenuated by the conversion of the sound energy into heat. This attenuation is dependent on the temperature and relative humidity of the air through which the sound is travelling and is frequency dependent with increasing attenuation towards higher frequencies. In these predictions a temperature of 10^{o}C and a relative humidity of 70% have been used, which give relativity low levels of atmosphere attenuation and corresponding worst case noise predictions.

Table 10.5.1 Atmospheric Attenuation Assumed for Noise Calculations (dB per km)

Temp (^{o}C)	% Humidity	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10	70	0.12	0.41	1.04	1.92	3.66	9.70	33.06	118.4

Barrier Attenuation The effect of any barrier between the noise source and the receiver position is that noise will be reduced according to the relative heights of the source, receiver and barrier and the frequency spectrum of the noise.

11.0 LANDSCAPE AND VISUAL

11.1 INTRODUCTION

This chapter comprises an assessment of the likely impacts of the proposed development in the townland of Bracetown, Gunnocks, Paddingstown, Normansgrove, Rowan, Portmanna, and Pace in County Meath on the landscape and visual environment.

The proposed development is for a 220 kV GIS substation with Gas Insulated Switchgear (GIS) technology to the south of a data storage development that is subject to a separate concurrent application under Meath County Council Reg. Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20. The proposed development also includes two 220 kV underground transmission cables. An underground MV circuit will be located within the roadbed of the L1010 (rural supply) to supply the proposed substation.

The proposed substation facility will occupy c. 3.6 hectares of the southern part of the 24.5 hectare site of the concurrent data storage development lands, and the transmission cables extend to additional areas in the public roadways and adjoining private fields.

The proposed development includes both high and medium voltage substations, an array of transformers, as well as access and maintenance roadways within a secure fenced compound. The development also includes localised alterations to elements of the data storage development site landscaping. The development will be accessed using the same entrances and internal road network as the proposed data storage development, including short-term access via a new entrance onto the R147, and longer term access via a new entrance to the east of the development site that will lead via a new link road to the Kilbride Road further east.

This chapter is accompanied by a set of Photomontages illustrating the physical and visual appearance of the proposed development which are included as *Appendix 11.1*.

The following aspects of development proposals are typically relevant to landscape and visual assessment:

- Design:
  - Form and massing of the proposed development;
  - Façade on all above ground structures; and
  - Cognisance of how design elements impact on views of the proposed development and any effects on the receiving environment, including landscape character.

- Operation:
  - Views of the proposed development and any effects on the receiving environment, including landscape character.

- Construction:
  - Views of the proposed development and any effects on the receiving environment, including landscape character; and
  - Loss or change of existing features that contribute to the receiving environment.

11.2 METHODOLOGY

11.2.1 General

The landscape assessment has considered the likely significant effects of the proposed development on the landscape as an environmental resource and the visual assessment has considered the effect of visual change on receptors. Landscape and visual effects have been considered for the construction and operation of the proposed development. Further, to support the assessment, a series of photomontages, illustrating the physical and visual appearance of the proposed development, has been prepared from a range of publicly accessible locations that are representative of the more open views in the surrounding environment. The Photomontage views are included as Appendix 11.1.

The following guidelines were considered and consulted for the purposes of the report:

- EPA Draft 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' (2017);
- EPA 'Draft Advice Notes for preparing Environmental Impact Statements' (2015);
- The Landscape Institute/ Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment (3rd Edition);
- 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);
- Meath County Development Plan 2013-2019; and,
- Dunboyne / Clonee / Pace Local Area Plan 2009-2015.

The methodology used for the landscape assessment entailed:

- Desktop studies of the site in relation to its overall context locally, regionally and nationally; including permitted and planned development in the locality; and
- Visiting the site and its environs between July and August 2019 to assess the following:
    - Quality and type of views in the area;
    - The extent of the visual envelope, i.e. the potential area of visibility of the site in the surrounding landscape; and,
    - The character and quality of the surrounding landscape in relation to the position of the proposed development.

11.2.2 Categorisation of the Baseline Environment

The landscape and visual assessment involved visits to the site and its environs, between June 2019 and July 2020, to review the nature and scale of existing development surrounding the site, to identify landscape features, local character and land uses, to identify key views to and from the proposed development, and to note receptor sensitivity.

This site based assessment was augmented by reviewing aerial photography, publications and reports and project information included within the application and in this EIA Report.

11.2.3 Impact Assessment Methodology

The landscape and visual impact assessment for the proposed development takes account of the character and nature of the existing site and its surrounds, the location of sensitive landscapes and visual receptors, the sensitivity and significance of the site, and its vulnerability to change.

The classification of significance of effects or impacts as set out in *Figure 11.1* below as included in EPA Draft '*Guidelines on the information to be contained in Environmental Impact Assessment Reports'* (2017), and on the professional experience of the author in carrying out landscape and visual assessments for over 25 years.

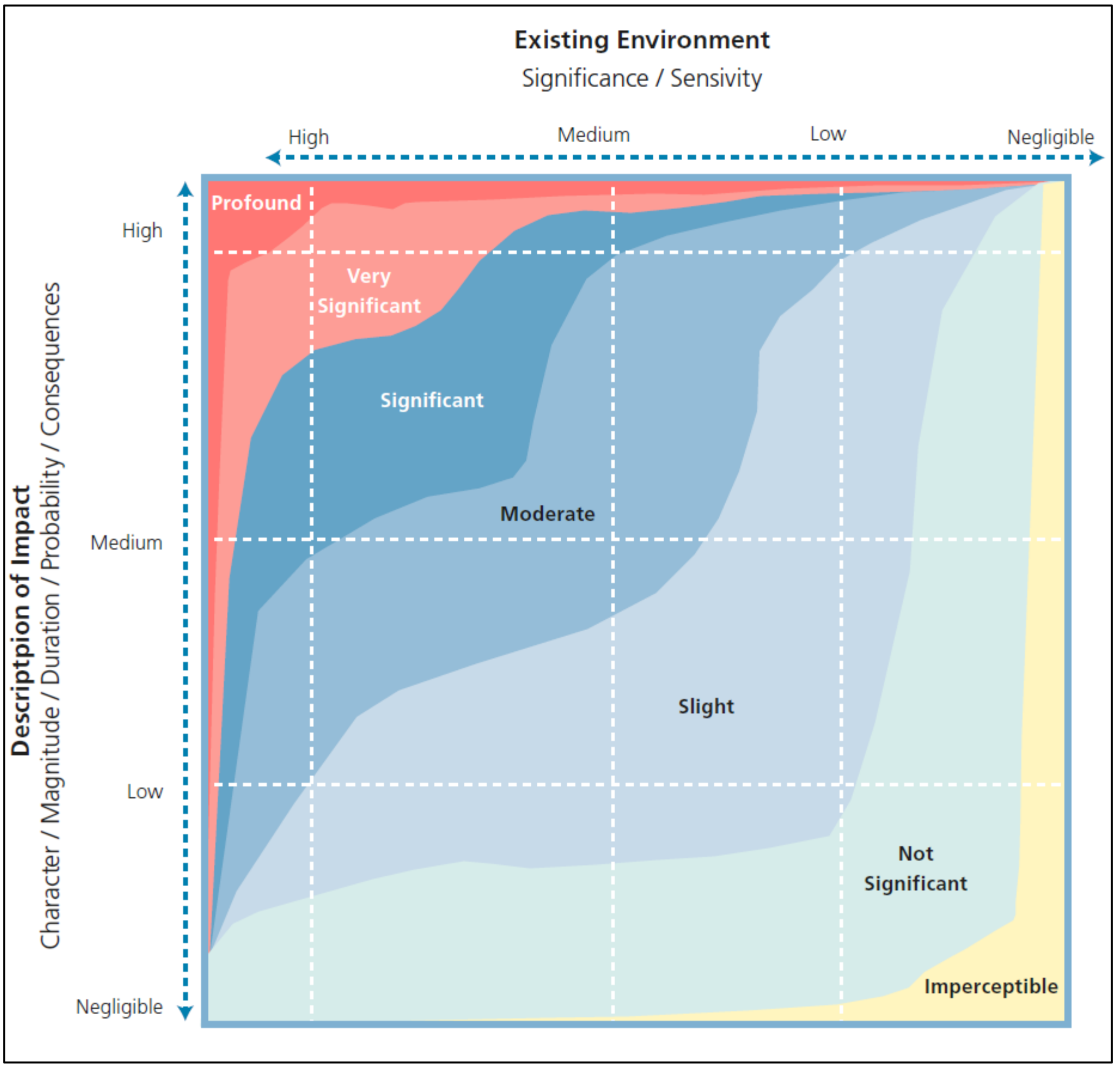

Figure 11.1 Significance of Effects, extract , Figure 3.5, EPA Draft 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' (2017).

These effects, which in nature may be positive, neutral or negative/adverse, are described in Table 1.2 in Chapter 1 Introduction of this EIAR.

11.3 RECEIVING ENVIRONMENT

11.3.1 Site Context

The proposed substation development site is immediately south of the concurrent data storage development located along the R147, east of the M3 motorway, and c. 1.5km east of the centre of Dunboyne. Currently, and until such time as construction is commenced on the data storage development, the lands are mostly rural and agricultural, comprising a network of arable fields with boundaries of mature hedge-rows, mature and semi-mature trees.

The area also comprises dispersed houses, clusters of houses and farm buildings, as well as the light industrial and commercial units at Bracetown Business Park and The Hub Logistic Park that adjoin the proposed development site. At c.1.0km to the southeast, adjoining the Meath/Fingal county boundary, the first phase of the Facebook facility has been constructed and comprises a large scale data storage facility set in high quality landscaped campus. Construction of the second phase of that facility is well advanced, and will extend the Facebook facility westwards towards the proposed development site.

Following commencement of construction of the data storage development, the emerging high tech built developments will have begun to substantially transform the agricultural character of the locality to a high tech campus character extending from the Bracetown Business Park to the established Facebook facility to the east.

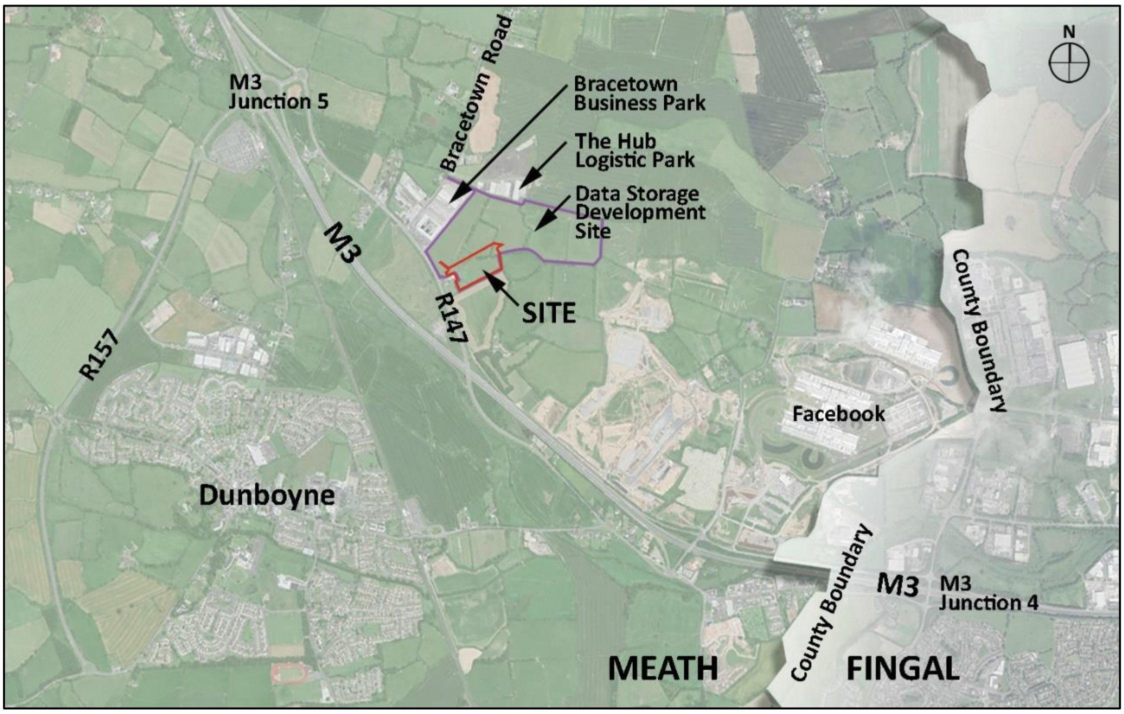

Figure 11.2 Site Location in Context

11.3.2 Site Description

The proposed development site of c. 1.7 hectares occupies the southern portion of the overall 24.5 hectares of the data storage development site. These lands have been in agricultural use, however, it is anticipated that the concurrent data storage development will transform that context to one of a high tech campus development, comprising data storage buildings, an energy centre and extensive associate internal and perimeter landscaping.

Access is currently via a narrow strip of land between the Bracetown Business Park and The Hub Logistic Park, and leading onto the Bracetown Road. As part of the concurrent data storage development, a new temporary access will be established from the R147 which will serve the developments until such time as a permanent access is opened in the eastern boundary. This will connect directly to a new roadway leading eastwards to Portan that is included in the non-statutory Masterplan (Revision One) which has been prepared for the 170 hectare northern parcel of lands in compliance with objective CER OBJ 3 of the Dunboyne, Clonee and Pace Local Area Plan 2009-2015.

The proposed substation development site occupies the southern 1.7 hectares of the overall data storage development site. The southern boundary, and part of the eastern boundary, adjoin agricultural fields, and landscape berms with mixed woodland planting are included as part of the data storage development to reinforce the existing field boundary. The northern substation boundary, and part of the eastern boundary, are internal to the data storage development, and will be contiguous to the campus landscape of that development.

The western boundary adjoins the rear of two private residential landholdings. The northernmost incorporates a detached dwelling, agricultural sheds, yard areas and open grassland. The southernmost is a detached dwelling some 50m further south along the R147.

The R147 continues further south, rising on an embankment to cross the motorway overbridge. Gunnocks House, a protected structure and recorded monument is located c. 350-450m south of the site boundary, and is at the base of the embankment adjoining the motorway overbridge. It is accessed via a driveway running along the base of the embankment.

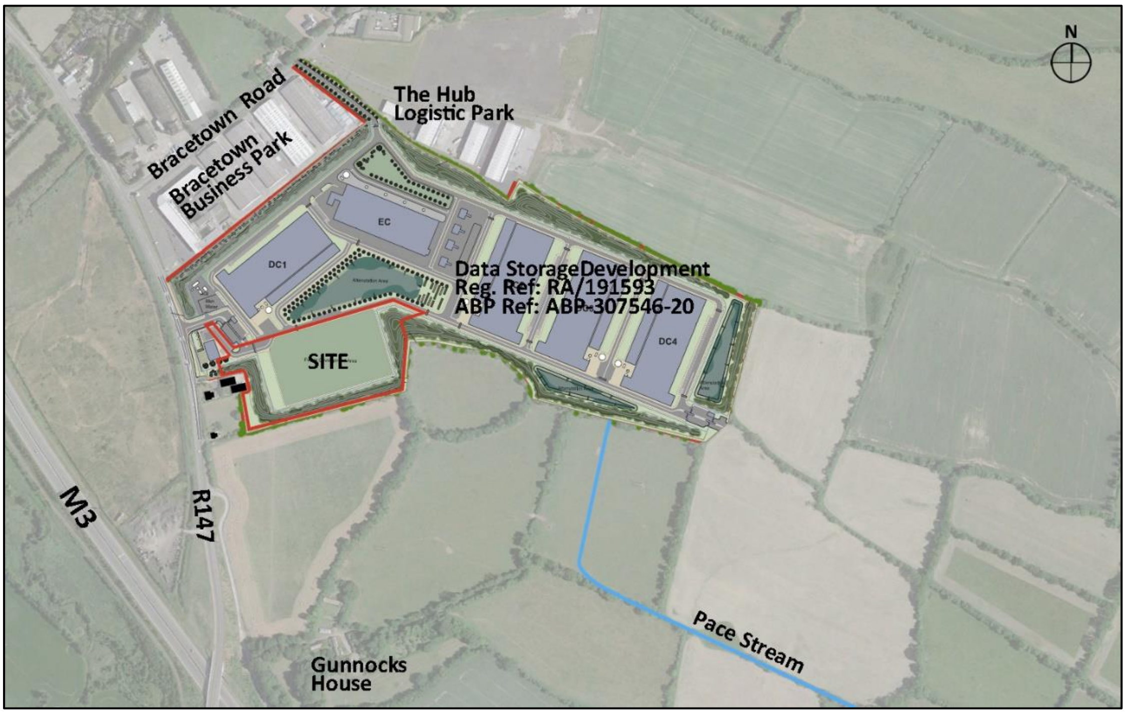

Figure 11.3 Proposed Site Area and immediate context

The proposed site area will be partly internal to the data storage development. The southern substation site boundary comprises substantial rows of generally mature trees that are located along both sides of the existing field boundary ditch. As part of the data storage development, the southern boundary is to be reinforced with additional landscape berms and mixed woodland planting. These will encompass the site area of the proposed substation development.

The western boundary is presently open to the two private residences, however, landscape berms and planting included as part of the data storage development are to establish a strong visual screen to the residential properties. As part of the current application, the landscape berm and planting of the data storage development is proposed to be set back from the rear property boundaries. This is discussed in more detail below.

11.3.3 Landscape Planning and Land Use Zoning

Land use zoning for the proposed development site is set out in the Meath County Development Plan 2013-2019 (MCDP). The Dunboyne North - Dunboyne - Clonee Land Use Zoning Map identifies substantial areas of lands to the east of the R147 that are **Zoned E2/E3:** *To provide for the creation of enterprise and facilitate opportunities for employment through industrial, manufacturing, distribution, warehousing and other general employment / enterprise uses in a good quality physical environment. To facilitate logistics, warehousing, distribution and supply chain management inclusive of related industry facilities which require good access to the major road network.*

Within the overall E2/E3 zoned area, there are two distinct but adjoining parcels of land identified as areas *'subject to Integrated Action Area Plan / Preparation of a Masterplan (Revision One).'* The southern parcel extends between the Kilbride Road (L5028) and the County Boundary, and substantially comprises the existing Facebook facility.

The northern parcel is the larger of the two at c. 170 hectares, and extends from the Kilbride Road (L5028) to the Bracetown Business Park. The data storage development site occupies the northern 24.5 hectares of this larger land parcel, and the proposed substation development occupies 3.6 hectares of that site area. It is noted that the second phase of the Facebook facility is currently at an advanced stage of construction and will occupy c.80 hectares of the overall 170 hectare lands.

11.3.4 Dunboyne, Clonee and Pace Local Area Plan 2009-2015, Masterplan (Revision One)

A non-statutory Masterplan (Revision One) has been prepared for the 170 hectare northern parcel of lands in compliance with objective CER OBJ 3 of the Dunboyne, Clonee and Pace Local Area Plan 2009-2015. The Masterplan (Revision One) demonstrates how the proposed development will form part of the overall lands, incorporating the permitted Phase 2 Facebook development, the balance of the E2/E3 zoned lands, F1 zoned Open Space and Recreation, and also the temporary and longer term site access arrangements for the proposed development to and from the R147 and the Kilbride Road respectively.

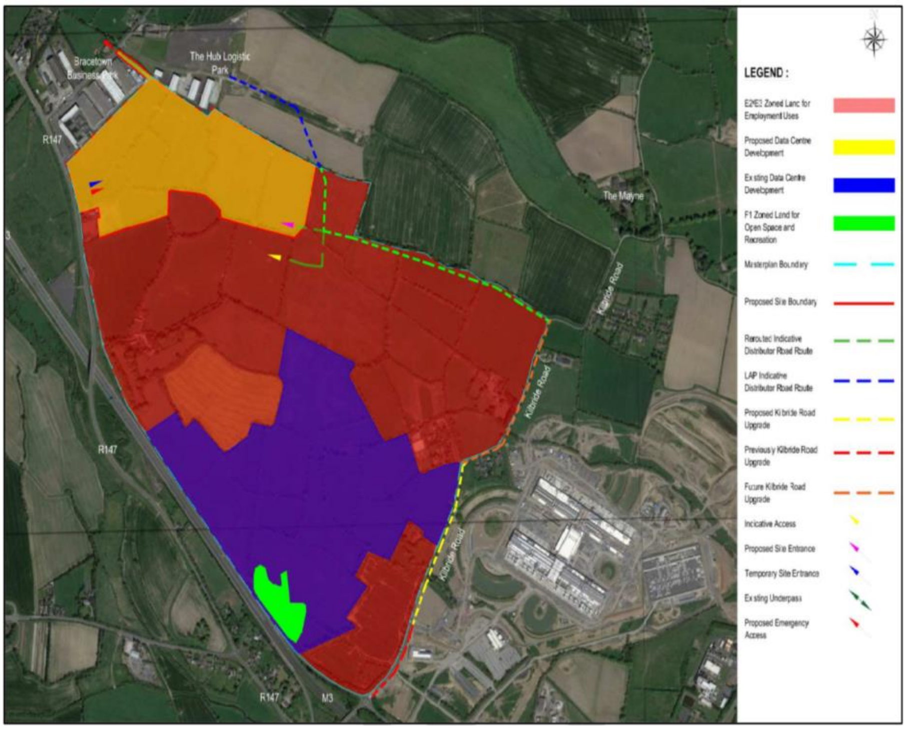

Figure 11.4 Non-statutory Masterplan (Revision One) for lands

11.3.5 Landscape Character Assessment

The Meath County Development Plan 2013-2019, with reference to the Meath County Landscape Character Assessment 2007, identifies four Landscape Character Types and twenty Landscape Character Areas throughout the county.

The proposed development site is located within The Ward Lowlands landscape character area, Map 01, which is identified as Low Value (Map 02). The area is also identified as an area of High Sensitivity (Map 03), which reflects the prevailing lowlands agricultural character of the wider area that extends northwards for over 15km to beyond Ashbourne and Ratoath.

The southernmost extent of this area, where the proposed development is to be located, has and continues to attract significant development activity by virtue of its proximity to the Dublin metropolitan area. Recent, ongoing and emerging high tech industrial developments have substantially altered the former agricultural character of the lands in this area, and the current land use zoning anticipates further expansion and intensification of such uses.

It is considered therefore that the High Sensitivity of the agricultural lands rating identified in 2007 is no longer appropriate to the local land use, and that the capacity of the area to accommodate high tech industrial facilities has been clearly established. It is however considered that integration of such development within the wider agricultural landscape is an important consideration in designing and planning for such development.

11.3.6 Protected Structures

Gunnocks House, c.350-450m from the southern site boundary, is a Protected Structure (RPS No. MH051-100) and Recorded Monument (RMP No. ME051-008). Originally a 17th century thatched house, it was during the 18th century to become a two-storey Georgian dwelling with associated outbuildings arranged around a working courtyard, and set within a range of mature woodland areas.

The house itself faces southeast onto lawn and parkland areas, and away from the proposed development site. The woodland setting of the house and gardens affords a high degree of enclosure and seclusion. Beyond the immediate setting of the house, the landscape has been highly modified, particularly with the introduction of the M3 motorway and the R147 motorway overbridge which lies c.150m west of the house, and immediately alongside the western woodland area.

Figure 11.5 Gunnocks House and woodlands adjacent to R147/M3 overbridge

Additionally, there are a number of Protected Structures within the built environment of Dunboyne, however, these are relatively remote from the proposed development and set within the existing urban context of Dunboyne village.

11.3.7 Other Landscape Designations

The MCDP, Chapter 9, includes details of Historic Landscape Characterisation, Tree Preservation Orders, Views and Prospects and Landscape Conservation Areas,

There are no listed or scenic views, no landscape, conservation or amenity designations or protected trees pertaining to the site, and no specific Green Infrastructure Objectives pertaining to the site.

11.3.8 Summary of Significance and Sensitivity of the Existing Landscape and Visual Environment

The site is not considered to be significant or sensitive from a landscape and visual aspect. The immediate site area is contained within an environment of agricultural lands with established and emerging industrial parks and high tech campus developments, together with the M3 motorway and associated infrastructure.

11.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development comprises a substation facility within the data storage development, together with two underground transmission cables and associated development. The substation facility will be within a compound with an overall dimension of c.100m x 145m, and will include:

- a high voltage substation building, c. 60m long, 20m wide, and 17m high;
- a medium voltage substation building, c. 50m long, 13m wide, and 6.0m high;
- 4 transformer units;
- perimeter security fencing; and,
- localised alterations to the landscape berms proposed as part of the data storage development, including altering the footprint of the larger berm to the northeast of the substation; revisions to the southern berm including incorporation of gabion walls along the inside of that berm, and, setting back the western berm facing the private residences by c. 30m, so as to enhance the residential amenity of those properties.

The proposed development will also include 2 No. underground transmission cables as follows:

- The first will lead north from the substation and under the R147 for c. 1.2km as far the eastern roundabout at Junction 4 on the M3, after which it will be constructed through a number of private agricultural fields to where an existing electricity pylon is located. The overall length if the grid connection is c. 1,900m.
- The second will lead from the substation and along the R147 and Bracetown Business Park boundaries before joining the Bracetown Road where it will continue northwards within the roadway for c. 700m. At this point, it will divert into an agricultural field, and continue underground to the existing electricity pylon in the north eastern corner of the field. The overall length if the grid connection is c. 1,730m.

Both of the existing connecting electricity pylons will be replaced with new pylons and drop down cables leading to fenced compounds to connect to the underground cables. The compound will be c. 20 x 30m, and defined by a 2.4m high palisade fence. The existing overhead cables between the two existing electricity pylons will be removed as part of a separate project.

A detailed description of the proposed development is provided in Chapter 2 of this EIAR.

11.5 LIKELY SIGNIFICANT EFFECTS

11.5.1 General

New development has the potential to impact on the immediate site environs or the surrounding site context, or both. The quality of impacts can be positive, neutral or negative, and the significance of impacts is determined by the particular characteristics of the development and the existing context or emerging context.

The data storage development including ancillary buildings and landscaping will introduce ordered northwestern and northeastern sides to the overall site area. The northern and eastern side of the proposed substation development site will be substantially within the larger data storage development site, with only the southern and western sides of the proposed development site facing outwards.

The proposed development will give rise to an appreciable change in character of the immediate site area that will be an intensification of the data storage development, and will be consistent with the land use zoning for the area and with the nature of both existing and emerging high tech developments within the locality.

Perimeter landscaping included as part of the data storage development, and including landscape modifications proposed under the current application, will serve to provide a strong buffer zone around the entire site that will serve as a visual foil from the more proximate locations and assist in integrating the development into the layers of field boundaries that are a characteristic of the wider agricultural context.

11.5.2 Do-Nothing Scenario

In the event that the proposed development does not proceed, the site development area is likely to remain in its current agricultural until permission for an alternative similar development is secured to service the data storage development.

11.5.3 Assessment of Effects During Construction

The proposed development will be constructed and commissioned subject to grant of planning permission, and as described in Chapter 2 of this EIAR.

Potential landscape and visual effects will arise from:

- Site establishment and preparation works;
- Establishment of construction compound and construction staff facilities;
- Site clearance;
- Erection of site hoarding and permanent security fencing;
- Site levelling, and excavation for foundations and underground utilities;
- Access and egress of construction traffic for material import and export;
- Erection and operation of tower cranes;
- Construction traffic movement on site;
- Construction site lighting;
- General construction activity, including construction and security personnel, and construction machinery;
- Formation of perimeter landscape berms;
- Gradual emergence of the proposed development on the site;
- Provision of landscaping and planting etc.; and
- Completion and commissioning of the development.

Outside of the proposed substation site, and relating to the construction of the grid connections, potential landscape and visual effects will arise from:

- Establishment of localised and rolling construction works areas within the public roadway;
- Temporary traffic management facilities;
- Movement of construction vehicles;
- Excavation of trenches within the public roadway;
- Temporary stockpiling of excavated material;
- Reinstatement of public roadway;
- Localised breaks in field boundary hedgerows;
- Construction activity with agricultural fields;
- Removal and replacement of existing electricity pylons;
- Construction of 2 No. fenced drop down compounds within fields; and
- Landscape reinstatement of field surfaces and intermediate hedgerows.

The perimeter landscaping around the western part of the overall data storage development site, including modifications proposed under this application, will be implemented at an early stage during the construction programme so as to facilitate early establishment of landscape screening in this area.

Given the prevailing landscape planning context and policy, and the low sensitivity of the site area, it is considered that the landscape and visual impact during construction will generally be ***slight to moderate***, ***negative*** and ***short-term***.

Construction works will not have longer-term or residual landscape or visual effects.

Effects on Landscape Character

Effects on landscape character during construction of the substation will be **temporary to short term**.

Within the substation site development area, the landscape character with change from its current agricultural use to an extensive construction site, however such change will be consistent with the preceding construction of the data storage development, and therefore effects on the immediate landscape character will be moderate and neutral.

Outside the immediate site area, and in the wider landscape context, effects in landscape character will range from not significant/slight to moderate. As the wider landscape context is generally flat and comprises multiple rows of intervening hedgerows and tree planting, visibility into the site is substantially limited. Tower cranes operating on the site, and the taller elements of the development may become partly visible from the wider setting, but in the context of the data storage development, and giving rise to **slight/moderate neutral** effects on landscape character.

In closer proximity to the development, and in particular along the R147 site frontage, the elevated embankment of the R147, and the M3 motorway in the vicinity of the development site, the relative proximity to the site will give rise to moderate neutral effects of landscape character as construction activity and the emerging structures will be an intensification of construction of the data storage development.

As Gunnocks House is located within its own strong woodland setting, and large agricultural fields separate it from the proposed development site, the landscape character in the vicinity of the house will be substantially unaltered.

Construction of the substation development will have negligible effect of the industrial and commercial properties at Bracetown Business Park and The Hub Logistics Park as the substation site will be beyond the more immediate data storage development.

Construction of the underground transmission cables will have temporary and localised effects as rolling construction areas are established and operated along the route alignments to install underground cables.

Effects on Views

Effects on views during construction will be temporary to short-term.

Within the immediate landscape setting of the site, effects on views will be **moderate** and **negative** and will be an intensification of construction of the data storage development.

From the wider agricultural locations, the presence of multiple rows of intervening hedgerows and trees, and the emergence of the data storage development, is such that construction of the proposed development including tower cranes and emerging structures, will be only partially and intermittently visible, giving rise to **not slight neutral** effects on views.

Views closer to the development site, and in particular along the R147, on the elevated embankment of the R147, and along the M3 motorway in the vicinity of the development site, will experience greater visibility of the emerging structures as the development will become apparent in the context of the data storage development, and will give rise to **slight/moderate neutral** effects on views.

Gunnocks House is substantially screened within its own woodland setting, and separated by large agricultural fields from the proposed development site. Effects of views from Gunnocks House will be **not significant**.

Effects of views from Bracetown Business Park and The Hub Logistics Park will be negligible as the substation site will be beyond the data storage development site and substantially out of view.

11.5.4 Assessment of Effects During Operation

The proposed development will introduce an additional building compound element into the landscape context, but within the larger grouping of built elements forming the data storage development. The outward landscape berms and planting, along the southern and western sides of the substation, will be a continuation of those proposed as part of the data storage development. These will reinforce existing site boundary planting and provide a strong perimeter landscape screen.

The perimeter landscape treatment, together with existing layers of field boundary hedgerow and tree planting and the emerging data storage development, will limit visibility of the proposed development to partial and intermittent views. The presence of the proposed development as perceived in the landscape will be moderated to varying degrees depending on location.

Effects on Landscape Character

Effects on landscape character during operation will be permanent.

From the wider landscape context, including the agricultural areas to the north and parts of the Dunboyne settlement, the proposed substation development will be substantially screened by either the existing intermediate landscape or the data storage development giving rise to **imperceptible neutral** effects on landscape character.

From closer vantage points to the west and south of the development site, including from along the R147, on the elevated embankment of the R147, and on the nearby M3 motorway, the substation will be partially visible in the context of the data storage development, giving rise to **moderate neutral effects** on landscape character.

The landscape character at Gunnocks House will be substantially unaltered given its enclosure within its own woodland setting, and separation from the proposed development by large agricultural fields.

Effects of landscape character from Bracetown Business Park and The Hub Logistics Park will be negligible as the substation will be substantially screened by the intervening data centre development.

Effects on Views

Effects on views during operation will be permanent.

Within the landscape context of the site, including more distant agricultural and urban settings, and closer range views from the R147 and M3, effects on views will range from **not significant/slight** to **moderate** and **neutral**.

From the more distant vantage points, intervening hedgerows and trees, together with the emerging data storage development, will substantially limit or restrict visibility of the proposed development.

Views closer to the development site from the south and west, including from along the R147, on the elevated embankment of the R147, and from the M3 motorway, will experience some visibility of the proposed development, however, such views will be in the context of the emerging data storage development and will give rise to moderate and neutral effects on views.

Gunnocks House is substantially screened within its own woodland setting, and separated by large agricultural fields from the proposed development site. Effects of views from Gunnocks House will be **not significant**.

The proposed development will be an intensification of the data storage development of the wider industrial development in the vicinity of Bracetown Business Park and The Hub Logistics Park. Effects of views will be **slight/moderate and neutral**.

11.6 MITIGATION MEASURES AND MONITORING

11.6.1. General

The proposed development is designed to be a part of the larger data storage development, and part of a high-quality facility established in suitably zoned lands, and in the context of other established, emerging and planned facilities that are similar in nature.

The architectural design strategy is to set the substation structures back from the public roadway and private residences, and to utilise a combination of powder coated metal and self-coloured fibre cement panels that are compatible with the data storage development. The substation will extend the overall presentation of the data storage development as a clean-lined contemporary and light industrial character. The overall will provide a coherent architectural composition, and set within a high quality campus type environment of the data storage development.

The site landscaping strategy for the substation adopts both the internal and perimeter landscaping strategy and details of the data storage development, with some localised modifications along the southern and western boundaries. The southern perimeter berm is reduced in width, but incorporates gabion walls on the inside face so as to achieve a similar berm height. The landscape berm along the western perimeter is moved c. 30m away from the two private residential properties and the internal gabion wall detail extends around the western berm. This provide a more open amenity to those properties than was proposed as part of the data storage development, while optimising the height of the berms and mixed woodland landscaping for visual screening.

The northern and eastern site boundaries are internal to the data storage development, and the substation will become a part of the wider campus of the data storage development.

Site lighting will also use horizontal cut-off light fittings for the lighting standards on site roads so as to minimise light spill.

The landscape proposals are provided on the Landscape Drawing 6694_320, submitted with the planning application for the proposed development.

Mitigation During Construction

The principal mitigation measures during construction are in ensuring a managed and orderly construction site, appropriate storage of materials, and ensuring debris is not carried onto the public roads by construction vehicles. Where the site or access points adjoin the public road, site hoarding will be established and maintained in an orderly manner so as to minimise the effect of the construction site on along the public road.

Trees and vegetation outside of the site shall be protected in accordance with BS:5837:2012 during construction works.

Mitigation During Operation

Landscape and visual mitigation measures are inherent in the architectural and landscape design of the proposed development. Mitigation therefore focusses on the successful and complete implementation of the architectural and landscape designs as proposed.

11.6.2 Monitoring

Monitoring During Construction

During construction, the contractor will ensure that the site is managed and maintained in an orderly manner and in accordance with the CEMP, with particular care and attention to perimeter areas that might give rise to adverse landscape and visual effects from outside the construction site.

Monitoring During Operation

All landscape works will be maintained in line with normal landscape maintenance / management works and failed and/or defective works will be made good, as required, on a regular basis.

11.7 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

It is noted that the land use to the immediate northwest and northeast at Bracetown Business Park and The Hub Logistic Park comprises established and emerging industrial and commercial development. Substantial areas of land to the east and southeast are zoned for E2/E3 Employment uses, and phase one of the Facebook facility is already in operation, and construction of phase 2 is well advanced.

The concurrent data storage development (Reg. Ref.: RA191593 and ABP Ref.: ABP-307546-20) adjacent to Bracetown Business Park and The Hub Logistic Park will further intensify the built character of the area and locally alter the agricultural character of the development area.

Predicted impacts are described with reference to Accurate Visual Representations (AVRs) included in Appendix 11.1, and include views from locations that are representative of the views towards the site from the vicinity of the development site and from the surrounding area.

The locations of the AVRs are indicated on *Figure 1.0 View Location Map* in *Appendix 11.1*, and for each view, the following variations are provided:

- As Existing, showing the current baseline situation
- As Existing, showing concurrent Data Storage Development
- As Proposed, including the concurrent Data Storage Development and the Proposed Substation Development.

View 1, *Figure 11.1.1*, is from a local road c. 1.1km north of the site close to where it joins the Bracetown Road and where a cluster of residential properties are located. At present, this location is substantially rural and agricultural in character, displaying fields bound by trees and hedgerows for the most part. The rear boundaries of the residential properties are to the right; some of the industrial units at The Hub Logistic Park are visible against the trees in the background; and high voltage power lines and supporting pylons are visible in the foreground.

Figure 11.1.2 includes the proposed data storage development, with the energy centre and three of the data storage buildings being partially visible. The existing tree canopies on the skyline are altered by virtue of trees within the site being removed, however, the new landscape berms and tree planting along the northern site boundary will establish a continuous landscape layer that screens the lower portions of the development. The proposed buildings are substantially larger than the existing industrial buildings, and the flues on the energy centre are substantial. However, the colour palette used will assist in integrating them into the setting and against the typical light grey/blue sky colour. The landscape and visual effect is considered moderate negative.

Figure 11.1.3 includes the proposed substation development, and illustrates that from this direction, the proposed substation will be entirely screened by the data storage development. The landscape and visual effect is considered negligible.

View 2, *Figure 11.2.1*, is from a local road c. 2.0km northeast of the site. At present, this location is predominantly rural and agricultural in character, with open fields permitting long views towards the development site. The ground level appears to rise gently, and the skyline is mostly defined by intermediate tree-lined field boundaries. Some high voltage pylons and power lines are also visible in the distance, suggesting a transition from the rural context. *Figure 11.2.2* includes the proposed data storage development and illustrates the energy centre building being substantially screened by intermediate field boundary tree canopies, and with only the flues becoming noticeable on the skyline. Parts of some of the data storage buildings will be intermittently visible beyond the tree canopies. Again, the colour palette proposed will be effective in reducing the visibility of the built elements, and the landscape and visual effect is considered slight/moderate negative.

Figure 11.2.3 includes the proposed substation development, and illustrates that from this direction, the proposed substation will be entirely screened by intervening vegetation, and also by the proposed data storage development. The landscape and visual effect is considered negligible.

View 3, *Figure 11.3.1*, is from the same local road, further south, where there is a row of residential properties facing the site at c. 1.5km north east of the site. Currently, the setting is very similar to that of View 2 with open fields beyond the roadside hedge permitting relatively long views in the direction of the site. Layers of sequential tree-lined field boundaries are visible, and electricity poles and pylons are intermittently visible. *Figure 11.3.2* includes the data storage development and illustrates that the parapet level of the taller buildings will be at a similar position on the skyline as the intermediate tree canopies. The buildings will be substantially screened, with only partial and intermittent visibility beyond the trees. The energy centre flues, as they appear over the building parapet, will also be intermittently visible depending on the vantage point and the location of middle ground trees. The landscape and visual effect is considered slight/moderate negative.

Figure 11.3.3 includes the proposed substation development, and illustrates that from this direction, the proposed substation will be entirely screened by intervening vegetation, and also by the proposed data storage development. The landscape and visual effect is considered negligible.

View 4, *Figure 11.4.1*, is from the railway overbridge on the L2228 local road leading from Dunboyne to Clonee. The bridge is elevated and permits open panoramic views over Dunboyne railway station and carpark, and also of the flat grasslands between the railway line and the M3 motorway. The motorway itself is substantially out of view behind the intervening tree-lined field boundaries. However the embankment and lighting of the R147 overbridge can be seen. The canopies of the mature woodlands at Gunnocks House can be seen beyond the overbridge, and to the left of the view, the upper parts of buildings at Bracetown are visible over the tree canopies. *Figure 11.4.2* includes the proposed data storage development and illustrates some alteration to the tree canopy profile in the vicinity of the site by virtue of tree removal within the site, and partial visibility of one of the data storage buildings and the energy centre building. The main building parapets will be at a similar level to the trees on the skyline, however, the flues will extent higher and will be visible on the skyline. The development will be partially visible, however as the background of a number of layers of natural and built features. The landscape and visual effect is considered slight/moderate negative.

Figure 11.4.3 includes the proposed substation development, and illustrates that from this direction, the proposed substation will be partially visible over the intervening layers of vegetation and against the backdrop of the data storage development. The landscape and visual effect is considered slight and neutral.

View 5, *Figure 11.5.1* from the playing field located at the centre of Dunboyne between the National School and St. Peter and Paul’s Church, at a distance of c. 1.4km to the site. The view comprises the playing field that affords relatively open views to the school buildings and the residential areas of The Meadows an Silver Birches.

Residential roofscapes and intermediate tree canopies for the skyline, and occasional electricity pylons are intermittently visible in the distance. *Figure 11.5.2* includes the data storage development and illustrates glimpse views of the upper parapet screen of one of the data storage buildings and parts of the energy centre beyond. The flues will be visible on the skyline, however, will mostly be at a similar level to the intervening tree canopies, and will not be prominent. The colour selection for the buildings and flues will assist in reducing the visibility of these elements and the landscape and visual effect is considered slight negative.

Figure 11.5.3 includes the proposed substation development, and illustrates that it will be substantially screened by intervening layers of vegetation. The landscape and visual effect is considered imperceptible and neutral.

View 6, *Figure 11.6.1*, is from the Junction 5 motorway overbridge c. 1.0km northwest of the site. The vantage point is elevated, and allows momentary open views along the motorway and of the landscape context of Dunboyne along both sides of the motorway. Currently, the landscaping along the motorway embankment and the fields immediately beyond presents an almost continuous landscape cover in the middle ground. There are glimpse views of a number of buildings, including dwellings and industrial units, and the Dublin mountains form the distant skyline. *Figure 11.6.2* includes the data storage development and illustrates the upper parapet of one of the data storage buildings partially visible on the skyline between existing tree canopies, and the flues of the energy centre presenting above the tree canopies on the skyline. The motorway nature of this location is such that it is a low sensitivity environment, and the landscape and visual effect is considered slight negative.

Figure 11.6.3 includes the proposed substation development, and illustrates that it will be substantially screened by both the intermediate vegetation and by the data storage development. The landscape and visual effect is considered imperceptible and neutral.

View 7, *Figure 11.7.1*, is from the R147 as it rises on embankment to the motorway overbridge further south. The view is elevated, affords open views across the foreground fields. Currently, the existing field boundary trees form most of the skyline, with elements of Bracetown Business Park presenting to the left of the view between and above the tree canopies. Electricity power lines are prominent in the view, and to the right of the view, but out of view, is the woodland setting of Gunnocks House. *Figure 11.7.2* includes the data storage development and illustrates the development taking the place of the tree canopies along parts of the skyline, and two of the data storage buildings and the energy centre building being partially but clearly visible in the view, and screening the buildings of Bracetown Business Park beyond. The boundary landscape treatment will assist in reinforcing the tree screening, however the development will introduce substantial new built elements at this location, giving rise to moderate negative landscape and visual effects.

Figure 11.7.3 includes the proposed substation development, and illustrates that it will be more modest in scale that the data storage development buildings, and will be partially visible against a backdrop of these buildings. The landscape and visual effect is considered slight and neutral.

View 8, *Figure 11.8.1*, is from the M3 motorway looking east, and at c. 300m to the site. The view, although momentary by nature, is of agricultural fields between the motorway and the R147 beyond, and includes elements of Bracetown Business Park and the R147 embankment leading to the motorway overbridge. *Figure 11.8.2* includes the data storage development and illustrates one of the data storage buildings the administration building being clearly visible in the view, with glimpse views of other built elements beyond. The landscape berms along the north western boundary and the R147 will be effective in screening the lower half of the data storage building, with the administration building, although smaller in scale, being more focal. The motorway nature of this location is such that it is a low sensitivity environment, and the landscape and visual effect is considered slight/moderate negative.

Figure 11.8.3 includes the proposed substation development, and illustrates that it will be more modest in scale, and partially visible as an intensification of the data storage development. The landscape and visual effect is considered slight and neutral.

View 9, *Figure 11.9.1*, is from the R147 opposite the two private properties (one just out of view) whose rear elevation face towards the development site. Currently, the setting of one of a rural roadside with private properties, but leading to the built environment of Bracetown Business Park which is partially visible in the distance. Figure 11.9.2 includes the proposed data storage development and illustrates alterations of the roadside planting beyond the private residence, as well as elements of the administration building, energy centre and southern western landscaped berms visible beyond the property. Landscape and visual effects are considered slight/moderate negative.

Figure 11.9.3 includes the proposed substation development, and shows the upper portion of the substation parapet being visible above the south western landscape berms. It is noted that the south western landscape berm is setback from that of the proposed data storage development, affording slight greater visibility of the stacks of the energy centre building in the distance. The landscape and visual effect is considered slight and negative.

View 10, *Figure 11.10.1*, is from the Bracetown Road approaching the location where the proposed underground transmission line will divert from the roadway into the adjoining filed. The existing pylon is partially visible beyond the roadside trees, and the existing cables can be seen leading to the left toward the next pylon which is out of view.

Figure 10.11.2 includes the proposed replacement pylon and associated drop down compound. View 10 is included as being representative of the landscape and visual effects of both of the proposed replacement pylons and drop down compounds, however the western pylon is set at a greater distance from the closest dwellings and less visible. The new pylon is more visible than the existing from this location as it will be constructed slightly west of the existing, and the drop down compound and associated infrastructure will be partially visible. It is noted that this location is one of a small number of locations that might afford visibility into the agricultural field, and that elsewhere along the roadway, the roadside hedges and trees substantially restrict visibility. Landscape and visual effects are considered slight/moderate negative.

In the vicinity of Bracetown Business Park and The Hub Logistic Park, the proposed substation development will represent a modest intensification of the data storage development, and will substantially beyond the larger data storage development and will not impact of the locality.

Gunnocks House will retain its separation from the proposed development site by virtue of the intervening agricultural fields, and also the strong woodland enclosure that is part of the setting of Gunnocks House. Landscape and visual effects at Gunnocks House will be not significant.

11.8 RESIDUAL IMPACTS

The proposed development will introduce an additional built element that will form part of a planned high tech campus development. These lands are part of the urban fringe along the Meath and Fingal County boundaries, zoned for Enterprise use, and have and continue to attract significant development activity by virtue of its proximity to the Dublin metropolitan area.

The proposed substation facility will occupy c. 3.6 hectares of the southern part of the 24.5 hectare site of the proposed data storage development lands (concurrent application), and the associated transmission cables will extend to additional areas in the public roadways and adjoining private fields.

The development lands currently display both an agricultural and an urban fringe context, with agricultural fields bound by trees and hedgerows, occasional dwellings and groups of dwellings, as well as commercial and industrial developments and motorway infrastructure in the immediate locality. The wider setting includes the built edges of Ongar, Blanchardstown and Mulhuddart, together with the industrial areas at Damastown and Portan (Facebook), and the settlement of Dunboyne.

It is anticipated that construction of the data storage development will intensify that built urban edge in a manner that is consistent with the emerging trend in the locality and with the land use zoning for the area, and that the proposed substation will represent a further intensification, but at a smaller scale.

Residual landscape and visual effects will vary within the wider and local setting of the development. From the more rural and agricultural lands, generally north of the development site, the proposed development will be substantially screened by or absorbed within the proposed data storage development, giving rise to imperceptible to slight landscape and visual effects.

Similarly, in the vicinity of Dunboyne, the proposed either screened by intervening built or landscape elements, or if partially visible, will be absorbed within the larger data storage development Landscape and visual effects will typically be slight.

In closer proximity to the development lands, at the existing business parks, along the R147 and the motorway, the proposed substation will be more distinct, but will nonetheless be seen as part of the larger scale data storage development and will not give rise to any additional adverse landscape and visual effects. Gunnocks House, a protected structure, is located nearby, however, the M3 motorway and the associated R147 ramp and overbridge have already altered the wider landscape context of the property. Gunnocks House benefits from the enclosure of its own strong woodland setting, and is secluded from contemporary development, and the proposed development will not give rise to any significant landscape and visual effects from the property.

11.9 CUMULATIVE IMPACT ASSESSMENT

The cumulative impact of the proposed development with any/all relevant other planned or permitted developments (including the concurrent development as outlined in Chapter 2) are discussed in Sections 11.9.1 and 11.9.2 below for construction and operational phases.

11.9.1 Construction Phase

Cumulative landscape and visual effects of the proposed development with any/all relevant other planned or permitted developments will generally be slight and medium term as the proposed development will be perceived as being a smaller part of the larger concurrent data storage development. Construction of the underground transmission cables will give rise to localised slight/moderate and temporary landscape and visual effects by virtue of the rolling construction methodology that will be adopted.

11.9.2 Operational Phase

As with construction impacts above, cumulative landscape and visual effects of the proposed development with any/all relevant other planned or permitted developments will generally be slight and neutral as the proposed development will be perceived as being a smaller part of the larger concurrent data storage development, and will be consistent with the established an continuing emerging trend of high tech development in the locality. The underground transmission cables will have no landscape and visual effects once surfaces are reinstated, and the two new pylons and drop down cable compounds will replace two existing electricity pylons with private agricultural fields.

It is considered that cumulative operational landscape and visual effects will be *long-term and not significant.*

11.10 REFERENCES

- Meath County Development Plan 2013-2019.
- Dunboyne / Clonee / Pace Local Area Plan 2009-2015
- Environmental Protection Agency, (2017) Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports.
- Environmental Protection Agency, (2015) Draft Advice Notes for preparing Environmental Impact Statements.
- Landscape Institute (UK) and Institute for Environmental Management & Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition.

APPENDIX 11.1

PHOTOMONTAGES

BRADY SHIPMAN MARTIN (2020)

PHOTOMONTAGES

for

Project No. 6694
ENGINENODE SUBSTATION

for

Client: AWN Consulting

Date: 22 July 2020
Document Number: RP03

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BSM
Est.
1968
Brady Shipman
Martin.
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Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

CONTENTS AMENDMENT RECORD

This report has been issued and amended as follows:

REVISION	DESCRIPTION	DATE	PREPARED BY	CHECKED BY
00	View Location Map and 10 no. of Photomontages	26 June 2020	BP	JK
01	Revision to 4 no. of Photomontages	17 July 2020	BP	JK
02	Changes to figures captions	22 July 2020	BP	JK

PHOTOMONTAGE TABLE OF CONTENT

Day:	26	17	22															
Month:	06	07	07															
Year:	20	20	20															
FIGURE NUMBER	**REVISION**																	
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1.1.2	00	00	00															
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Figure: 1.0

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View Location Map

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< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm ANGLE OF VISION / LENS FOCAL LENGTH 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.1.1 **Rev: 00**

View from local road at Portmanna looking south

As Existing

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< 73.7° / 24mm	< 65.5° / 28mm	< 54.4° / 35mm	< 39.6° / 50mm	< 28.8° / 70mm	ANGLE OF VISION / LENS FOCAL LENGTH	70mm / 28.8° >	50mm / 39.6° >	35mm / 54.4° >	28mm / 65.5° >	24mm / 73.7° >

Figure: 1.1.2 **Rev: 00**

View from local road at Portmanna looking south
Showing Concurent Data Strage Development

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Figure: 1.1.3 **Rev: 00**

View from local road at Portmanna looking south

Showing Proposed Substation Development together with Concurent Data Strage Development

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Figure: 1.2.1 **Rev: 00**

View from local road at Ballintry at Pinkeen River crossing looking southwest

As Existing

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Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

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Figure: 1.2.2 **Rev: 00**

View from local road at Ballintry at Pinkeen River crossing looking southwest
Showing Concurent Data Strage Development

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Red outline represents size and location of the proposed development

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Figure: 1.2.3 **Rev: 00**

View from local road at Ballintry at Pinkeen River crossing looking southwest

Showing Proposed Substation Development together with Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

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Figure: 1.3.1 **Rev: 00**

View from local road at The Mayne looking west

As Existing

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm ANGLE OF VISION / LENS FOCAL LENGTH 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.3.2 **Rev: 00**

View from local road at The Mayne looking west

Showing Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

Red outline represents size and location of the proposed development

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm ANGLE OF VISION / LENS FOCAL LENGTH 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.3.3 **Rev: 00**

View from local road at The Mayne looking west

Showing Proposed Substation Development together with Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm	< 65.5° / 28mm	< 54.4° / 35mm	< 39.6° / 50mm	< 28.8° / 70mm	ANGLE OF VISION / LENS FOCAL LENGTH	70mm / 28.8° >	50mm / 39.6° >	35mm / 54.4° >	28mm / 65.5° >	24mm / 73.7° >

Figure: 1.4.1 **Rev: 00**

View from Station Road at railway crossing looking northeast

As Existing

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm ANGLE OF VISION / LENS FOCAL LENGTH 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.4.2 **Rev: 00**

View from Station Road at railway crossing looking northeast

Showing Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm | ANGLE OF VISION / LENS FOCAL LENGTH | 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.4.3 **Rev: 01**

View from Station Road at railway crossing looking northeast

Showing Proposed Substation Development together with Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm | ANGLE OF VISION / LENS FOCAL LENGTH | 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.5.1 **Rev: 00**

View from playing fields at Dunboyne Senior National School looking northeast

As Existing

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm | ANGLE OF VISION / LENS FOCAL LENGTH | 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.5.2 **Rev: 00**

View from playing fields at Dunboyne Senior National School looking northeast

Showing Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

Figure: 1.5.3 **Rev: 00**

View from playing fields at Dunboyne Senior National School looking northeast
Showing Proposed Substation Development together with Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm | ANGLE OF VISION / LENS FOCAL LENGTH | 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.6.1 **Rev: 00**

View from M3 overbridge at R157 looking southeast

As Existing

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm ANGLE OF VISION / LENS FOCAL LENGTH 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.6.2 **Rev: 00**

View from M3 overbridge at R157 looking southeast

Showing Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm ANGLE OF VISION / LENS FOCAL LENGTH 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.6.3 **Rev: 00**

View from M3 overbridge at R157 looking southeast

Showing Proposed Substation Development together with Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

THE IMAGE ABOVE IS A PANORAMA ASSEMBLED FROM TWO OR MORE PHOTOGRAPHS

Figure: 1.7.1 **Rev: 00**

View from R147 looking northeast

As Existing

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

THE IMAGE ABOVE IS A PANORAMA ASSEMBLED FROM TWO OR MORE PHOTOGRAPHS

Figure: 1.7.2 **Rev: 00**

View from R147 looking northeast

Showing Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

THE IMAGE ABOVE IS A PANORAMA ASSEMBLED FROM TWO OR MORE PHOTOGRAPHS

Figure: 1.7.3 **Rev: 01**

View from R147 looking northeast

Showing Proposed Substation Development together with Concurent Data Strage Development

Brady Shipman Martin.
Built.
Environment.
Est. 1968

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm | ANGLE OF VISION / LENS FOCAL LENGTH | 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.8.1 **Rev: 00**

View from M3 looking east

As Existing

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm | ANGLE OF VISION / LENS FOCAL LENGTH | 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.8.2 **Rev: 00**

View from M3 looking east

Showing Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm | ANGLE OF VISION / LENS FOCAL LENGTH | 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.8.3 **Rev: 01**

View from M3 looking east

Showing Proposed Substation Development together with Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

THE IMAGE ABOVE IS A PANORAMA ASSEMBLED FROM TWO OR MORE PHOTOGRAPHS

Figure: 1.9.1 **Rev: 00**
View from R147 looking northeast
As Existing

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

THE IMAGE ABOVE IS A PANORAMA ASSEMBLED FROM TWO OR MORE PHOTOGRAPHS

Figure: 1.9.2 **Rev: 00**

View from R147 looking northeast

Showing Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

THE IMAGE ABOVE IS A PANORAMA ASSEMBLED FROM TWO OR MORE PHOTOGRAPHS

Figure: 1.9.3 **Rev: 01**

View from R147 looking northeast

Showing Proposed Substation Development together with Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm ANGLE OF VISION / LENS FOCAL LENGTH 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.10.1 **Rev: 00**

View from L1010 looking north

As Existing

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6694	Document Number:	RP03	Revision:	02
Project Name:	ENGINENODE SUBSTATION	Document Title:	PHOTOMONTAGES	Date:	22 July 2020

< 73.7° / 24mm | < 65.5° / 28mm | < 54.4° / 35mm | < 39.6° / 50mm | < 28.8° / 70mm ANGLE OF VISION / LENS FOCAL LENGTH 70mm / 28.8° > | 50mm / 39.6° > | 35mm / 54.4° > | 28mm / 65.5° > | 24mm / 73.7° >

Figure: 1.10.2 **Rev: 00**

View from L1010 looking north

Showing Proposed Substation Development together with Concurent Data Strage Development

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

12.0 ARCHAEOLOGICAL, ARCHITECTURAL AND CULTURAL HERITAGE

12.1 INTRODUCTION

The following chapter assesses the predicted impacts of the proposed development on archaeological, architectural and cultural heritage. The proposed development is located in c. 1.8km north-east of Dunboyne and c. 14km north-west of Dublin City Centre (ITM 702833, 743174), see Figure 12.1). The Proposed Substation Development and Subsurface Grid Connection traverses the townlands of Bracetown, Gunnocks, Normanstown, Pace and Portmanna, in the the Barony of Dunboyne and the Civil Parish of Dunboyne.

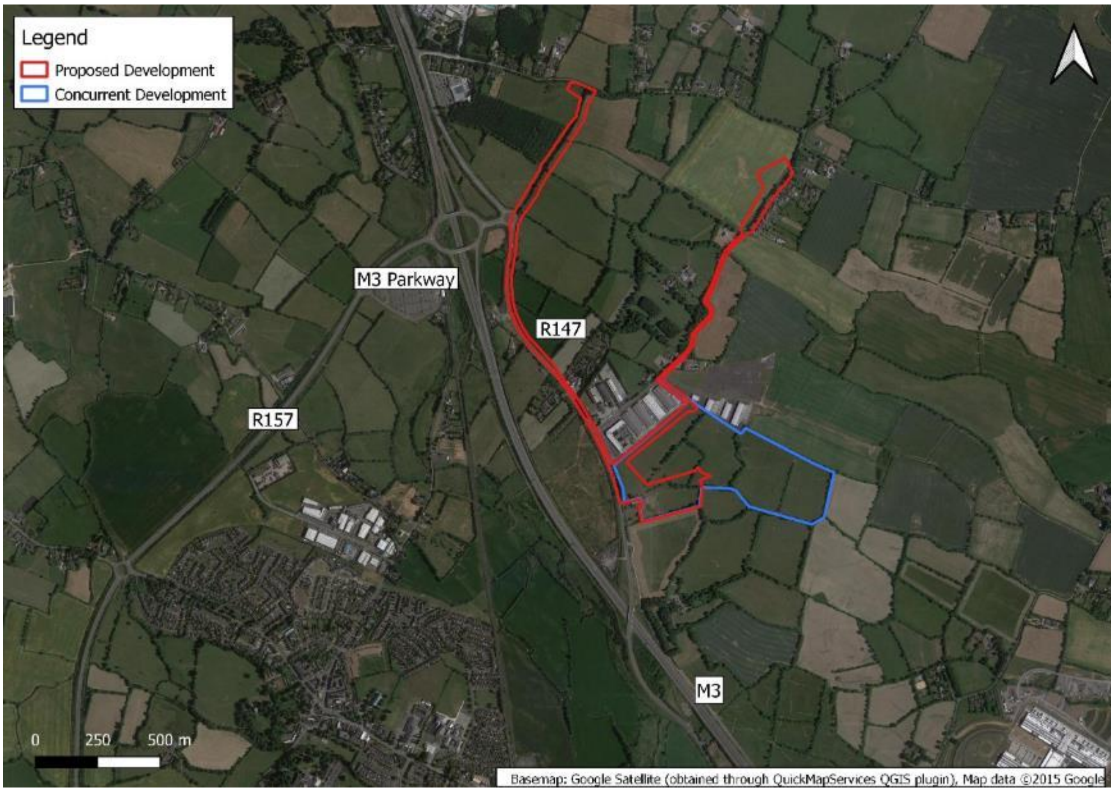

Figure 12.1 Layout of proposed development

12.2 METHODOLOGY

The Record of Monuments and Places (RMP), comprising the results of the Archaeological Survey of Ireland, is a statutory list of all recorded archaeological monuments known to the National Monuments Service. The RMP was established under the National Monuments (Amendment) Act, 1994. The relevant files for these sites contain details of documentary sources and aerial photographs, early maps, OS memoirs, the field notes of the Archaeological Survey of Ireland and other relevant publications. Sites included on the RMP all receive statutory protection under the National Monuments Acts 1930 - 2004. The information contained within the RMP is derived from the earlier non-statutory Sites and Monuments Record (SMR); some entries, however, were not transferred to the statutory record as they refer to features that on inspection by the Archaeological Survey were found not to merit inclusion in that record or could not be located with sufficient accuracy to be included. Such sites however remain part of the SMR. The record is a dynamic one and is updated so as to take account of on-going research. The RMP was consulted in the Archives of the Department of Culture, Heritage and the Gaeltacht. There are three recorded archaeological monuments within the study area which comprises a distance of c. 1.5km from the proposed development (see Figure 12.2 and Appendix 12.1).

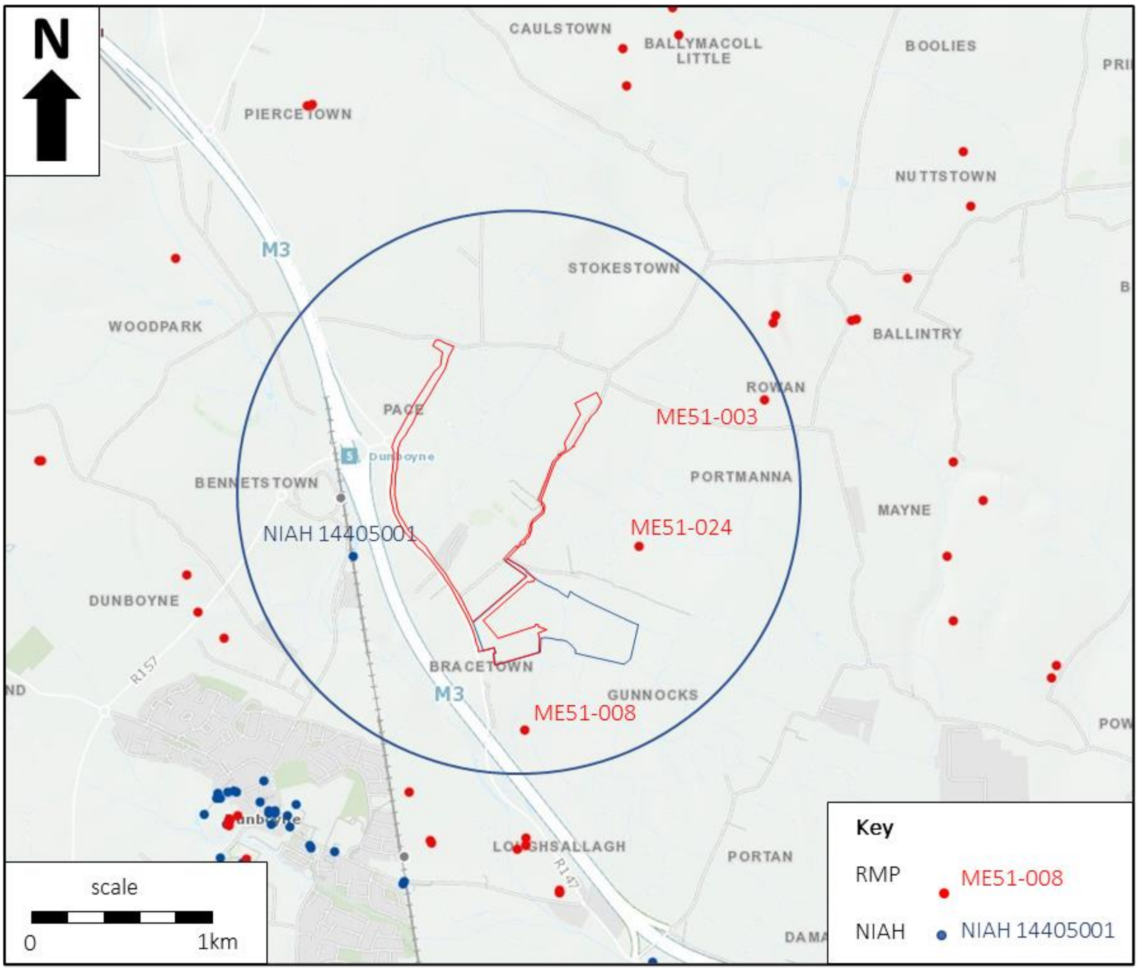

Figure 12.2 Recorded archaeological monuments and structures listed in the NIAH / RPS for County Meath, within c. 1.5km of the proposed development (source: www.archaeology.ie; Meath County Development Plan).

The National Museum of Ireland's topographical files are a national archive of all known archaeological finds from Ireland. They relate primarily to artefacts but also include references to monuments and contain a unique archive of records of previous excavations. The topographical files were consulted to determine if any archaeological artefacts had been recorded from the area. Other published catalogues of prehistoric material were also studied: Raftery (1983 - Iron Age antiquities), Eogan (1965; 1993; 1994 - bronze swords, Bronze Age hoards and goldwork), Harbison (1968; 1969a; 1969b - bronze axes, halberds and daggers). The townlands within the study area, namely Bennetstown, Bracetown, Dunboyne, Gunnocks, Loughsallagh, Mayne, Normansgrove, Pace, Paddingstowon, Portan, Portmanna, Stokestown and Whitesland were assessed (see Appendix 12.2).

Cartographic sources were used to identify additional potential archaeological and cultural heritage constraints. Primary cartographic sources consulted consisted of the Down Survey 'Barony Map of Dunboine in the County of East Meath 1654-6' (see Figure 12.3) and the Ordnance Survey 6" and 25" maps, first and subsequent editions (see Figures 12.4 & 12.5; T.C.D. Map Library, www.osi.ie).

Figure 12.3 Extract from Down Survey 'Barony Map of Dunboine in the County of East Meath 1654-6' (source www.downsurvey.trinity.ie).

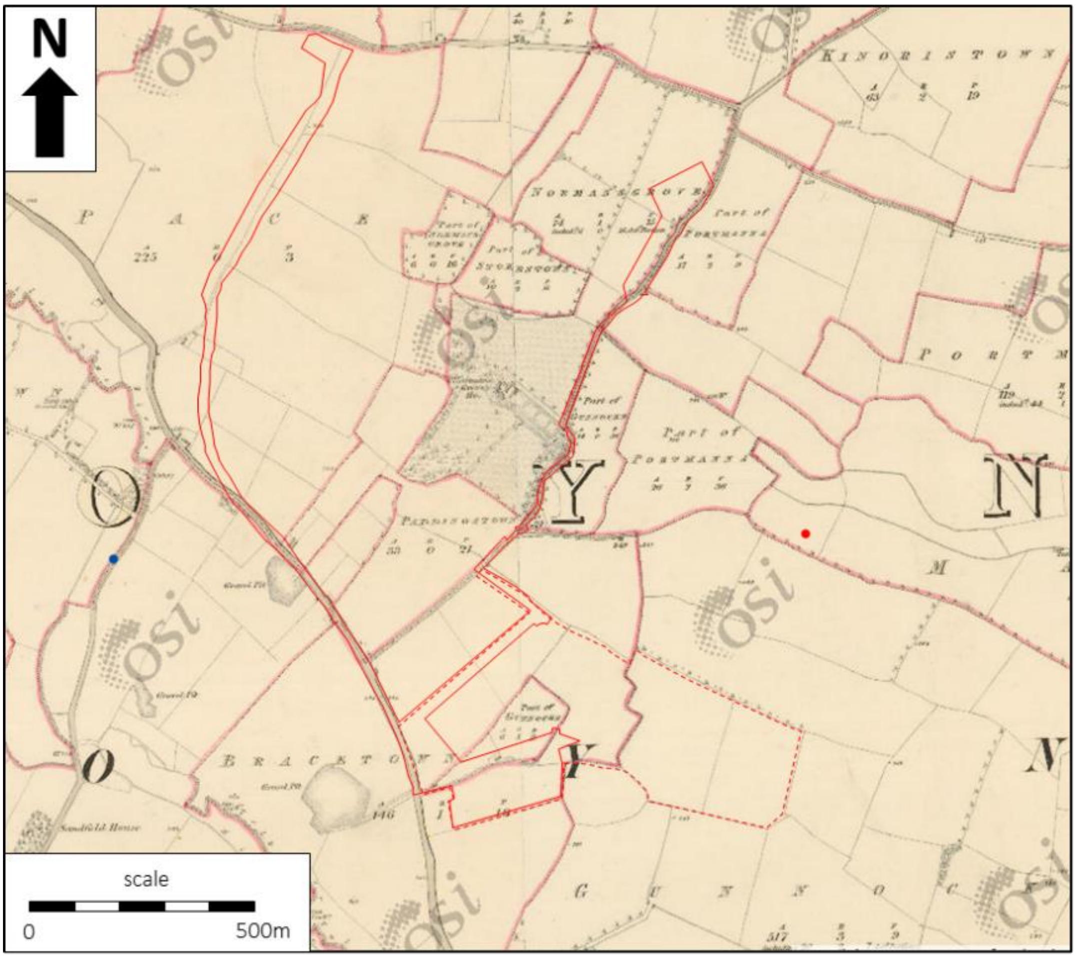

Figure 12.4 Extract from 1st edition Ordnance Survey 6" Map (base map source: www.archaeology.ie).

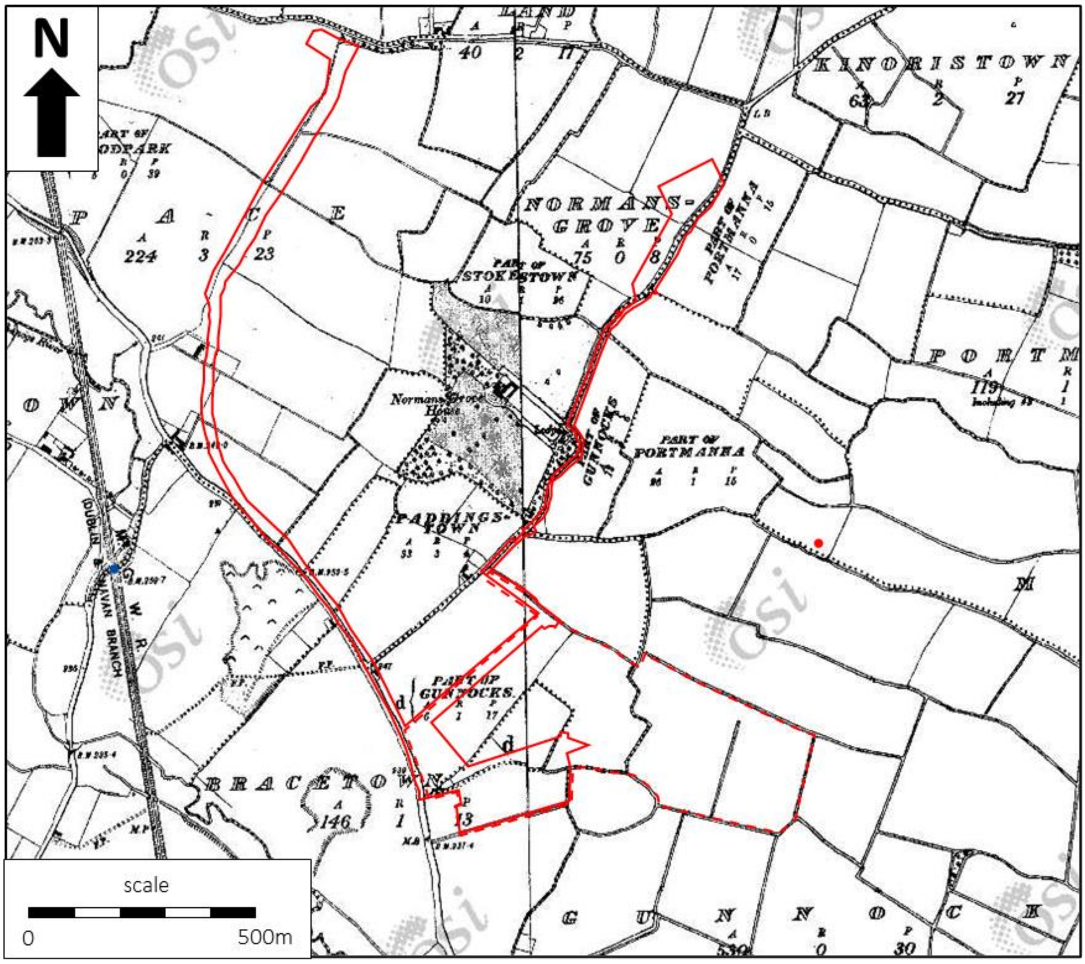

Figure 12.5 Extract from Cassini edition Ordnance Survey 6" Map (base map source: www.archaeology.ie).

Modern Ordnance Survey aerial photographic coverage dating from 1999, 2000 and 2005 available on the Ordnance Survey of Ireland (www.osi.ie) and Google Maps (www.google.com/maps) were assessed. Aerial photographic coverage indicates that the site has been subject to minimal change in recent years, limited to the remove of some internal field boundaries.

The excavation bulletin website (www.excavations.ie) was consulted to identify previous excavations that have been carried out within the study area. This database contains summary accounts of excavations carried out in Ireland from 1970 to 2019. The townlands of Bracetown and Gunnocks were assessed (see Appendix 12.3).

The National Inventory of Architectural Heritage (NIAH) is a systematic programme of identification, classification and evaluation of the architectural heritage of the State. The Minister for Arts, Heritage and the Gaeltacht is currently using the Inventory as the basis for making recommendations for the NIAH. There is one structure included in the NIAH within the study area which comprises a distance of c. 1.5km from the proposed development (see Figure 12.2).

The Meath County Development Plan 2013-2019 was consulted. The plan includes policy objectives for the protection of the County's archaeological, architectural and cultural heritage. The Record of Protected Structures (RPS) contained within each plan includes every structure which is of special architectural, archaeological, artistic, cultural, scientific, social or technical interest within the county boundaries. There are no structures included in the RPS within the site boundary. There is one structure included in the RPS within c. 1.5km of the proposed development (see Table 12.1).

Table 12.1 Features of architectural heritage interest

RPS Ref. No.	NIAH Ref. No.	Address	Description
MH051-100	N/A	Gunnocks, Dunboyne	Originally thatched, from 17thC, late Georgian two-storey, three-bay front added including outbuildings.
N/A	14405001	Bennetstown	Single-arch rock-faced limestone railway bridge with string courses and copings, built c.1850, carrying the road over the former railway track which is now disused.

The baseline historical research utilised sources including Lewis' Topographical Dictionary of Ireland (Lewis 1837), the Proceedings of the Royal Irish Academy and the Journal of the Royal Society of Antiquaries. See Bibliography for full list of references used.

12.3 RECEIVING ENVIRONMENT

12.3.1 Archaeological, Architectural and Cultural Background

The site of the proposed development is located to the north-east of the town of Dunboyne. While there are no prehistoric monuments recorded in the vicinity of Dunboyne, several stray archaeological finds have been recovered that indicate the presence of people in the Mesolithic, Neolithic and subsequent periods in prehistory (from *c.* 9,000 BP). These include three flint arrowheads and a stone axehead (NMI1968:380, NMI1968:381, NMI1968:382, NMI1988: 122 respectively, see Appendix 12.2). The flint arrowheads, found near Dunboyne, represent activity in the earliest period in prehistory. The stone axehead is made from porcellanite, a material only available from two sources in Ireland, both of which lie to the north of the country, at Tievebulliagh, Co. Antrim, and on Rathlin Island, off the north coast of the county. A stone axehead was also discovered during the current phase of field survey (see Section 12.3.3 below).

Over 21,000 stone axeheads are known from Ireland (Sheridan et al. 1992, 391; Cooney and Mandal 1998, 4). They represent the 'single most numerous artefact type surviving from prehistory in Ireland' (Mandal 1997, 289; Mandal *et al* 2004, 116; Woodman 1978; 1987; Cooney and Grogan 1994), with their production and usage noted as commencing in the early Mesolithic and continuing well into the Bronze Age (Cooney & Mandal 1998, 1; Sheridan *et al* 1992, 400; Cooney *et al* 2011, 432; Cooney 2000, 210). Since 1991 stone axeheads have been the focus of detailed research by the Irish Stone Axehead Project (ISAP). Stone axeheads were both a symbol of prestige and an ordinary working tool for people for thousands of years. They served a wide range of functions in early prehistoric Irish society, including use in woodworking, in burial and ceremonial contexts and as symbols of power.

Substantial evidence of Bronze Age (2500-500 BC) settlement occurs in the immediate vicinity, uncovered during recent archaeological investigations associated with development works in Gunnock and Bracetown. A number of burnt mounds or fulachta fiadh were recently uncovered as part of a testing programme in advance of construction works (License no. 15E0583, see Appendix 12.3). Burnt mounds or fulacht fiadh comprise mounds of charcoal rich soil, heat-fractured stones accompanied by a trough sometimes lined with wooden planks, stone slabs or even clay (Waddell 1998). They are generally located close to water sources including streams, rivers, lakes or marshy ground. The exact use of these sites is still somewhat ambiguous with their traditional interpretation as cooking places coming into question in recent years. They date predominantly to the Bronze Age but date ranges from the Mesolithic period to the medieval period have been returned. Ring ditches, are also recorded within the study area from the townland of Dunboyne (RMP no. ME050-031---- and ME050-032002-), the townland of Loughsallagh (RMP no. ME051-019001- and ME051-019002-), and the townland of Mayne (RMP no. ME051-024----). Ring ditches are small, circular or sub-circular features, comprising a fosse and usually measuring less than 10m in diameter. As in the cases within the study area, they are usually identified through the examination of aerial photography.

In the first centuries AD, there began an expansion of population from west of the Shannon of groups who claimed common ancestry to Niall Níogiallach, Niall of the Nine Hostages, and who came to be known as the Uí Neill, the principal dynasty of the northern half of the country in the medieval period. The Uí Neill were split between northern and southern septs, with the southern Uí Neill consisting of Síl Áedo Sláine (The Seed of Áed of Slane) and Clann Cholmáin Máir (The Children of Colmán the Great) who held sway over the ancient kingdoms of Brega and Míde. The area between Dunboyne and Navan would have fallen within the hegemony of the Síl Áedo Sláine, whose principal residences were at Lagore, Oristown and Knowth (Byrne 2001, 87). Christianity was largely accepted across the country during the period, which saw a flourishing in the production of intricate metalwork, manuscripts and sculpture under the patronage of wealthy monasteries. This was also the period that witnessed the missions of various Irish saints abroad and the establishment of a distinct Irish church. The economy was based on farming and various legal tracts provide valuable information on the variety of land uses and the range of crops and breeds reared; archaeological excavation has generally concurred with the information in these tracts. The settlement pattern in this period was largely rural and isolated, exemplified by ringforts and crannogs. However, some ecclesiastical sites had attained considerable size and complexity during the medieval period while the Vikings had established permanent bases at Dublin, Waterford, Limerick and elsewhere.

Meath suffered as a result of its prominence and wealth throughout the period. There were bloody clashes throughout the eight to eleventh centuries as various groups tried to achieve or consolidate power (e.g. Bhreathnach 1999, 16). Settlement during this period was characterised by ring forts. Ringforts, the characteristic settlement site of the early medieval period, generally consist of a circular area surrounded by a bank or fosse, or simply by a rampart of stone. Ringforts are usually interpreted as being defended farmsteads. Many ringforts have been partially or completely destroyed since the 1960s and often the only indication of the former presence of a ringfort is preserved in townland name elements such as Dún, Rath, Cashel or Lios. However, monuments which have experienced above-ground disturbance continue to be of archaeological interest due to the potential for subsurface remains to exist at their locations. The term ‘enclosure’ is applied to monuments that cannot be classified more accurately without archaeological assessment but were identified as enclosures during fieldwork or through the study of aerial photography or other sources. There are two enclosures to the south the study area including one in the townland of Dunboyne (RMP no. ME050-032001-) and one in the townland of Loughsallagh (RMP no. ME051-019----). While it is possible that these features represent the ploughed out remains of former ringforts, their morphology and associated with ring-ditch monuments may indicate a prehistoric construction date.

The proposed development is located to the north-east of the town of Dunboyne and within the barony and civil parish of that name. The placename Dunboyne is variously translated as ‘the Fortress on the Flood or Stream’ or as ‘*Domnach Baoithin’* meaning

The Church of St. Baoithin. St Baoithin was a distinguished scribe, who took over the monastery at Iona after the death of St. Cholmcille, who was instrumental in the production of the Book of Kells. According to the Annals of the Four Masters, St. Baoithin died in 595 AD. As at Dunboyne, the establishment of Anglo-Norman settlements in the later medieval period is often associated with existing church sites. A bronze coated iron bell (NMI 1972:10; see Appendix 12.2), found in an area of Dunboyne known locally as Kilbrennan, where aerial photography has shown ancient earthworks, consistent with early monastic activity. The bell is relatively plain in that there is no evidence for decoration or ‘precious’ materials (gold/ precious stones) suggesting it was a working bell (as opposed to a shrine).

The Liberty of Meath was granted to Hugh de Lacy, a Welsh Lord by Henry II. De Lacy divided Eastmeath in to seven large grants amongst principal sub-tenants, with several smaller areas allocated to various knights. He apparently retained much of Eastmeath for himself, including some of the richest monastic sites. Dunboyne developed as a small unwalled borough, a centre for trade, with a fair and market. Dunboyne’s wide main street and spacious ‘triangle’ is a testimony to its origins. Borough status offered economic and jurisdictional rights, which increased rights and increased social status. By the mid-seventeenth century, Dunboyne contained “six hundred & five Acres of lande beinge all Profitable Arrable meadow and Pastur”, divided among eleven proprietors and with only one stone house and mill listed (Simmington 1940). The medieval parish church, according to Bishop Dopping's Visitation Book 1682-1685, was standing unroofed since 1641 (Johnson 2001).

Mid-seventeenth century sources indicate that the townland of Bracetown was the property of the Earl of Fingall and contained mostly arable land with ‘three small thatched houses’ (Simmington 1940, 122). In 1836, over three acres in the west of the townland was given over to gravel extraction. Much of this area (on the east of the existing N3) has been quarried and backfilled in modern times.

Normansgrove House and surrounding estate is visible on the 1st edition Ordnance Survey Map (see Figure 12.4) and many of the features of this estate survive today, notably the estate wall which also marks the townland boundary between (part of) Gunnocks, Normansgrove, Paddingtown and (part of) Portmanna (along the Bracetown to Belgree Lane road) (see Section 12.3.3 below).

12.3.2 Geophysical Survey & Archaeological Testing

Previous archaeological investigations have been undertaken in the immediate vicinty, comprising geophysical survey and test trenching, including The Hub Phase 2 development site immediately to the north, and a substantial development site located in Gunnocks, Loughsallagh and Portan immediately to the east-southeast (Nicholls 2009, License no. 09R0058; Nicholls 2017, License no. 17R0229). No significant discoveries were made as a result of the geophysical survey undertaken for The Hub Phase 2 development.

Geophysical survey was undertaken in March 2019 by Target Archaeological Geophysics (Licence no. 19R0071) as part of the overall archaeological management plan for the main development site. The survey objectives were to identify the location, form and extent of buried archaeological remains, where present within the site boundary, and to advise further works prior to proposed development at the site.

High resolution magnetic gradiometer survey was undertaken within the boundary of the concurrent data storage development site, investigating all available lands, completing a total 19.71 hectares in 8 locations (see Figure 12.6). The geophysical survey of the proposed development has recorded the location of two enclosures (one a small circular enclosure (A) probably a ring-ditch, measuring c. 12.5m in diameter; the other a pair of intersecting curvilinear enclosure ditches (B)) in the south-west of M1. Remnants of an associated field system (C, D, E) of probable medieval origin have also been identified in this area and extending into M3-M5. Further discrete positive responses and weak trends of potential interest were also identified, most significantly in areas M1 and M4 in proximity to the enclosure remains and suspected early medieval field system, and in M8 at survey centre. Interpretation of the small-scale positives recorded in M2 and M6-M7 is tentative. While the potential significance of these responses should not be ignored a natural soil/geological, recent land use or modern ferrous origin for these should also be considered. Elsewhere, the results from survey highlight patterns of former cultivation traversing M1-M5 northeast-southwest, remnants of former land divisions, possible land drains and responses of suspected natural soil/geological origin.

Figure 12.6 Results of geophysical survey of site (source Target Archaeological Geophysics (Licence no. 19R0071).

A programme of archaeological test excavations commenced on site by Stephen Hickey of AMS Consultants in May 2020 and is on-going at the time of writing (License no. 20E0246). The testing is focussed on the potential features identified during the geophysical survey but will also assess the entire site.

12.3.3 Site survey

A windscreen and partial walkover survey was undertaken on 25th May 2020 in sunny, dry weather (see Figure 12.7. The greenfield portion of the western cable route was not accessible at the time of the survey due to livestock being present on the land. This route will run along the existing R147 from the development site to the roundabout with the M3. From here, it will traverse northeast through farmland in open pasture along the line of the mature hedgerow.

The eastern cable route runs along the existing Bracetown to Belgree Lane road along the townland boundary between (part of) Gunnocks, Normansgrove, Paddingtown and (part of) Portmanna (see Figure 12.4 and 12.5). The estate wall of the Normansgrove estate runs for approximately 5m along this stretch of the road (see Figures 12.8 to 12.9). The northeastern most 500m of the cable route traverses greenfield; a large field under crop – although the section of the field through which the proposed cable will run is unplanted and under grass (see Figure 12.10).

Whilst no features or finds were noted during the survey, Ger O'Donoghue of Moore Group found a small stone axehead on the surface in this field (northwest portion) whilst undertaking his ecological survey. Stone axes are the characteristic artefact type dating to the Neolithic period and this find most likely relates to farming activity in the area some 5,000 – 6,000 years ago (see Figure 12.11).

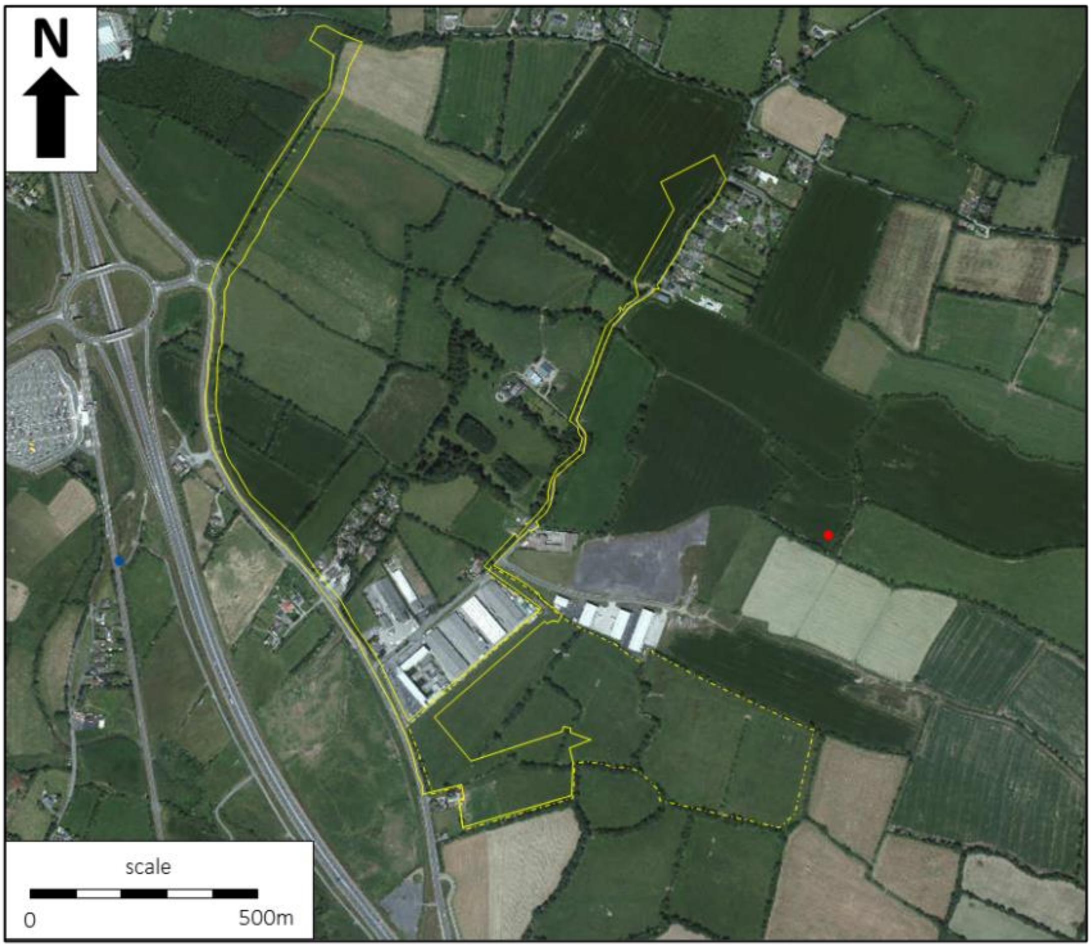

Figure 12.7 Aerial photograph of the proposed route showing field survey area.

Figure 12.8 The estate wall of Normansgrove estate (which runs along the townland boundary).

Figure 12.9 Forged iron gate and gateposts relating to Normansgrove estate

Figure 12.10 View facing northeast of greenfield area through which the proposed cable will run.

Figure 12.11 Stone axehead found during field survey by Ger O'Donoghue of Moore Group (May 2020).

12.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The project description is outlined in Chapter 2 and summarised here.

The development will comprise:
- 1 no Indoor Gas Insulated Switchgear (GIS) two storey building equipped with 8 no. 220kV bays and rated for the system voltage of 220 kV;
- Approximate Building dimensions (L: 63 metre W: 21 metre H: 17.5 metre)
- Two 220kV underground cables which will connect the proposed Substation development to existing transmission system;
- Oil-filled step-down 220/20 kV power transformers positioned within bunded enclosures; (height circa 2 x 8.6 m);
- no. lightning protection masts (height circa 6 x 19 m);
- Single storey buildings used for control and ancillary;
- Internal access roads;
- A 2.6-metre-high palisade fence;
- Drainage infrastructure; and
- All associated and ancillary site development works.

12.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

12.5.1 Construction Phase

No recorded archaeological or architectural heritage features will be impacted on by the proposed routes.

Potential impacts on archaeological and cultural heritage associated with the proposed development involves ground disturbance associated with the laying of the electrical cables and associated services and buildings. Whilst the majority of the proposed routes are along existing roadways and thus disturbed ground, ground disturbance in greenfield areas would remove sub-surface archaeological features, should any occur.

The eastern route runs along the road from Bracetown to Belgree Lane, along a long-standing townland boundary and the line of the Normansgrove estate wall. There is potential for excavation works relating to the route to impact on these features.

12.5.2 Operational Phase

There are no potential impacts on archaeological, architectural and cultural heritage expected as a result of the operational phase of the proposed development.

12.5.3 Do-nothing Scenario

There are no immediate potential impacts on archaeological, architectural and cultural heritage expected in the case of a Do-nothing Scenario.

12.6 REMEDIAL AND MITIGATION MEASURES

12.6.1 Construction Phase

Archaeological monitoring (by a suitably qualified archaeologist under license to the National Monuments Service) should be undertaken where ground disturbance will be undertaken in greenfield areas

Any archaeological features identified during monitoring will require permission from National Monuments for archaeological excavation (preservation by record) of these remains, in advance of development works continuing in these areas.

Financial, logistical and time provision should be made for archaeological excavation, if required, prior to the commencement of the construction phase of the development.

The estate wall and other features associated with Normanstown estate should be avoided and provision made for its protection during construction works.

Please note that the recommendations given here are subject to the approval of the National Monuments Service, Department of the Culture, Heritage and the Gaeltacht.

12.6.2 Operational Phase

No mitigation measures are required for archaeological, architectural and cultural heritage during the operational phase of the proposed development.

12.7 PREDICTED IMPACT OF THE DEVELOPMENT

12.7.1 Construction Phase

The construction phase of the proposed development will not impact directly on any sites included in the Record of Monuments and Places. However, it is possible that ground disturbance in greenfield areas will impact on previously unrecorded sub-surface archaeological features. As noted above, there is the potential for the proposed development works to impact on architectural features associated with Normansgrove estate. However, the implementation of mitigation measures detailed in Section 12.6.1, will ensure that the effect is ***neutral*** and ***imperceptible***.

12.7.2 Operational Phase

The operational phase of the proposed development is not predicted to have any impact on archaeological, architectural and cultural heritage.

12.8 RESIDUAL IMPACTS

Subject to the implementation of appropriate archaeological mitigation measures, no residual impacts on archaeological, architectural and cultural heritage are predicted.

The cumulative impact assessment is addressed in Section 12.9 below.

Interactions are addressed in Chapter 16 of this EIA Report.

12.9 CUMULATIVE IMPACT ASSESSMENT

12.9.1 Construction Phase

The construction phase of the proposed development and the concurrent data storage development will not impact directly on any sites included in the Record of Monuments and Places. The ability to excavate this site through the construction phase will provide data to the archaeological community from the potential subsurface sites. The potential to gain knowledge outweighs the negative impact. Ground disturbance will impact on sub-surface archaeological features within the development sites. However, the implementation of mitigation measures detailed in Section 12.6.1 for the proposed development, and as required by planning conditions for the concurrent data storage development will ensure that the cumulative effect is neutral and not significant.

12.9.2 Operational Phase

The operational phase of the proposed development and the concurrent data storage development will not require any subsurface disturbance and as such is not predicted to have any impact on archaeological, architectural and cultural heritage, and therefore no potential for cumulative impact.

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APPENDIX 12.1

RECORDED ARCHAEOLOGICAL MONUMENTS

PREPARED BY CRDS LTD.

Recorded Archaeological Monuments located within c. 1.5km of the proposed development are listed below (source Sites and Monuments Record for Co. Meath, www.archaeology.ie). All are scheduled for inclusion in the next revision of the RMP.

RMP No.: **ME051-003----**
Class: Enclosure
Townland: ROWAN
Description: The following description is derived from the published 'Archaeological Inventory of County Meath' (Dublin: Stationery Office, 1987). In certain instances the entries have been revised and updated in the light of recent research.
Date of revision: 10 July 2007
Revision: Cropmark of double-ditched enclosure (dims. c. 120m N-S, c. 100m E-W) (CUCAP, AYR 56, BDH 29).

RMP No.: **ME051-008----**
Class: House - 18th/19th century
Townland: GUNNOCKS
Description: The Archaeological Survey of Ireland (ASI) is in the process of providing information on all monuments on The Historic Environment Viewer (HEV). Currently the information for this record has not been uploaded. To access available information for research purposes please make an appointment in advance with the Archive Unit (open Fridays 10.00 am – 5.00 pm), Department of Culture, Heritage and the Gaeltacht, The Custom House, Dublin 1 D01W6XO or email nmarchive@chg.gov.ie.

RMP No.: **ME051-024----**

Class: Ring-ditch
Townland: MAYNE
Description: Located on what might be a slight rise in a fairly level landscape. The cropmark of a small circular enclosure (int. diam. c. 6m) is visible only on Google Earth (24/06/2018). It was first reported by Jean-Charles Caillere.
See the attached image from Google Earth 24/06/2018
Compiled by: Michael Moore
Date of upload: 5 June 2018

APPENDIX 12.2

ARCHAEOLOGICAL FINDS

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The recorded archaeological finds in the vicinity of the proposed development, are listed below, all noted in the National Museum of Ireland files, Kildare Street, Dublin 2, or in other published catalogues of prehistoric material: Raftery (1983 - iron age antiquities), Eogan (1965; 1993; 1994 - bronze swords, Bronze Age hoards and goldwork), Harbison (1968; 1969a; 1969b - bronze axes, halberds and daggers) and the Irish Stone Axe Project Database. The following townlands were assessed Bennetstown, Bracetown, Dunboyne, Gunnocks, Loughsallagh, Mayne, Normansgrove, Pace, Paddingstown, Portan, Portmanna, Stokestown and Whitesland.

<table>
<tr><th>NMI 1951:6</th><th>Portmanna, found in garden.</th></tr>
<tr><td colspan="2">Stone object.
Polished on one surface. Previously described as a scraper (?).
No further information on file.</td></tr>
</table>

<table>
<tr><th>NMI 1968:380</th><th>Near Dunboyne</th></tr>
<tr><td colspan="2">Flint arrowhead
Arrowhead of yellow flint, triangular with broad tang. Chipped all over and retouched on edges (L 3.5cm; W 2.3cm; T 5mm)</td></tr>
</table>

<table>
<tr><th>NMI 1968:381</th><th>Near Dunboyne</th></tr>
<tr><td colspan="2">Flint arrowhead
Arrowhead of yellow flint. Triangular blade with exceptionally large and long tang. Worked all over both faces. Elliptical cross-section (L 3.6cm; W 1.6cm; T 3mm)</td></tr>
</table>

<table>
<tr><th>NMI 1968:382</th><th>Near Dunboyne</th></tr>
<tr><td colspan="2">Flint arrowhead
Arrowhead of yellow flint. Triangular blade. Stout tang which may be damaged at base. Chipped all over both faces (L 3.2cm; W 1.5cm; T 5mm).</td></tr>
</table>

<table>
<tr><th>NMI 1972:10</th><th>Dunboyne</th></tr>
<tr><td colspan="2">Bell
Bronze-coated iron bell. Roughly trapezoidal in outline. In cross-section it takes the form of an oval truncated at each end and in long-section it is an elongated D-shape. The sides are flat, the broad faces convex in outline. The bell is forged from a single sheet of iron folded along the sides and held together by means of 6 rivets (three on each side). On one side the bronze coating has been eroded from the heads of the rivets, on the other, the position of the rivets is marked by low circular protuberances covered by the bronze coating. The mouth of the bell is flanged internally. The handle is approximately semi-circular in outline and bears high flanges along each side. The bronze coating, presumably applied by means of dipping the iron in molten bronze is severely weathered.
Possibly a monastic site</td></tr>
</table>

<table>
<tr><th>NMI 1972:13</th><th>Dunboyne</th></tr>
<tr><td colspan="2">Pottery
Ceramic. Glazed red earthen ware. Possible North Devon gravel-tempered pipkin handle.
Pottery fragment with traces of greenish glaze. Possibly portion of a leg of a vessel. Circular is cross-section with a central cylindrical perforation. Splayed to a ring in one direction, splayed in opposite direction but broken off. Pinkish grey fine ware with reddish surface. Smooth surfaced with traces of greenish glaze near the broken edge. Height 3.8cm; max diameter 3.2cm, diameter of perforation 7mm.</td></tr>
</table>

<table>
<tr><th>NMI 1988:122</th><th>Dunboyne, Gavishes Pond</th></tr>
<tr><td colspan="2">Axehead
Stone. Polished stone axehead of Tievebulliagh porcellanite. Oblique, chipped butt and flattish oval cross section, asymmetrical cutting edge. Straight narrow sides. Length 10.4; width at cutting edge 5.6; width at butt 4.1; thickness 2.5. Found at building site.</td></tr>
</table>

<table>
<tr><th>NMI 1995:24</th><th>Dunboyne, Church of Ireland Cemetery</th></tr>
<tr><td colspan="2">Tile
Clay, line impressed tile fragment.
No further information on file.</td></tr>
</table>

<table>
<tr><th>NMI 1995:187</th><th>Dunboyne, found in an outhouse in Dunboyne</th></tr>
<tr><td colspan="2">Mortar
Stone mortar, small limestone mortar, roughly round in outline, with flat base. Outer surface roughly pocked. Four small lugs on rim, one of which is hollowed for pouring. Diameter including lugs 19.7, height 8.8.
Possibly of medieval date.</td></tr>
</table>

<table>
<tr><th>NMI 2009:30</th><th>Dunboyne</th></tr>
<tr><td colspan="2">Pin
Copper alloy stick pin with biconical head. Three concentric lines around the head of the pin. Otherwise without decoration and heavily corroded. Length 8.7cm with a shank diameter of 0.3cm for most of its length, tapering to a blunt point over its lower 2cm. It appears to be cast in copper allow. The head, which is bi-conical in form, is 0.7cm in diameter. The pin is heavily corroded and no ornamentation remains visible on the shank. Three parallel lines around the upper surface of the head are the only apparent decoration. The most notable feature of the pin is the hollow form of its head. No similar features have yet been identified in the published descriptions of stick pins.
Copper alloy stick pins came into use in Ireland in the latter part of the 10th century and remained popular until the end of the thirteenth century (Pryor 1976, 75.
Housing estate, spreading redeposited topsoil in back garden of new house
Trowel article.</td></tr>
</table>

APPENDIX 12.3

EXCAVATIONS

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The excavation bulletin website (www.excavations.ie) was consulted to identify previous excavations that have been carried out in the vicinity of the proposed development. This database contains summary accounts of excavations carried out in Ireland from 1970 to 2019. The following townlands were assessed - Bracetown, and Gunnocks.

Excavations.ie ref. no.: 2016:050
Site name: 'Fulacht G' and 'Fulacht H', Data Centre, Clonee, Portan and Gunnocks
Sites and Monuments Record No.: n/a
Licence number: 15E0583
Author: Paul Duffy
Site type: Burnt mound/fulacht fiadh
ITM: E 704687m, N 742042m
Latitude, Longitude (decimal degrees): 53.416920, -6.432478

'Fulacht G'

Located on a gentle slope on the north-eastern bank of the Portan Stream, the site was initially named 'Fulacht G' and identified as a burnt spread and possible trough during a testing programme in advance of construction works (15E0109). Following stripping of the site, multiple features were identified including; a burnt spread, 7 troughs, 19 pits, post-holes, stake-holes and a possible slot trench. It is likely that the burnt spread, while partially ploughed out, originally covered a larger area. The spread overlay numerous pits and troughs, one of which may have functioned as a well. Several pits and troughs were located in the immediate vicinity of the spread. Various outlying features were also identified.

To the north-west of the spread a rectangular, timber-lined trough was identified. The surviving wood was present at the base and two of the sides. A large trough filled with charcoal and heat-affected stone was located to the north-west of the main spread. Another trough was located to the south-east of the main spread. A small burnt spread which overlay numerous stake-holes, was located to the north-east of the main spread. Immediately to the south-east of this a slot trench was cut into the natural subsoil. A cluster of pits was located to the north of the main spread. The burnt mound activity and associated features extended over an area of approximately 30m x 30m. Post-excavation analysis is ongoing.

'Fulacht H'

The site was located to the north of the Pace Stream and was initially identified as 'Fulacht H' during a testing programme in advance of construction works (15E0109). Following the removal of the overlying topsoil numerous features of archaeological significance were revealed. The features comprised of troughs, pits and stake-holes which were predominantly filled with a material consisting of charcoal and heat-affected stone. The main area of the site was represented by two adjacent clusters, comprising of 3 troughs and 5 pits respectively. Small outlying pits and stake-holes were identified to the south-east of this concentration. The archaeological activity and associated features extended over an area of approximately 30m x 20m. Post-excavation analysis is ongoing.

This record will be updated following completion of final report

IAC, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Excavations.ie ref. no.: 2016:051
Site name: Portan/Gunnocks
Sites and Monuments Record No.: n/a
Licence number: 15E0577
Author: Paul Duffy
Site type: Monitoring - Greenfield
ITM: E 704200m, N 741900m
Latitude, Longitude (decimal degrees): 53.416920, -6.432478

Monitoring of extensive soil stripping under this licence is currently ongoing within the townlands of Gunnocks, Portan and Loughsallagh. A number of features, largely isolated pit features have been identified. These have been resolved under individual licence numbers and post excavation works are in progress.

This record will be updated upon completion of the project, making reference to all related licence numbers.

IAC, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Excavations.ie ref. no.: 2015:420
Site name: Clonee, Portan, Gunnocks

Sites and Monuments Record No.: n/a
Licence number: 15E0109 and 15R0028
Author: Graham Hull, TVAS (Ireland) Ltd
Site type: Burnt stone spreads
ITM: E 704200m, N 741900m
Latitude, Longitude (decimal degrees): 53.416920, -6.432478

Test-trenching targeted at geophysical anomalies on lands at Clonee, Co. Meath located two burnt stone spreads and associated troughs. Many of the geophysical anomalies proved, on testing, to be either naturally-occurring geological deposits or modern agricultural activity. Metal detection of the test trenches did not locate archaeological artefacts.

AHISH, BALLINRUAN, CRUSHEEN, CO. CLARE

Excavations.ie ref. no.: **2016:540**
Site name: Site 16 (Field 13) Gunnocks
Sites and Monuments Record No.: n/a
Licence number: 16E0195
Author: David Bayley, IAC Ltd
Site type: Pit
ITM: E 703855m, N 742810m
Latitude, Longitude (decimal degrees): 53.425160, -6.437370

Archaeological monitoring of topsoil stripping associated with the development of a data centre at Clonee, Co. Meath commenced in December 2015 and is currently ongoing. The site is situated c. 120m north of the village of Clonee in the townlands of Clonee, Portan and Gunnocks. The site comprised of 14 field of pasture and 4 arable fields bound to the east by the River Pinkeen; which also forms the Meath-Dublin County boundary. Monitoring is being carried as per the approved Monitoring licence 15E0577, directed by David Bayley, in response to planning conditions attached to the development. Monitoring follows on from previous geophysical survey (licence 15R0005) and test trenching with metal detection (licence 15E0109 and 15E0028). Two burnt mound sites (Site 1 and 2) were identified as a result of these investigations which were subsequently excavated under licence 15E0583 by Paul Duffy in February and March 2016.

A number of archaeological features have been identified during monitoring to date across the site for which separate licence numbers have been granted to undertake subsequent excavation.

Site 16 was identified in March 2016 during monitoring in Field 13. The site comprised a single pit of unknown date or function. Several sites containing single pits have been recorded across the development area, with an example recorded at Site 21 c. 25m to the north.

IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Excavations.ie ref. no.: **2016:547**
Site name: Site 20 (Field 17), Gunnocks
Sites and Monuments Record No.: n/a
Licence number: 16E0227
Author: David Bayley, IAC Ltd
Site type: Pits
ITM: E 704285m, N 741945m
Latitude, Longitude (decimal degrees): 53.417308, -6.431185

Monitoring of topsoil stripping associated with the development of a data centre at Clonee, Co. Meath commenced in December 2015 and is currently (September 2017) ongoing. The site is situated c. 120m north of the village of Clonee in the townlands of Clonee, Portan and Gunnocks. The site comprised of 14 field of pasture and 4 arable fields bound to the east by the River Pinkeen, which also forms the Meath-Dublin County boundary. Monitoring is being carried out under licence 15E0577, directed by David Bayley, in response to planning conditions attached to the development. Monitoring follows on from previous geophysical survey (licence 15R0005) and test trenching with metal detection (licence 15E0109 and 15E0028).

Two burnt mound sites (Site 1 and 2) were identified as a result of these investigations which were subsequently excavated under licence 15E0583 by Paul Duffy in February and March 2016.

A number of archaeological features have been identified during monitoring to date across the site for which separate licence numbers have been granted to undertake subsequent excavation.

Site 20 was identified as a pair of shallow pits in April 2016. The first pit measured c. 0.5m x 0.5m x 0.05m; the second pit measured 0.4m x 0.45m x 0.07m. The fill of both pits comprised dark grey silt

clay with moderate charcoal inclusions. While numerous similar features have been identified in the development lands, none are located within 100m of Site 20.
IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Excavations.ie ref. no.: 2016:548
Site name: Site 21 (Field 13), Gunnocks
Sites and Monuments Record No.: n/a
Licence number: 16E0259
Author: David Bayley, IAC Ltd
Site type: Pit
ITM: E 704210m, N 742173m
Latitude, Longitude (decimal degrees): 53.419371, -6.432237
Monitoring of topsoil stripping associated with the development of a data centre at Clonee, Co. Meath commenced in December 2015 and is currently (September 2017) ongoing. The site is situated c. 120m north of the village of Clonee in the townlands of Clonee, Portan and Gunnocks. The site comprised of 14 field of pasture and 4 arable fields bound to the east by the River Pinkeen, which also forms the Meath-Dublin County boundary. Monitoring is being carried out under licence 15E0577, directed by David Bayley, in response to planning conditions attached to the development. Monitoring follows on from previous geophysical survey (licence 15R0005) and test trenching with metal detection (licence 15E0109 and 15E0028).
Two burnt mound sites (Site 1 and 2) were identified as a result of these investigations which were subsequently excavated under licence 15E0583 by Paul Duffy in February and March 2016.
A number of archaeological features have been identified during monitoring to date across the site for which separate licence numbers have been granted to undertake subsequent excavation.
Site 21 was identified as a single pit located centrally in the development area during May 2016. The pit measured c. 0.4m x 0.38m x 0.1m and contained two fills with black silty clay and frequent charcoal inclusions. It may represent a charcoal clamp.
IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Excavations.ie ref. no.: 2016:551
Site name: Site 24 (Field 16), Gunnocks
Sites and Monuments Record No.: n/a
Licence number: 16E0284
Author: David Bayley, IAC Ltd
Site type: Pit
ITM: E 704450m, N 742153m
Latitude, Longitude (decimal degrees): 53.419144, -6.428635
Monitoring of topsoil stripping associated with the development of a data centre at Clonee, Co. Meath commenced in December 2015 and is currently (September 2017) ongoing. The site is situated c. 120m north of the village of Clonee in the townlands of Clonee, Portan and Gunnocks. The site comprised of 14 field of pasture and 4 arable fields bound to the east by the River Pinkeen, which also forms the Meath-Dublin County boundary. Monitoring is being carried out under licence 15E0577, directed by David Bayley, in response to planning conditions attached to the development. Monitoring follows on from previous geophysical survey (licence 15R0005) and test trenching with metal detection (licence 15E0109 and 15E0028).
Two burnt mound sites (Site 1 and 2) were identified as a result of these investigations which were subsequently excavated under licence 15E0583 by Paul Duffy in February and March 2016.
A number of archaeological features have been identified during monitoring to date across the site for which separate licence numbers have been granted to undertake subsequent excavation.
Site 24 was discovered during topsoil stripping in the footprint of an attenuation pond within the northern limit of the development site in Gunnocks townland. The site comprised a pit which measured 1.36m x 1.34m x 0.3m that contained three fills. The upper deposit comprised mid-brown silty clay and contained some burnt bone fragments and a possible burnt flint fragment. The secondary deposit comprised mottled black/orange silty clay with frequent charcoal inclusions. The primary deposit comprised yellowish-brown silty clay. Numerous singular pits have been recorded elsewhere in the development area, the nearest of which comprised that at Site 25, 30m to the west.
IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Excavations.ie ref. no.: 2016:552
Site name: Site 25 (Field 13), Gunnocks

Sites and Monuments Record No.: n/a
Licence number: 16E0302
Author: David Bayley, IAC Ltd
Site type: Pit
ITM: E 704409m, N 742159m
Latitude, Longitude (decimal degrees): 53.419206, -6.429249

Monitoring of topsoil stripping associated with the development of a data centre at Clonee, Co. Meath commenced in December 2015 and is currently (September 2017) ongoing. The site is situated c. 120m north of the village of Clonee in the townlands of Clonee, Portan and Gunnocks. The site comprised of 14 field of pasture and 4 arable fields bound to the east by the River Pinkeen, which also forms the Meath-Dublin County boundary. Monitoring is being carried out under licence 15E0577, directed by David Bayley, in response to planning conditions attached to the development. Monitoring follows on from previous geophysical survey (licence 15R0005) and test trenching with metal detection (licence 15E0109 and 15E0028).

Two burnt mound sites (Site 1 and 2) were identified as a result of these investigations which were subsequently excavated under licence 15E0583 by Paul Duffy in February and March 2016.

A number of archaeological features have been identified during monitoring to date across the site for which separate licence numbers have been granted to undertake subsequent excavation.

Site 25 was identified as a single pit in June 2016 within the northern part of the development area in Gunnocks townland. The pit measured 0.3m x 0.28m x 0.1m and was filled by a mid-brown silty clay deposit. The deposit contained occasional flecks of charcoal and moderate to frequent inclusions of burnt bone fragments. A larger pit containing charred material was identified c. 30m to the east at Site 24.

IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Excavations.ie ref. no.: 2016:555
Site name: Site 28 (Field 16), Gunnocks
Sites and Monuments Record No.: n/a
Licence number: 16E0405
Author: David Bayley, IAC Ltd
Site type: Spread of burnt material
ITM: E 704630m, N 742051m
Latitude, Longitude (decimal degrees): 53.418192, -6.425962

Monitoring of topsoil stripping associated with the development of a data centre at Clonee, Co. Meath commenced in December 2015 and is currently (September 2017) ongoing. The site is situated c. 120m north of the village of Clonee in the townlands of Clonee, Portan and Gunnocks. The site comprised of 14 field of pasture and 4 arable fields bound to the east by the River Pinkeen, which also forms the Meath-Dublin County boundary. Monitoring is being carried out under licence 15E0577, directed by David Bayley, in response to planning conditions attached to the development. Monitoring follows on from previous geophysical survey (licence 15R0005) and test trenching with metal detection (licence 15E0109 and 15E0028).

Two burnt mound sites (Site 1 and 2) were identified as a result of these investigations which were subsequently excavated under licence 15E0583 by Paul Duffy in February and March 2016.

A number of archaeological features have been identified during monitoring to date across the site for which separate licence numbers have been granted to undertake subsequent excavation.

Site 28 was identified within the north-east area of development in July 2016. A single feature was recorded as a shallow spread of burnt material that measured c. 1.75m x 0.78m x 0.02m. The deposit comprised dark grey silty clay with moderate inclusions of charcoal and burnt bone. A burnt mound was identified c. 60m to the east at Site 1 (referenced above) which may be related.

IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Excavations.ie ref. no.: 2016:558
Site name: Site 5 (Field 2), Gunnocks
Sites and Monuments Record No.: n/a
Licence number: 16E0038
Author: Paul Duffy, IAC Ltd
Site type: Pits
ITM: E 704517m, N 741794m
Latitude, Longitude (decimal degrees): 53.415905, -6.427746

Monitoring of topsoil stripping associated with the development of a data centre at Clonee, Co. Meath commenced in December 2015 and is currently (September 2017) ongoing. The site is situated c. 120m north of the village of Clonee in the townlands of Clonee, Portan and Gunnocks. The site comprised of 14 field of pasture and 4 arable fields bound to the east by the River Pinkeen, which also forms the Meath-Dublin County boundary. Monitoring is being carried out under licence 15E0577, directed by David Bayley, in response to planning conditions attached to the development. Monitoring follows on from previous geophysical survey (licence 15R0005) and test trenching with metal detection (licence 15E0109 and 15E0028).

Two burnt mound sites (Site 1 and 2) were identified as a result of these investigations which were subsequently excavated under licence 15E0583 by Paul Duffy in February and March 2016.

A number of archaeological features have been identified during monitoring to date across the site for which separate licence numbers have been granted to undertake subsequent excavation.

Site 5 was identified during monitoring within the route of a haul road in Field 2, Gunnocks, in January 2016. The features comprised two pits and three non-archaeological tree-boles. Pit 1 measured 1.2m x 0.65m x 0.15m. Pit 2 measured 1.1m x 0.45m. Both pits were cut into the subsoil and were filled with a similar light grey heavy clay which contained frequent fragments and flecks of charcoal. Additional stripping of the topsoil within the vicinity of these features indicated no further archaeological features within its proximity.

IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Excavations.ie ref. no.: 2016:559
Site name: Site 6 (Field 1), Gunnocks
Sites and Monuments Record No.: n/a
Licence number: 16E0063
Author: Paul Duffy, IAC Ltd
Site type: Pits
ITM: E 704460m, N 742242m
Latitude, Longitude (decimal degrees): 53.419941, -6.428455

Monitoring of topsoil stripping associated with the development of a data centre at Clonee, Co. Meath commenced in December 2015 and is currently (September 2017) ongoing. The site is situated c. 120m north of the village of Clonee in the townlands of Clonee, Portan and Gunnocks. The site comprised of 14 field of pasture and 4 arable fields bound to the east by the River Pinkeen, which also forms the Meath-Dublin County boundary. Monitoring is being carried out under licence 15E0577, directed by David Bayley, in response to planning conditions attached to the development. Monitoring follows on from previous geophysical survey (licence 15R0005) and test trenching with metal detection (licence 15E0109 and 15E0028).

Two burnt mound sites (Site 1 and 2) were identified as a result of these investigations which were subsequently excavated under licence 15E0583 by Paul Duffy in February and March 2016.

A number of archaeological features have been identified during monitoring to date across the site for which separate licence numbers have been granted to undertake subsequent excavation.

Site 6 was identified as a pair of pits during monitoring in Field 1, Gunnocks townland, in February 2016. Two small circular pits were recorded 1m distant from each other, measuring c. 0.3m and 0.25m in diameter. Large chunks of charcoal and burnt bone fragments (measuring between 0.01–0.02m in length) were noted on the surface of each pit. Subsequent topsoil stripping of the surrounding area did not reveal any nearby archaeological features. Site 6 is located c. 300m north-west of the burnt mound excavated at Site 1 (licence 15E0583).

IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Excavations.ie ref. no.: 2018:181
Site name: Loughsallagh, Portan and Gunnocks
Sites and Monuments Record No.: n/a
Licence number: 18E0013
Author: Tim Coughlan, IAC Ltd
Site type: Pits, burnt mound activity
ITM: E 703316m, N 742374m
Latitude, Longitude (decimal degrees): 53.421352, -6.445616

A programme of pre-planning archaeological testing was carried out at Clonee Data Centre Phase 2, which is located in the townlands of Loughsallagh, Portan and Gunnocks, Co. Meath. It follows a previous geophysical assessment report carried out by Target Archaeological Geophysics, License No. 17R0229.

The testing identified some localised pits and burnt mound activity. A number of linear ditch-like features appear to represent drainage or infilled former field boundaries although no corresponding boundaries were identified on the first edition or later mapping. Some areas highlighted in geophysics as areas of burning have been confirmed as burning on or within the topsoil layer and are associated with modern agricultural clearance and are not archaeological.
IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Excavations.ie ref. no.: **2004:1191**
Site name: TESTING AREA 5, BRACETOWN/DUNBOYNE/LOUGHSALLAGH
Sites and Monuments Record No.: N/A
Licence number: 04E0489
Site type: Various
ITM: E 702066m, N 742343m
Latitude, Longitude (decimal degrees): 53.421313, -6.464425
An assessment of the M3 Contract 1 (Clonee-Dunshaughlin), Testing Area 5, along the proposed route of the Mainline (Chainage 700-1100) and Bracetown Road (Chainage 200-900) was requested by Meath County Council. Located in the townlands of Bracetown, Dunboyne and Loughsallagh, the area comprised six fields along both banks of the Tolka River. A geophysical survey suggested that the area had the potential to contain archaeological sites.
A total of 79 test-trenches were excavated through the area, with a combined length of 4046m (resulting in a total excavated area of 8699m2). The assessment determined that some of the anomalies recorded in the geophysical survey were archaeological sites. A single rim sherd of medieval pottery was located within this area. It was a locally produced fabric with traces of an external dark-green glaze. Three separate sites were located within this area.
Bracetown 1 was a disturbed spread of heat-fractured stone and charcoal c. 13.2m north-south by 8.9m. There were no discernible associated features, which were probably obscured by the spread. The feature was situated next to the Tolka River, directly opposite the site of Dunboyne 1.
Dunboyne 1 comprised two circular pits containing cremated bone and charcoal. Each pit was 0.4m in diameter and survived to a depth of c. 0.1m.
Loughsallagh 1 was a post-medieval road or path. The road was noticeable at ground level as a raised area flanked by a narrow marshy line and an existing hedgerow. The road was constructed of rounded and angular cobbles, possibly sourced from the nearby Tolka River. The road measured 7.5m wide and had an average height of 0.25m. The road extends towards Loughsallagh cemetery (SMR 51:6), a 17th-century graveyard, and it is possible the road may be contemporary with that site.
Robert O'Hara, Archaeological Consultancy Services Ltd, Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth.

Excavations.ie ref. no.: **2005:AD4**
Site name: BRACETOWN 1, BRACETOWN
Sites and Monuments Record No.: N/A
Licence number: A017/006
Author: Linda Clarke, Archaeological Consultancy Services Ltd, 21 Boyne Business Park, Greenhills, Drogheda.
Site type: Burnt mound
ITM: E 702422m, N 742557m
Latitude, Longitude (decimal degrees): 53.423167, -6.459003
This site was located within Contract 1 (Dunboyne to Dunshaughlin) of the proposed M3 Clonee to North of Kells motorway and was excavated during August 2005. It was identified by Robert O’Hara during the assessment phase of works in 2004 (Excavations 2004, No. 1191, 04E0489)
During the resolution phase, an area 30m by 30m was stripped of topsoil to expose the truncated remains of a burnt-stone spread, located within the flood-plain of the River Tolka and representing the remains of a fulacht fiadh. It covered an area of 15.25m by 8m and was extremely shallow, varying in depth between 0.05 and 0.25m. Four small shallow depressions were located beneath the burnt-stone spread. No trough was identified and, apart from the occasional fragment of animal bone, no finds were recovered. This spread was partially sealed by alluvial deposits.

Excavations.ie ref. no.: 2008:979
Site name: Pace/Bennetstown/Bracetown/Dunboyne/Castlefarm/ Rusk/Clonee/Hilltown, Co. Meath, and Barnhill and

Barberstown, Co. Dublin
Sites and Monuments Record No.: N/A
Licence number: 08E0988
Author: Ros Ó Maoldúin, ADS Ltd, 110 Amiens Street, Dublin 1.
Site type: Monitoring
ITM: E 701585m, N 744548m
Latitude, Longitude (decimal degrees): 53.441220, -6.470946

Monitoring is taking place of the works carried out in connection with the Dunboyne M3 commuter rail project. This will comprise a twin-track railway line from an M3 interchange at Pace, through to Clonsilla Station, linking into the city centre at the new Docklands Station, providing a new service for commuters along the route. The proposed length of the new line between the M3 interchange and Clonsilla is 7.5km and follows the route of the old Navan branch. Two new stations are proposed along the route, at Dunboyne and Pace, which also comprises a major park-and-ride facility. No archaeological remains have been uncovered to date but works are ongoing.

APPENDIX 12.4

NATIONAL INVENTORY OF ARCHITECTURAL HERITAGE

PREPARED BY CRDS LTD.

The recorded architectural structure within c. 1.5km of the proposed development are listed below, all noted in the National Inventory of Architectural Heritage for Kildare (source www.archaeology.ie).

BENNETSTOWN, County Meath

Reg No **14405001**

Rating	Regional
Cat. Special Interest	Architectural Technical
Original Use	Bridge
Date	1840 - 1860
Coordinates	301869, 243473
Date Recorded	22/04/2002
Date Updated	--/--/--
Description	Single-arch rock-faced limestone railway bridge with string courses and copings, built c.1850, carrying the road over the former railway track which is now disused.
Appraisal	The masonry treatment of this railway bridge adds textural interest to the site. The robust rustication of the walls, voussoirs, string courses and copings was executed by skilled craftsmen. This bridge forms part of a group with the related railway structures along this disused line.

13.0 TRAFFIC AND TRANSPORTATION

13.1 INTRODUCTION

This chapter assesses the traffic impact the Proposed Development will have on the surrounding road network during construction and operation (the Proposed Development is defined in Chapter 2.)

The Proposed Development will be designed to provide a permanent power supply to meet the demand for the proposed data storage facility subject to a separate concurrent application under Meath County Council Reg. Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20.

The Proposed Development comprises a new 220kV substation with Gas Insulated Switchgear (GIS) technology and two 220 kV underground transmission cables (connecting to existing 220 kV overhead lines to the north of the proposed substation) along with associated and ancillary works. A full description of the proposed development is presented in Chapter 2.

In accordance with section 2 of Transport Infrastructure Ireland (TII)'s Traffic and Transport Assessment Guidelines (May 2014), a Traffic and Transport Assessment is recommended when the additional traffic generated by a development results in the traffic to and from the development exceeding 10% of the traffic flow on the adjoining road or 5% of the traffic on the adjoining road where congestion exists or the location is sensitive.

The proceeding sections of this chapter will demonstrate that the traffic generation associated with this development lies below these thresholds (i.e. development traffic would comprise less than 1% of traffic flows on adjoining roads). Therefore, this report provides a basic assessment of the traffic and transport related matters associated with the Proposed Development, and does not include a detailed traffic impact assessment of the junctions in the vicinity of the development.

13.2 METHODOLOGY

This chapter has been prepared taking the following documents into account:

- Meath County Development Plan 2013-2019, Meath County Council;
- Meath County Development Plan 2020-2026 Draft Plan, Meath County Council;
- TII Traffic and Transport Assessment Guidelines, 2014;
- Design Manual for Urban Roads and Streets (DMURS), 2013, Department of Transport, Tourism and Sport & Department of Environment, Community and Local Government;
- TII Project Appraisal Guidelines – Unit 5.3: Travel Demand Projections, 2016;
- Planning documents associated with the following surrounding developments;
  - RA150972: Warehousing development located within the Hub Logistics Park, to the north east of the current proposed development;
  - RA170586: an extension to existing office development within Bracetown Business Park to the north west of the current proposed development;
  - RA180671: an expansion of the existing data centre campus to provide an additional two data centre buildings, an administration/ office building

    and associated ancillary infrastructure to the south east of the current proposed development; and
  - RA170887: revised design of previously permitted Biopharmaceutical Manufacturing Facility (RA/161021) on a site located approximately 2.5km north of the proposed development.
  - RA191593: The construction of 4 number 2 storey data storage buildings with a combined gross floor area of c. 92, 172 sq.m, associated single storey energy centre with a grass floor area of c. 8,906 sq.m with an ancillary 1 storey MV operations building with part basement with a gross floor area of c. 1,016 sq.m, EngineNode 2 storey offices with a gross floor area of 736 sq.m
- Traffic and Transport Chapter of EIA for Meath County Council Reg. Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20, Bracetown Business Park, Meath, CSEA 2020.

The methodology used to conduct the assessment includes:

1. Establishing baseline conditions – The existing conditions will be recorded including existing site location and use, surrounding road network, public transport services, baseline (do-nothing) traffic volumes, and committed development proposals in area;
2. Defining the development – This includes size, use, access arrangements, parking, staffing, trip generation and distribution, etc. for the operational stages of the development. Details relating to the peak construction phase will also be outlined;
3. Assessing impact of the development – The impact of the operational phase of the development will be stated without doing junction analysis;
4. The worst case construction traffic impact will also be discussed for the peak construction traffic movements; and
5. Mitigation measures will then be proposed to offset any impacts that may result from the develpment.

13.3 RECEIVING ENVIRONMENT

13.3.1 Existing Site Location and Use

The Proposed development is located within the townlands of Bracetown, Gunnocks, Paddingstown, Normansgrove, Rowan, Portmanna, and Pace. The application site has a total area of c. 14.35 hectares. The substation site is 1.7 hectares in area and is zoned as industrial/commercial (E2 - General Industry and Employment/E3 - Warehousing and Distribution as per the Meath County Development Plan 2013-2019 (MCDP)).

13.3.2 Existing Road Network

The surrounding road network in the vicinity of the site includes the R147, the CR580, and the M3.

R147
The R147 is a regional road, approximately 58.9 kilometres in length. It connects to the N3 adjacent to the Meath/Cavan border at its north-east end and to the R156 and L3025 approximately 1km east of Clonee at its south west end. The site is bounded by the R147 to the east of the site.

In the vicinity of the site, the R147 provides one traffic lane and one bus lane in the northbound direction and one traffic lane in the southbound direction and has a posted speed limit of 80km/hr.

Bracetown Business Park Access Road (CR580/L1010)
The CR580/L1010 is a class 1 County Road. It extends in a north-north-easterly direction from its southern end (where it connects to the R147) for a distance of approximately 2.3 Kilometres and connects to the CR508 at the north east end. It provides access to the Bracetown Business Park and the Hub Logistics park and will connect to the Future Distributor Road, when complete.

The CR580 provides one lane in each direction and has a posted speed limit of 80km/hr.

N3/M3
The N3/M3 extends in a north-easterly direction from its southern end (where it connects to junction 6 of the M50) for a distance of approximately 135 Kilometres (including the 51 kilometre section north of junction 4 which is classed as motorway i.e. M3) and connects to the A509 at the northern Ireland border in Fermanagh.

The Pace roundabout is the closest junction to the site with access to the M3. In the vicinity of the Pace roundabout, the M3 provides two traffic lanes in each direction, with a posted speed limit of 120km/hr.

13.3.3 Existing Public Transport Services

The site is currently serviced by Bus and Rail. Bus Eireann services 109, 109B and 105 stop along the R147, just north of its t-junction with the CR580:

- The 109 bus provides services between Kells and Busaras in Dublin City Centre via Navan, Dunshaughlin and Bracetown, with the first service departing Dublin City Centre for Bracetown Business Park at 06:45am and the last bus departing Bracetown Business Park for Dublin City Centre at 23:08; respectively. Buses typically operate on 30 minute intervals during the day, with services less frequent during quieter periods (early morning and late at night);
- The 109B bus provides services between Trim and Busaras in Dublin City Centre via Dunshaughlin and Bracetown, with the first service departing Dublin City Centre for Bracetown Business Park at 07:15am and the last bus departing Bracetown Business Park for Dublin City Centre at 19:38; respectively. Buses typically operate on 120 minute intervals on Mondays to Saturdays, with services less frequent on Sundays; and
- The 105 bus provides services between Drogheda and Blanchardstown via Ashbourne, Rathoath and Bracetown, with the first service departing Drogheda for Bracetown Business Park at 05:30am and the last bus departing Bracetown Business Park for Drogheda at 21:07; respectively. It should be noted that a bus transfer may be required to travel between Bracetown Business Park and Drogheda as only half of the services stop in Drogheda and only half of the services stop at Bracetown Business Park. No bus transfer is required to travel between Bracetown Business Park and Blanchardstown. Buses stopping at Bracetown Business Park typically operate on 60 minute intervals from Mondays to Saturdays. Sunday services do not stop at Bracetown Business Park.

The nearest railway station to the Proposed Development is the M3 Parkway station, which is located adjacent to the Pace roundabout, circa 2km north of the proposed development. Services are available from this station to Clonsilla, Docklands and Hansfield. The approximate travel time into Dublin City Centre (Docklands), is 30 minutes from M3 Parkway. This service approximately operates on a 30 minute frequency during peak hours and on an hourly frequency during off-peak times.

13.3.4 Existing Traffic Volumes

12 hour traffic surveys were conducted at the following junctions on Tuesday 13th August 2019 between 7am and 7pm:

- Roundabout of R147 (south), R157, and R147 (north);
- T-junction of Bracetown Business Park Access Road, R147 (south), R157, and R147 (north);
- Roundabout of R147 (southeast), R147 (northwest), on-ramp to M3 and R147 (northeast).

Surveys were conducted by Nationwide Data Collection (NDC) in accordance with NTA guidelines. Resulting peak hours from the surveys were found to be 07:00-08:00 and 17:15-18:15 for AM and PM, respectively, across the 3 junctions. AM and PM peak hour traffic volumes are shown in Appendix 13.1.

13.3.5 Proposed Future Development in the Area

Table 3.9 of Chapter 3 provides a list of planning applications located in the area surrounding the site that have received planning approval from Meath County Council in the past 5 years.

Many of the developments listed are either low trip generators and/or are located too far from the site to have a meaningful impact on traffic in the vicinity of the site. Some of the developments listed were operational at the time the traffic survey was conducted (13th August 2019), and thus the traffic associated with the operation of these developments was reflected in the counts.

However, the following developments may have an impact on traffic volumes on the road network surrounding our site and were approved but were not yet operational at the time the traffic survey was conducted on 13th August 2019:

- RA150972: Warehousing development located within the Hub Logistics Park, to the north east of the current proposed development;
- RA170586: an extension to existing office development within Bracetown Business Park to the north west of the current proposed development;
- RA180671: an expansion of the existing Project Runways data centre campus to provide an additional two data centre buildings, an administration/ office building and associated ancillary infrastructure to the south east of the current proposed development;
- RA170887: revised design of previously permitted Biopharmaceutical Manufacturing Facility (RA/161021) on a site located approximately 2.5km north of the proposed development; and
- RA/191593: The construction of 4 no. 2 storey data storage buildings with a combined gross floor area of c. 92, 172 sq.m, associated single storey energy centre with a grass floor area of c. 8,906 sq.m with an ancillary 1 storey MV operations building with part basement with a gross floor area of c. 1,016 sq.m EngineNode 2 storey offices with a gross floor area of 736 sq.m.

In order to understand the cumulative impact of our development on the surrounding road network, existing and future traffic generation associated with these adjacent developments must be understood and accounted for.

Warehousing/ Light Industrial development located in Hub Logistics Park RA150972
Permission was granted in October 2015 for 28,944m^2 of warehousing and light industrial development within the Hub Logistics Park under planning application reference RA150972. This (most recently approved) development application for the site made changes to the two preceding approved planning applications DA50233 (original application) and DA101063 (time extension on original planning application DA50233) on the site. DA50233/ DA101063 were previously approved for the construction of 6 warehousing and light industrial buildings, four of which have been built to date. The two remaining buildings that have not been built (referred to as buildings A01 and A02), comprised a total GFA of 13,615m2 in DA50233 and DA101063 .

RA150972 effectively replaced the previous permissions to construct two warehousing/ light industrial Buildings A01 and A02 with a new permission to construct three warehousing/ light industrial buildings, including revised Buildings A01 and A02 and a third building A03, with a combined total GFA of 28,615m2.

No traffic and transportation report was provided to support development application RA150972. However, it is assumed that buildings A01, A02 and A03 will be operational prior to the opening year of the proposed development. Given that these buildings were not operational at the time the traffic counts were conducted in August 2019, the operational trip generation associated with approved buildings A01, A02 and A03 must be taken into account in Baseline traffic flows.

With no traffic and transportation report provided to support development application RA150972, trip generations associated with approved development RA150972 must be derived. Given the similarities in GFAs between the original application RA50233 (which also included four warehousing/light industrial buildings which have since been constructed and were operational at the time the traffic counts were conducted, and thus, do not need to be added to our baseline flows), and RA150972, it is assumed that the trip generations associated with the two warehousing/light industrial development applications would be similar.

Taking a conservative approach (i.e. the overall GFA associated with RA150972 is 329m2 less than that associated with DA50233), the trip generation associated with the warehousing/light industrial development as reported in the traffic and transportation report for RA50233 (see Table 12.3.2), has been used to represent the operational trip generation associated with RA150972. The trip generations shown in Figure 13.1 will be taken into account when calculating baseline flows for the construction and opening years at the 3 junctions where the traffic surveys were conducted.

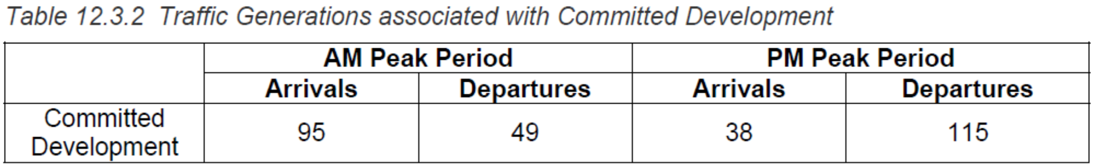


Table 12.3.2 Traffic Generations associated with Committed Development

	AM Peak Period		PM Peak Period	
	Arrivals	Departures	Arrivals	Departures
Committed Development	95	49	38	115

Figure 13.1 Trip generation assumed for RA150972

Axial Properties Ltd. Office Development - Bracetown Business Park RA170586
Permission was granted to Axial Properties Ltd. in January 2018 for an extension to existing office accommodation to the rear of Lacken Plaza at Bracetown Business

Park, including the demolition of an existing single storey office block and replacement with a three storey office block with a net increase in office GFA of 2,489m^2 (excl 33m^2 entrance foyer) . There is limited information provided in the planning documents for RA170586 relating to traffic and transportation matters. Section 8.5 of the planning report supporting this development application provides information on access, public transport and parking (no additional parking is proposed for the office development).

This office extension development was not operational at the time the traffic counts were conducted but will most likely be operational when the proposed development is operational. Therefore, the trip generation associated with this office extension development must be accounted for when calculating baseline flows for the proposed development.

However, since no estimated trip generation was provided with the planning documents for RA170586, TRICS database will be used to estimate likely trip generation for this office development. TRICS database is the UK and Ireland's national system of trip generation analysis, containing over 7150 directional transport surveys at over 110 types of development.

Table 13.1 shows the estimated trip generation during the peak hours obtained from the August 2019 count (07:00-08:00 and 17:15-18:15) for an office development with a GFA of 2,489m^2. Associated TRICS data is provided in Appendix 13.2.

Table 13.1 Trip generation estimated for RA170586 using TRICs database

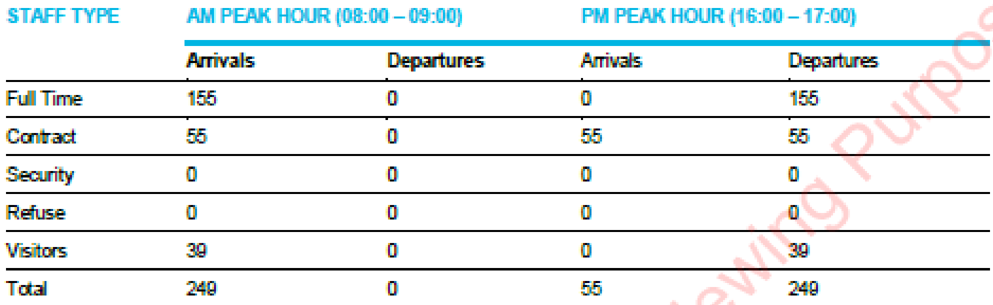
	AM Peak (07:00-08:00)		**PM Peak (17:15-18:15)**	
In	14 veh	14pcu	3 veh	3pcu
Out	2 veh	2pcu	25 veh	25pcu

The peak hour trip generations shown in Table 13.2 will be added to construction and opening year flows to assist in the calculation of baseline flows for each of these analysis years for the 3 junctions.

Project Runways Data Centre Development RA180671
Permission was granted to Runways Information Services Ltd. (RISL) in July 2018 for the expansion of the existing data centre campus to provide an additional two data centre buildings, an administration/ office building and associated ancillary infrastructure to the south east of the current proposed development (Planning Ref. RA180671).

At the time the August 2019 traffic counts were conducted, this data centre expansion development was not yet operational (construction of same had begun). The development is envisaged to be operational in Q2 2021. Taking a conservative approach, the operational trips projected for this development will be taken into account when calculating baseline traffic flows for the construction and opening years, without deducting the construction trips that may have been on the road network when the traffic counts were taken.

The traffic and transport assessment that accompanied this RA180671 planning application provides trip generation estimates for the operational phase of the above mentioned development.



STAFF TYPE	AM PEAK HOUR (08:00 – 09:00)		PM PEAK HOUR (16:00 – 17:00)	
	Arrivals	Departures	Arrivals	Departures
Full Time	155	0	0	155
Contract	55	0	55	55
Security	0	0	0	0
Refuse	0	0	0	0
Visitors	39	0	0	39
Total	249	0	55	249

Figure 13.2 Trip generation assumed for RA180671

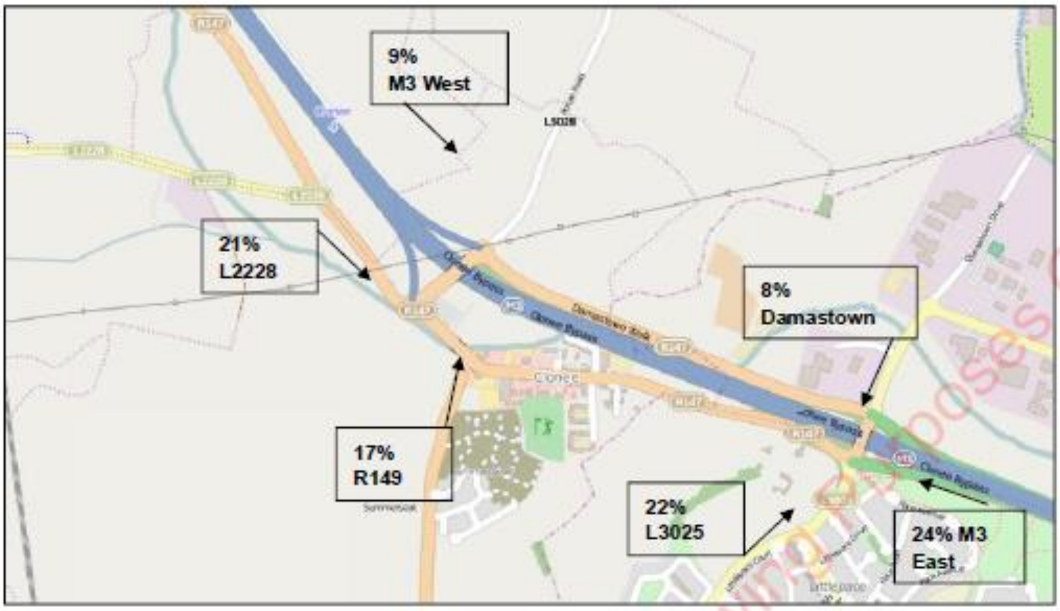


Figure 13.3 Trip Distribution assumed for RA180671

The peak hour trip generations shown in Figure 13.2 will be added to 2021 construction year and 2022 opening year flows to assist in the calculation of baseline flows for each of these analysis years, with the distribution of trips assigned to the road network in accordance with guidance provided in Figure 13.3.

Shire Pharmaceutical Development RA170887

Permission was granted in October 2017 for a revised design to a previously permitted Biopharmaceutical Manufacturing Facility (RA/161021) located 2.5 kilometers north of the Proposed Development in Dunboyne, County Meath. The revised approved development includes revisions to the original application to provide a Biopharmaceutical Production Building with a GFA of 10,083m^2, a single storey warehousing facility with a GFA of 2,625 m^2, a three storey laboratory and administration building with a GFA of 7,022m^2 and a number of ancillary buildings. The development also includes minor modifications to a permanent staff, sustaining contractor and visitor car park for 362 cars (that was already constructed wihen this planning application was submitted). The development also includes a covered bicycle facility for 100 bicycles.

Appendix D of the traffic and transport assessment report (Jacobs, September 2017) submitted with this approved development RA170887 provides details on the trip generation associated with the development (see Figures 13.4 and 13.5 for AM and PM peak trip generation, respectively). The trip generation shown in these Figures corresponds to a maximum staff number of 345 staff.

This approved development was only partially operational at the time the traffic counts were conducted in August 2019. There were approximately 100 staff on site at the time of the counts. Therefore, the remaining projected staff (245 staff), which will occupy the development prior to the opening year of the proposed development, must be accounted for when calculating baseline flows for the proposed development. 71% (i.e. 245/345 =0.71) of the flows shown in Figures 13.4 and 13.5 will be taken into account when calculating baseline flows for the construction and opening years at the 3 junctions where the traffic surveys were conducted. The flows that will be added to 2021 and 2022 flows to assist in calculating baseline flows for the same years are shown in Table 13.2.

Table 13.2 Trip generation estimated for RA170887

	AM Peak (07:00-08:00)	PM Peak (17:15-18:15)
In	155pcu	30pcu
Out	31pcu	157pcu

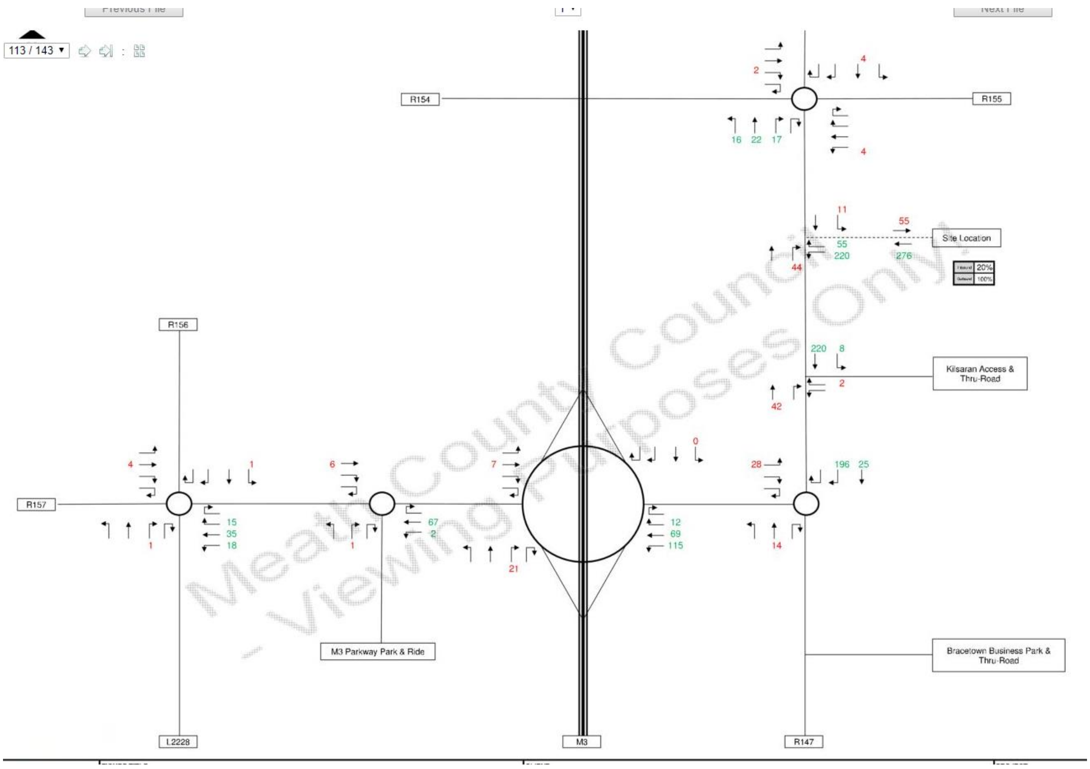


Figure 13.5 AM Peak hour Trip generation and assignment for RA170887

Concurrent EngineNode Data Storage Facility

The proposed substation is located to the south of a proposed data storage facility subject to a separate concurrent application under Meath County Council Reg. Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20.

The concurrent development consists of the: construction of 4 no. 2 storey data storage buildings with a combined gross floor area of c. 92, 172 sq.m, a single storey energy centre with a gross floor area of c. 8,906 sq.m with an ancillary 1 storey MV operations building with part basement with a gross floor area of c. 1,016 sq.m, EngineNode 2 storey offices with a gross floor area of 736 sq.m.

The data storage campus shall comprise the following uses: offices, canteen, computer and associated support areas, electrical component rooms, plant and associated equipment. Each Data Storage building includes for a total of 18 number 21.5 m high back-up generator exhaust flues which are incorporated on to the building facade.

The energy centre shall comprise: gas engines, ancillary plant and associate equipment. Each Data Storage building includes for a total of 18 number 21.5m high back-up generator exhaust flues which are incorporated on to the building facade. The energy centre shall comprise of: gas engines, ancillary plant and associate equipment. The energy centre includes for 4 number 40m high x 5m diameter exhaust flues and a standby diesel generator with a 22m high exhaust flue.

Ancillary facilities on site include for an Above Ground Installation for gas connection, and a temporary ESB MV Substation with gross floor area of 40 sq.m in support of this development. Also included are all associated storage tanks, flues, access roads, services, entrance gates, railings, perimeter fencing at 3m high, landscaping and infrastructure inclusive of 245 No. car parking spaces and 3 number attenuation retention ponds.

The development was not operational or under construction when the traffic counts were conducted in 2019. Chapter 2 and Chapter 13 of the EIAR (AWN, October 2019) submitted with this approved development RA191593 provides details on the construction schedule and trip generation associated with the development.

The construction schedule shows that an office building, energy centre and one data centre will be under construction/operational during the construction/opening year of the Proposed Development, as detailed in Table 13.3.

Table 13.3 Construction Schedule of EngineNode Data Centre and Energy Centre

	Office Building	**Energy Centre**	**Data Centre**
2021 (Construction Year)	Construction - Peak	Construction – Peak	Construction - Peak
2022 (Opening Year)	Operational	Operational – Phase 1	Operational – Phase 1

Table 13.4 shows the estimated trip generation during the peak hours derived from the traffic volumes and percentage of trips in/out of the development at peak times as described in Chapter 13 of the EIAR for RA1911563.

Table 13.4 Trip generation estimated for RA191563

		AM Peak			**PM Peak**		
	Year	Office Building	Energy Centre	Data Centre	Office Building	Energy Centre	Data Centre
In	2021	24 Cars, 6 HGVs, 2 LVs		48 Cars, 11 HGVs, 3 LVs	5 Cars, 3 HGVs, 1 LV		10 Cars, 6 HGVs, 2 LVs
Out	2021	5 Cars, 3 HGVs, 1 LV		10 Cars, 6 HGVs, 2 LVs	24 Cars, 6 HGVs, 2 LVs		48 Cars, 11 HGVs, 3 LVs
In	2022	20 Cars, 0 HGVs, 0 LVs	10 Cars, 2 HGVs, 1 LV	20 Cars, 5 HGVs, 1 LV	0 Cars, 0 HGVs, 0 LVs	2 Cars, 1 HGV, 0 LVs	4 Cars, 2 HGVs, 1 LV
Out	2022	0 Cars, 0 HGVs, 0 LVs	2 Cars, 1 HGV, 0 LVs	4 Cars, 2 HGVs, 1 LV	10 Cars, 0 HGVs, 0 LVs	10 Cars, 2 HGVs, 1 LV	20 Cars, 5 HGVs, 1 LV

Table 13.5 Trip generation estimated for RA191563

	Year	**AM Peak (07:00-08:00)**	**PM Peak (17:15-18:15)**
In	2021	114pcu	36pcu
Out	2021	36pcu	114pcu
In	2022	69pcu	15pcu
Out	2022	15pcu	59pcu

The peak hour trip generations shown in Table 13.5 will be added to construction and opening year flows to assist in the calculation of baseline flows for each of these analysis years for the 3 junctions.

13.3.6 Future Road Proposals in the Area

Meath County Development Plan 2013-2019 zoning map shows an indicative distributor road objective (please refer to the yellow dotted line on Figure 13.6) to connect the Bracetown Business Park to the Kilbride Road.

The Meath County Development Plan 2013-2019 Meath County Development Plan 2020-2026 Draft Plan has the Proposed Development site zoned as E2/E3 – General Enterprise and Employment/Warehousing and Distribution.

The Masterplan document for the *Project Runways Data Centre Development* (Planning Ref.RA/180671) proposed to reroute the indicative distributor road to along the northern boundary of the Master Plan Area which would provide access from the Bracetown Business Park to the Kilbride Road. Please note, the revised route proposed by this Master Plan is indicative only and is outside of land within the RISL's control. In this proposal the intention was to seek to upgrade the Kilbride Road (L5028) as part of the works granted permission.

The proposed upgrades (phase 1) will essentially be an extension of the existing Kilbride Road upgrades which were carried out as part of the existing adjacent data centre campus project. This equates to delivery of circa 45% of upgraded distributor road (including the already upgraded section of the Kilbride Road (L5028) and proposed upgrades of circa 550m) on lands in RISL's control (delivery of circa 27% of the total distributor road).

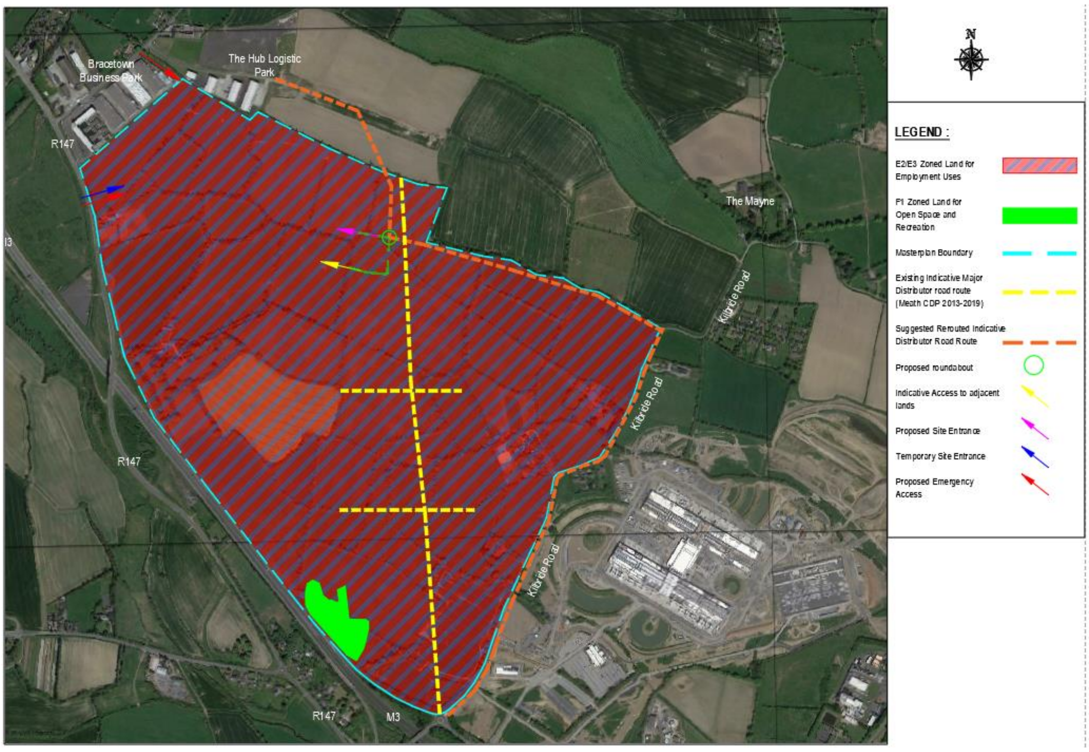


Figure 13.6 Existing & Proposed Distributor Road Routes

13.4 CHARACTERISTICS OF THE DEVELOPMENT

13.4.1 General Description and Use

The Proposed Development, as described in further detail in Chapter 2, comprises the following:

The development will comprise:

- 1 no Indoor Gas Insulated Switchgear (GIS) two storey building equipped with 8 no. 220kV bays and rated for the system voltage of 220 kV;
- Approximate building dimensions (L: 63 metre W: 21 metre H: 17.5 metre)
- Two 220kV underground cables which will connect the proposed Substation development to existing transmission system;
- A rural supply (75kVA) underground cable which will comprise a looped MV circuit installed underground in HDPE ducting;
- Two no oil-filled step-down 220/20 kV power transformers positioned within bunded enclosures; (height circa 2 x 8.6 m);
- 6 no. lightning protection masts (height circa 6 x 19 m);
- Single storey buildings used for control and ancillary;
- Internal access roads;
- A 2.6-metre-high palisade fence;
- Drainage infrastructure; and
- All associated and ancillary site development works including localised alterations to the landscape berms proposed as part of the data storage development, including altering the footprint of the larger berm to the northeast of the substation; revisions to the southern berm including incorporation of gabion walls along the inside of that berm, and, setting back the western berm facing the private residences by c. 30m, so as to enhance the residential amenity of those properties.

13.4.2 Trip Generation

Maintenance of 220kV Substation

Following completion of the 220kV substation, the worst case scenario trip generation for the site would occur during the annual maintenance operation.

Maintenance works will be conducted annually on each cubicle and would take a maximum of 15 days (120 hours). Vehicular trips would typically be in the order of two return light vehicle trips per day during this period.

Inspection of 220kV Cable

Following completion of the 220kV underground cable, vehicular trips typically in the order of one return light vehicle trip every 3 years (apart from the initial single return LV trip taken to inspect the asset one year after completion) will be required for maintenance.

For the purpose of our assessment, a worst case scenario trip generation of 2 return LV trips has been assumed for the Proposed Development, with two LVs arriving during the AM Peak hour and two LVs departing during the peak hour as shown in Table 13.6.

Table 13.6 Worst Case Scenario Operational Trip Generation for the Proposed Development

	AM Peak	PM Peak
Arriving	2 LVs, (2 PCU’s)	0 LVs (0 PCU’s)
Departing	0 LVs (0 PCU’s)	2 LVs (2 PCU’s)

13.4.3 Modal Choice

For the purpose of this report, a worst-case scenario has been assumed for traffic generation by assuming all trips to the site are by private car or HGV.

13.4.4 Trip Distribution

It has been assumed that all trips to the site will be new trips (i.e. trips that would not appear on the road network without the development). This represents the worst case scenario for trip generation.

13.4.5 Trip Assignment

It is assumed that all operational (i.e. maintenance) trips associated with the proposed 220kV GIS substation and 220kVA underground cable will travel to and from the site via the approved main site access.

The substation is accessible from the R147 and in time will be accessed through the data centre development from a new access in the northwest once road development works are completed.

During construction and early phases of operation, the traffic accessing the GIS substation will approach and access the substation through an entrance to be constructed off the R147 as a temporary t-junction access onto the R147 prior to the opening of the new distributor road. This is the temporary site access for the future concurrent EngineNode data storage development and has been designed in accordance with the Design Manual for Roads and Bridges (DMRB), with widening provided along the R147 at the junction to facilitate a short right turning lane into the site. Once the indicative distributor road has been completed, access will be through the data centre development. A maximum speed limit of 10km/hour will be in place on the access road. The temporary access will be closed and used for emergency access only.

It is anticipated that the indicative distributor road will be operational by 2029 (i.e. the first year the concurrent data storage facility development will be fully operational). Permanent access will be provided to the proposed development site via a roundabout junction onto the rerouted indicative distributor road to the north east.

The proposed permanent site access connecting to the distributor road has been designed in accordance with the Design Manual for Roads and Bridges (DMRB) and is shown in Figure 13.8. This permanent access will be used and the temporary access will be closed as soon as the indicative distributor road is operational.

Figure 13.8 Proposed Permanent Site Access via Roundabout onto future Distributor Road

It is expected that the origins and destinations of traffic to/from the main access during operation will continue to match the distribution of traffic currently travelling on the road network in the vicinity of the site.

It is assumed that the Proposed Development will be fully operational by Q1 2022. Thus, an opening year of 2022 has been assumed for the Proposed Development (i.e. the year when the first annual maintenance check of the substation will be conducted).

It is expected that a worst case scenario for construction traffic impact will be in 2021.

2021 and 2022 traffic flows have been derived by applying TII growth factors (published in the TII Project Appraisal Guidelines – Unit 5.3 Travel Demand Projections, 2016) to existing 2019 network traffic. In accordance with these guidelines, Table 13.7 displays the central (medium) growth factors used to estimate future traffic flows from 2019 volumes:

Table 13.7 Central Growth Factors for the Mid-East region (including Meath County Council LGA)

Years	Growth Factor for LVs	Growth Factor for HVs
Annual factor (2013-2030)	1.0140	1.0237
2019 to 2021	1.0282	1.0480
2019 to 2022	1.0426	1.0983

Once these growth factors were applied to the 2019 traffic volumes, the additonal future traffic associated with surrounding approved developments not accounted for in the 2019 count was accounted for to establish baseline (do-nothing) traffic flows as follows:

- RA150972: Warehousing development located within the Hub Logistics Park, to the north east of the current proposed development;
- RA170586: an extension to existing office development within Bracetown Business Park to the north west of the current proposed development;
- RA180671: an expansion of the existing data centre campus to provide an additional two data centre buildings, an administration/ office building and associated ancillary infrastructure to the south east of the current proposed development; and
- RA170887: revised design of previously permitted Biopharmaceutical Manufacturing Facility (RA/161021) on a site located approximately 2.5km north of the proposed development.
- RA/191593: The construction of 4 no. 2 storey data storage buildings with a combined gross floor area of c. 92, 172 sq.m, associated single storey energy centre with a grass floor area of c. 8,906 sq.m with an ancillary 1 storey MV operations building with part basement with a gross floor area of c. 1,016 sq.m EngineNode 2 storey offices with a gross floor area of 736 sq.m.

Following establishment of Baseline (do-nothing) traffic flows, baseline flows will be compared to baseline plus operational traffic from the Proposed Development to assess the worst case operational impact of the development. This will be discussed further in Section 12.5.1.

During construction of the proposed 220kV GIS substation and 220kV underground cable, construction traffic will travel to and from the site via the construction site access located on the southern section of the site, which forms a T-junction with the R147. It is expected that the origins and destinations of construction traffic will continue to match the distribution of traffic currently using the surrounding road network. Construction traffic will be discussed further in Section 12.5.3.

13.4.6 Parking

Car parking provision

Following completion of the proposed 220kV GIS substation and 220kV underground cables, it is anticipated that a maximum of four ESB staff will travel to the site in two vehicles during the most labour intensive maintenance operation – i.e. during the annual maintenance testing of the 220kV GIS substation.

Annual maintenance works will be conducted on each substation cubicle and will take a maximum of 15 days (120 hours). Therefore, it is proposed to provide 6 car parking spaces as part of the concurrent data storage development during the operational phase of development to facilitate these maintenance operations.

Cycle parking provision

Following completion of the proposed 220kV GIS substation and 220kV underground cables, it is anticipated that a maximum of four staff will travel to the site in two vehicles during the annual maintenance testing of the 220kV GIS substation. The maintenance checks (for the substation and the 220kV cable) require the use of equipment which could not be transported safely by bicycle. Therefore, no cycle parking is proposed for the operational phase of development.

13.4.7 Pedestrian Facilities

220kV Substation

The proposed substation development includes internal pedestrian footpaths providing safe passage for pedestrians between internal buildings. External public footpaths are provided on both sides of the road along the south and east boundaries of the site. The internal footpaths connect to these external footpaths, through the sites main access.

220kV Cable Installation

No access will be required by pedestrians to these underground cable following completion of the works, apart from two ESB staff, who may walk sections of the two routes while carrying out testing of the infrastructure, typically once every 3 years. Therefore, no pedestrian facilities are proposed along the routes of the 220kV cable installation.

13.4.8 Cycle Facilities

The future distributor road, which will facilitate permanent access to the concurrent data storage development, will provide 2 metre wide cycle lanes in each direction. This is expected to be operational in 2029.

The R147, which will facilitate temporary access to the concurrent data storage development until the future distributor road is complete, currently provides a combined bus and cycle lane in the northbound direction of travel.

No construction traffic is proposed to be carried out by bicycle and no access will be required by cyclists to the substation or underground cable following completion of the works. Therefore, no cyclist facilities are proposed to the 220kV substation or along the route of the 220kV cable installation.

13.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

13.5.1 Operational Phase

In order to identify any potential impacts, the traffic impact of the Proposed Development on the road network adjacent to the main site access (i.e. where development traffic would be most concentrated) is shown in Table 13.8.

Table 13.8 Proposed Development traffic that will be added to network as percentage of 2-way 2022 base (do-nothing) flows on adjoining roads

Junction	Year	AM			PM		
		2-way base flow (PCU's)	Pr.Dev traffic (PCU's)	%	2-way base flow (PCU's)	Pr.Dev traffic (PCU's)	%
Roundabout of R147 (south), R157, and R147 (north)	2022	790	2	0.25	1111	2	0.18
T-junction of Bracetown Business Park Access Road, R147 (south), R157, and R147 (north)	2022	430	2	0.47	754	2	0.27
Roundabout of R156, R147 and the on-ramp from M3	2022	1282	0	0.00	1573	0	0.00

Table 13.8 shows the additional two-way traffic that will be added to various road links with the Proposed Development as a percentage of two-way 2022 baseline (do-nothing) flows on those links.

The table shows that the maximum two-way Proposed Development traffic added as a percentage of baseline two-way traffic flows is 0.47% and occurs on the Bracetown Business Park access road during the AM peak hour.

This demonstrates that the traffic impact of the operational phase of the Proposed Development is ***long-term***, ***neutral*** and ***imperceptible***, with the proposed developments operational traffic volumes significantly below the thresholds stated in the TII Guidelines for Traffic and Transport Assessments, 2014 for junction analysis.

13.5.2 Environmental Impact

As stated above, the Proposed Development will not generate a significant volume of additional vehicular traffic during construction (see Section 12.5.3 below) or operation. The level of increase is not likely to have any adverse transport-related environmental effects in terms of noise, air quality, vibrations, etc. The impact of the construction period will be ***short-term***, ***negative*** and ***not significant*** in nature.

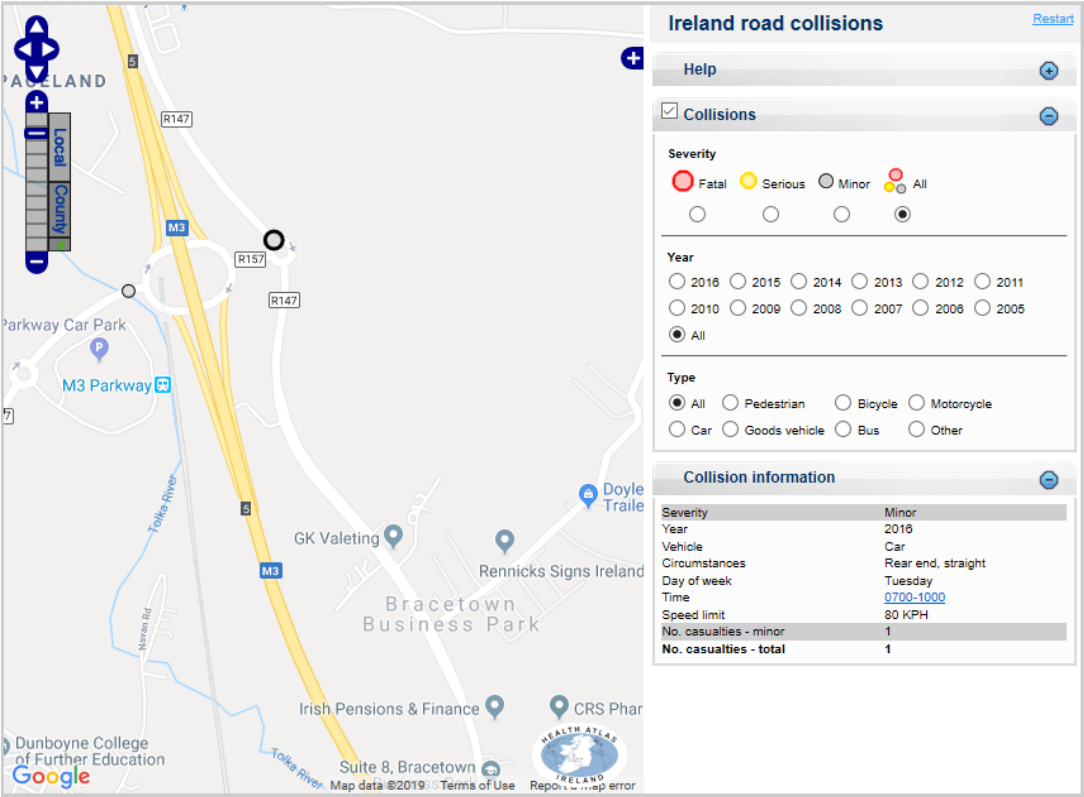
13.5.2.1 Road Safety

Collision Data

Table 13.9 shows collision data recorded within the study area for the 5 most recent years of available data (see Figure 13.9, for area captured in analysis). Collision data was sourced from the RSA Irish Road Collision database (http://www.rsa.ie/RSA/Road-Safety/Our-Research/Collision-Statistics/ Ireland-Road-Collisions/).

Table 13.9 Accident Data for Study Area

Location	Severity	Road User(s)	Accident Type	No. Casualties	Year	Day	Time	Speed
Northern arm of R147/ R157 Roundabout	Minor	Car	Rear end straight	1	2016	Tue	7-10am	80km/hr
Exit onto R157 from Pace Interchange	Minor	Car	Single vehicle only	1	2016	Sat	10-4pm	80km/hr



Ireland road collisions

☑ Collisions

Severity

○ Fatal ○ Serious ○ Minor ● All

Year

○ 2016 ○ 2015 ○ 2014 ○ 2013 ○ 2012 ○ 2011
○ 2010 ○ 2009 ○ 2008 ○ 2007 ○ 2006 ○ 2005
● All

Type

● All ○ Pedestrian ○ Bicycle ○ Motorcycle
○ Car ○ Goods vehicle ○ Bus ○ Other

Collision information

Severity	Minor
Year	2016
Vehicle	Car
Circumstances	Rear end, straight
Day of week	Tuesday
Time	0700-1000
Speed limit	80 KPH
No. casualties - minor	1
No. casualties - total	**1**

Figure 13.9 RSA Collision Map showing extent of study area captured in data for analysis

These collisions were both minor in severity. One was classified as a “single vehicle collision”, while the other was a “rear end, straight collision” between two cars. Both were at similar speeds – 80km/hr, and occurred on the same year – 2016.

They differed in the time and day of the week, with the rear end collision occurring on a Tuesday morning, and the single vehicle collision occurring on a Saturday midday.

Based on the above collision data analysis, it can be concluded that the number of accidents recorded in the area surrounding the site over the 5 most recent years of data is low, with no accident black spots or notable accident patterns that would indicate a road safety design flaw on the road infrastructure surrounding the site.

13.5.3 Construction Traffic

Construction of the Proposed Development would take place over a period of approximately 12 months from the commencement of construction for site development works.

It is proposed to provide the route of the Gunnocks-Corduff gridline on-road, along the L1010. The route of the Gunnocks-Woodland gridline is mostly on-road, along the R147, and has agricultural crossings towards the L5026. Incremental closure of one or more lanes may be required. The section of works requiring lane closures will be subject to a T2 licence application to Meath County Council, which will inform the construction methodology and timing for these works.

During construction of off-road works, no construction vehicles will access the site (or commence work) before 7.00a.m and all construction vehicles departing the site will do so before 7.00p.m. Any works on the public road requiring the closure of one traffic lane will be carried out at night, between the hours of 7pm and 6am. Construction activities will be carried out Monday to Saturday, with no on site construction activities to take place on Sundays or Bank Holidays.

In general, the impact of the construction period would be short-term in nature.

Construction traffic would consist of the following:

- Private vehicles belonging to site construction staff;
- Private vehicles belonging to site security staff;
- Occasional Private vehicles belonging to professional staff (i.e. design team, utility companies); and
- Excavation plant and dumper trucks used for site development works.

Construction traffic has been estimated based on contractor experience of similar substation works and underground cable installation works, taking into account the scale of the substation and the length of underground cables to be installed, also noting that sections of the underground cable routes are on-road and off-road.

It is expected that the origins and destinations of traffic travelling to/from the main access during construction will continue to match the distribution of traffic currently travelling on the road network in the vicinity of the site.

The following construction data has been used to estimate peak daily construction traffic (assumed to occur during the civil works period for the substation building):

- Average construction staff: 15-20;
- Peak construction staff (peak staff levels during Civil Works): 30;
- Peak cars entering/exiting site per day: 18;
- Peak HGVs entering/exiting site per day: 10; and
- Peak LGVs entering/exiting site per day: 2.

1. Of the 18 Cars (LVs) entering and exiting the site during peak construction, it is assumed:
    - 20% enter the site in the AM peak hour;
    - 4% exit the site in the AM peak hour;
    - 4% enter the site in the PM peak hour; and
    - 20% exit the site in the PM peak hour

2. Of the 10 HGVs entering and exiting the site during peak construction, it is assumed:
    - 10% enter the site in the AM peak hour;
    - 5% exit the site in the AM peak hour;
    - 5% enter the site in the PM peak hour; and
    - 10% exit the site in the PM peak hour

3. Of the 2 LGVs entering and exiting the site during peak construction, it is assumed:
   - 10% enter the site in the AM peak hour;
   - 5% exit the site in the AM peak hour;
   - 5% enter the site in the PM peak hour; and
   - 10% exit the site in the PM peak hour

Table 13.10 outlines the peak construction traffic generation:

Table 13.10 Peak hour flows corresponding to peak construction periods.

Peak Construction Traffic		AM		PM	
		Entering	Exiting	Entering	Exiting
Cars	18	4	1	1	4
HGVs	10	1	1	1	1
LGVs	2	1	0	0	1
Total (PCU's)		**7**	**3**	**3**	**7**

In order to identify any potential impacts, the traffic impact of the construction traffic from the Proposed Development on the road network adjacent to the main site access (i.e. where development traffic would be most concentrated) was determined. Table 13.11 shows the additional two-way traffic that will travel on various road links during peak construction as a percentage of two-way 2021 baseline (do-nothing) flows on those links.

Table 13.11 Proposed Development traffic that will be added to network as percentage of 2-way 2021 base (do-nothing) flows on adjoining roads

Junction	Year	AM			PM		
		2-way base flow (PCU's)	Pr.Dev traffic (PCU's)	%	2-way base flow (PCU's)	Pr.Dev traffic (PCU's)	%
Roundabout of R147 (south), R157, and R147 (north)	2021	898	7	0.78	1168	7	0.60
T-junction of Bracetown Business Park Access Road, R147 (south), R157, and R147 (north)	2021	499	10	2.00	844	10	1.18
Roundabout of R156, R147 and the on-ramp from M3	2021	1275	3	0.24	1566	3	0.19

Table 13.11 shows that the maximum two-way construction traffic added as a percentage of 2021 baseline two-way traffic flows is 2.00% and occurs and occurs on the Bracetown Business Park access road during the AM peak hour.

This demonstrates that the impact of the construction phase of the development would be minor and is below the thresholds stated in the TII Guidelines for Traffic and Transport Assessments, 2014 for junction analysis. Given the temporary nature of the peak construction phase, the overall impact of the construction phase is considered ***short-term***, ***negative*** and ***not significant.***

Given the short term nature of the peak construction phase, the overall impact of the construction phase is considered ***short-term***, ***negative*** and ***not significant.***

13.6 REMEDIAL AND MITIGATION MEASURES

13.6.1 Construction Phase

The following measures will be put in place during the construction works:

- The contractor will be required to provide wheel cleaning facilities, and regular cleaning of the main access road;
- Temporary car parking facilities for the construction workforce (30 no. spaces) will be provided within the site and the surface of the car park will be prepared and finished to a standard sufficient to avoid mud spillage onto adjoining roads;
- Monitoring and control of construction traffic will be ongoing during construction works. Construction traffic will minimise movements during peak hours.
- Construction traffic routes minimising traffic impact on surrounding residential development will be used by construction vehicles.

13.6.2 Operational Phase

The potential traffic impact of the development was found to be long-term, neutral and imperceptible, with the development operational traffic volumes significantly below the thresholds stated in the TII Guidelines for Traffic and Transport Assessments, 2014 for junction analysis. Therefore, no junction modifications are recommended on the public road to facilitate the Proposed Development.

13.7 PREDICTED IMPACTS OF THE DEVELOPMENT

Mitigation measures (discussed in Section 12.6) will be put in place to offset any potential traffic impacts of the development. Therefore, the predicted impact of the development will be ***short-term***, ***negative*** and ***not significant*** for the construction phase and ***long-term, neutral*** and ***imperceptible*** for the operational phase.

13.8 RESIDUAL IMPACTS

The residual traffic impacts of the development will be neutral and imperceptible.

The operational traffic impact assessment takes cumulative impacts into account. The cumulative traffic impact is also summarised in Chapter 15 of this EIA Report.

Interactions are addressed in Chapter 16 of this EIA Report**.**

13.9 CUMULATIVE IMPACT

13.9.1 Construction Phase

Construction of the proposed development, if approved, would commence in Q1 2021, and would take place over a period of approximately 12 months from the commencement of construction for site development works.

Construction activities associated with two other projects in the area may occur concurrently with construction activities associated with the proposed development during short periods. These projects include the Project Runways Project and the EngineNode Data Centres and Energy Centre Project.

Project Runways Development

Construction of the Project Runways development is scheduled to be complete at the end of Q1 2021, which would result in a 3 month construction period overlap with the Proposed Development. The number of daily construction vehicles travelling to the project runways site in January 2021 expected to be approximately 260LVs/ 130 HGVs, 150LVs/ 75 HGVs in February 2021, and150LVs/ 75HGVs in March 2021.

However, in accordance with Chapter 13 of the EIA report associated with this project, construction traffic will, for the most part, use the roundabout of the L5028, the R156, the R147 and the off-ramp from M3 and the roundabout of the R147 (SE, NW and NE approaches), and the on-ramp to the M3 to access the project runways site to and from the M3. In contrast, the construction traffic associated with the proposed development will, for the most part, use the Pace roundabout to access the M3.

Therefore, the cumulative impact of construction traffic impact in Q1 2021 of the concurrent construction activities for the GIS Substation and Transmission Line and the Project Runways development is considered ***short-term***, ***neutral*** and ***not significant.***

The concurrent EngineNode data storage facility development

The construction traffic impact in Q2 2021 of the concurrent construction activities for Data Centre 1 (peak construction), the Energy Centre (peak construction), the Engine Node Headquarter Office (peak construction) and the GIS Substation and Transmission Line (peak construction) would be lower than the peak construction traffic impact of the EngineNode Data centres and Energy Centre which is envisage to take place in Q4 2022. Peak construction for this project is described as when Data Centre 1 is partially operational and undergoing the process of fitting out the final data halls, the Energy Centre is partially operational and undergoing the process of fitting out the final elements of equipment, and Data Centre 2 is at peak construction.

Therefore, the cumulative impact of construction traffic impact in Q1 2021 of the concurrent construction activities for the GIS Substation and Transmission Line and the Project Runways development is considered ***short-term***, ***neutral*** and ***not significant.***

13.9.2 Operational Phase

The operational trip generation associated with the following approved developments was taken into account in the calculation of baseline traffic flows for the proposed development for opening, Future and Horizon analysis years:

- RA150972: Warehousing development located within the Hub Logistics Park, to the north east of the current proposed development;

- RA170586: an extension to existing office development within Bracetown Business Park to the north west of the current proposed development;

- RA180671: an expansion of the existing data centre campus to provide an additional two data centre buildings, an administration/ office building and associated ancillary infrastructure to the south east of the current proposed development; and

- RA170887: revised design of previously permitted Biopharmaceutical Manufacturing Facility (RA/161021) on a site located approximately 2.5km north of the proposed development.

- RA191593: The construction of 4 no. 2 storey data storage buildings with a combined gross floor area of c. 92, 172 sq.m, associated single storey energy centre with a grass floor area of c. 8,906 sq.m with an ancillary 1 storey MV operations building with part basement with a gross floor area of c. 1,016 sq.m, EngineNode 2 storey offices with a gross floor area of 736 sq.m

Once operational, this GIS Substation and Transmission Line would not require any full time staff to operate it. However, maintenance of the substation would be required as described in Section 13.4.2.

Given the low frequency and number of staff required to maintain the GIS substation and associated cabling, the traffic impact of the operational phase of this development with any of the surrounding developments/proposed developments will be negligible.

Therefore, the cumulative impact of the operational phase is considered ***long-term***, ***neutral*** and ***imperceptible***.

13.10 REFERENCES

- Meath County Developments Plan 2020-2026, Meth County Council;
- Meath County Development Plan 2020-2026 Draft Plan, Meath County Council;
- TII Traffic and Transport Assessment Guidelines, 2014;
- Design Manual for Urban Roads and Streets (DMURS), 2013, Department of Transport, Tourism and Sport & Department of Environment, Community and Local Government;
- TII Project Appraisal Guidelines – Unit 5.3: Travel Demand Projections, 2016 with reference to the planning documents for the following surrounding developments;
  - RA150972: Warehousing development located within the Hub Logistics Park, to the north east of the current proposed development;
  - RA170586: an extension to existing office development within Bracetown Business Park to the north west of the current proposed development;
  - RA180671: an expansion of the existing data centre campus to provide an additional two data centre buildings, an administration/ office building and associated ancillary infrastructure to the south east of the current proposed development; and
  - RA170887: revised design of previously permitted Biopharmaceutical Manufacturing Facility (RA/161021) on a site located approximately 2.5km north of the proposed development
  - RA191593: The construction of 4 no. 2 storey data storage buildings with a combined gross floor area of c. 92, 172 sq.m, associated single storey energy centre with a grass floor area of c. 8,906 sq.m with an ancillary 1 storey MV operations building with part basement with a gross floor area of c. 1,016 sq.m, EngineNode 2 storey offices with a gross floor area of 736 sq.m
- Traffic and Transportation Chapter of EIS for Project G, Tyrellstown, Dublin 15, CSEA, 2017;
- Transport Statement to support planning application Bestseller Retail Irelands Fashion Office Development, Arup, 2018; and
- Traffic and Transport Chapter of EIS for Project G Development, Tyrellstown, Dublin 15, CSEA 2017.
- Traffic and Transport Chapter of EIS for Engine Node Data Centres and Energy Centre, Bracetown Business Park, Meath, CSEA 2020.

APPENDIX 13.1

TRICS DATA

PREPARED BY CSEA

Calculation Reference: AUDIT-441201-190916-0929

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 02 - EMPLOYMENT
Category : A - OFFICE

VEHICLES

Selected regions and areas:

02	SOUTH EAST		
	BD	BEDFORDSHIRE	1 days
	ES	EAST SUSSEX	1 days
	HF	HERTFORDSHIRE	2 days
	KC	KENT	5 days
	SC	SURREY	1 days
	SO	SLOUGH	2 days
03	SOUTH WEST		
	DC	DORSET	1 days
	WL	WILTSHIRE	1 days
04	EAST ANGLIA		
	CA	CAMBRIDGESHIRE	3 days
	NF	NORFOLK	2 days
	SF	SUFFOLK	1 days
05	EAST MIDLANDS		
	LE	LEICESTERSHIRE	1 days
06	WEST MIDLANDS		
	WO	WORCESTERSHIRE	2 days
07	YORKSHIRE & NORTH LINCOLNSHIRE		
	NY	NORTH YORKSHIRE	1 days
	WY	WEST YORKSHIRE	1 days
08	NORTH WEST		
	LC	LANCASHIRE	1 days
09	NORTH		
	CB	CUMBRIA	1 days
	DH	DURHAM	2 days
10	WALES		
	CO	CONWY	1 days
	MT	MERTHYR TYDFIL	1 days
	PS	POWYS	1 days
	SW	SWANSEA	2 days
11	SCOTLAND		
	DU	DUNDEE CITY	1 days
12	CONNAUGHT		
	CS	SLIGO	1 days
	RO	ROSCOMMON	1 days
13	MUNSTER		
	CR	CORK	1 days
16	ULSTER (REPUBLIC OF IRELAND)		
	MG	MONAGHAN	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Secondary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter:	Gross floor area
Actual Range:	610 to 33180 (units: sqm)
Range Selected by User:	500 to 175000 (units: sqm)

Parking Spaces Range: All Surveys Included

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/11 to 14/03/19

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Monday	8 days
Tuesday	9 days
Wednesday	7 days
Thursday	10 days
Friday	5 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	39 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Town Centre	4
Edge of Town Centre	22
Suburban Area (PPS6 Out of Centre)	1
Edge of Town	12

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Industrial Zone	3
Commercial Zone	8
Development Zone	4
Residential Zone	2
Built-Up Zone	14
Out of Town	1
High Street	1
No Sub Category	6

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

A1	2 days
B1	37 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Secondary Filtering selection (Cont.):

Population within 1 mile:

1,000 or Less	1 days
1,001 to 5,000	4 days
5,001 to 10,000	9 days
10,001 to 15,000	5 days
15,001 to 20,000	5 days
20,001 to 25,000	1 days
25,001 to 50,000	14 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,001 to 25,000	4 days
25,001 to 50,000	5 days
50,001 to 75,000	2 days
75,001 to 100,000	5 days
100,001 to 125,000	3 days
125,001 to 250,000	20 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	11 days
1.1 to 1.5	23 days
1.6 to 2.0	5 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

Yes	12 days
No	27 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	39 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

1 BD-02-A-03 OFFICES BEDFORDSHIRE
BROMHAM ROAD
BEDFORD

Edge of Town Centre
No Sub Category
Total Gross floor area: 1469 sqm
Survey date: MONDAY 14/10/13 Survey Type: MANUAL

2 CA-02-A-04 OFFICE CAMBRIDGESHIRE
BRETTON WAY
PETERBOROUGH

Edge of Town
Commercial Zone
Total Gross floor area: 6483 sqm
Survey date: THURSDAY 20/10/11 Survey Type: MANUAL

3 CA-02-A-05 OFFICES CAMBRIDGESHIRE
NEW ROAD
PETERBOROUGH

Town Centre
Built-Up Zone
Total Gross floor area: 8793 sqm
Survey date: TUESDAY 16/12/14 Survey Type: MANUAL

4 CA-02-A-06 OFFICES CAMBRIDGESHIRE
LYNCH WOOD
PETERBOROUGH

Edge of Town
Commercial Zone
Total Gross floor area: 4040 sqm
Survey date: WEDNESDAY 19/10/16 Survey Type: MANUAL

5 CB-02-A-02 OFFICE CUMBRIA
PORT ROAD
CARLISLE

Edge of Town Centre
Industrial Zone
Total Gross floor area: 925 sqm
Survey date: FRIDAY 24/06/16 Survey Type: MANUAL

6 CO-02-A-01 GOVERNMENT OFFICES CONWY
NARROW LANE
LLANDUDNO JUNCTION

Edge of Town
Commercial Zone
Total Gross floor area: 6186 sqm
Survey date: WEDNESDAY 28/03/18 Survey Type: MANUAL

7 CR-02-A-01 STATISTICS OFFICES CORK
MAHON CRESCENT
CORK

Edge of Town
No Sub Category
Total Gross floor area: 8600 sqm
Survey date: MONDAY 23/06/14 Survey Type: MANUAL

8 CS-02-A-02 COUNCIL OFFICE SLIGO
QUAY STREET
SLIGO

Town Centre
Built-Up Zone
Total Gross floor area: 2750 sqm
Survey date: FRIDAY 01/11/13 Survey Type: MANUAL

LIST OF SITES relevant to selection parameters (Cont.)

9 DC-02-A-09 COUNCIL OFFICES DORSET
THE GROVE
DORCHESTER

Edge of Town Centre
Built-Up Zone
Total Gross floor area: 11664 sqm
Survey date: MONDAY 28/11/11 Survey Type: MANUAL

10 DH-02-A-02 CONSTRUCTION COMPANY DURHAM
DURHAM ROAD
NEAR DURHAM
BOWBURN
Edge of Town
Industrial Zone
Total Gross floor area: 2000 sqm
Survey date: TUESDAY 27/11/12 Survey Type: MANUAL

11 DH-02-A-03 ENGINEERING COMPANY DURHAM
ALDERMAN BEST WAY
DARLINGTON

Edge of Town
No Sub Category
Total Gross floor area: 3530 sqm
Survey date: THURSDAY 18/10/18 Survey Type: MANUAL

12 DU-02-A-01 OFFICES DUNDEE CITY
GREENMARKET
DUNDEE

Edge of Town Centre
Development Zone
Total Gross floor area: 3200 sqm
Survey date: THURSDAY 27/04/17 Survey Type: MANUAL

13 ES-02-A-12 COUNCIL OFFICES EAST SUSSEX
VICARAGE LANE
HAILSHAM

Edge of Town Centre
Built-Up Zone
Total Gross floor area: 3640 sqm
Survey date: THURSDAY 26/11/15 Survey Type: MANUAL

14 HF-02-A-03 OFFICE HERTFORDSHIRE
60 VICTORIA STREET
ST ALBANS

Edge of Town Centre
Built-Up Zone
Total Gross floor area: 610 sqm
Survey date: WEDNESDAY 16/10/13 Survey Type: MANUAL

15 HF-02-A-04 OFFICES HERTFORDSHIRE
STATION WAY
ST ALBANS

Edge of Town Centre
Residential Zone
Total Gross floor area: 5000 sqm
Survey date: THURSDAY 02/10/14 Survey Type: MANUAL

16 KC-02-A-07 KCC HIGHWAYS REG. KENT
KAVELIN WAY
ASHFORD
HENWOOD IND. ESTATE
Edge of Town
Commercial Zone
Total Gross floor area: 2525 sqm
Survey date: MONDAY 05/12/11 Survey Type: MANUAL

LIST OF SITES relevant to selection parameters (Cont.)

17 KC-02-A-08 KCC HIGHWAYS REG. OFFICE KENT
ST MICHAEL'S CLOSE
AYLESFORD
CLAY WOOD
Edge of Town
Industrial Zone
Total Gross floor area: 3168 sqm
Survey date: MONDAY 28/11/11 Survey Type: MANUAL

18 KC-02-A-09 COUNCIL OFFICES KENT
SANDLING ROAD
MAIDSTONE

Edge of Town Centre
Built-Up Zone
Total Gross floor area: 1500 sqm
Survey date: WEDNESDAY 19/10/11 Survey Type: MANUAL

19 KC-02-A-10 COUNCIL OFFICES KENT
SANDLING ROAD
MAIDSTONE

Edge of Town Centre
Built-Up Zone
Total Gross floor area: 2900 sqm
Survey date: WEDNESDAY 19/10/11 Survey Type: MANUAL

20 KC-02-A-11 COUNTY HALL KENT
SANDLING ROAD
MAIDSTONE

Edge of Town Centre
Built-Up Zone
Total Gross floor area: 32793 sqm
Survey date: MONDAY 17/10/11 Survey Type: MANUAL

21 LC-02-A-09 OFFICES LANCASHIRE
FURTHERGATE
BLACKBURN

Suburban Area (PPS6 Out of Centre)
Built-Up Zone
Total Gross floor area: 2600 sqm
Survey date: TUESDAY 04/06/13 Survey Type: MANUAL

22 LE-02-A-04 COUNCIL OFFICES LEICESTERSHIRE
BURTON STREET
MELTON MOWBRAY

Edge of Town Centre
Built-Up Zone
Total Gross floor area: 3981 sqm
Survey date: WEDNESDAY 30/11/16 Survey Type: MANUAL

23 MG-02-A-02 OFFICES MONAGHAN
ARMAGH ROAD
MONAGHAN

Edge of Town
Out of Town
Total Gross floor area: 3205 sqm
Survey date: WEDNESDAY 16/11/16 Survey Type: MANUAL

24 MT-02-A-02 COUNCIL OFFICES MERTHYR TYDFIL
CASTLE STREET
MERTHYR TYDFIL

Edge of Town Centre
Built-Up Zone
Total Gross floor area: 5250 sqm
Survey date: THURSDAY 17/10/13 Survey Type: MANUAL

LIST OF SITES relevant to selection parameters (Cont.)

25 NF-02-A-02 FINANCIAL PLANNERS NORFOLK
NORTH QUAY
GREAT YARMOUTH

Edge of Town Centre
Commercial Zone
Total Gross floor area: 894 sqm
Survey date: MONDAY 11/09/17 Survey Type: MANUAL

26 NF-02-A-03 OFFICES NORFOLK
NORTH QUAY
GREAT YARMOUTH

Edge of Town Centre
Commercial Zone
Total Gross floor area: 5500 sqm
Survey date: TUESDAY 12/09/17 Survey Type: MANUAL

27 NY-02-A-02 DISTRICT COUNCIL OFFICES NORTH YORKSHIRE
STATION ROAD
RICHMOND

Edge of Town Centre
No Sub Category
Total Gross floor area: 1930 sqm
Survey date: THURSDAY 14/03/19 Survey Type: MANUAL

28 PS-02-A-01 COUNCIL OFFICES POWYS
SEVERN ROAD
WELSHPOOL

Edge of Town Centre
No Sub Category
Total Gross floor area: 3920 sqm
Survey date: TUESDAY 12/05/15 Survey Type: MANUAL

29 RO-02-A-02 GOVERNMENT OFFICES ROSCOMMON
GOLF LINKS ROAD
ROSCOMMON
ARDSALLAGH BEG
Edge of Town Centre
Residential Zone
Total Gross floor area: 7200 sqm
Survey date: TUESDAY 23/09/14 Survey Type: MANUAL

30 SC-02-A-16 BANK OF AMERICA SURREY
STANHOPE ROAD
CAMBERLEY

Edge of Town
Commercial Zone
Total Gross floor area: 39230 sqm
Survey date: TUESDAY 10/05/11 Survey Type: MANUAL

31 SF-02-A-02 OFFICES SUFFOLK
BATH STREET
IPSWICH

Edge of Town Centre
Commercial Zone
Total Gross floor area: 6505 sqm
Survey date: FRIDAY 19/07/13 Survey Type: MANUAL

LIST OF SITES relevant to selection parameters (Cont.)

32 SO-02-A-01 COUNCIL OFFICES SLOUGH
HIGH STREET
SLOUGH

Town Centre
High Street
Total Gross floor area: 1800 sqm
Survey date: THURSDAY 27/02/14 Survey Type: MANUAL

33 SO-02-A-02 COUNCIL OFFICES SLOUGH
BATH ROAD
SLOUGH

Edge of Town Centre
Built-Up Zone
Total Gross floor area: 5050 sqm
Survey date: THURSDAY 27/02/14 Survey Type: MANUAL

34 SW-02-A-01 OFFICES SWANSEA
LANGDON ROAD
SWANSEA

Edge of Town Centre
Development Zone
Total Gross floor area: 6630 sqm
Survey date: FRIDAY 25/10/13 Survey Type: MANUAL

35 SW-02-A-02 OFFICE SWANSEA
KINGS ROAD
SWANSEA

Edge of Town Centre
Development Zone
Total Gross floor area: 2225 sqm
Survey date: THURSDAY 24/10/13 Survey Type: MANUAL

36 WL-02-A-01 PET INSURANCE COMPANY WILTSHIRE
THE CRESCENT
AMESBURY
SUNRISE WAY
Edge of Town
Development Zone
Total Gross floor area: 2500 sqm
Survey date: TUESDAY 18/09/18 Survey Type: MANUAL

37 WO-02-A-01 OFFICES WORCESTERSHIRE
ST MARY'S STREET
WORCESTER

Town Centre
Built-Up Zone
Total Gross floor area: 22657 sqm
Survey date: FRIDAY 23/05/14 Survey Type: MANUAL

38 WO-02-A-02 OFFICE WORCESTERSHIRE
MOOR STREET
WORCESTER CITY COUNCIL

Edge of Town Centre
Built-Up Zone
Total Gross floor area: 2000 sqm
Survey date: MONDAY 14/11/16 Survey Type: MANUAL

39 WY-02-A-05 OFFICES WEST YORKSHIRE
PIONEER WAY
CASTLEFORD
WHITWOOD
Edge of Town
No Sub Category
Total Gross floor area: 1230 sqm
Survey date: TUESDAY 23/05/17 Survey Type: MANUAL

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

TRIP RATE for Land Use 02 - EMPLOYMENT/A - OFFICE

VEHICLES

Calculation factor: 100 sqm

Estimated TRIP rate value per 2489 SQM shown in shaded columns

BOLD print indicates peak (busiest) period

	ARRIVALS				DEPARTURES				TOTALS			
Time Range	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate
00:00 - 00:30												
00:30 - 01:00												
01:00 - 01:30												
01:30 - 02:00												
02:00 - 02:30												
02:30 - 03:00												
03:00 - 03:30												
03:30 - 04:00												
04:00 - 04:30												
04:30 - 05:00												
05:00 - 05:30												
05:30 - 06:00												
06:00 - 06:30												
06:30 - 07:00												
07:00 - 07:30	39	5731	0.125	3.107	39	5731	0.015	0.368	39	5731	0.140	3.475
07:30 - 08:00	39	5731	0.418	10.401	39	5731	0.057	1.425	39	5731	0.475	11.826
08:00 - 08:30	39	5731	0.608	15.145	39	5731	0.062	1.548	39	5731	0.670	16.693
08:30 - 09:00	**39**	**5731**	**0.743**	**18.498**	39	5731	0.091	2.261	39	5731	0.834	20.759
09:00 - 09:30	39	5731	0.610	15.190	39	5731	0.103	2.561	39	5731	0.713	17.751
09:30 - 10:00	39	5731	0.347	8.642	39	5731	0.121	3.018	39	5731	0.468	11.660
10:00 - 10:30	39	5731	0.212	5.279	39	5731	0.123	3.074	39	5731	0.335	8.353
10:30 - 11:00	39	5731	0.160	3.987	39	5731	0.112	2.795	39	5731	0.272	6.782
11:00 - 11:30	39	5731	0.142	3.530	39	5731	0.124	3.096	39	5731	0.266	6.626
11:30 - 12:00	39	5731	0.138	3.430	39	5731	0.115	2.873	39	5731	0.253	6.303
12:00 - 12:30	39	5731	0.133	3.319	39	5731	0.157	3.898	39	5731	0.290	7.217
12:30 - 13:00	39	5731	0.156	3.887	39	5731	0.198	4.933	39	5731	0.354	8.820
13:00 - 13:30	39	5731	0.178	4.432	39	5731	0.173	4.299	39	5731	0.351	8.731
13:30 - 14:00	39	5731	0.183	4.566	39	5731	0.140	3.475	39	5731	0.323	8.041
14:00 - 14:30	39	5731	0.160	3.976	39	5731	0.123	3.063	39	5731	0.283	7.039
14:30 - 15:00	39	5731	0.117	2.907	39	5731	0.162	4.043	39	5731	0.279	6.950
15:00 - 15:30	39	5731	0.100	2.495	39	5731	0.171	4.265	39	5731	0.271	6.760
15:30 - 16:00	39	5731	0.089	2.216	39	5731	0.194	4.833	39	5731	0.283	7.049
16:00 - 16:30	39	5731	0.084	2.094	39	5731	0.421	10.479	39	5731	0.505	12.573
16:30 - 17:00	39	5731	0.088	2.183	39	5731	0.484	12.050	39	5731	0.572	14.233
17:00 - 17:30	39	5731	0.072	1.804	**39**	**5731**	**0.792**	**19.723**	**39**	**5731**	**0.864**	**21.527**
17:30 - 18:00	39	5731	0.046	1.136	39	5731	0.427	10.635	39	5731	0.473	11.771
18:00 - 18:30	38	5849	0.027	0.672	38	5849	0.315	7.850	38	5849	0.342	8.522
18:30 - 19:00	38	5849	0.010	0.258	38	5849	0.125	3.102	38	5849	0.135	3.360
19:00 - 19:30												
19:30 - 20:00												
20:00 - 20:30												
20:30 - 21:00												
21:00 - 21:30												
21:30 - 22:00												
22:00 - 22:30												
22:30 - 23:00												
23:00 - 23:30												
23:30 - 24:00												
Total Rates:			4.946	123.154			4.805	119.667			9.751	242.821

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

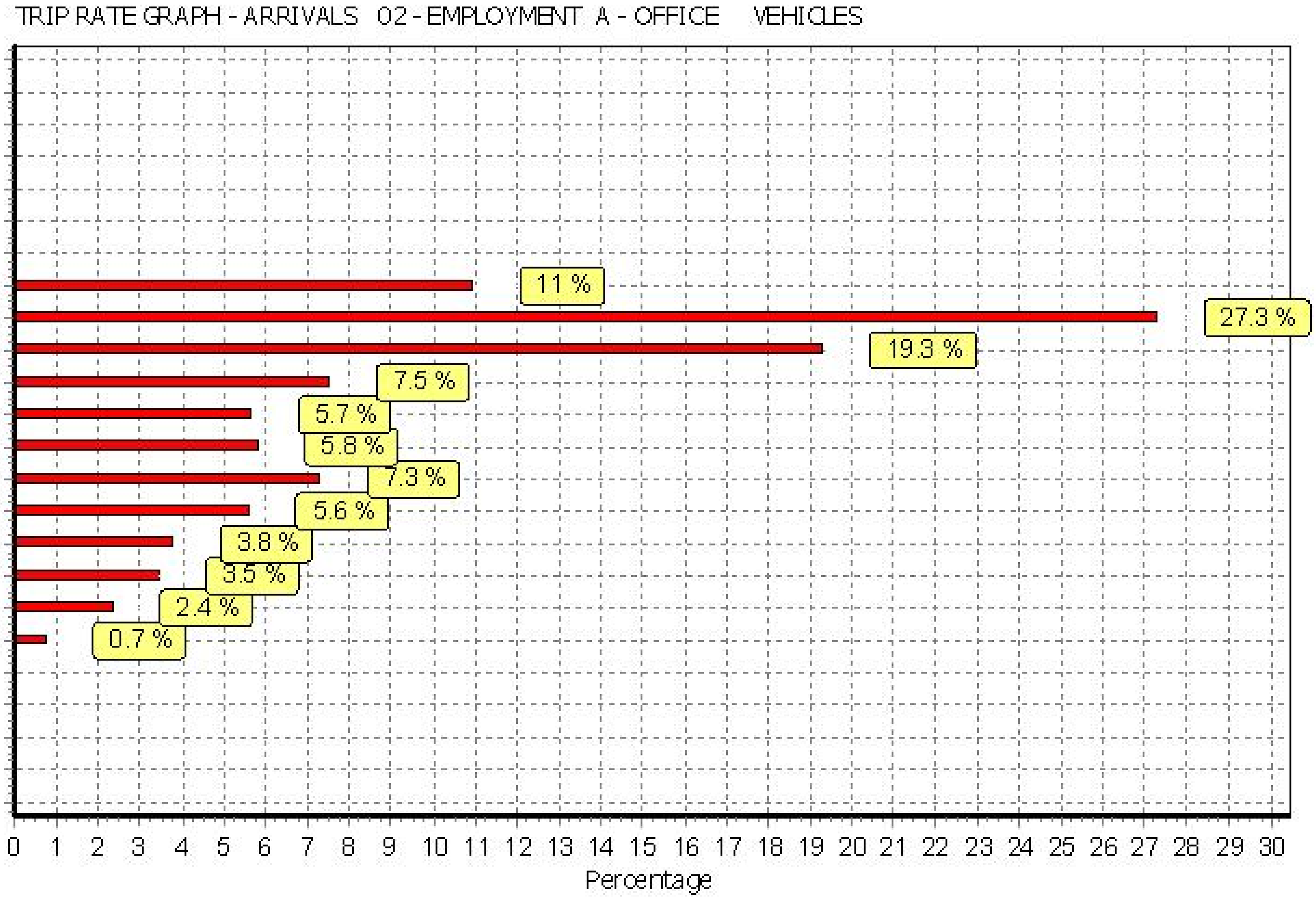
*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	610 - 33180 (units: sqm)
Survey date date range:	01/01/11 - 14/03/19
Number of weekdays (Monday-Friday):	39
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	3
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

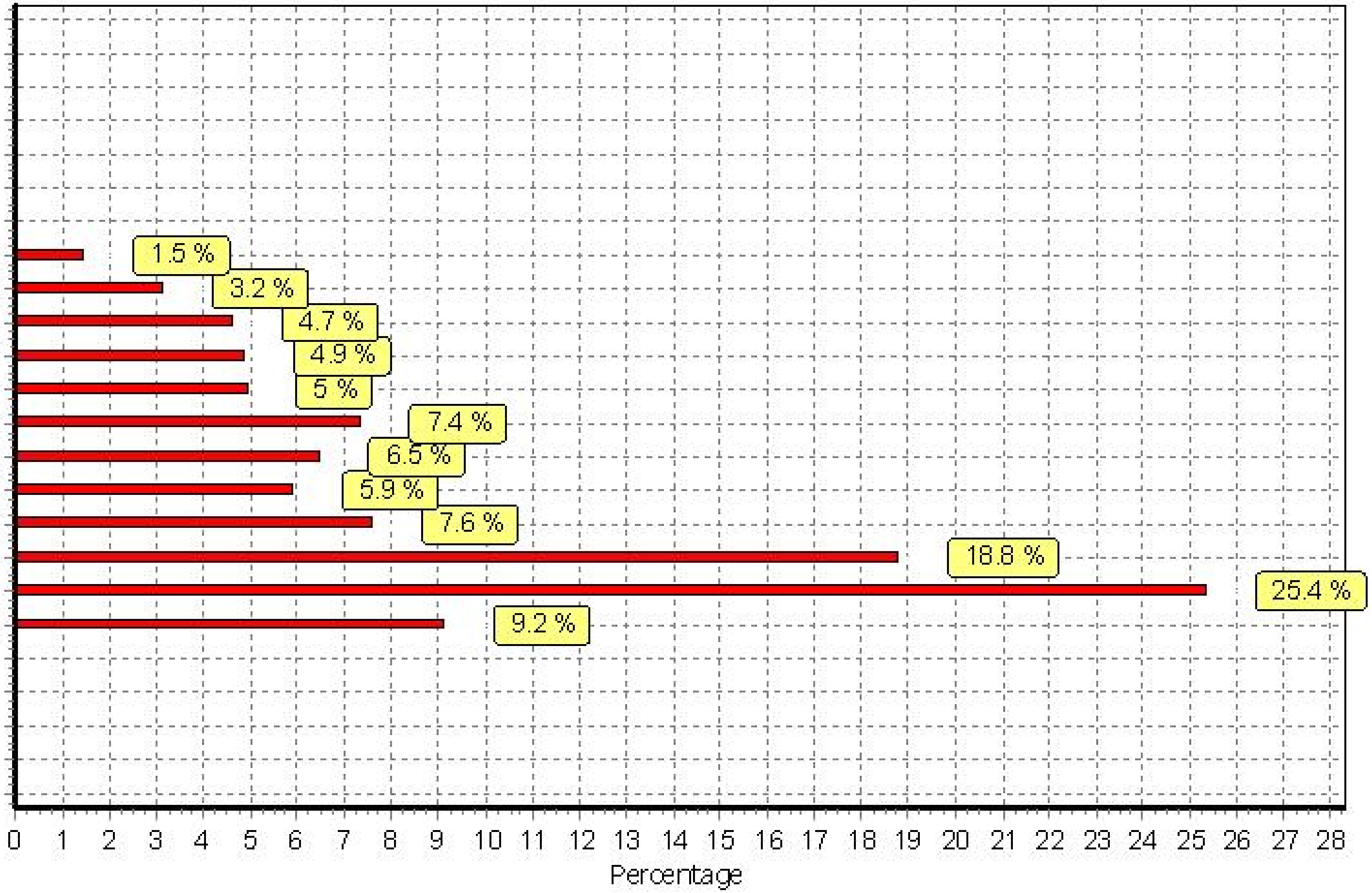
TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.543	11.0
08:00-09:00	1.351	27.3
09:00-10:00	0.957	19.3
10:00-11:00	0.372	7.5
11:00-12:00	0.280	5.7
12:00-13:00	0.289	5.8
13:00-14:00	0.361	7.3
14:00-15:00	0.277	5.6
15:00-16:00	0.189	3.8
16:00-17:00	0.172	3.5
17:00-18:00	0.118	2.4
18:00-19:00	0.037	0.7
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

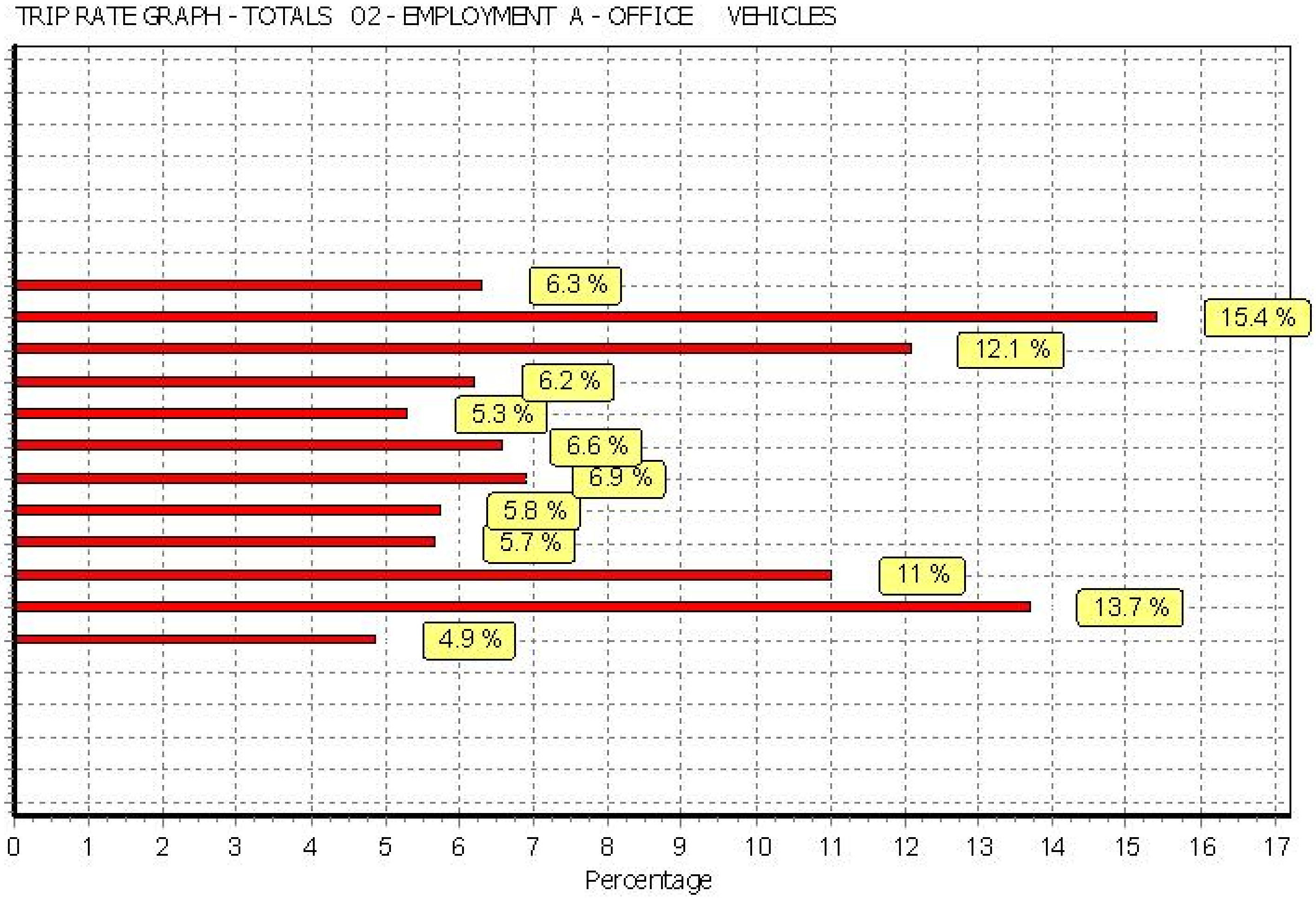
TRIP RATE GRAPH - DEPARTURES 02 - EMPLOYMENT A - OFFICE VEHICLES

TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.072	1.5
08:00-09:00	0.153	3.2
09:00-10:00	0.224	4.7
10:00-11:00	0.235	4.9
11:00-12:00	0.239	5.0
12:00-13:00	0.355	7.4
13:00-14:00	0.313	6.5
14:00-15:00	0.285	5.9
15:00-16:00	0.365	7.6
16:00-17:00	0.905	18.8
17:00-18:00	1.219	25.4
18:00-19:00	0.440	9.2
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.615	6.3
08:00-09:00	1.504	15.4
09:00-10:00	1.181	12.1
10:00-11:00	0.607	6.2
11:00-12:00	0.519	5.3
12:00-13:00	0.644	6.6
13:00-14:00	0.674	6.9
14:00-15:00	0.562	5.8
15:00-16:00	0.554	5.7
16:00-17:00	1.077	11.0
17:00-18:00	1.337	13.7
18:00-19:00	0.477	4.9
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

TRIP RATE for Land Use 02 - EMPLOYMENT/A - OFFICE
TAXIS
Calculation factor: 100 sqm
Estimated TRIP rate value per 2489 SQM shown in shaded columns
BOLD print indicates peak (busiest) period

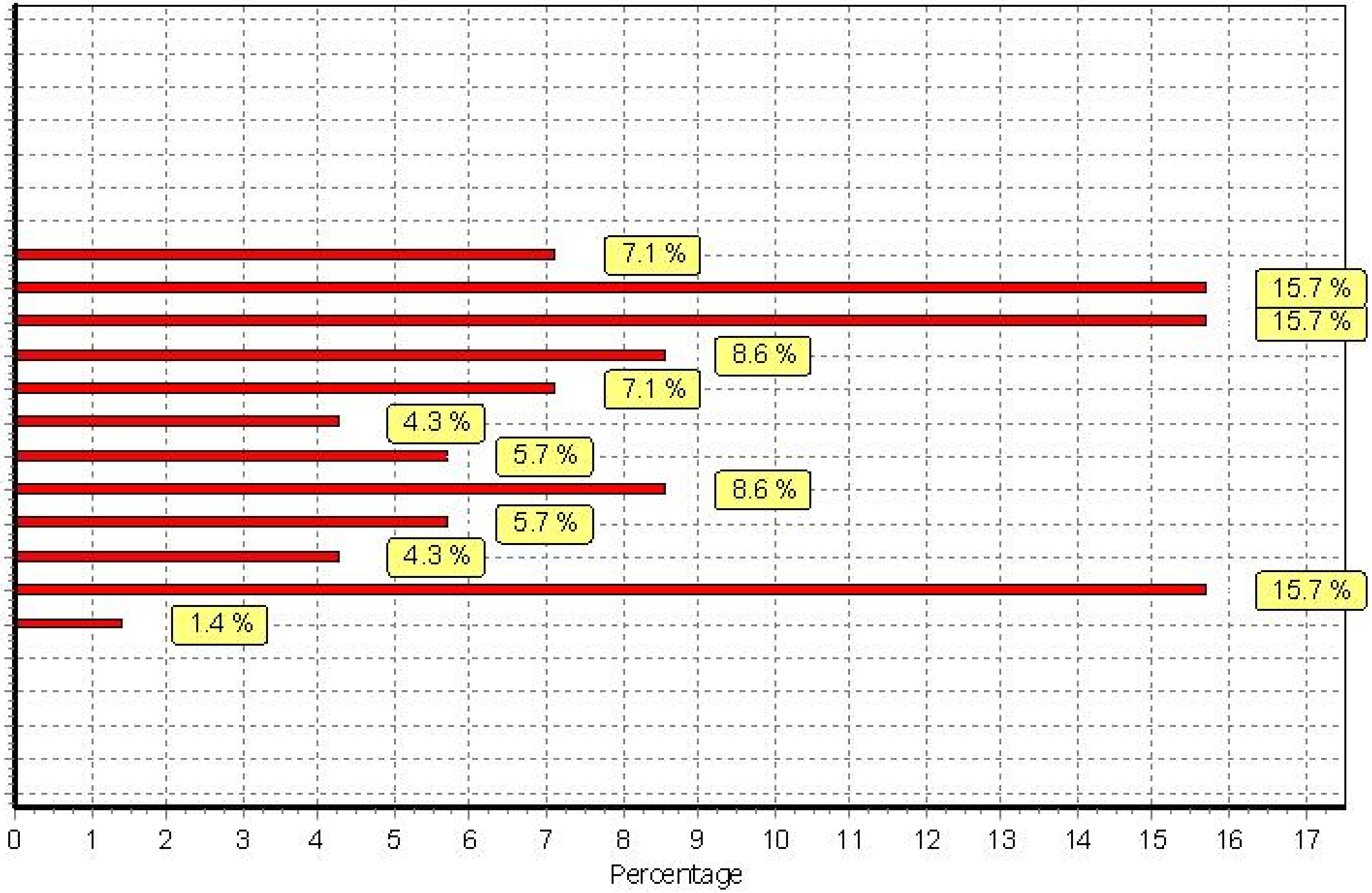
	ARRIVALS				DEPARTURES				TOTALS			
Time Range	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate
00:00 - 00:30												
00:30 - 01:00												
01:00 - 01:30												
01:30 - 02:00												
02:00 - 02:30												
02:30 - 03:00												
03:00 - 03:30												
03:30 - 04:00												
04:00 - 04:30												
04:30 - 05:00												
05:00 - 05:30												
05:30 - 06:00												
06:00 - 06:30												
06:30 - 07:00												
07:00 - 07:30	39	5731	0.001	0.033	39	5731	0.001	0.033	39	5731	0.002	0.066
07:30 - 08:00	39	5731	0.004	0.100	39	5731	0.004	0.100	39	5731	0.008	0.200
08:00 - 08:30	39	5731	0.006	0.145	39	5731	0.005	0.123	39	5731	0.011	0.268
08:30 - 09:00	39	5731	0.005	0.134	39	5731	0.005	0.123	39	5731	0.010	0.257
09:00 - 09:30	39	5731	0.007	0.167	39	5731	0.007	0.178	39	5731	0.014	0.345
09:30 - 10:00	39	5731	0.004	0.089	39	5731	0.004	0.111	39	5731	0.008	0.200
10:00 - 10:30	39	5731	0.004	0.100	39	5731	0.004	0.100	39	5731	0.008	0.200
10:30 - 11:00	39	5731	0.002	0.045	39	5731	0.003	0.067	39	5731	0.005	0.112
11:00 - 11:30	39	5731	0.003	0.067	39	5731	0.002	0.056	39	5731	0.005	0.123
11:30 - 12:00	39	5731	0.002	0.045	39	5731	0.002	0.045	39	5731	0.004	0.090
12:00 - 12:30	39	5731	0.002	0.045	39	5731	0.002	0.045	39	5731	0.004	0.090
12:30 - 13:00	39	5731	0.001	0.033	39	5731	0.001	0.033	39	5731	0.002	0.066
13:00 - 13:30	39	5731	0.001	0.022	39	5731	0.001	0.022	39	5731	0.002	0.044
13:30 - 14:00	39	5731	0.003	0.067	39	5731	0.002	0.056	39	5731	0.005	0.123
14:00 - 14:30	39	5731	0.002	0.056	39	5731	0.003	0.067	39	5731	0.005	0.123
14:30 - 15:00	39	5731	0.004	0.089	39	5731	0.004	0.089	39	5731	0.008	0.178
15:00 - 15:30	39	5731	0.002	0.056	39	5731	0.002	0.056	39	5731	0.004	0.112
15:30 - 16:00	39	5731	0.002	0.045	39	5731	0.002	0.045	39	5731	0.004	0.090
16:00 - 16:30	39	5731	0.001	0.033	39	5731	0.001	0.022	39	5731	0.002	0.055
16:30 - 17:00	39	5731	0.002	0.045	39	5731	0.002	0.045	39	5731	0.004	0.090
17:00 - 17:30	**39**	**5731**	**0.009**	**0.212**	**39**	**5731**	**0.008**	**0.189**	**39**	**5731**	**0.017**	**0.401**
17:30 - 18:00	39	5731	0.002	0.045	39	5731	0.003	0.078	39	5731	0.005	0.123
18:00 - 18:30	38	5849	0.001	0.034	38	5849	0.001	0.034	38	5849	0.002	0.068
18:30 - 19:00	38	5849	0.000	0.000	38	5849	0.000	0.000	38	5849	0.000	0.000
19:00 - 19:30												
19:30 - 20:00												
20:00 - 20:30												
20:30 - 21:00												
21:00 - 21:30												
21:30 - 22:00												
22:00 - 22:30												
22:30 - 23:00												
23:00 - 23:30												
23:30 - 24:00												
Total Rates:			0.070	1.707			0.069	1.717			0.139	3.424

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE GRAPH - ARRIVALS 02 - EMPLOYMENT A - OFFICE TAXIS

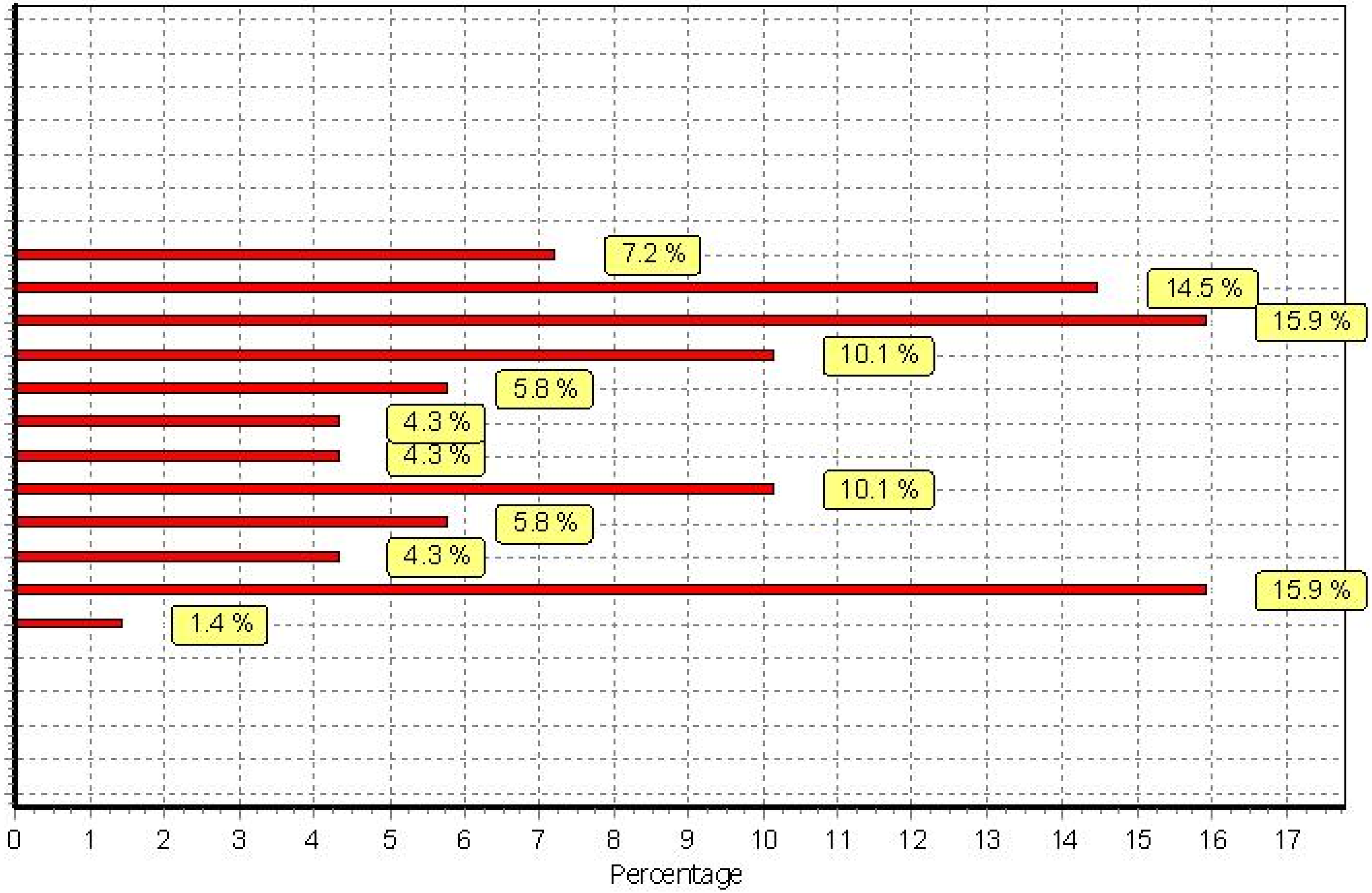
TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.005	7.1
08:00-09:00	0.011	15.7
09:00-10:00	0.011	15.7
10:00-11:00	0.006	8.6
11:00-12:00	0.005	7.1
12:00-13:00	0.003	4.3
13:00-14:00	0.004	5.7
14:00-15:00	0.006	8.6
15:00-16:00	0.004	5.7
16:00-17:00	0.003	4.3
17:00-18:00	0.011	15.7
18:00-19:00	0.001	1.4
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		



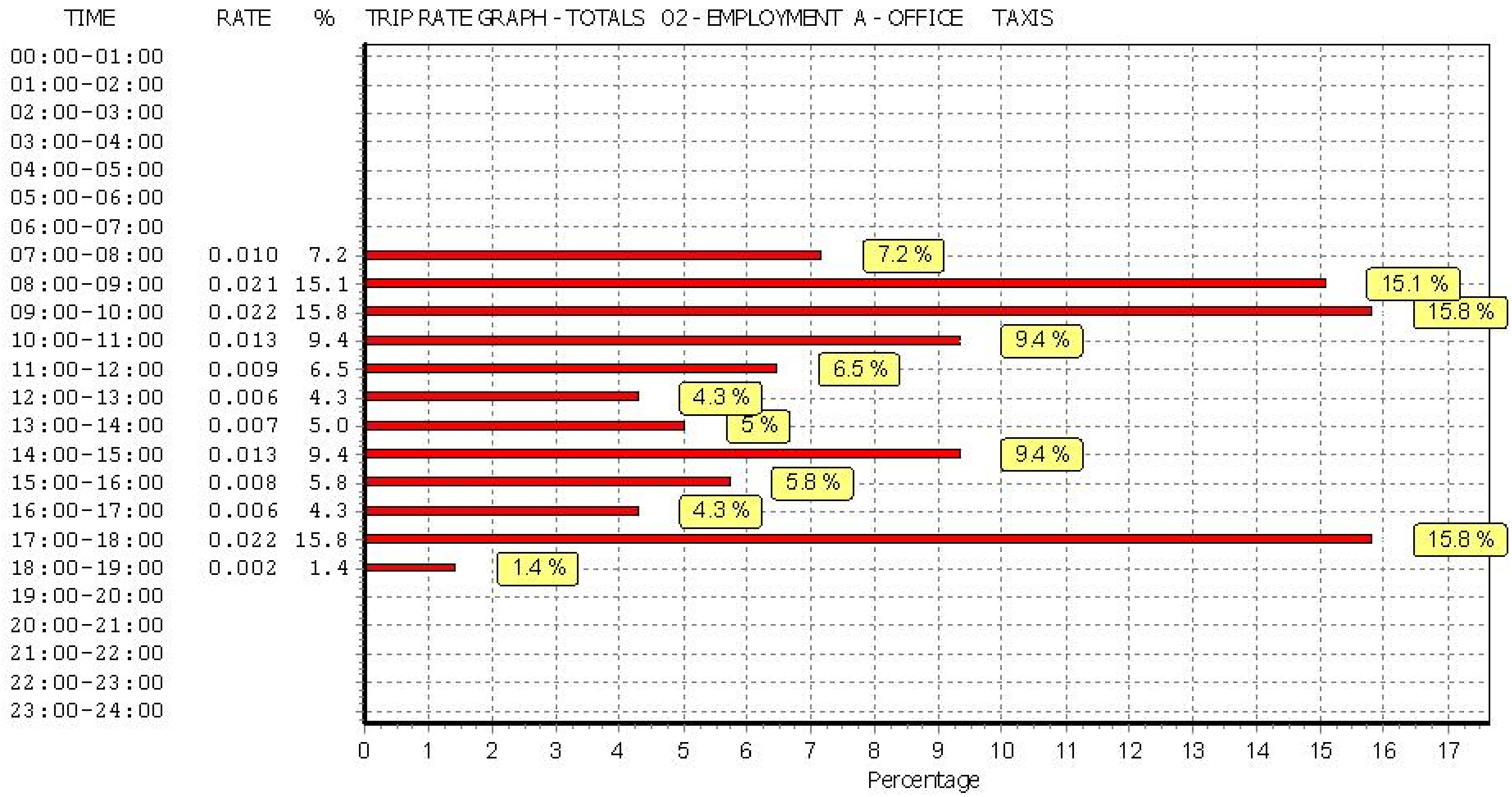
This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.005	7.2
08:00-09:00	0.010	14.5
09:00-10:00	0.011	15.9
10:00-11:00	0.007	10.1
11:00-12:00	0.004	5.8
12:00-13:00	0.003	4.3
13:00-14:00	0.003	4.3
14:00-15:00	0.007	10.1
15:00-16:00	0.004	5.8
16:00-17:00	0.003	4.3
17:00-18:00	0.011	15.9
18:00-19:00	0.001	1.4
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		

TRIP RATE GRAPH - DEPARTURES 02 - EMPLOYMENT A - OFFICE TAXIS



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.



TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.010	7.2
08:00-09:00	0.021	15.1
09:00-10:00	0.022	15.8
10:00-11:00	0.013	9.4
11:00-12:00	0.009	6.5
12:00-13:00	0.006	4.3
13:00-14:00	0.007	5.0
14:00-15:00	0.013	9.4
15:00-16:00	0.008	5.8
16:00-17:00	0.006	4.3
17:00-18:00	0.022	15.8
18:00-19:00	0.002	1.4
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		

This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

TRIP RATE for Land Use 02 - EMPLOYMENT/A - OFFICE

OGVS

Calculation factor: 100 sqm

Estimated TRIP rate value per 2489 SQM shown in shaded columns

BOLD print indicates peak (busiest) period

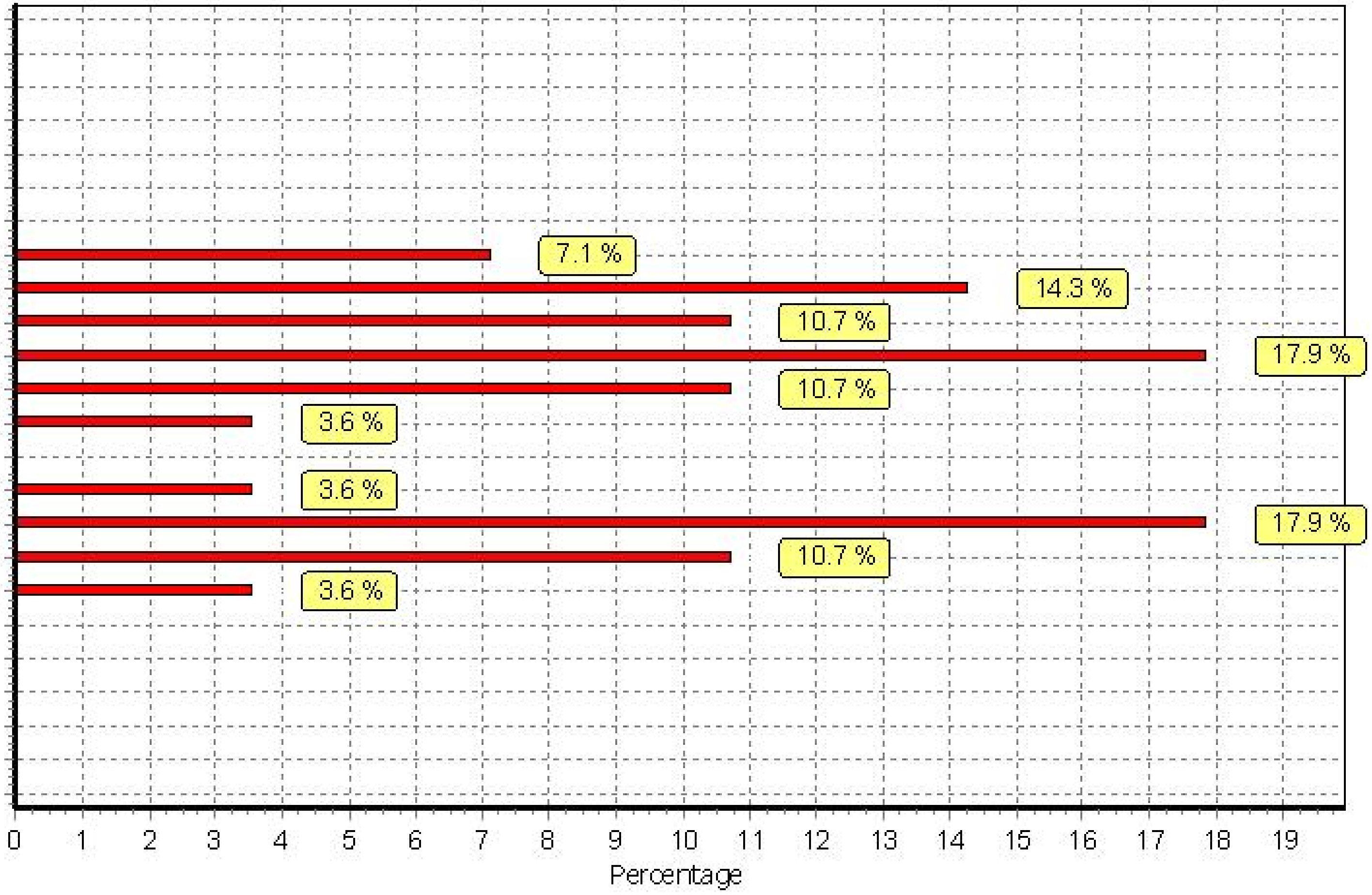
	ARRIVALS				DEPARTURES				TOTALS			
Time Range	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate
00:00 - 00:30												
00:30 - 01:00												
01:00 - 01:30												
01:30 - 02:00												
02:00 - 02:30												
02:30 - 03:00												
03:00 - 03:30												
03:30 - 04:00												
04:00 - 04:30												
04:30 - 05:00												
05:00 - 05:30												
05:30 - 06:00												
06:00 - 06:30												
06:30 - 07:00												
07:00 - 07:30	39	5731	0.001	0.022	39	5731	0.000	0.000	39	5731	0.001	0.022
07:30 - 08:00	39	5731	0.001	0.033	39	5731	0.002	0.045	39	5731	0.003	0.078
08:00 - 08:30	39	5731	0.002	0.045	39	5731	0.002	0.045	39	5731	0.004	0.090
08:30 - 09:00	39	5731	0.002	0.056	39	5731	0.001	0.033	39	5731	0.003	0.089
09:00 - 09:30	39	5731	0.001	0.022	39	5731	0.002	0.045	39	5731	0.003	0.067
09:30 - 10:00	39	5731	0.002	0.056	39	5731	0.002	0.045	39	5731	0.004	0.101
10:00 - 10:30	39	5731	0.003	0.067	39	5731	0.002	0.045	39	5731	0.005	0.112
10:30 - 11:00	39	5731	0.002	0.045	39	5731	0.002	0.056	39	5731	0.004	0.101
11:00 - 11:30	39	5731	0.002	0.056	39	5731	0.002	0.056	39	5731	0.004	0.112
11:30 - 12:00	39	5731	0.001	0.022	39	5731	0.002	0.045	39	5731	0.003	0.067
12:00 - 12:30	39	5731	0.000	0.011	39	5731	0.000	0.011	39	5731	0.000	0.022
12:30 - 13:00	39	5731	0.001	0.022	39	5731	0.000	0.000	39	5731	0.001	0.022
13:00 - 13:30	39	5731	0.000	0.011	39	5731	0.002	0.045	39	5731	0.002	0.056
13:30 - 14:00	39	5731	0.000	0.011	39	5731	0.000	0.000	39	5731	0.000	0.011
14:00 - 14:30	39	5731	0.001	0.033	39	5731	0.001	0.033	39	5731	0.002	0.066
14:30 - 15:00	39	5731	0.000	0.011	39	5731	0.000	0.000	39	5731	0.000	0.011
15:00 - 15:30	39	5731	0.001	0.033	39	5731	0.001	0.033	39	5731	0.002	0.066
15:30 - 16:00	**39**	**5731**	**0.004**	**0.089**	39	5731	0.002	0.056	**39**	**5731**	**0.006**	**0.145**
16:00 - 16:30	39	5731	0.002	0.045	39	5731	0.002	0.045	39	5731	0.004	0.090
16:30 - 17:00	39	5731	0.001	0.022	39	5731	0.001	0.022	39	5731	0.002	0.044
17:00 - 17:30	39	5731	0.001	0.033	**39**	**5731**	**0.003**	**0.067**	39	5731	0.004	0.100
17:30 - 18:00	39	5731	0.000	0.000	39	5731	0.000	0.011	39	5731	0.000	0.011
18:00 - 18:30	38	5849	0.000	0.000	38	5849	0.000	0.000	38	5849	0.000	0.000
18:30 - 19:00	38	5849	0.000	0.000	38	5849	0.000	0.000	38	5849	0.000	0.000
19:00 - 19:30												
19:30 - 20:00												
20:00 - 20:30												
20:30 - 21:00												
21:00 - 21:30												
21:30 - 22:00												
22:00 - 22:30												
22:30 - 23:00												
23:00 - 23:30												
23:30 - 24:00												
Total Rates:			0.028	0.745			0.029	0.738			0.057	1.483

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

TRIP RATE GRAPH - ARRIVALS 02 - EMPLOYMENT A - OFFICE OGVS

TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.002	7.1
08:00-09:00	0.004	14.3
09:00-10:00	0.003	10.7
10:00-11:00	0.005	17.9
11:00-12:00	0.003	10.7
12:00-13:00	0.001	3.6
13:00-14:00		
14:00-15:00	0.001	3.6
15:00-16:00	0.005	17.9
16:00-17:00	0.003	10.7
17:00-18:00	0.001	3.6
18:00-19:00		
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		



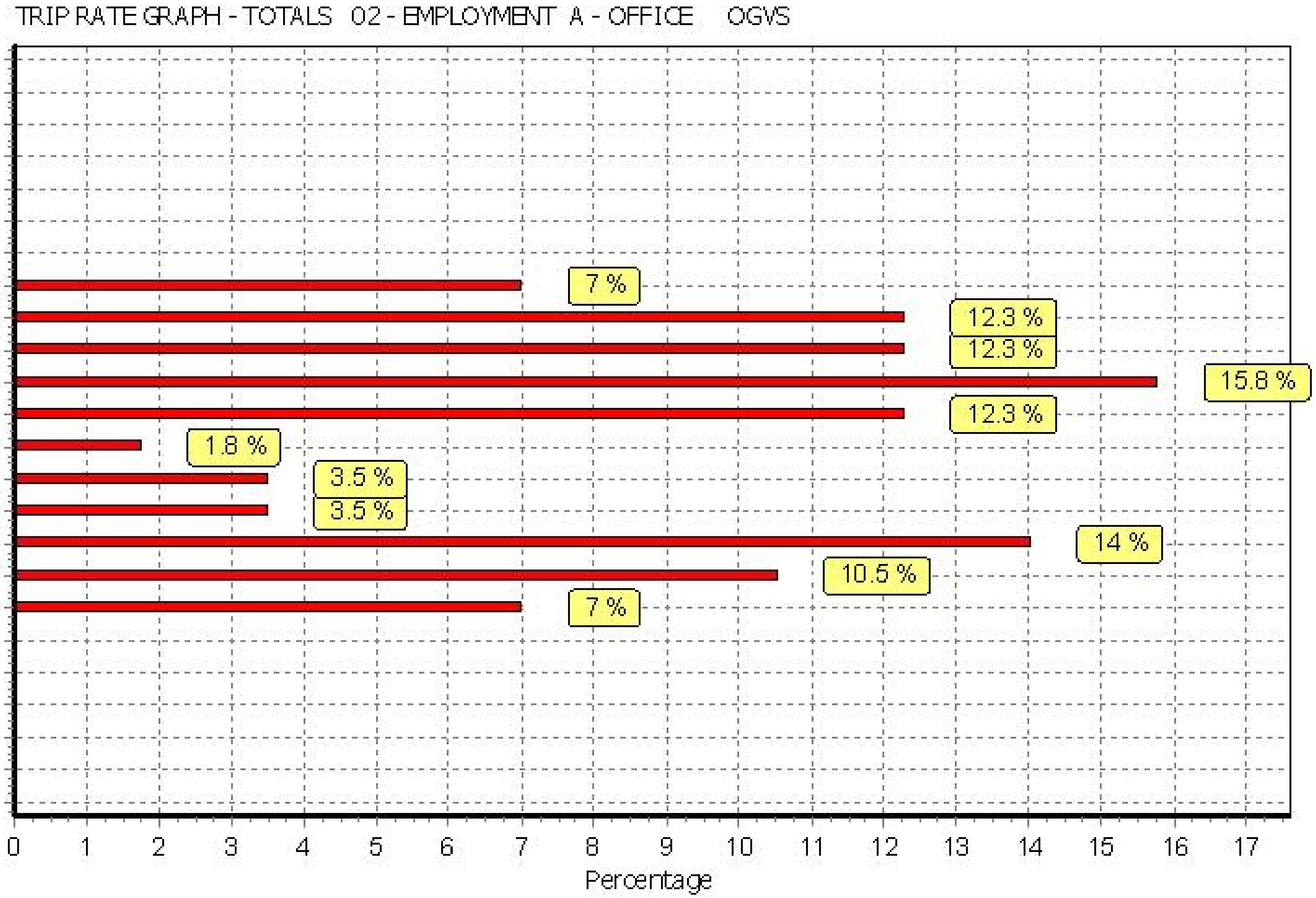
This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

TRIP RATE GRAPH - DEPARTURES 02 - EMPLOYMENT A - OFFICE OGVS

TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.002	6.9
08:00-09:00	0.003	10.3
09:00-10:00	0.004	13.8
10:00-11:00	0.004	13.8
11:00-12:00	0.004	13.8
12:00-13:00		
13:00-14:00	0.002	6.9
14:00-15:00	0.001	3.4
15:00-16:00	0.003	10.3
16:00-17:00	0.003	10.3
17:00-18:00	0.003	10.3
18:00-19:00		
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		

This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.004	7.0
08:00-09:00	0.007	12.3
09:00-10:00	0.007	12.3
10:00-11:00	0.009	15.8
11:00-12:00	0.007	12.3
12:00-13:00	0.001	1.8
13:00-14:00	0.002	3.5
14:00-15:00	0.002	3.5
15:00-16:00	0.008	14.0
16:00-17:00	0.006	10.5
17:00-18:00	0.004	7.0
18:00-19:00		
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

TRIP RATE for Land Use 02 - EMPLOYMENT/A - OFFICE

PSVS

Calculation factor: 100 sqm

Estimated TRIP rate value per 2489 SQM shown in shaded columns

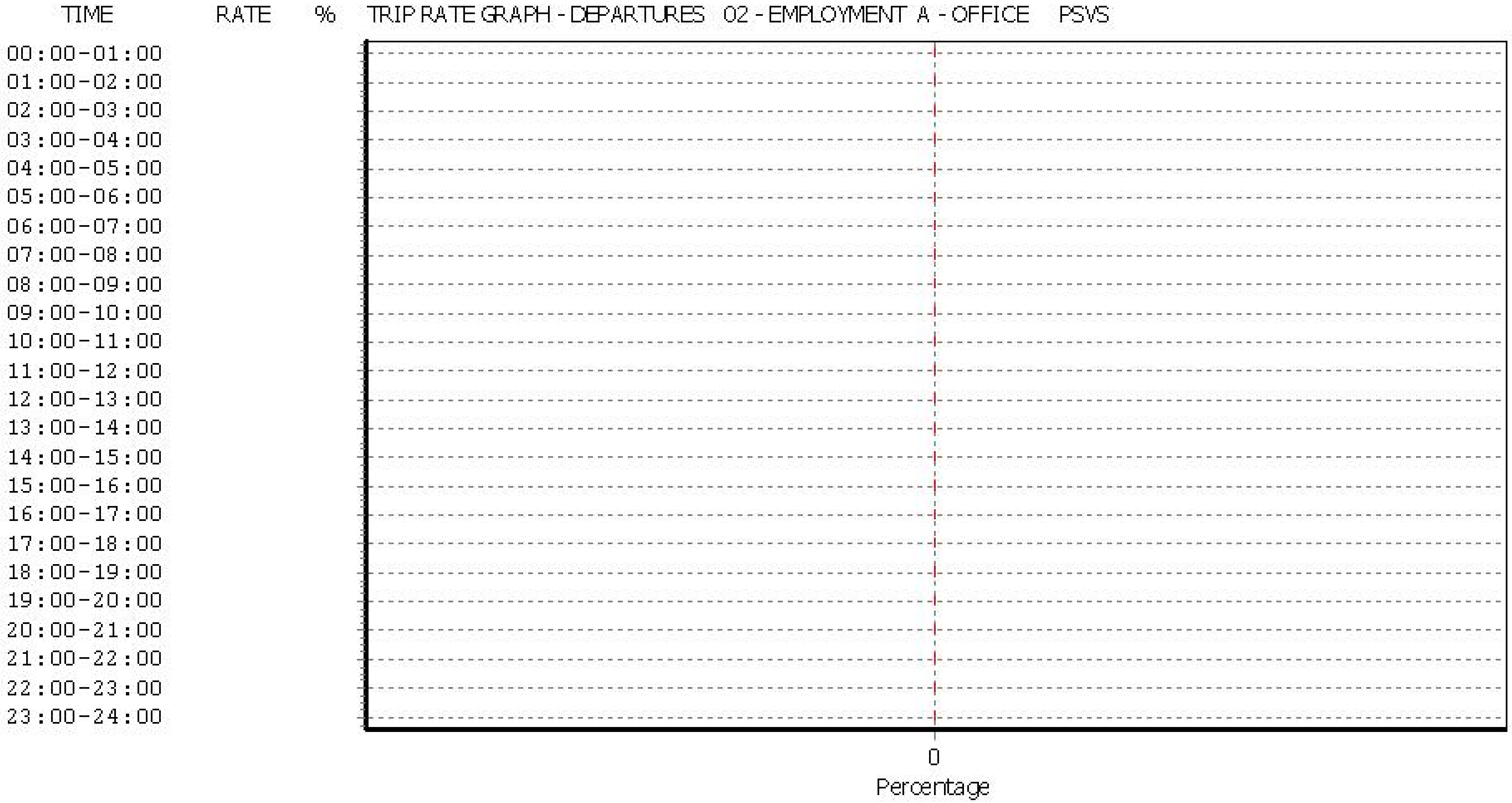
BOLD print indicates peak (busiest) period

	ARRIVALS				DEPARTURES				TOTALS			
Time Range	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate
00:00 - 00:30												
00:30 - 01:00												
01:00 - 01:30												
01:30 - 02:00												
02:00 - 02:30												
02:30 - 03:00												
03:00 - 03:30												
03:30 - 04:00												
04:00 - 04:30												
04:30 - 05:00												
05:00 - 05:30												
05:30 - 06:00												
06:00 - 06:30												
06:30 - 07:00												
07:00 - 07:30	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
07:30 - 08:00	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
08:00 - 08:30	39	5731	0.000	0.011	39	5731	0.000	0.000	39	5731	0.000	0.011
08:30 - 09:00	**39**	**5731**	**0.001**	**0.022**	39	5731	0.000	0.000	**39**	**5731**	**0.001**	**0.022**
09:00 - 09:30	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
09:30 - 10:00	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
10:00 - 10:30	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
10:30 - 11:00	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
11:00 - 11:30	39	5731	0.000	0.011	**39**	**5731**	**0.000**	**0.011**	39	5731	0.000	0.022
11:30 - 12:00	39	5731	0.000	0.011	39	5731	0.000	0.011	39	5731	0.000	0.022
12:00 - 12:30	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
12:30 - 13:00	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
13:00 - 13:30	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
13:30 - 14:00	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
14:00 - 14:30	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
14:30 - 15:00	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
15:00 - 15:30	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
15:30 - 16:00	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
16:00 - 16:30	39	5731	0.000	0.011	39	5731	0.000	0.011	39	5731	0.000	0.022
16:30 - 17:00	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
17:00 - 17:30	39	5731	0.000	0.000	39	5731	0.000	0.011	39	5731	0.000	0.011
17:30 - 18:00	39	5731	0.000	0.000	39	5731	0.000	0.000	39	5731	0.000	0.000
18:00 - 18:30	38	5849	0.000	0.000	38	5849	0.000	0.000	38	5849	0.000	0.000
18:30 - 19:00	38	5849	0.000	0.000	38	5849	0.000	0.000	38	5849	0.000	0.000
19:00 - 19:30												
19:30 - 20:00												
20:00 - 20:30												
20:30 - 21:00												
21:00 - 21:30												
21:30 - 22:00												
22:00 - 22:30												
22:30 - 23:00												
23:00 - 23:30												
23:30 - 24:00												
Total Rates:			0.001	0.066			0.000	0.044			0.001	0.110

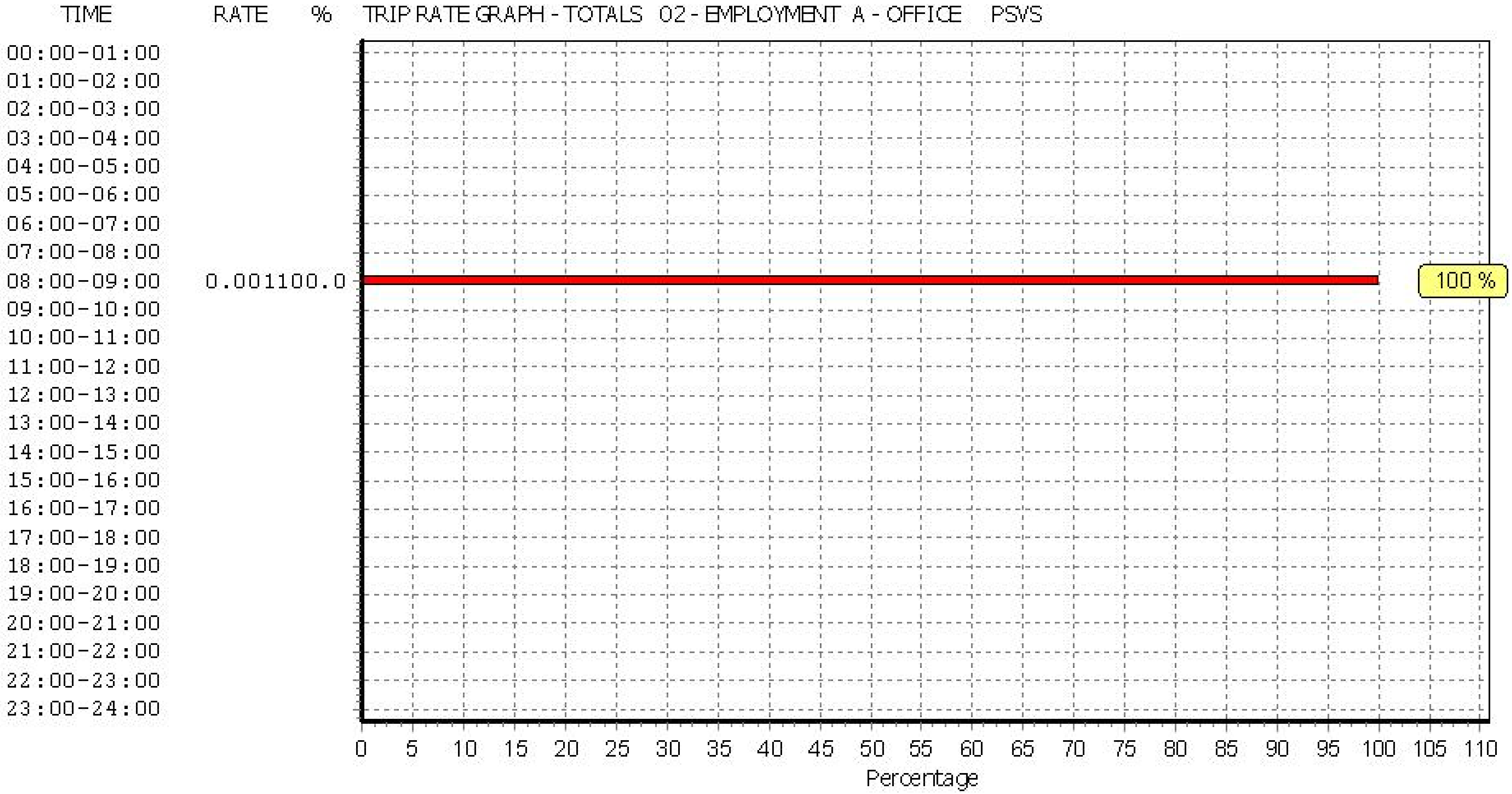
This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

TRIP RATE for Land Use 02 - EMPLOYMENT/A - OFFICE

CYCLISTS

Calculation factor: 100 sqm

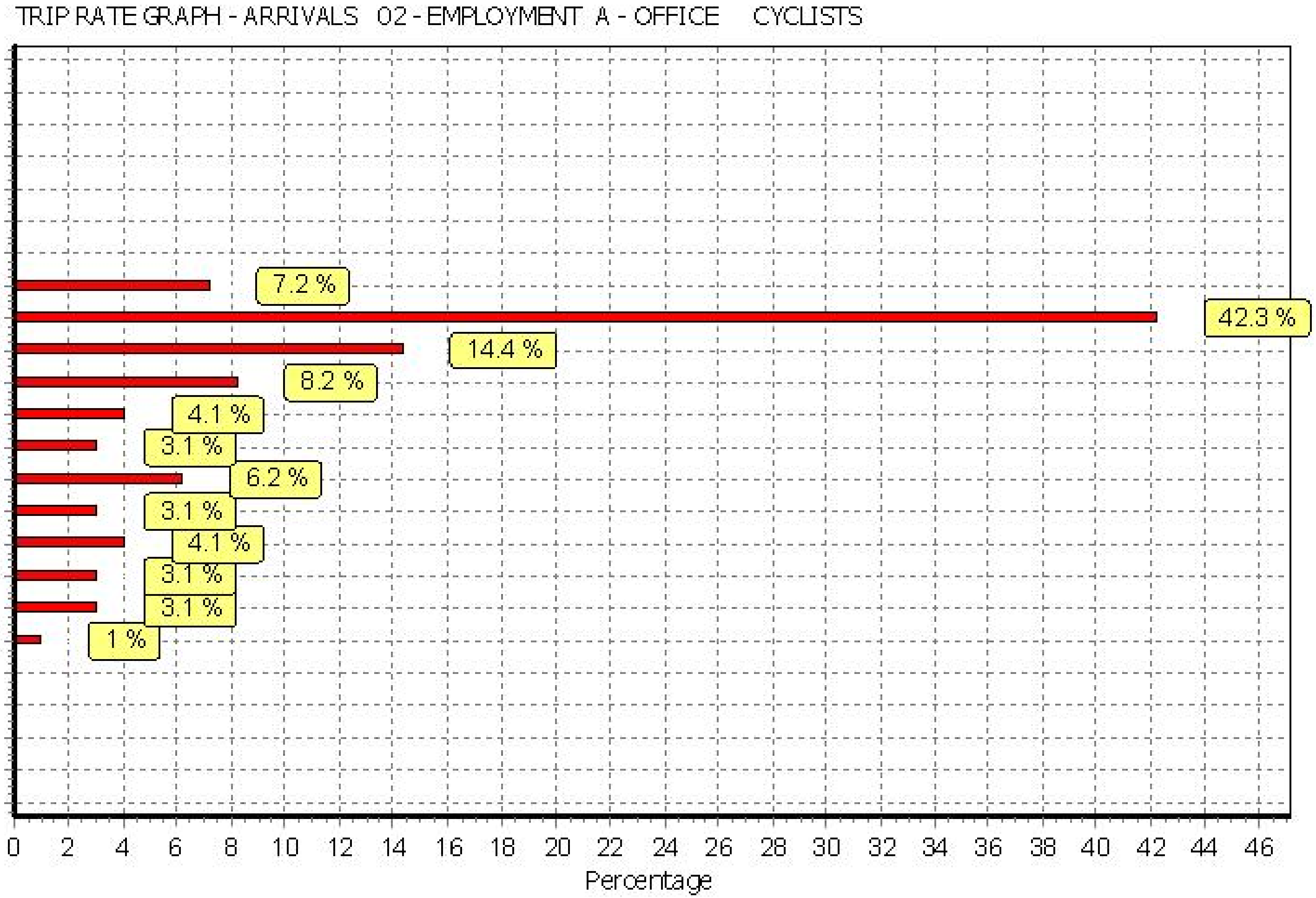
Estimated TRIP rate value per 2489 SQM shown in shaded columns
BOLD print indicates peak (busiest) period

	ARRIVALS				DEPARTURES				TOTALS			
Time Range	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate
00:00 - 00:30												
00:30 - 01:00												
01:00 - 01:30												
01:30 - 02:00												
02:00 - 02:30												
02:30 - 03:00												
03:00 - 03:30												
03:30 - 04:00												
04:00 - 04:30												
04:30 - 05:00												
05:00 - 05:30												
05:30 - 06:00												
06:00 - 06:30												
06:30 - 07:00												
07:00 - 07:30	39	5731	0.001	0.022	39	5731	0.000	0.000	39	5731	0.001	0.022
07:30 - 08:00	39	5731	0.006	0.156	39	5731	0.002	0.045	39	5731	0.008	0.201
08:00 - 08:30	39	5731	0.012	0.290	39	5731	0.000	0.000	39	5731	0.012	0.290
08:30 - 09:00	**39**	**5731**	**0.029**	**0.713**	39	5731	0.000	0.000	**39**	**5731**	**0.029**	**0.713**
09:00 - 09:30	39	5731	0.009	0.234	39	5731	0.000	0.000	39	5731	0.009	0.234
09:30 - 10:00	39	5731	0.005	0.134	39	5731	0.000	0.000	39	5731	0.005	0.134
10:00 - 10:30	39	5731	0.005	0.123	39	5731	0.002	0.045	39	5731	0.007	0.168
10:30 - 11:00	39	5731	0.003	0.078	39	5731	0.002	0.045	39	5731	0.005	0.123
11:00 - 11:30	39	5731	0.001	0.022	39	5731	0.002	0.045	39	5731	0.003	0.067
11:30 - 12:00	39	5731	0.003	0.067	39	5731	0.002	0.045	39	5731	0.005	0.112
12:00 - 12:30	39	5731	0.001	0.033	39	5731	0.004	0.100	39	5731	0.005	0.133
12:30 - 13:00	39	5731	0.002	0.056	39	5731	0.004	0.089	39	5731	0.006	0.145
13:00 - 13:30	39	5731	0.004	0.089	39	5731	0.002	0.056	39	5731	0.006	0.145
13:30 - 14:00	39	5731	0.002	0.045	39	5731	0.003	0.067	39	5731	0.005	0.112
14:00 - 14:30	39	5731	0.001	0.022	39	5731	0.003	0.078	39	5731	0.004	0.100
14:30 - 15:00	39	5731	0.002	0.056	39	5731	0.004	0.111	39	5731	0.006	0.167
15:00 - 15:30	39	5731	0.003	0.067	39	5731	0.003	0.067	39	5731	0.006	0.134
15:30 - 16:00	39	5731	0.001	0.033	39	5731	0.005	0.123	39	5731	0.006	0.156
16:00 - 16:30	39	5731	0.002	0.056	39	5731	0.006	0.156	39	5731	0.008	0.212
16:30 - 17:00	39	5731	0.001	0.033	39	5731	0.009	0.212	39	5731	0.010	0.245
17:00 - 17:30	39	5731	0.001	0.022	**39**	**5731**	**0.019**	**0.468**	39	5731	0.020	0.490
17:30 - 18:00	39	5731	0.002	0.045	39	5731	0.017	0.434	39	5731	0.019	0.479
18:00 - 18:30	38	5849	0.001	0.034	38	5849	0.006	0.157	38	5849	0.007	0.191
18:30 - 19:00	38	5849	0.000	0.011	38	5849	0.004	0.090	38	5849	0.004	0.101
19:00 - 19:30												
19:30 - 20:00												
20:00 - 20:30												
20:30 - 21:00												
21:00 - 21:30												
21:30 - 22:00												
22:00 - 22:30												
22:30 - 23:00												
23:00 - 23:30												
23:30 - 24:00												
Total Rates:			0.097	2.441			0.099	2.433			0.196	4.874

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

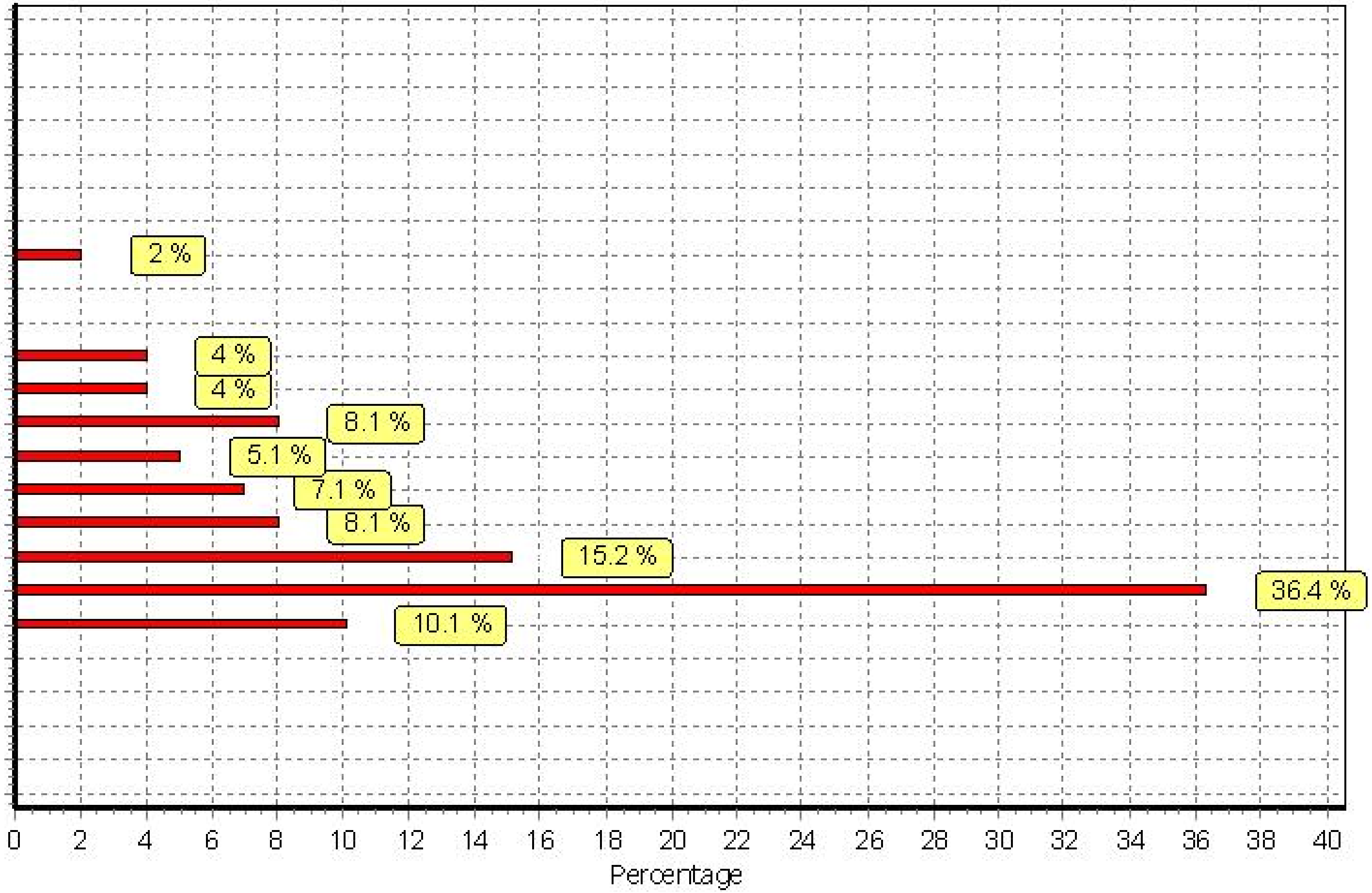
TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.007	7.2
08:00-09:00	0.041	42.3
09:00-10:00	0.014	14.4
10:00-11:00	0.008	8.2
11:00-12:00	0.004	4.1
12:00-13:00	0.003	3.1
13:00-14:00	0.006	6.2
14:00-15:00	0.003	3.1
15:00-16:00	0.004	4.1
16:00-17:00	0.003	3.1
17:00-18:00	0.003	3.1
18:00-19:00	0.001	1.0
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

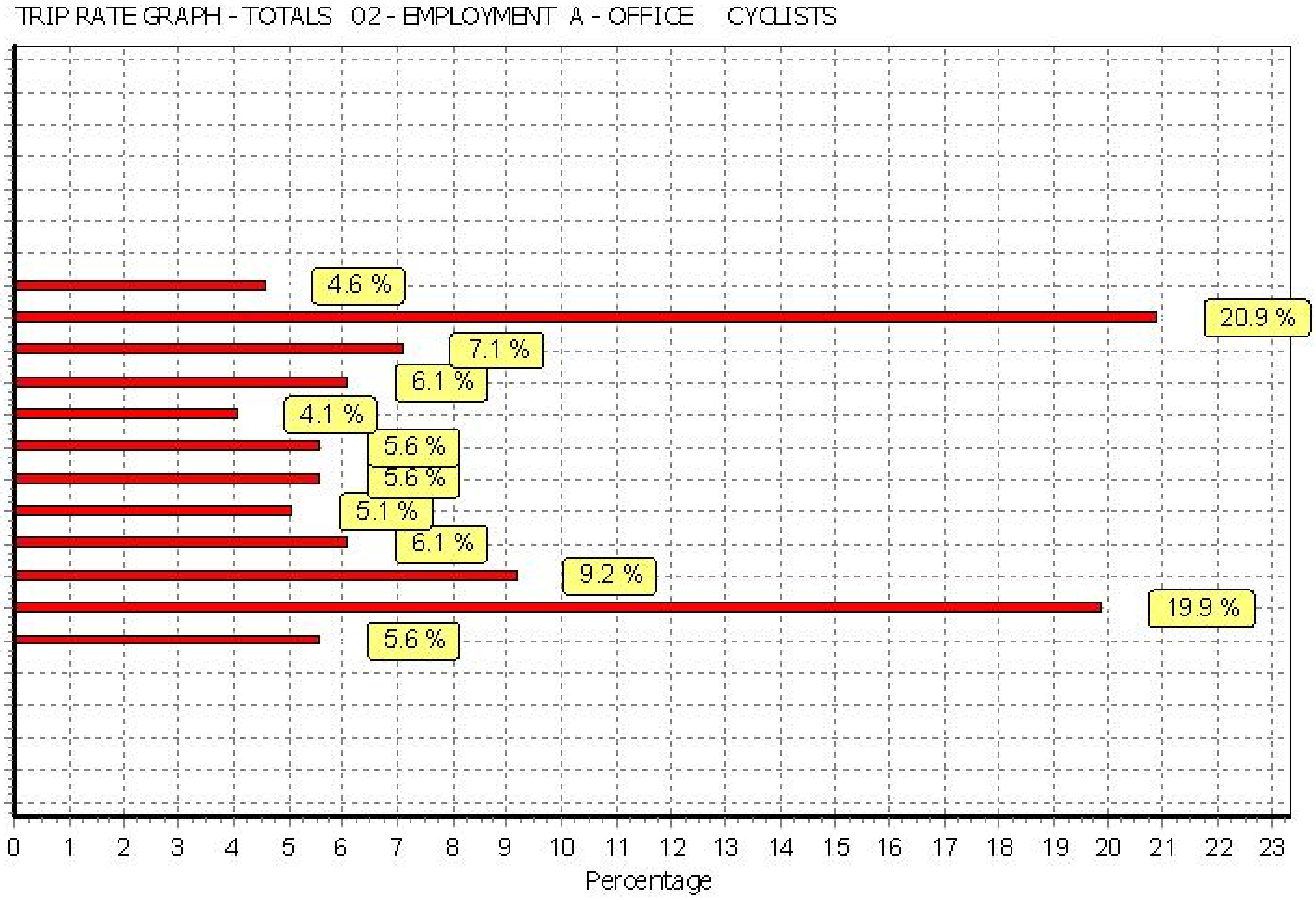
TRIP RATE GRAPH - DEPARTURES 02 - EMPLOYMENT A - OFFICE CYCLISTS

TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.002	2.0
08:00-09:00		
09:00-10:00		
10:00-11:00	0.004	4.0
11:00-12:00	0.004	4.0
12:00-13:00	0.008	8.1
13:00-14:00	0.005	5.1
14:00-15:00	0.007	7.1
15:00-16:00	0.008	8.1
16:00-17:00	0.015	15.2
17:00-18:00	0.036	36.4
18:00-19:00	0.010	10.1
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.009	4.6
08:00-09:00	0.041	20.9
09:00-10:00	0.014	7.1
10:00-11:00	0.012	6.1
11:00-12:00	0.008	4.1
12:00-13:00	0.011	5.6
13:00-14:00	0.011	5.6
14:00-15:00	0.010	5.1
15:00-16:00	0.012	6.1
16:00-17:00	0.018	9.2
17:00-18:00	0.039	19.9
18:00-19:00	0.011	5.6
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

APPENDIX 13.2

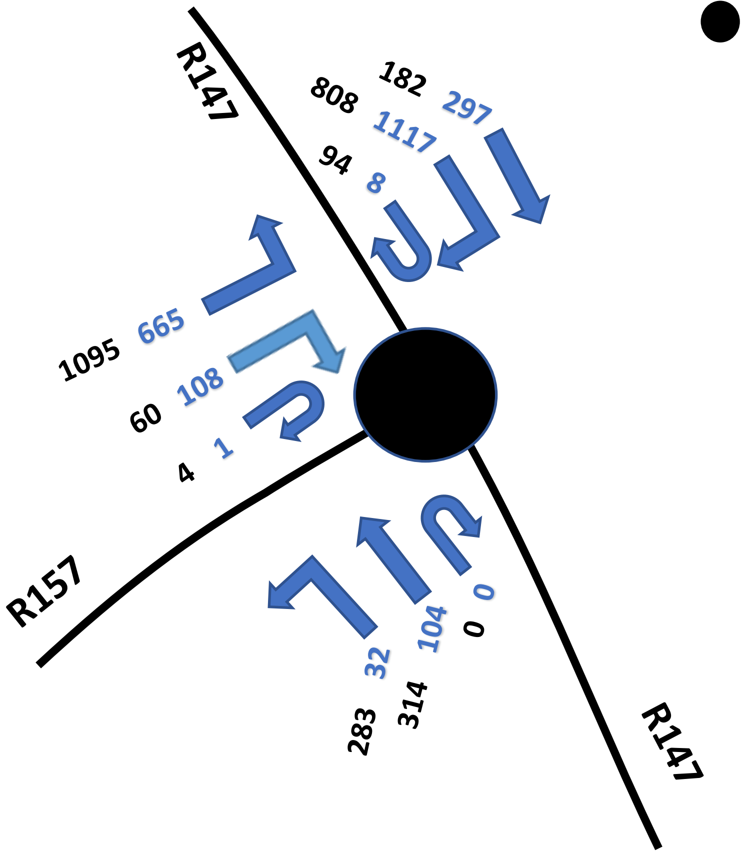
TRAFFIC VOLUMES

PREPARED BY CSEA

2019 - Count

🔵 AM Peak Hour

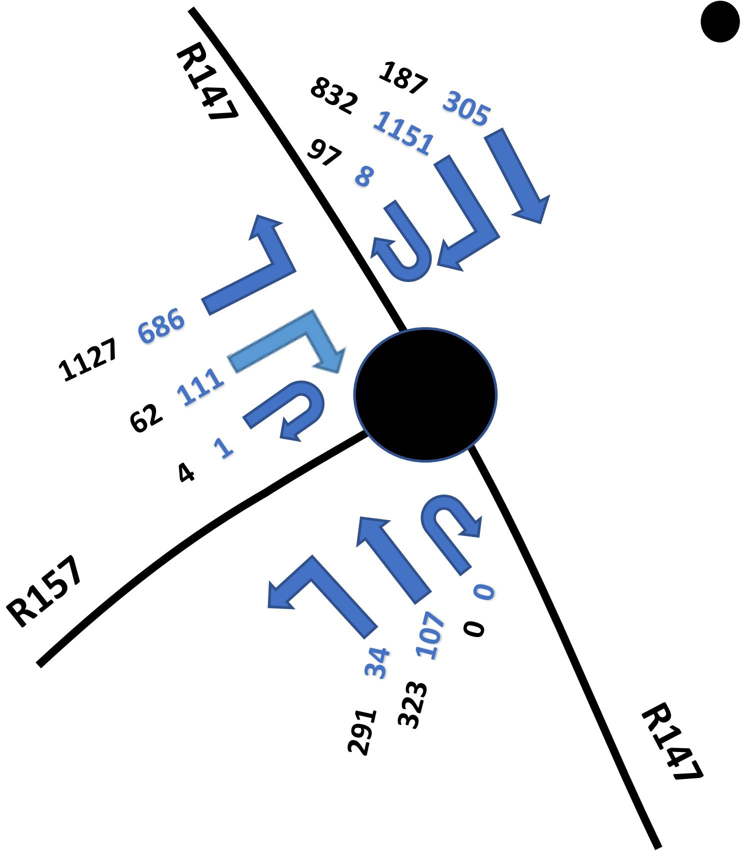
● PM Peak Hour



2021 – Adjusted Flows – Construction Year

🔵 AM Peak Hour

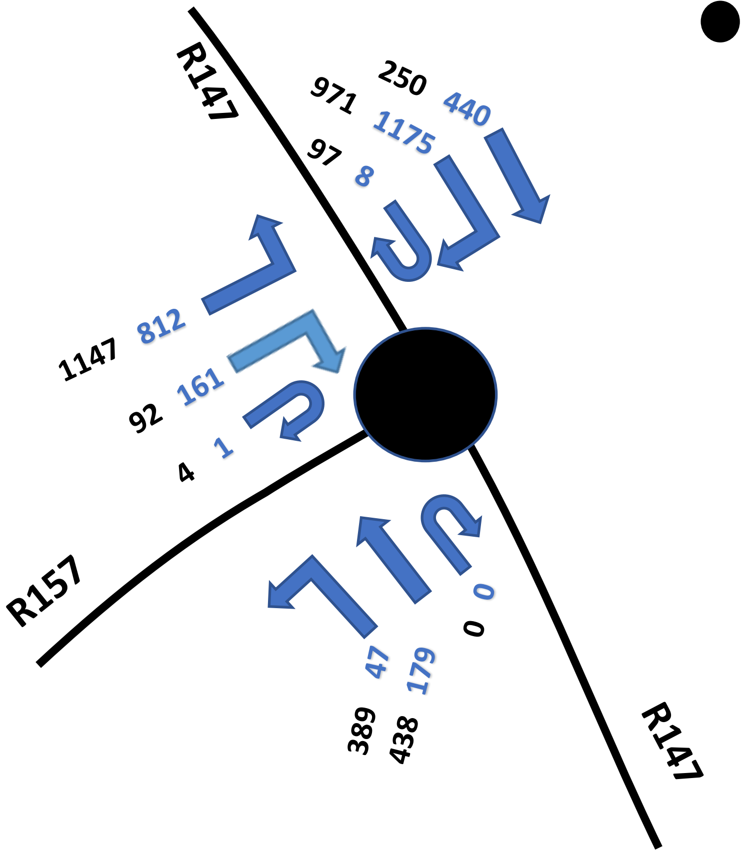
⚫ PM Peak Hour



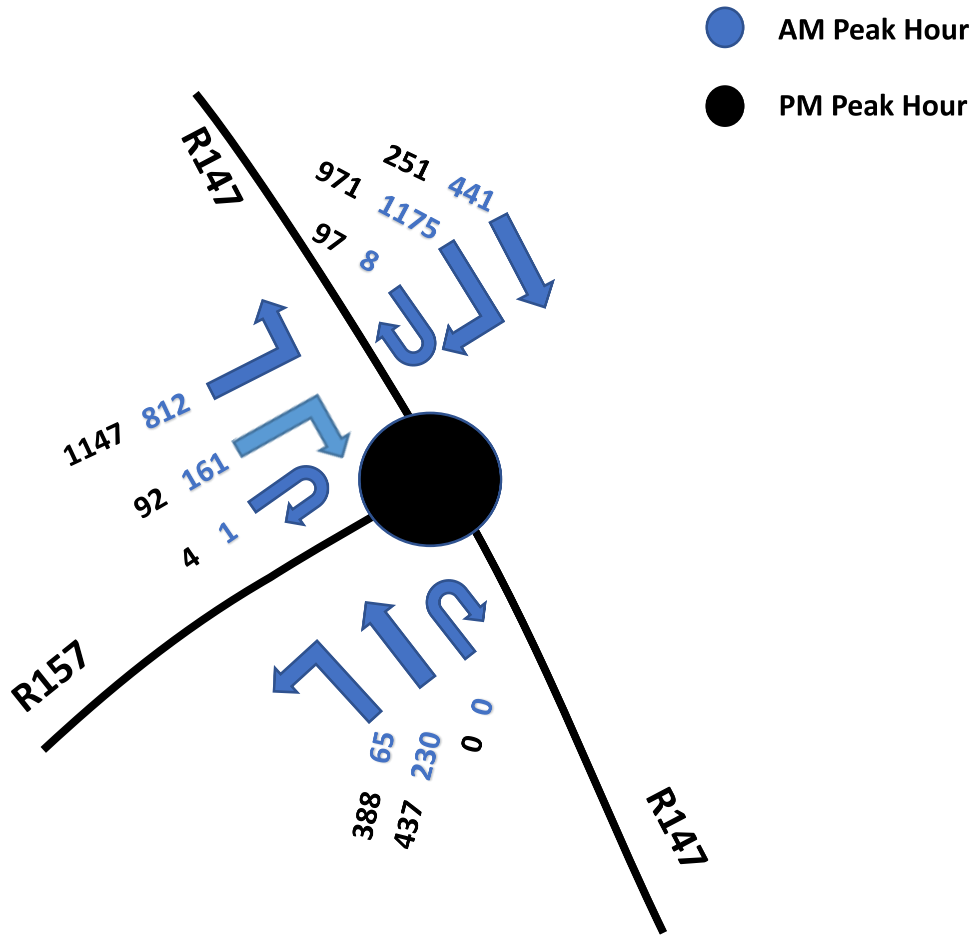
2021 - Baseline Flows (with surrounding approved development)

● AM Peak Hour

● PM Peak Hour



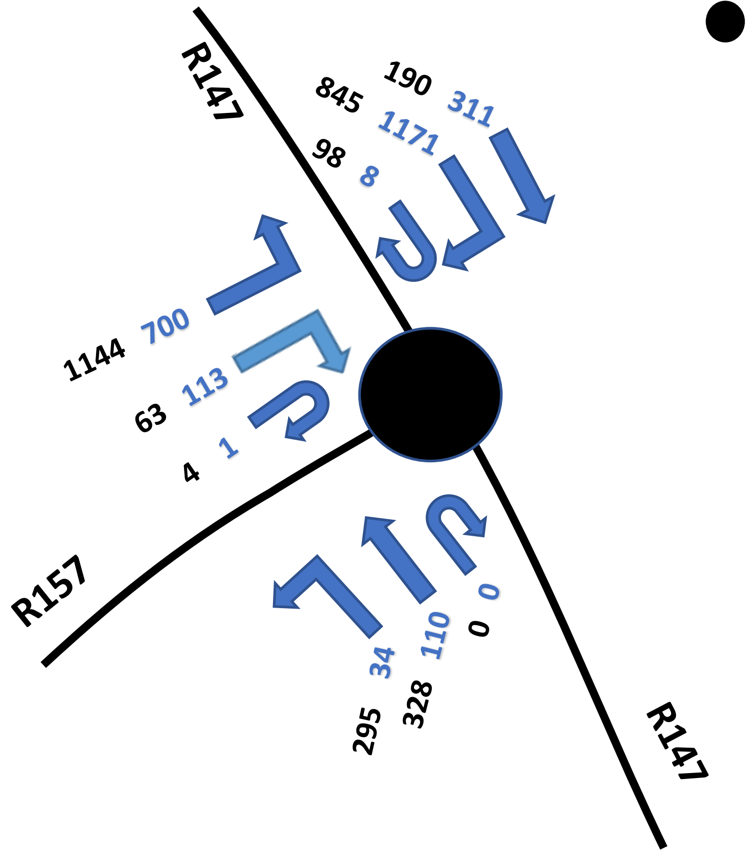
2021 - Baseline Flows plus Construction Flows from Proposed Development



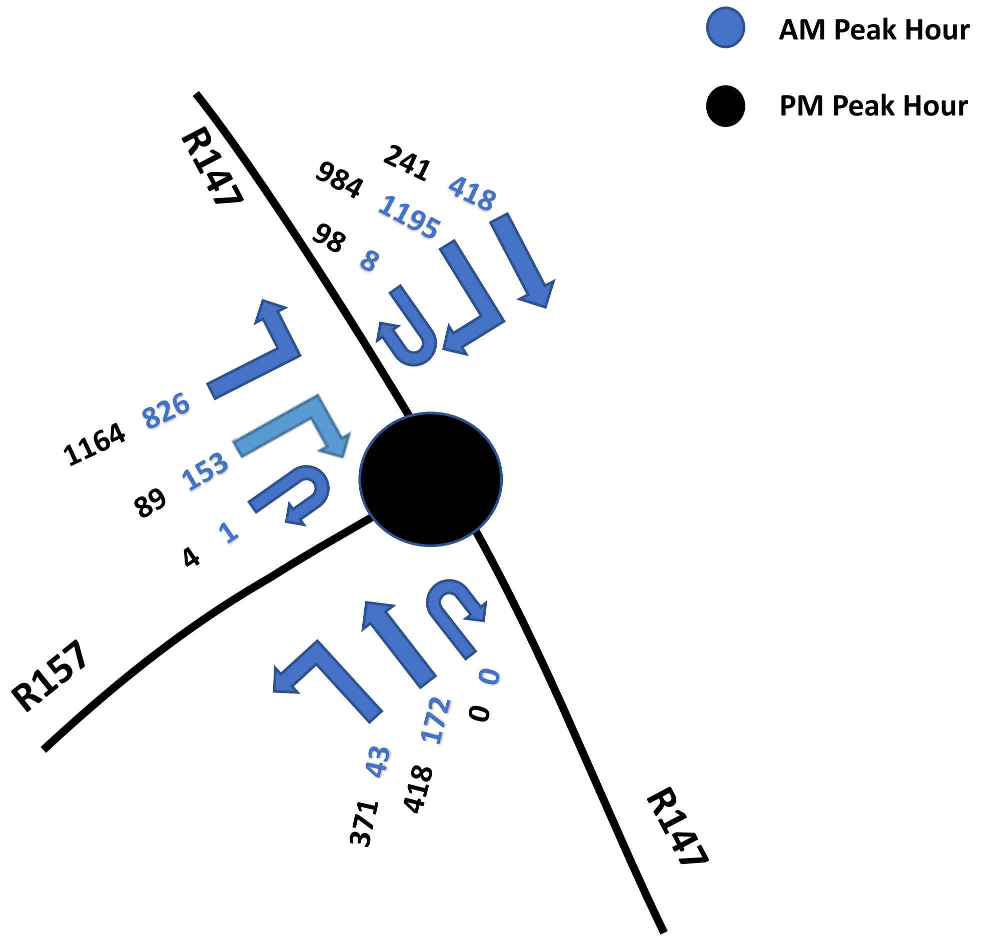
2022 Adjusted Flows – Opening Year

🔵 AM Peak Hour

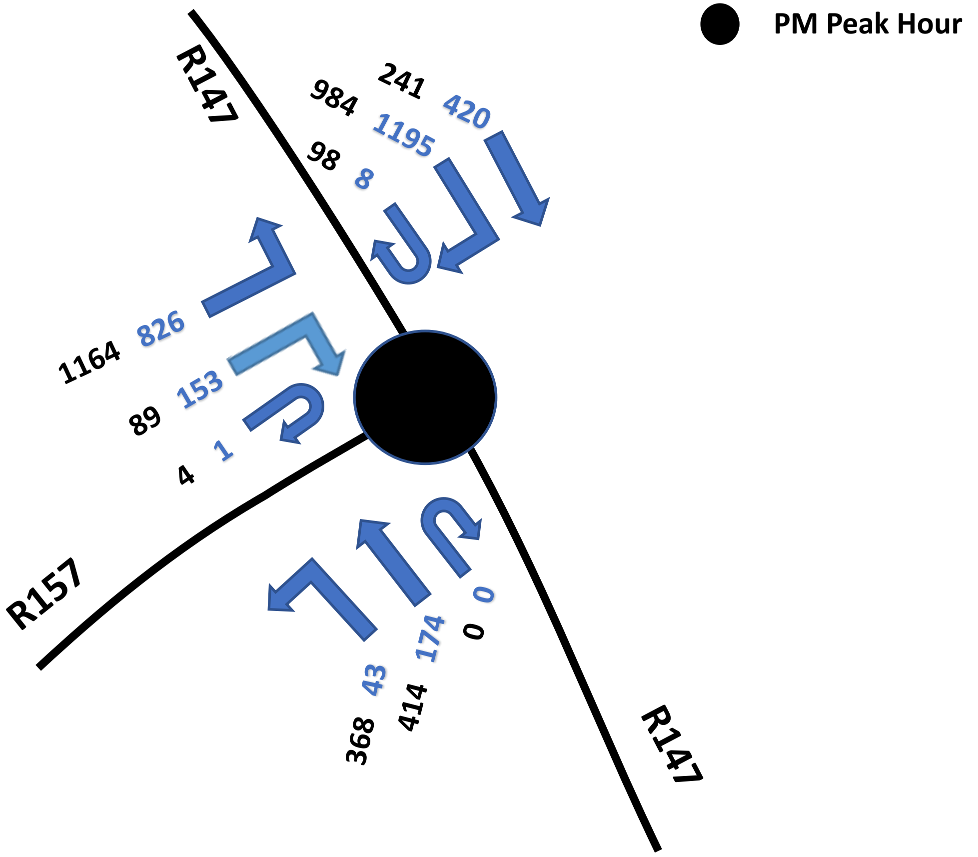
● PM Peak Hour



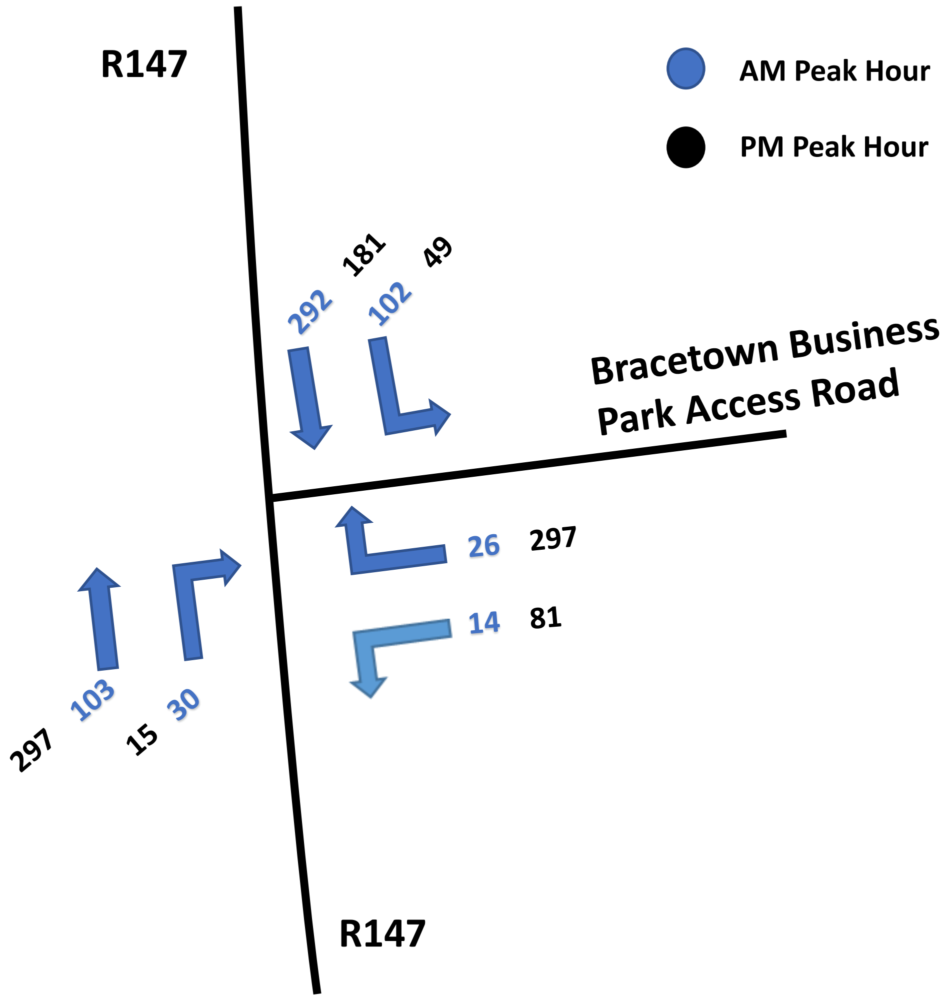
2022 - Baseline Flows (with surrounding approved development)



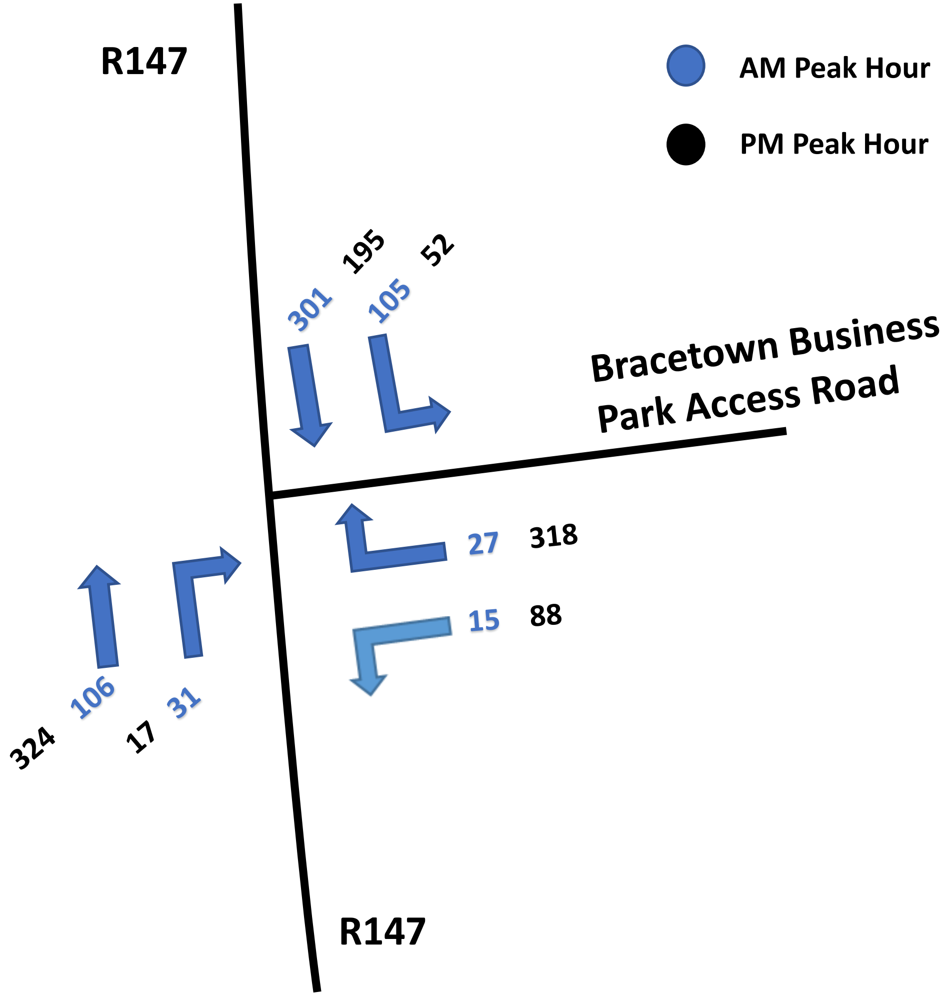
2022 - Baseline Flows plus Operational Flows from Proposed Development



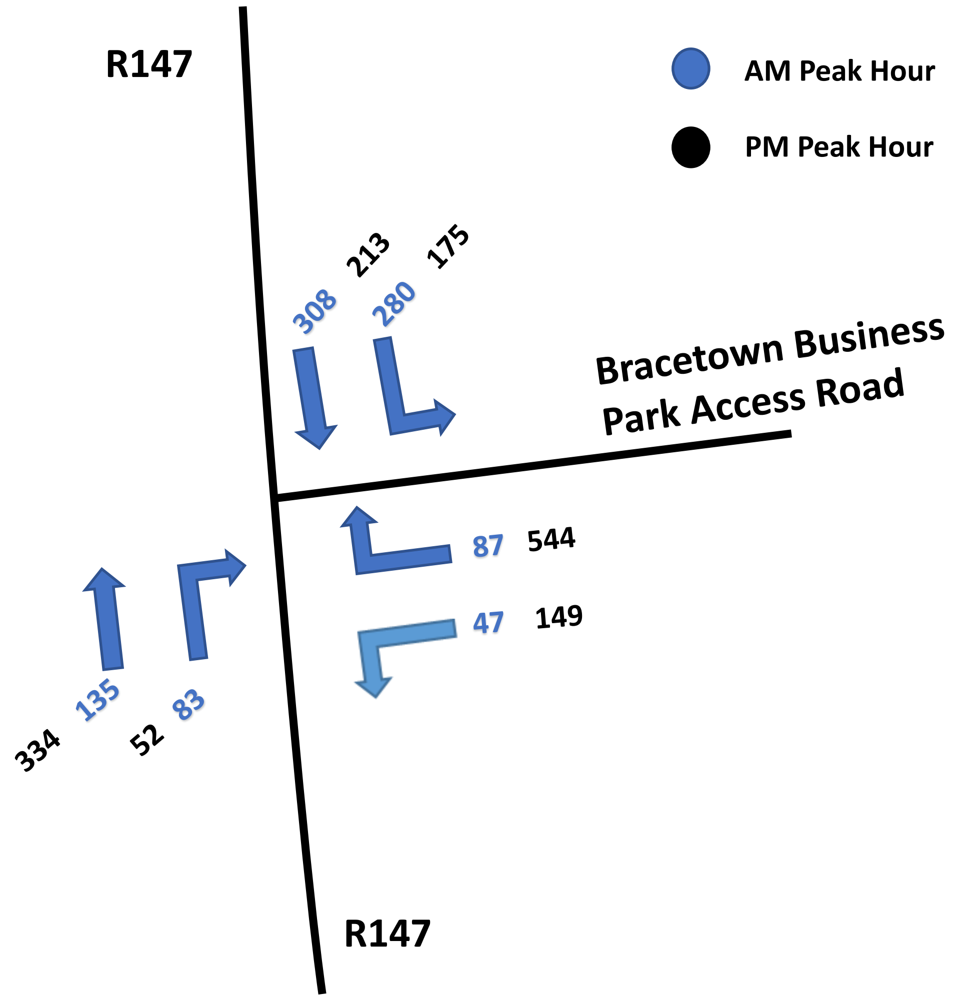
2019 - Count


R147
● AM Peak Hour
● PM Peak Hour
292
181
102
49
Bracetown Business Park Access Road
26
297
14
81
297
103
15
30
R147

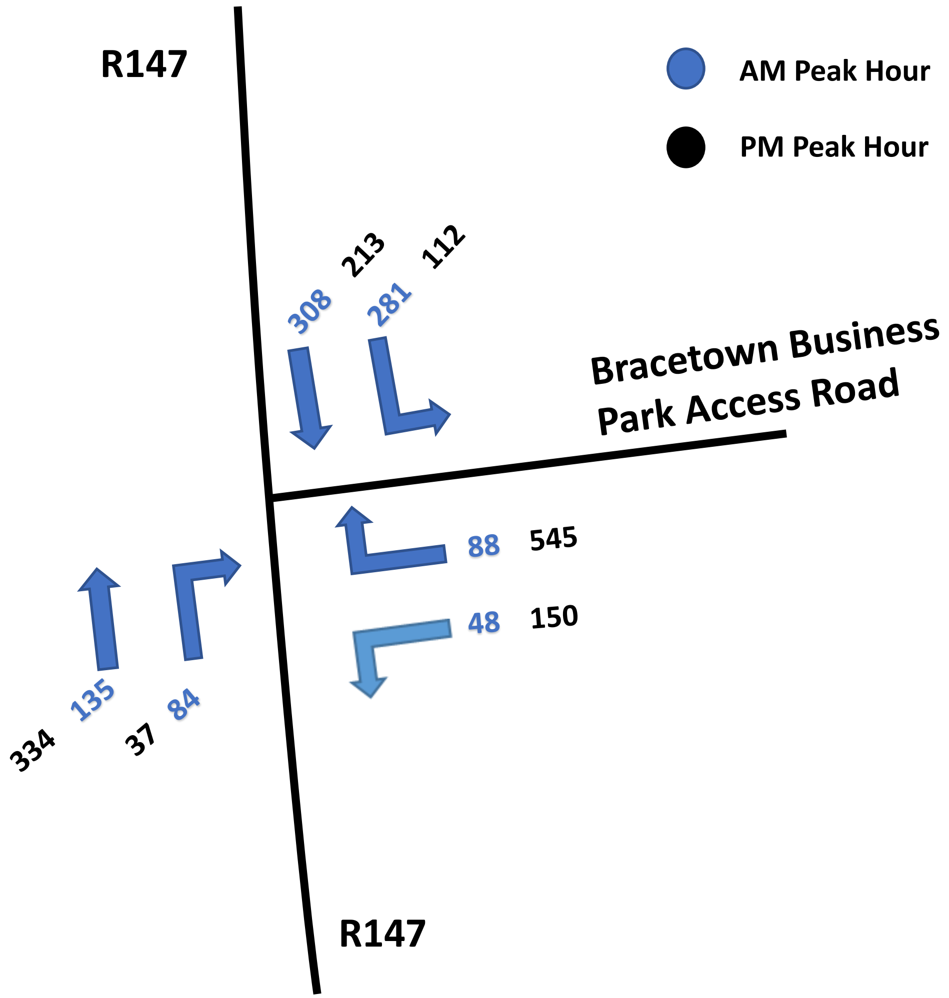
2021 – Adjusted Flows – Construction Year



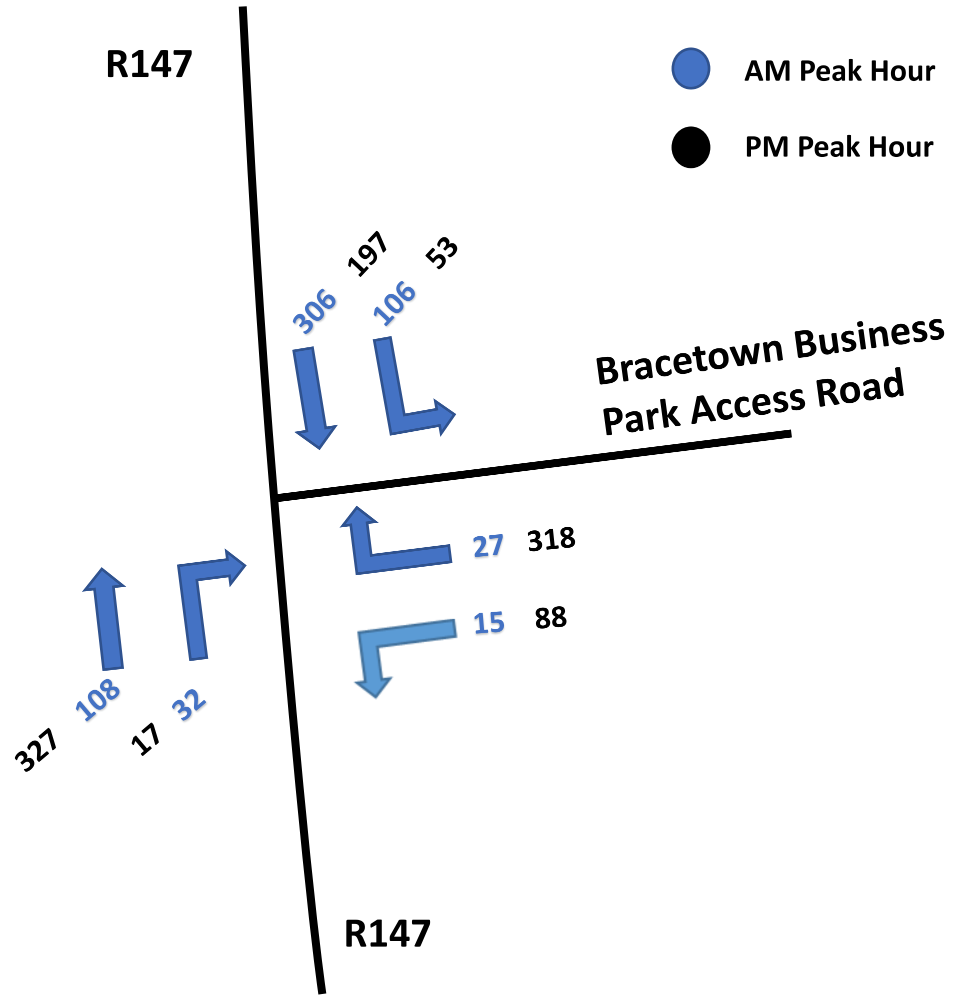
2021 - Baseline Flows (with surrounding approved development)



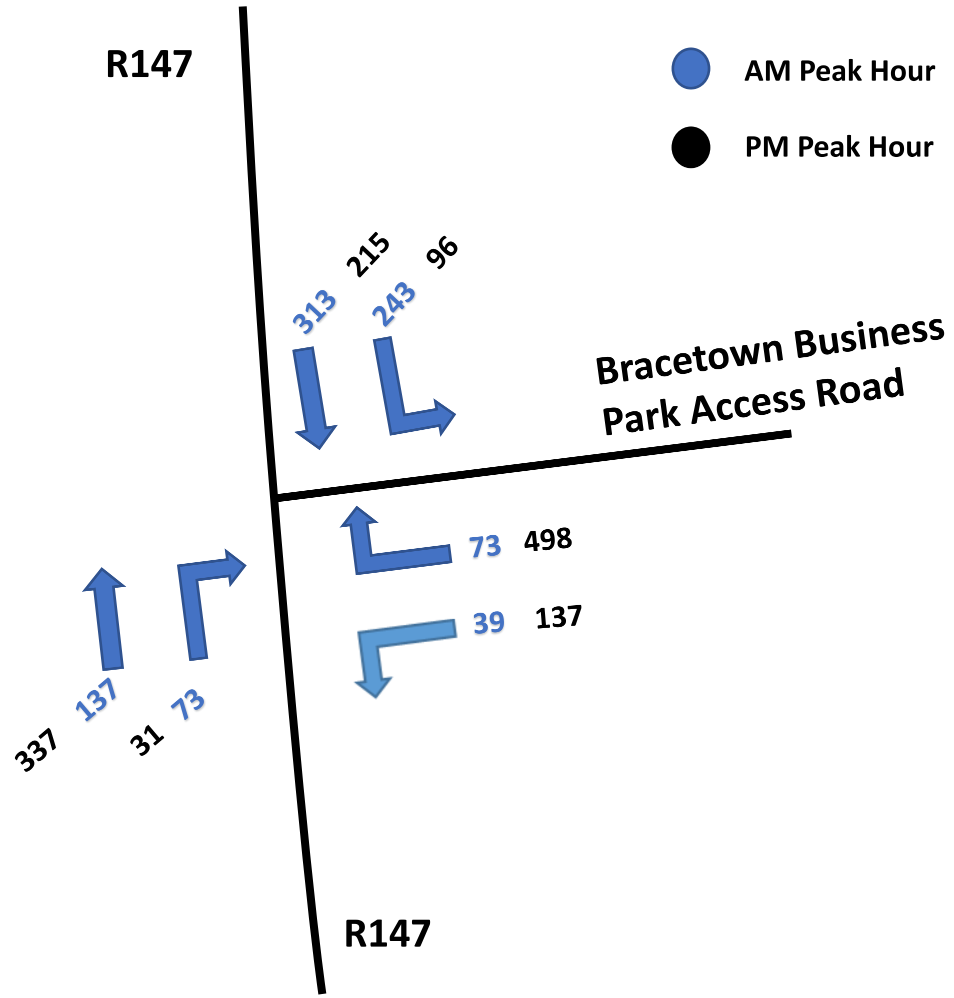
2021 - Baseline Flows plus Construction Flows from Proposed Development



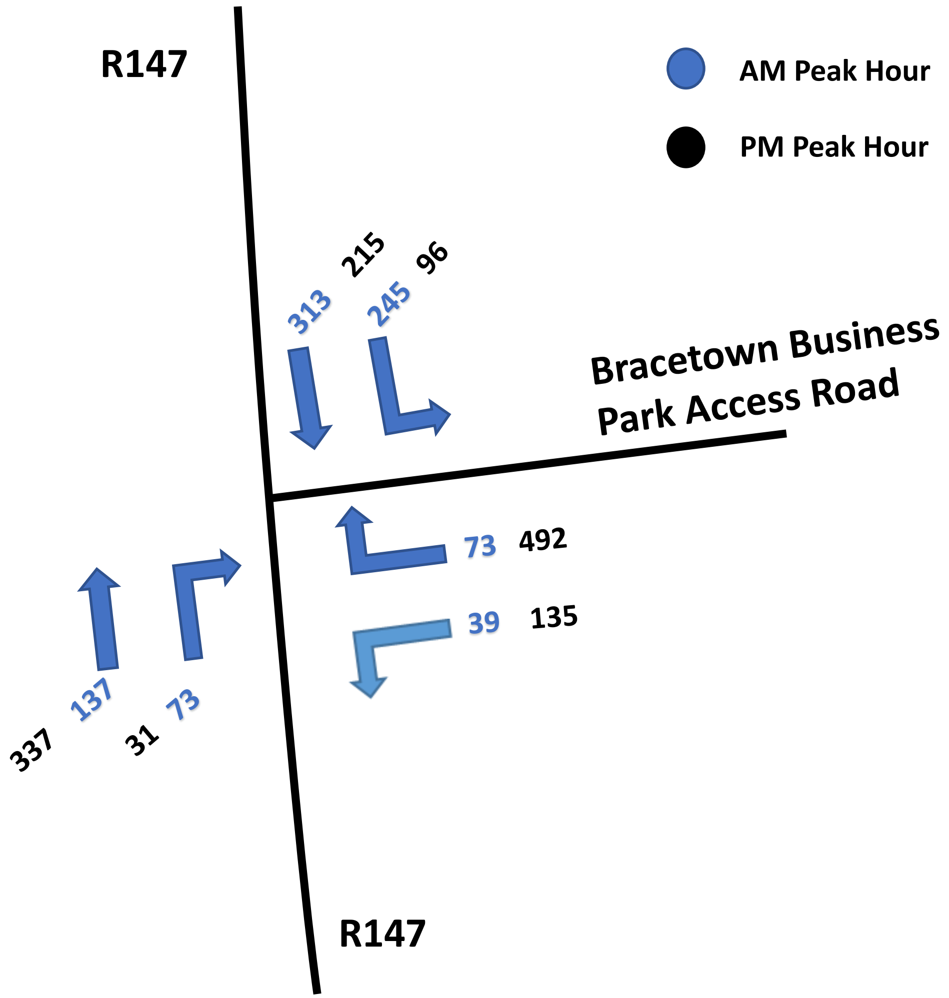
2022 – Adjusted Flows – Opening Year



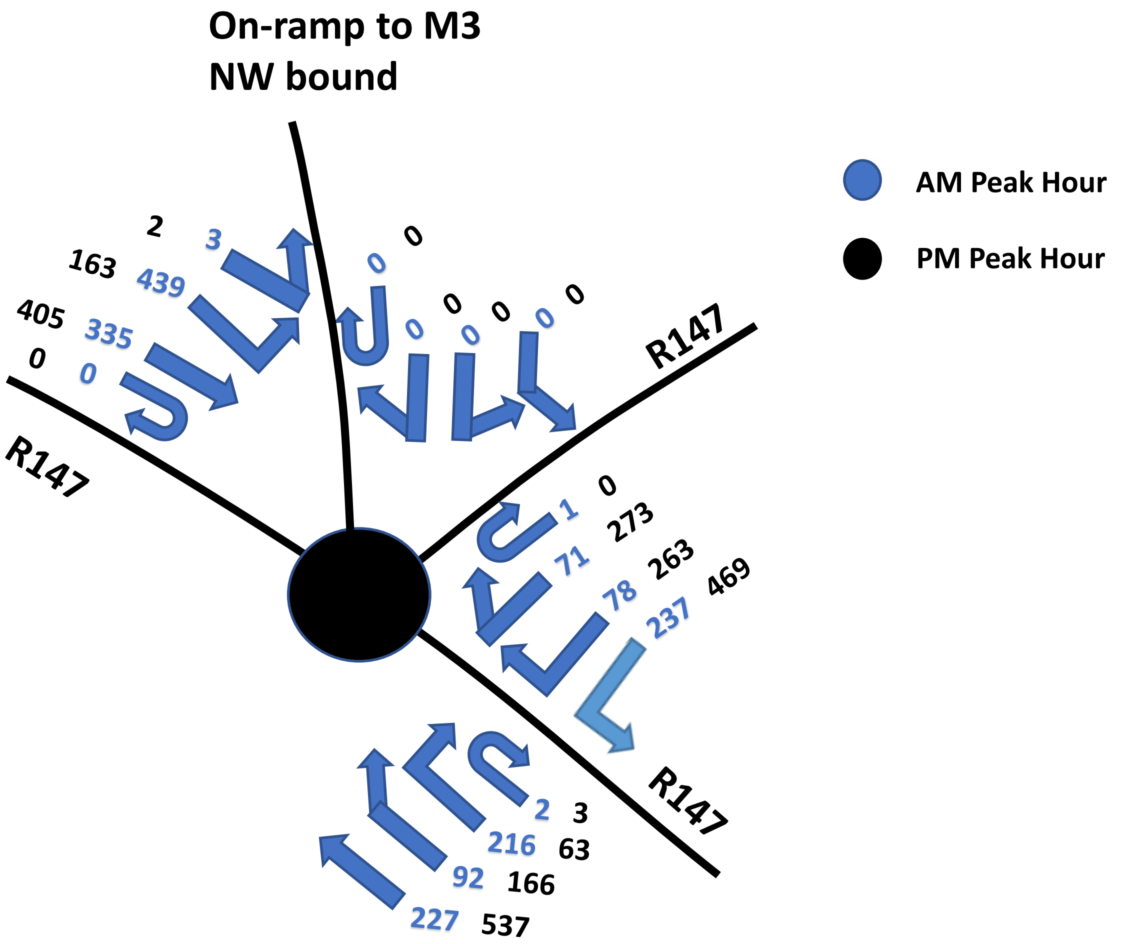
2022 - Baseline Flows (with surrounding approved development)



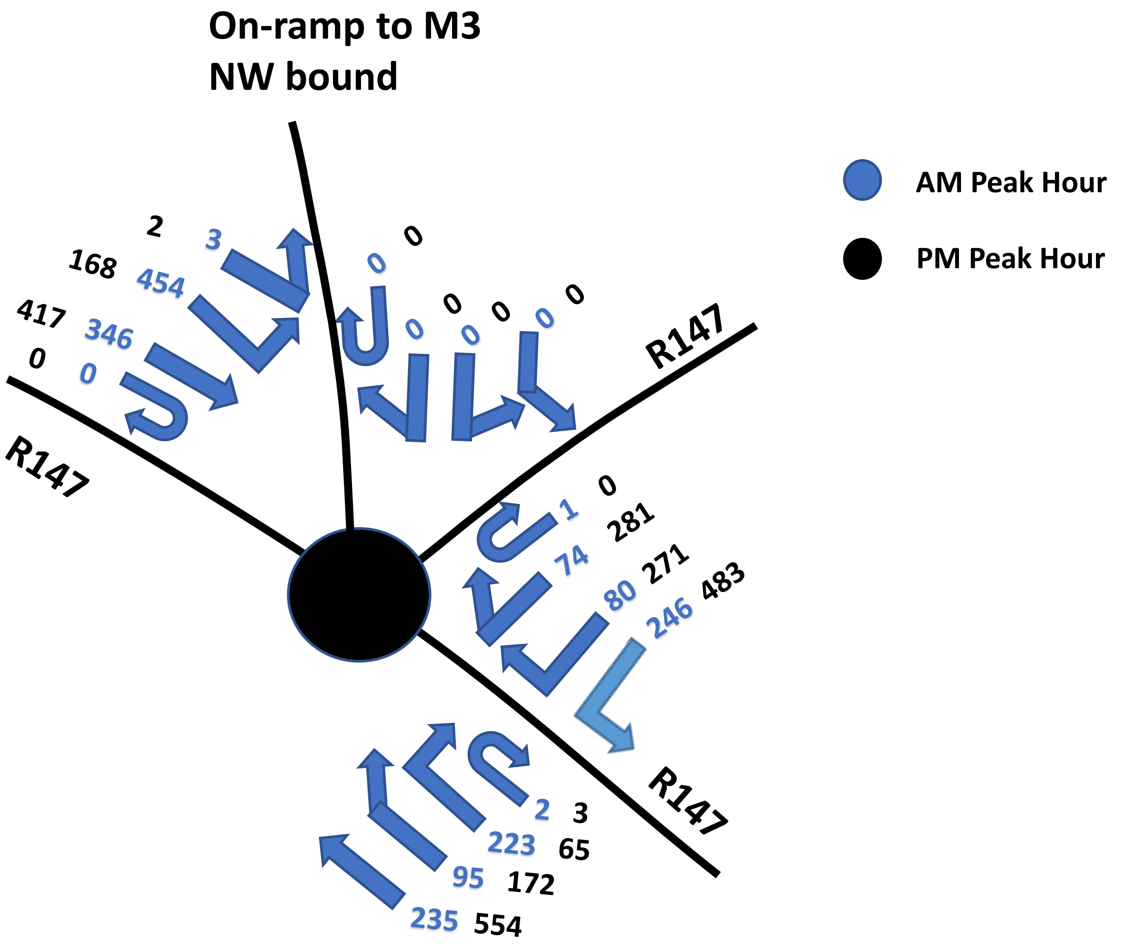
2022 - Baseline Flows plus Operational Flow from Proposed Development



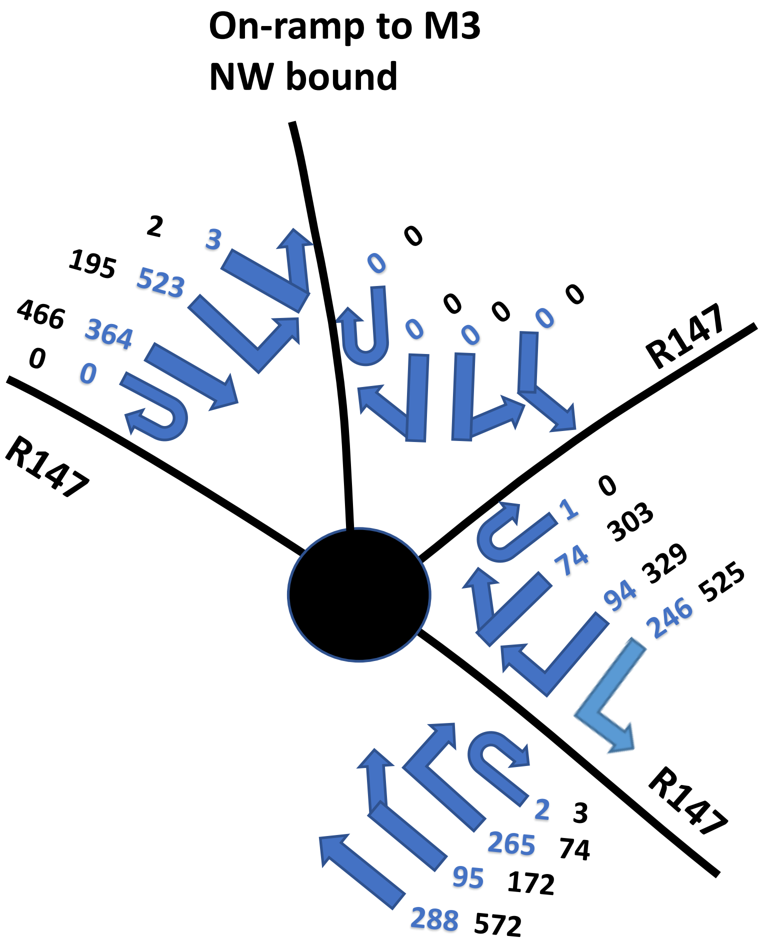
2019 - Count


On-ramp to M3
NW bound
R147
R147
R147
2
3
163
439
405
335
0
0
0
0
0
0
0
0
0
0
1
0
71
273
78
263
237
469
2
3
216
63
92
166
227
537
● AM Peak Hour
● PM Peak Hour

2021 – Adjusted Flows – Construction Year



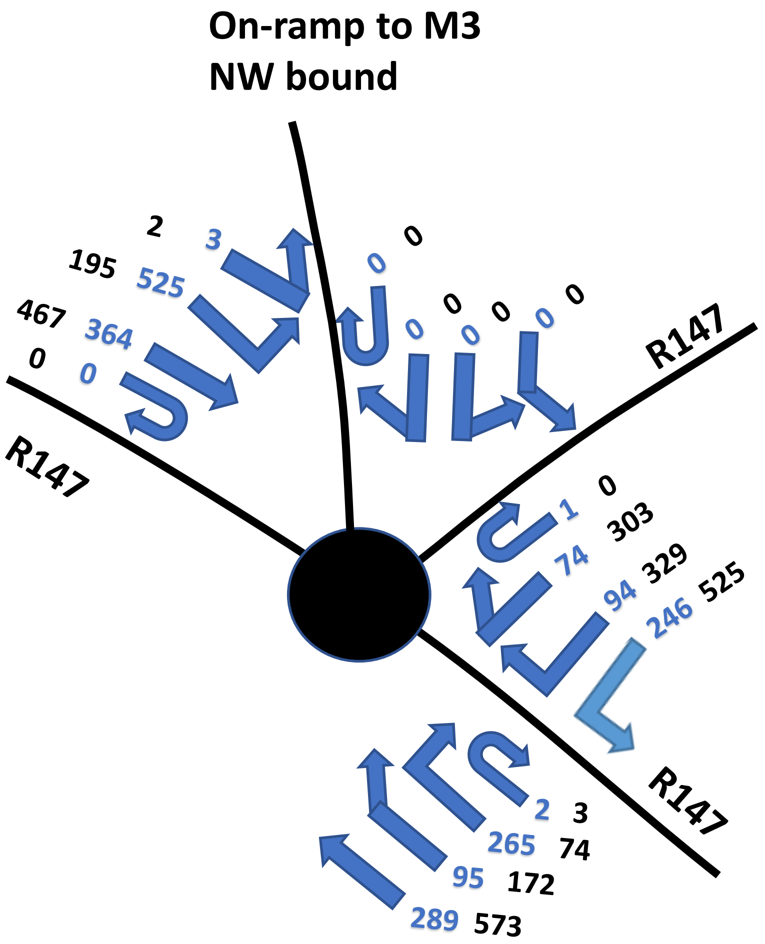
2021 - Baseline Flows (with surrounding approved development)



● AM Peak Hour

● PM Peak Hour

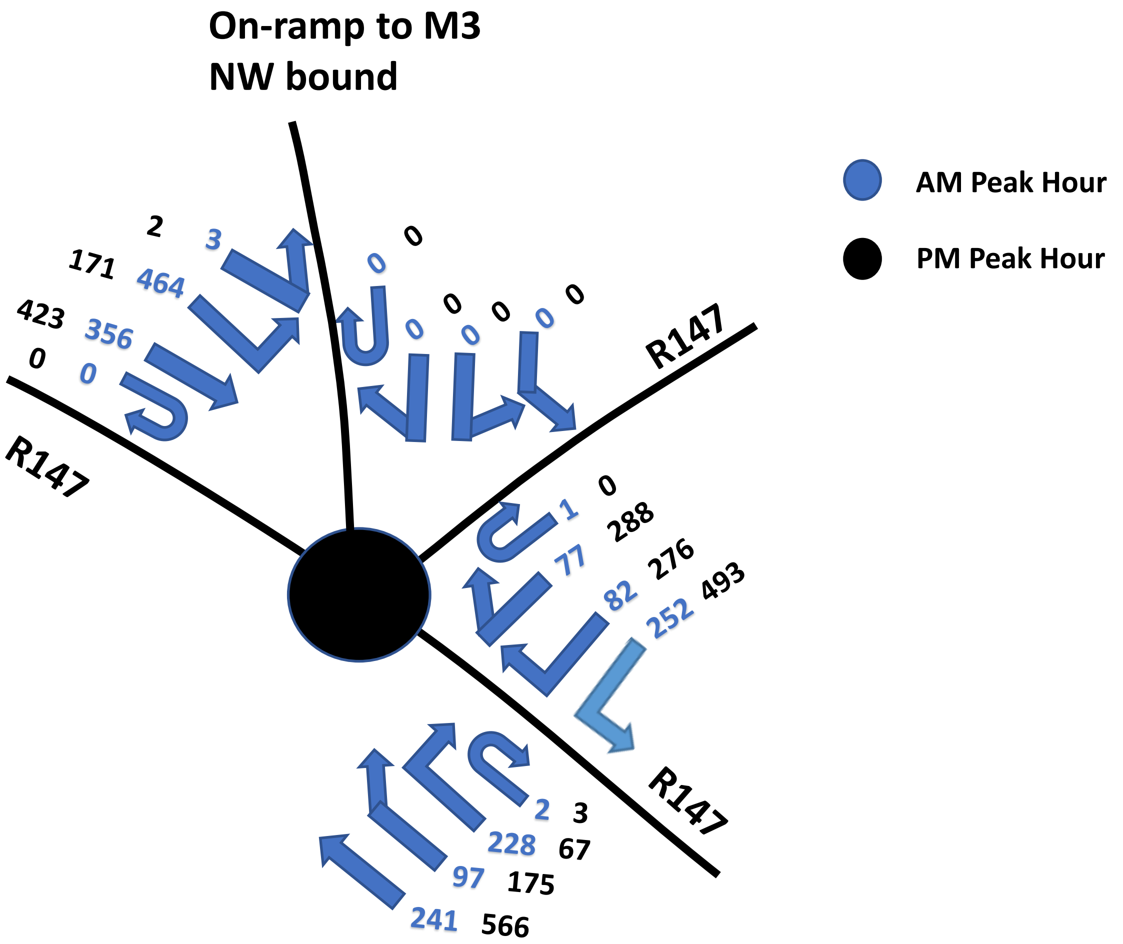
2021 - Baseline Flows plus Construction Flows from Proposed Development



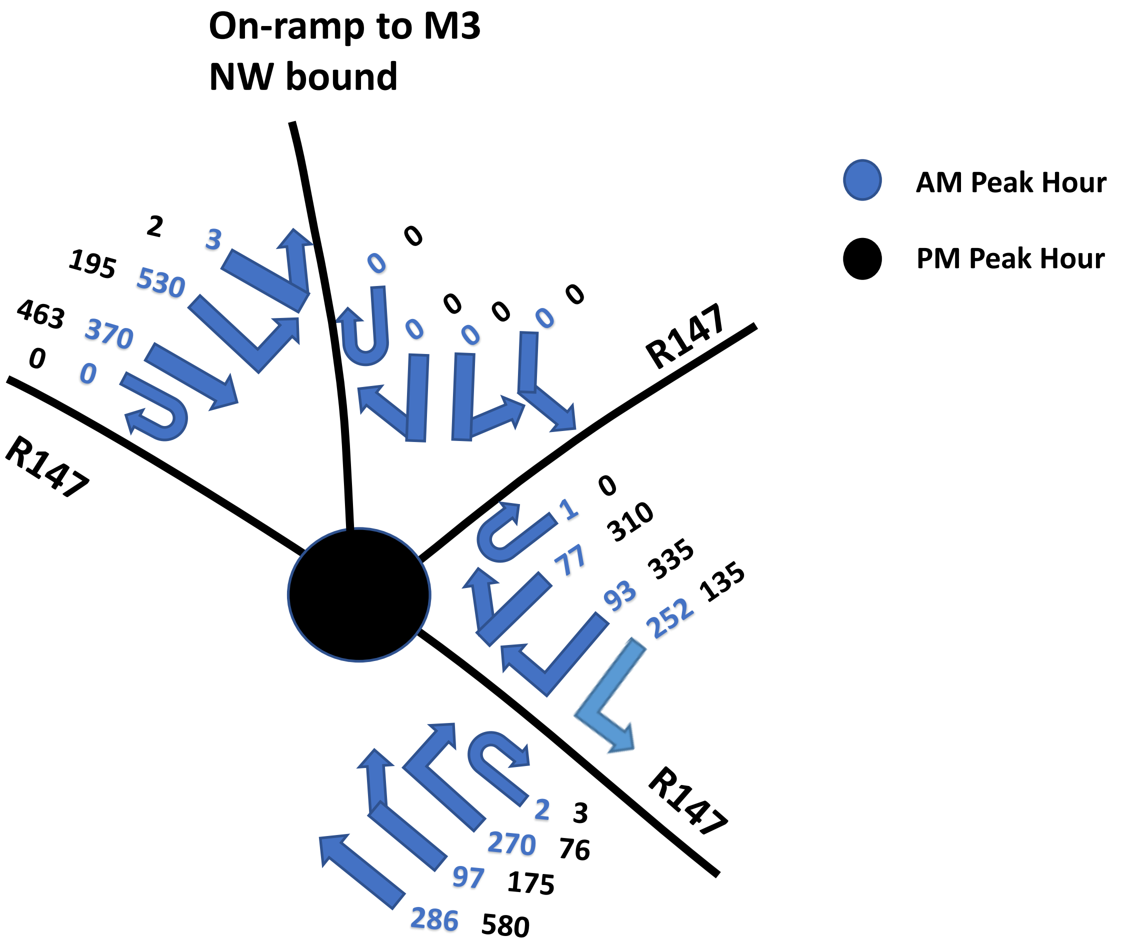
● AM Peak Hour

● PM Peak Hour

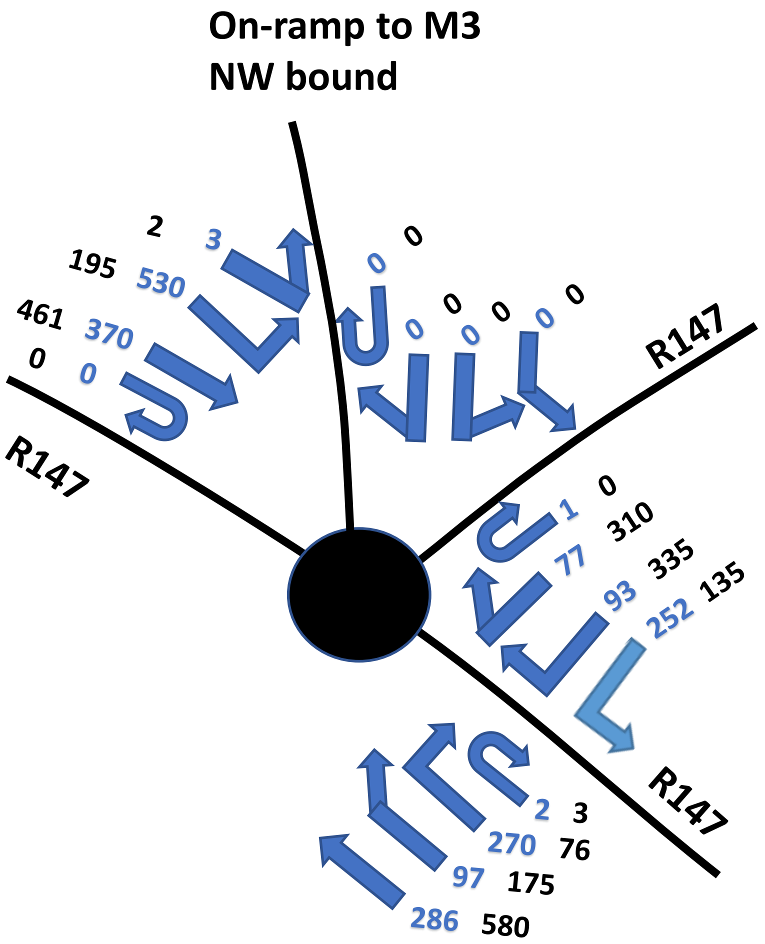
2022 – Adjusted Flows – Opening Year



2022 - Baseline Flows (with surrounding approved development)



2022 - Baseline Flows plus Operational Flows from Proposed Development



● AM Peak Hour

● PM Peak Hour

14.0 MATERIAL ASSETS

14.1 INTRODUCTION

This chapter prepared by AWN Consulting Ltd. evaluates the potential impacts, from the proposed development on Material Assets as defined in the EPA Guidelines *Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2017), and Advice Notes *Draft Advice Notes for Preparing Environmental Impact Statements* (EPA, 2015).

14.2 METHODOLOGY

The Directive 2011/92/EU defined Material Assets as '*resources that are valued and that are intrinsic to specific places; they may be of either human or natural origin'* this included architectural and archaeological heritage. The Directive 2014/52/EU included architectural and archaeological heritage as components of cultural heritage; this EIA report has also done so within in Chapter 12 Archaeological, Architectural and Cultural Heritage

The EPA 2017 Guidelines state that material assets are taken to mean "*built services and infrastructure, roads and traffic and waste management"*. The EPA 2015 Advice Notes also gives examples of material assets including; assimilative capacity of air and water; ownership and access; and tourism and recreational infrastructure.

In this EIA Report, the impacts on some of the material assets described above have already been considered and therefore will not be discussed in this chapter. The EIA report Chapters 5, 9, 12, 13 and 15 discuss material assets in terms of Population and Human Health, Air Quality & Climate, Cultural Heritage, Traffic & Transportation, and Waste Management respectively; therefore these aspects will not be addressed in specific detail within this chapter.

This chapter assesses ownership and access, built services and infrastructure, which have not already been addressed elsewhere in this EIA Report. The subsequent sections address built services and infrastructure. The potential impacts on built services and infrastructure, if any, are assessed in terms of the following:

- Land Use, Property, and Access
- Power and Electrical Supply;
- Surface water infrastructure;
- Foul drainage infrastructure;
- Water supply; and
- Telecommunications.

The proposed development will not impact on any other structures or water resources.

Assessment of impact on utilities has been undertaken by confirmation of supply with the utility supplier. Mitigation measures are proposed where required.

The proposed drainage infrastructure has been described in Chapter 2 (Description of the Development) and Chapter 6 (Hydrology). Detailed water supply and drainage design information is provided in the *Engineering Planning Report – Drainage and Water Services*, prepared by CSEA, which accompanies this application and in the

Engineering and Water Services Report, prepared by CSEA, which accompanied the planning application for the concurrent data storage development (MCC Planning Ref. RA/191593).

The associated built services and infrastructure in the vicinity of the site are summarised in the following sections.

14.3 RECEIVING ENVIRONMENT AND CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

14.3.1 Land Use, Property, and Access

The proposed development comprises a 220kV Gas Insulated Switchgear (GIS) Substation, 4 Transformers, Substation Control Room, an underground double circuit 220kV cable installation and an underground 49kVA cable installation. Each underground 220 kV underground circuit will terminate at a Cable – overhead interface compound, and overhead line tower to facilitate connection of the new underground cables to the existing “Woodland – Corduff” overhead line.

The substation site is approximately 1.7 ha and zoned as industrial/commercial (E2 - General Industry and Employment/E3 - Warehousing and Distribution. The substation will be located south of the concurrent data storage development, all currently within a large greenfield area located in Bracetown, Dunboyne, Co. Meath just off the M3 Motorway.

The route of the underground double circuit 220 kV circuit comprises 2 no. underground cables, no. 1 Corduff to Gunnocks; and 1 no. Gunnocks to Woodlands.

The Gunnocks-Woodland route will run (subsurface) along the R147 road from the proposed substation building c.1km to its junction with the R157 road. At this point, the route will cross agricultural land, where it continues to the NE c. 550m towards the existing overground 220kV line, located c.80m to the south of the L5026.

The Gunnocks-Corduff route is projected along the L1010 road from the proposed substation site c. 750m to the NE where it enters the concurrent data storage development site prior to exiting to the L1010 route for c. 300m towards the existing overground 220kV line, located c.160m to the south of the L5026.

The underground 220kV cable and 49kVA cable installation will be constructed within a c. 1m wide, and c. 1.35m below ground level (bgl) but may increase to up to c. 3.0 to 6.0m at utility crossings. The trenching works are predominantly on the public domain and agricultural lands in third party ownership; these lands have no specific zoning. The associated cable overhead interface compound, 27 m X 22 m, and overhead line tower are located predominantly on the public domain and agricultural lands in third party ownership; these lands have no specific zoning.

Letters of consent, to apply for development on the lands have been obtained from the third-party landowners, additionally consent from MCC for permission to use public lands has been obtained, these consent letters and are included with the planning application documentation.

The proposed substation development is bounded by the overall landholding for the concurrent data storage development on the northern and eastern sides. The western boundary is defined by two detached private residential properties and agricultural shed and the R147. The southern boundary is currently undeveloped agricultural lands. In regards to the overall context of the entire landholding, the Bracetown Business Park is located to north with further warehouse development (The Hub Logistics Park) currently being constructed. There is a permitted data storage facility Runways Information Services Limited (RISL) (MCC Ref: RA180671) on the lands to the south east with construction ongoing. The RISL facility under construction adjoins an existing RISL data storage facility (MCC Ref: RA150605) further to the south east across the L5028 / Portan Road.

During construction and early phases of development, the traffic accessing the GIS substation will approach and access the substation through an entrance to be constructed off the R147. The R147 access is temporary in nature, it is temporary pending the development of the distributor road to the east of the site. Once this distributor road is constructed the substation will be accessed through the concurrent development site.

The underground cable will require no formal access points when operational.

14.3.2 Power and Electrical Supply

The availability of power is a key consideration in site selection for the concurrent development. One of the key reasons the site was chosen for the concurrent development was the relative proximity to the 220kV overhead line.

During construction, contractors will require power their onsite construction compound, lighting, and for construction equipment/plant. The construction compound and temporary power supply established for the construction of the concurrent development will be utilised for the Proposed Development. The additional power requirements for the construction phase will be relatively minor.

Power supply for the purposes of construction shall be provided by a supply from the proposed 10-KV substation to be constructed by ESB. The use of temporary generators may also be required.

The excavation of trenches within the vicinity of existing electrical services will be carried out in consultation with EBS Networks to ensure their no impact on existing users.

Once operational the substation will draw its required power directly from the grid.

The proposed 220kV transmission line and associated development will not require the provision of any additional electrical services.

14.3.3 Telecommunications

It is planned that a fibre optic cable distribution network will be installed for the concurrent development. The concurrent development will connect to the existing telecommunication lines that are located within the bed of the R147 and also to the T50 Network.

Telecommunications including fibre required during the construction phase will be provided via a temporary mobile connection.

The fibre optic cable distribution network for the concurrent development will be extended to the proposed GIS substation. The extension from the concurrent development to accommodate the Proposed Development will be entirely within the overall landholding and will not require any offsite connections.

The proposed 220kV transmission line and associated development will not require the provision of telecommunications services.

14.3.4 Surface Water Infrastructure

There is no drainage system currently serving the site. The lands fall to the south east of the site and are bordered by a network of drainage ditches which form a single ditch / watercourse which in turn forms a tributary of the Pinkeen Stream.

During construction, welfare facilities (canteens, toilets etc.) will be available within the construction compound for the concurrent development, and it is proposed that these can be utilised for the small number of staff required for the construction phase of the Proposed Development. The increase in surface water discharges, if any, will be imperceptible and will not affect existing users.

Once operational, rainwater runoff from the proposed 220kV GIS substation will discharge to the surface water drainage network for the concurrent development. The surface water drainage network for the concurrent development was designed to accommodate surface water drainage from the Proposed Development. The attenuated storm water will be discharged at the allowable greenfield run off rate (i.e. 24.4l/s) to the existing watercourse bordering the site to the southeast, which joins the Pinkeen Stream approximately 2 km east of the site. It is proposed to provide a Class 1 bypass interceptor upstream of the surface water attenuation system to capture the additional runoff from the proposed development.

The proposed underground cable works and associated interface compound, and towers will be constructed on a primarily permeable gravel surface (with concrete bases at the towers which will drain to the gravel area). Rainfall will drain to ground, as it currently does in these areas. The proposed 220kV transmission line and associated development will not require the provision of surface water connection.

Further detail on the storm water drainage system and the basis of its design is provided in the *Engineering Planning Report – Drainage and Water Services*, prepared by CSEA, which accompanies this application and in the *Engineering and Water Services Report*, prepared by CSEA, which accompanied the planning application for the concurrent data storage development (MCC Planning Ref. RA/191593). Chapter 6 Hydrology address the impacts on storm water drainage.

14.3.5 Foul Drainage Infrastructure

The site is currently not serviced by foul sewage. The foul drainage network runs along the R147 and ultimately discharges to Ringsend WWTP. A pre-connection enquiry (PCE) was submitted to Irish Water (IW) which addressed wastewater discharges for the concurrent development (MCC Planning Ref. RA/191593) and is included within Appendix C to the CSEA *Engineering Planning Report – Drainage and Water Services*. This PCE include the requirements of the proposed development.

During construction, foul sewage arising from welfare facilities (canteens, toilets etc.) will collected by tanker and disposed of appropriately. Once the foul drainage network for the concurrent development has been constructed it is likely that a temporary connection for the construction compound will be made to the mains foul sewage network.

The foul sewage arising from at the GIS substation will be collected in a newly constructed foul drainage network within the site and discharged through a new pumping station which will be constructed as part of the concurrent development, to the foul drainage network which runs along the R147 and ultimately discharges to Ringsend WWTP. The average daily foul water demand is 1 litre per day. The wastewater contribution from the Proposed Development will be minimal.

Due to the consequences of a spillage entering the surface water system it is proposed to connect the discharge from the electrical substation transformer bunds to the foul system. This drainage is to pass through a Class 1 Full Retention Oil Separator before entering the foul water network.

Further detail on the storm water drainage system and the basis of its design is provided in the *Engineering Planning Report – Drainage and Water Services*, prepared by CSEA, which accompanies this application and in the *Engineering and Water Services Report*, prepared by CSEA, which accompanied the planning application for the concurrent development (MCC Planning Ref. RA/191593). Further reference is made to the sewerage and wastewater treatment system in Chapter 6 Hydrology.

14.3.6 Water Supply

There is an existing 450mmø water main located in the R147 which is deemed to be suitable to provide a connection to serve the concurrent data storage development (Meath County Council Reg. Ref.: RA191593 and An Bord Pleanála Reg. Ref.: ABP-307546-20.), subject to agreement with Irish Water.

During construction, a temporary connection will be required for welfare facilities, dust suppression and general construction activities will be sourced from the existing 450mm watermain under the R147. Although before initial connections to the water supply are made it may need to be trucked onto site.

The proposed development requires minimal water, and is restricted to general potable supply for drinking, sanitary facilities and cleaning. Total annual water usage for the proposed development is 365 m^3. Peak daily usage will be 6 l/day and average demand 1 l/day.

A pre-connection enquiry (PCE) was submitted to IW which addressed potable water demand for the concurrent development (MCC Planning Ref. RA/191593) and is included within Appendix C to the CSEA *Engineering Planning Report – Drainage and Water Services*. This PCE include the requirements of the proposed development.

Further detail on the storm water drainage system and the basis of its design is provided in the *Engineering Planning Report – Drainage and Water Services*, prepared by CSEA, which accompanies this application and in the *Engineering and Water Services Report*, prepared by CSEA, which accompanied the planning application for the concurrent development (MCC Planning Ref. RA/191593). Further reference is made to the water supply in Chapter 6 Hydrology.

14.4 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

14.4.1 Land Use and Property

The proposed development is not anticipated to generate significant air (including odour), noise or water emissions during normal operations; these have been discussed further in the respective Chapters of the EIAR. The overall development will have a moderate impact on the immediate residential settlements and agricultural lands around the site.

The majority of the land is appropriately zoned or within the public domain; the proposed development is generally a low impact activity and is subservient to the concurrent development.

The proposed development represents a loss of agricultural land however in the overall context of Ireland’s available agricultural land the loss is negligible. The substation site is within an area zoned as industrial/commercial (E2 - General Industry and Employment/E3 - Warehousing and Distribution as per the Meath County Development Plan 2013-2019 (MCDP)).

The proposed development is not a Seveso site, and will not lie within the consultation distance of other sites.

The potential impact associated with land use and property during the construction and operational stage is ***moderate,*** and ***long term***.

14.4.2 Construction Phase

Power and Electrical Supply

The power and electrical supply requirements during construction are relatively minor, and there is no potential impact anticipated on existing users.

When the required excavations and connections are undertaken with consultation with EBS Networks there is no potential impact anticipated on existing users.

The potential impacts associated with power and electrical supply for the construction phase will be a ***neutral, imperceptible, and short-term.***

Telecommunications

Telecommunications including fibre required during the construction phase will be provided via a mobile connection.

The connection works to the fibre optic cable distribution network are entirely within concurrent and proposed site boundaries, there will be no potential offsite impact.

There are no potential impacts associated with telecommunications for the proposed development for the construction phase.

The potential impacts associated with telecommunication for the construction phase will be a ***neutral, imperceptible, and temporary.***

Surface Water Infrastructure

The surface water drainage network for the concurrent development was designed to accommodate surface water drainage from the Proposed Development. As such, there is capacity for the concurrent development to accommodate surface water runoff from the Proposed Development and no potential impacts on the surface water infrastructure.

In order to mitigate any impact on surface water runoff, the new drainage network will be constructed on a phased basis and consideration will be given to the construction of temporary pipes and detention ponds, as required

Run-off water containing silt will be contained on site and treated (using temporary on-site settlement ponds/tanks) to ensure adequate silt removal.

There are no potential impacts associated with surface water infrastructure for the Proposed Development for the construction phase.

Foul Drainage Infrastructure

Welfare facilities (canteens, toilets etc.) will be required for the construction phase. It is anticipated foul sewage arising from welfare facilities will collected by tanker. It is planned that this can be utilised for the small number of staff required for the construction phase of the Proposed Development.

There are no potential impacts associated with the existing foul sewer network for the proposed development during construction or operation.

Water Supply

Welfare facilities will be available within the construction compound in the concurrent development. It is proposed that this can be utilised for the small number of staff required for the construction phase of the Proposed Development. The increase in water demand, if any, will not be significant enough to impact existing users.

The increase in water demand, if any, will not be significant enough to impact existing users.

There are no potential impacts associated with the existing mains water network for the proposed development during construction.

14.4.3 Operational Phase

Power and Electrical Supply

The proposed 220kV GIS substation and associated transmission lines are designed to support power demand for the concurrent development.

In this instance the nature of the Proposed Development ensures that rather than utilising electricity, the Proposed Development will ensure continuity of supply of electricity to the concurrent development.

Consultation has been undertaken with EirGrid and ESB. There is no perceptible impact on the existing power infrastructure.

There are no potential impacts associated with power and electrical supply for the Proposed Development for the operational phase.

Telecommunications

There is sufficient capacity available in the network to accommodate the development, so there are no potential impacts associated with telecommunications for the proposed development for the operation phase. There is no perceptible impact on the existing water infrastructure.

Surface Water Infrastructure

As the design incorporates management of run-off to greenfield run off rate and in compliance with GSDS requirements there is no perceptible impact on receiving surface water infrastructure or flooding risk off site.

Foul Drainage Infrastructure

The overall wastewater discharge associated with the proposed development is in accordance with the discharge rates outlined in the PCE. IW have agreed in principal that the wastewater requirements for the development can be accommodated, subject to application.

The concurrent development incorporates a pumping station which will facilitate wastewater discharge for adjacent development the potential impact is positive and long-term on foul drainage infrastructure and with no perceptible impact on the receiving foul drainage infrastructure.

Water Supply

The PCE allowed for sufficient provision for the proposed development.

IW have agreed in principal that the water requirements for the development can be met from existing supplies and the necessary water connections made subject to application. There is no perceptible impact on the existing water infrastructure.

14.5 REMEDIAL AND MITIGATION MEASURES

14.5.1 Construction Phase

Construction of the proposed development will require connections to water supply and drainage infrastructure, power and telecommunications.

Ongoing consultation with MCC, Irish Water, EirGrid, ESB Networks, Gas Networks Ireland and other relevant service providers within the locality and compliance with any requirements or guidelines they may have will ensure a smooth construction schedule without disruption to local and business community.

Power and Electricity Supply

The power demand for the construction phase will be relatively minor and the connection works are entirely within concurrent and proposed site boundaries, so it is predicted that there will be no offsite impact.

The excavation of trenches within the vicinity of existing electrical services will be carried out in consultation with ESB Networks to ensure there is no impact on existing users.

As such, no additional remedial or mitigation measures are required in relation to power supply for the construction phase.

Telecommunications

The telecommunications will be connected to the existing network on the R147 and the from Clonee T50 to accommodate the proposed development by the relevant network companies. No remedial or mitigation measures are required in relation to telecommunications.

Surface Water and Foul Drainage Infrastructure and Water Supply

The provided welfare facilities within the construction compound during the construction phase will be in place for the construction of the Proposed Development.

It is likely that a temporary connection will be put in place for the construction of the proposed development. This will be fed from the existing 450mm diameter mains along the R147.

Foul drainage for the proposed development will be in accordance with the Building Regulations Technical Guidance Document H for design and construction.

The works contractor will be obliged to put best practice measures in place to ensure that there are no interruptions to the utilities supply, unless this has been agreed in advance.

Strict quality control measures will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.

No additional remedial or mitigation measures are required in relation to surface water and foul drainage infrastructure and water supply.

14.5.2 Operational Phase

Power and Electricity Supply

The Proposed Development has been designed in accordance with ESB Networks requirements. A Connection Method Confirmation has been supplied by EirGrid to connect into the Corduff to Woodland 220 kV line to the north of the EngineNode site in Gunnocks, County Meath No remedial or mitigation measures are required in relation to power and electricity supply.

Telecommunications

As there are no potential effects on telecommunications during the operational phase of the Proposed Development, no remedial or mitigation measures are required.

Surface Water and Foul Drainage Infrastructure and Water Supply

IW have agreed in principal that the wastewater and water requirements for the development can be met from existing supplies and the necessary water connections made subject to application.

The surface water drainage network will connect to the concurrent development which has been designed with sufficient capacity. It is proposed to provide a Class 1 bypass interceptor upstream of the surface water attenuation system upstream to capture the additional runoff from the proposed development.

There are no potential effects associated with surface water and foul drainage infrastructure or water supply for the Proposed Development for the operational phase and as such no additional remedial or mitigation measures deemed necessary required.

14.6 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

14.6.1 Construction Phase

The implementation of mitigation measures detailed in Section 14.7.1 will ensure that the predicted impacts on the material assets will be***, neutral, imperceptible*** and ***short-term*** for the construction phase.

14.6.2 Operational Phase

The implementation of mitigation measures detailed in Section 14.7.2 will ensure that the predicted impacts on the material assets will be, ***neutral, not-significant,*** and ***long-term.***

14.7 CUMULATIVE IMPACT ASSESSMENT

Chapter 14 considers the environmental effects as a result of the proposed development. The following considers the cumulative impacts of the proposed development and proposed and permitted facilities in the surrounding area in relation to Material Assets.

The Proposed Development entails minimal use of material assets during construction. The proposed 220kV transmission line and 49kVA cable installation and cable connection towers will not require any surface water, foul drainage or water infrastructure. The proposed GIS substation will connect to the surface water, foul drainage and water supply infrastructure for the concurrent development, which was designed to accommodate the Proposed Development which was initially included as part of the planning application for the concurrent development (MCC Planning Ref. RA/191593)

The predicted impact of the Proposed Development on material assets is considered to be ***long-term*** and ***imperceptible***. Based on this, it is predicted that the cumulative impact of the Proposed Development with other permitted and planned developments is considered to be ***imperceptible*** during the construction and operational phases.

14.8 RESIDUAL IMPACTS

The Proposed Development entails minimal use of material assets examined in this chapter (i.e. power and electrical supply, telecommunications, surface water infrastructure, foul drainage infrastructure and water supply) during construction with no impact once operational. The overall predicted residual impact of the Proposed Development can be classed as *long-term* and *not significant* with respect to material assets.

APPENDIX 14.1

IRISH WATER RESPONSE TO CDS19006045 PRE-CONNECTION ENQUIRY

May 2020

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

Conor Doherty

Seafort Lodge
Castledawson Ave. Blackrock
Dublin
A94P768

29 May 2020

Re: CDS19006045 pre-connection enquiry - Subject to contract | Contract denied

Connection for Business Connection of 6 unit(s) at Bracetown, Clonee, Meath

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Bracetown, Clonee, Meath (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrades by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	The connection offer for the entire 5 No. Building proposed development will be made limiting peak flow to 15.56l/s with an annual limit of 7673 m3 . Annual demand should not exceed 7673 m3 without consultation with Irish Water. 7673 m3 allows for: • Domestic Demand (3696 m3) • Industrial Demand (3977 m3) If the customer requires to refill their storage during a summer period or needs to go over their annual allowance, they should in the first instance contact Irish Water. It will be a requirement that a meter that can be hooked up to our telemetry system and a flow control valve are installed as part of the connection.

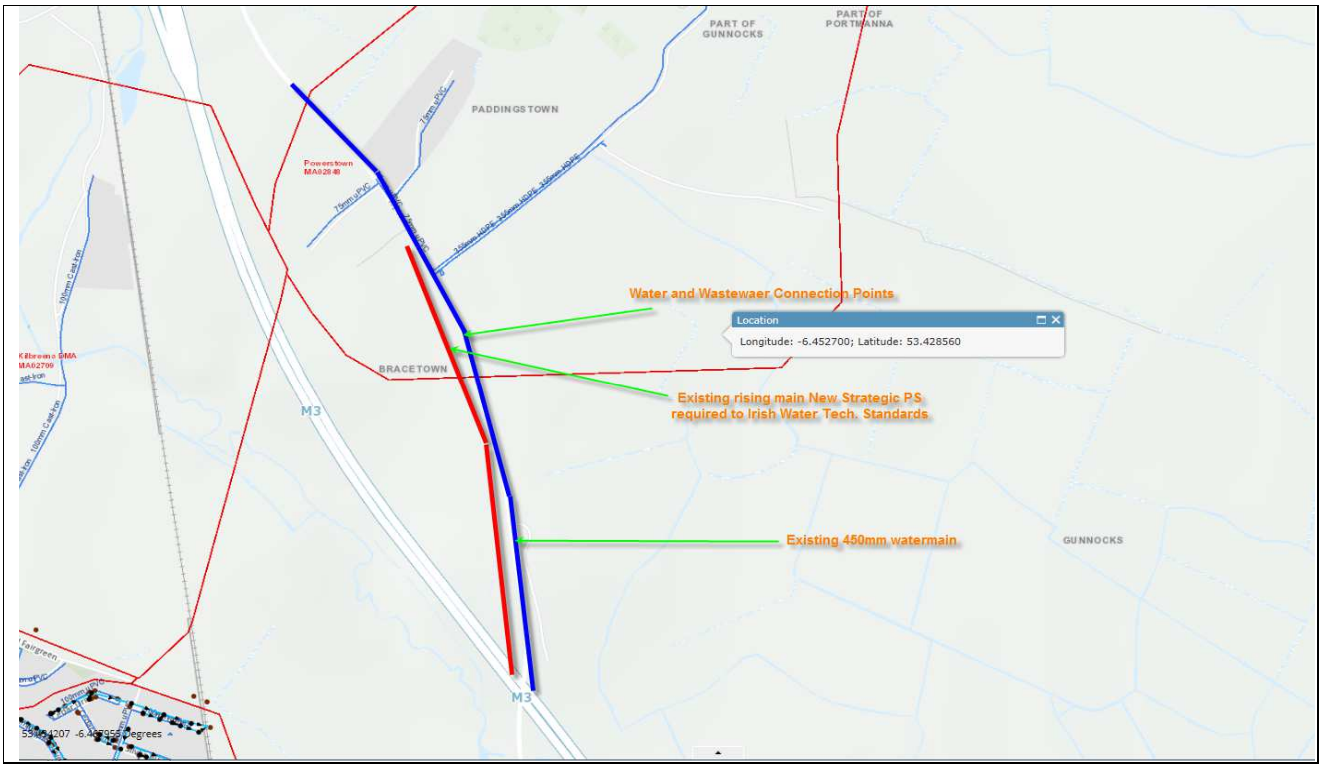
Stiúrthóirí / Directors: Cathal Marley (Chairman), Niall Gleeson, Eamon Gallen, Yvonne Harris, Brendan Murphy, Maria O'Dwyer
Oifig Chláraithe / Registered Office: Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin 1, D01 NP86
Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Irish Water is a designated activity company, limited by shares.
Uimhir Chláraithe in Éirinn / Registered in Ireland No.: 530363

IW-HP-BUS

REV012

<table>
<tr><td>Wastewater Connection</td><td>A strategic pump station is required to serve the proposed development and catchment subject to an Agreement with Irish Water to be outlined prior to the connection application stage. Irish Water does not currently have any plans to carry out the works required.</td></tr>
<tr><td colspan="2">The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.</td></tr>
</table>

The map included below outlines the current Irish Water infrastructure adjacent to your site:



Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Paul Fuller from the design team on 018230382 or email PFuller@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,

M ODwyer

Maria O’Dwyer

Connections and Developer Services

APPENDIX 14.2

EIRGRID CONNECTION METHOD CONFIRMATION, AND EXTENSION TO RESERVATION OF CONNECTION METHOD

July 2020

EIRGRID

www.eirgrid.com

The Oval, 160 Shelbourne Road
Ballsbridge, Dublin D04 FW28, Ireland

Telephone +353 1 677 1700
Email info@eirgrid.com

Ronan Kneafsey,
EngineNode Limited,
6/9 Trinity Street,
Dublin 2,
Co.Dublin

17th January 2020 Our ref: D57-BM-002

Re: Phase 1 - Connection Method Confirmation for a Facility with a Maximum Import Capacity ("MIC") of 98.53 MVA at Bracetown, Co.Meath

Dear Ronan,

This letter outlines EirGrid's (the "**Company**") Connection Method Confirmation (the "**Connection Method Confirmation**") with reference D57 issued to EngineNode Limited (the "**Customer**") for a demand Facility with an MIC of 98.53 MVA at Bracetown, Co. Meath.

The Connection Method is reserved by the Company for the Customer on the basis of the following Customer Preferred Connection Method ("**Preferred Connection Method**") request received from the Customer:

> *"… to connect into the Corduff to Woodland 220 kV line to the north of the EngineNode site in Gunnocks, County Meath. For the avoidance of doubt this is the option EngineNode would like EirGrid to consider.*
>
> - *In particular, the preference is to connect into the Corduff to Woodland 220 kV line using the standard EirGrid line/cable interface compounds and run a 220 kV cable along the road into the new 220 kV substation that would be built on EngineNode's site in Gunnocks"*

EirGrid notes that the Customer has submitted an application for planning permission on 27th November 2019. If the customer requests input from EirGrid with regard to their planning permission application, EirGrid will provide appropriate assistance.

To progress to Stage 2 of the Offer Process, proof of valid planning permission must be provided to EirGrid by 17th July 2020. After this deadline of the 17th July 2020, this Connection Method cannot be progressed by the Customer without approved extension by the Company. Under exceptional circumstances, EirGrid may consider requests to grant an extension in line with current connection policy should the Customer be unable to secure a decision on planning permission within this time period. Once proof of valid planning permission is received for the project, EirGrid will complete the construction, charging and legal aspects in relation to the connection application and issue a connection offer to the customer.

Should you have any queries in relation to this matter or if I can be of further assistance, feel free to contact me at 01 237 0374 or by email at barrie.mcmullin@eirgrid.com.

Yours sincerely,

____

Barrie McMullin
Connections & Contracts

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Ronan Kneafsey,
EngineNode Limited,
6/9 Trinity Street,
Dublin 2,
Co.Dublin

17th July 2020 Our ref: D57-BM-003

Re: Extension to reservation of Connection Method

Dear Ronan,

On the 17th January 2020 EirGrid (the "**Company**") issued a letter with reference D57-BM-002 to EngineNode Limited (the "**Customer**") reserving the Customer Preferred Connection Method for D57 EngineNode until 17th July 2020. Given the delays introduced to the planning process by the current pandemic, and also the proof of engagement with the planning process that EngineNode have provided, we are approving the Customer's request for an extension to the reserved Connection Method.

The Company will reserve the Customer Preferred Connection Method for D57 EngineNode for a further four months until 17th November 2020. If full planning permission is not achieved before this date, the reserved Connection Method (referenced in the D57-BM-002 letter) will expire. This extension should provide sufficient time to deal with potential objections.

Should you have any queries in relation to this matter or if I can be of further assistance, feel free to contact info@eirgrid.com or myself directly at barrie.mcmullin@eirgrid.com.

Yours sincerely,

Barrie McMullin
Connections & Contracts

15.0 WASTE MANAGEMENT

15.1 INTRODUCTION

This chapter has been prepared to address the issues associated with waste management during the construction and operational phase of the Proposed Development.

A site specific Construction & Demolition Waste Management Plan (C&D WMP) has been prepared to deal with waste generation during the construction phase of the Proposed Development and is included as Appendix 14.1. The C&D WMP has been prepared in accordance with the '*Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects'* document produced by the National Construction and Demolition Waste Council (NCDWC) in conjunction with the Department of the Environment, Heritage and Local Government in July 2006.

15.2 METHODOLOGY

The assessment of the impacts of the Proposed Development arising from the consumption of resources and the generation of waste materials, was carried out taking into account the methodology specified in relevant guidance documents, along with an extensive document review to assist in identifying current and future requirements for waste management including national and regional waste policy, waste strategies, management plans, legislative requirements and relevant reports. A summary of the documents reviewed and the relevant legislation is provided in Appendix 14.1 C&D WMP.

This chapter is based on the Proposed Development, as described in Chapter 2 and considers the following aspects:

- Legislative context;
- Construction phase (including site preparation, excavation and levelling); and
- Operational phase.

A desk study was carried out which included the following:

- Review of applicable policy and legislation which creates the legal framework for resource and waste management in Ireland;
- Description of the typical waste materials that will be generated during the construction phase; and
- Identification of mitigation measures to prevent waste generation and promote management of waste in accordance with the waste hierarchy.

Estimates of soils and stones generated during the construction phase of the Proposed Development have been calculated by the project engineers Clifton Scannell Emerson Associates (CSEA).

There will be a very small amount of waste generated during the operation phase.

Mitigation measures are proposed to minimise the effect of the Proposed Development on the environment during the construction phase, to promote efficient waste segregation and to reduce the quantity of waste requiring disposal. This information is presented in Section 14.6.

A review of the existing ground conditions on a regional, local and site specific scale are presented in Chapter 6 Land, Soils, Geology and Hydrogeology.

15.2.1 Legislation and Guidance

Waste management in Ireland is subject to EU, national and regional waste legislation which defines how waste materials must be managed, transported and treated. The overarching EU legislation is the Waste Framework Directive (2008/98/EC) which is transposed into national legislation in Ireland. The cornerstone of Irish waste legislation is the Waste Management Act 1996 (as amended).

In addition, the Irish government issues regular policy documents which outline measures aimed to improve waste management practices in Ireland and help the country to achieve EU targets in respect of recycling and disposal of waste. The most recent policy document *A Resource Opportunity – Waste Management Policy in Ireland* was published in 2012 and stresses the environmental and economic benefits of better waste management, particularly in relation to waste prevention.

The strategy for the management of waste from the construction phase is in line with the requirements of the *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects* published in 2006 by the Department of the Environment, Heritage and Local Government (DoEHLG). by the Department of the Environment, Heritage and Local Government (DoEHLG).. The guidance document *Construction and Demolition Waste Management: A handbook for Contractors and Site Managers*, published by FÁS and the Construction Industry Federation, 2002 was also consulted in the preparation of this assessment.

15.3 RECEIVING ENVIRONMENT

The Proposed Development is located within the Local Authority area of Meath County Council (MCC).

In terms of waste management, the receiving environment is largely defined by MCC as the local authority responsible for setting and administering waste management activities in the area. This is governed by the requirements set out in the *Eastern-Midlands Region (EMR) Waste Management Plan 2015 – 2021*. This plan replaces the previous plan for the Dublin region due to changing National policy as set out in *A Resource Opportunity: Waste Management Policy in Ireland* and changes being enacted by the Waste Framework Directive. The waste management plan sets the following targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

The Regional Plan sets out the strategic targets for waste management in the region and sets a specific target for C&D waste of *“70% preparing for reuse, recycling and other recovery of construction and demolition waste”* (excluding natural soils and stones and hazardous wastes) to be achieved by 2020.

The National Waste Statistics update published by the EPA in October 2019 identifies that Ireland's current progress against this C&D waste target is at 71% and our progress against 'Preparing for reuse and recycling of 50% by weight of household derived paper, metal, plastic & glass (includes metal and plastic estimates from household WEEE)' is at 45%. Both of these targets are required to be met by 12 December 2020 in accordance with the requirements of the Waste Framework Directive.

The *Meath County Development Plan 2013 – 2019* sets out a number of policies and objectives for County Meath in line with the objectives of the regional waste management plan. The plan identifies waste prevention and minimisation will be a priority and there will be increased focus on the schools, community and business sectors to reduce waste arisings. Waste policies and objectives with a particular relevance to the proposed development are:

Policies:

- *WM POL 1: 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.*
- *WM POL 4: To seek in the Council's dealings with private companies that all waste shall be undertaken in compliance with the requirement of the EPA and relevant waste management legislation and policy.*

- *WM POL 7: To encourage the recycling of construction and demolition waste and the reuse of aggregate and other materials in future construction projects.*

Objectives:

- *WM OBJ 2: To continue to expand environmental awareness initiatives designed to create increased public awareness of waste prevention minimisation, reuse and resource efficiency. This should be encouraged at all sectors of society.*
- *WM OBJ 7: To promote the implementation of Waste Management Activities in accordance with 'Best Practice' and national policy.*
- *WM OBJ 8: To facilitate the implementation of national legislation and national and regional waste management policy*

The *Draft Meath County Development Plan 2020 – 2026* is currently under public consultation. This new development plan also sets out a number of new policies and objectives for County Meath in line with the objectives of the regional waste management plan, which is also currently out for public consultation. Waste policies and objectives with a particular relevance to the proposed development are:

Policies:

- *INF POL 65: 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 shall 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.*

- *INF POL 66: 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.*
- *INF POL 70: To encourage the recycling of construction and demolition waste and the reuse of aggregate and other materials in future construction projects.*

Objectives:

- *INF OBJ 68: To require developers to prepare construction and demolition waste management plans for new construction projects over certain thresholds which shall meet the relevant recycling/recovery targets for such waste in accordance with the national legislation and national and regional waste management policy*.

In terms of physical waste infrastructure, three municipal solid waste landfills remain operational in the Eastern Midlands Region (EMR) and are all operated by the private sector. There are a number of other licensed and permitted facilities in operation in the EMR including waste transfer stations, hazardous waste facilities and integrated waste management facilities. There are two existing thermal treatment facilities, one in Duleek, Co. Meath and a second facility in Poolbeg in Dublin.

15.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The Proposed Development is described in detail in Chapter 2 (Description of the Development). The aspects relevant to this chapter are described in the following sections.

15.4.1 Construction Phase

The construction of foundations for the GIS substation and the installation of ducting for the 220kV transmission line will require the excavation topsoil and potentially subsoil.

The optimum depth of excavation required to facilitate installation of the 220kV ducting for the transmission line is 1.21m below ground level (bgl) but may increase to up to c. 3.5m at utility crossings. The optimum width of each trench is 1.02m, however this may vary depending on ground conditions and existing services.

CSEA have estimated that c. 5,500m^3 of excavated material will be generated, i.e. c. c. 5,500m^3 of soils/stones (refer to Table 14.1). Suitable soils and stones will be reused on site as backfill or landscaping, where possible, it is currently envisaged that all of the excavated material will be reused onsite.

If there is any surplus excavated material that for some reason cannot be reused on site it will be removed off-site either as a waste or, where appropriate, as a by-product. Where the material is to be reused on another site as a by-product (and not as a waste), this will be done in accordance with Article 27 of the *European Communities (Waste Directive) Regulations 2011*. A formal documented EPA approval will be obtained before re-using the material as a by-product. It is not currently envisaged that any excavated material will be removed offsite.

If the material is deemed to be a waste, removal and reuse/recycling/recovery/disposal of the material will be carried out in accordance with the *Waste Management Act 1996* (as amended), the *Waste Management (Collection Permit) Regulations 2007* (as amended) and the *Waste Management (Facility Permit & Registration) Regulations*

2007 (as amended). The volume of waste requiring recovery/disposal will dictate whether a Certificate of Registration (COR), permit or licence is required by the receiving facility.

Nonetheless, in order to establish the appropriate reuse, recovery and/or disposal route for the surplus soils and stones to be removed off-site as a waste, it will first need to be classified. The material will initially need to be classified as hazardous or non-hazardous in accordance with the EPA publication *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous*. Environmental soil analysis will be carried out on a number of representative soil samples for a range of parameters to allow the soil to be accurately classified as hazardous or non-hazardous. In addition, soil analysis will also be carried out in accordance with the requirements for acceptance of waste at landfills (Council Decision 2003/33/EC Waste Acceptance Criteria). This legislation sets limit values for acceptance of waste at landfills based on properties of the waste including potential pollutant concentrations and leachability. (Note: Clean inert soils and stones excavated from greenfield sections of the route would generally not require classification/testing but would require a letter of suitability to be provided to the receiving facility.)

If there are any unforeseen surplus soils and stones they may be suitable for acceptance at either inert or non-hazardous soil recovery facilities/landfills in Ireland or, in the event of hazardous material being encountered, be transported for treatment/recovery or exported abroad for disposal in suitable facilities.

It is expected that wastes generated (other than excavated material and trees/shubbery) from other construction activities will be negligible and will generally comprise waste generated from construction workers. These wastes would generally be organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided at the site compound during the construction phase. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices. The welfare facilities and site office for the Proposed Development will be located in a site compound on an existing data storage facility site to the south of the Proposed Development where construction works are currently ongoing.

Further detail on the waste materials likely to be generated during the excavation and construction works are presented in the project-specific C&D WMP included as Appendix 14.1. The C&D WMP provides an estimate of the main waste types likely to be generated during the construction phase of the Proposed Development and these are summarised in Table 14.1. Volumes of surplus excavated material are based on estimates by the project engineers CSEA.

Table 14.1 Estimates for construction waste.

Waste Type	Tonnes
(Topsoil) Soils & Stones	5,500
Other	10
Total	5,510

It should be noted that until final materials and detailed construction methodologies have been confirmed it is difficult to predict with a high level of accuracy the construction waste that will be generated from the construction of the Proposed Development as the exact materials and quantities may be subject to some degree of change and variation during the detailed design and construction process. However, the above estimates are considered to be the worst case scenario

15.4.2 Operational Phase

Once operational, it is anticipated that very small amount of waste will be generated at the GIS substation from ESB networks staff during their inspections and maintenance works.

These wastes may include organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons) and non-recyclable waste. Waste fuels/oils, waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently.

15.5 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

This section details the potential waste impacts associated with the Proposed Development.

15.5.1 Construction Phase

As detailed in Section 14.4.1, the Proposed Development will generate waste from the welfare facilities and site office at the site compound.

If there is an surplus excavated material classified as waste (as opposed to a by-product) it will be segregated at source and transferred directly from site by a suitably permitted waste contractor(s) to suitably authorised receiving facilities.

Waste materials generated at the site compound from the welfare facilities and site office will be temporarily stored in dedicated receptacles at the site compound pending collection by a suitably permitted waste contractor(s). The waste storage area will need to be easily accessible to waste collection vehicles.

If waste material is not managed and stored correctly on the site or at the site compound, it is likely to lead to litter or pollution issues at site, site compound and/or on adjacent properties. The knock-on effect of litter issues is the presence of vermin on the site, site compound and the surrounding areas. Waste material will be appropriately managed on site so as to avoid these issues.

The use of non-permitted waste contractors for transportation or unauthorised receiving facilities could give rise to inappropriate management of waste and result in negative environmental impacts or pollution. Removal and reuse/recycling/recovery/disposal of waste material from site will be carried out in accordance with the *Waste Management Act 1996* (as amended), the *Waste Management (Collection Permit) Regulations 2007* (as amended) and the *Waste Management (Facility Permit & Registration) Regulations 2007* (as amended). It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices.

Wastes will be collected by a suitably permitted contractor(s) and be transferred to suitably registered/permitted/licenced waste facilities for processing and segregation, reuse, recycling, recovery and/or disposal. There are numerous authorised waste facilities in the Leinster region which can accept non-hazardous and hazardous waste materials and acceptance of waste from the Proposed Development would be in line with daily activities at these facilities. At present, there is sufficient capacity for the acceptance of the predicted construction waste materials at facilities in the region.

Where offsite reuse of the wastes generated is not feasible, recycling and/or recovery of the waste will be carried where possible. Recovery and recycling of construction waste has a positive impact on sustainable resource consumption, for example where waste trees/shrubbery is mulched into a landscaping product or waste asphalt is recycled for use in new pavements. The use of recycled materials, where suitable, reduces the consumption of natural resources.

There is a quantity of material (soils and stones) which will need to be excavated to facilitate the Proposed Development. Clean inert soils and stones excavated will be reused on site as backfill and for landscaping, where practical. In the event that potentially contaminated material is encountered, correct classification and segregation of the excavated material is required to ensure that any potentially contaminated materials are identified and handled in a way that will not impact negatively on the health and safety of workers as well as on the receiving environment, both on and off-site. Contaminated material will need to be removed off-site for appropriate treatment and/or disposal.

Reuse of suitable clean inert excavated material onsite, where practical, will reduce consumption of natural quarry resources.

The potential effect of construction waste generated from the Proposed Development is considered to be ***short-term, negative and not significant.***

15.5.2 Operational Phase

No waste will be generated from the operation of the proposed 220kV transmission line.

Small volumes of waste will be generated at the proposed GIS substation. The potential impacts on the environment of improper, or a lack of, waste management during the operational phase would be a diversion from the priorities of the waste hierarchy which would lead to small volumes of waste being sent unnecessarily to landfill.

The nature of the development means the generation of waste materials during the operational phase is an unavoidable impact. Networks of waste collection, treatment, recovery and disposal infrastructure are in place in the region to manage waste efficiently from this type of development. Waste which is not suitable for recycling is typically sent for energy recovery. There are also facilities in the region for segregation of municipal recyclables which is typically exported for conversion in recycled products (e.g. paper mills and glass recycling).

The waste materials generated on a weekly basis will require site storage within the substation prior to collection by an authorised waste contractor. Waste collection vehicles will be required to service the development on a regular basis to remove waste.

If waste material is not managed and stored correctly, it is likely to lead to litter or pollution issues at the development and on adjacent developments. The knock-on

effect of litter issues is the presence of vermin within the development and the surrounding areas.
The use of non-permitted waste contractors or unlicensed facilities could give rise to inappropriate management of waste and result in negative environmental impacts or pollution. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices.

The potential impact of operational waste generation from the development is considered to be ***long-term, negative*** and ***not significant***.

15.5.3 Do Nothing Scenario

If the Proposed Development was not to proceed there would be no additional construction or operational waste generation.

15.6 REMEDIAL AND MITIGATION MEASURES

This section outlines the measures that will be employed in order to reduce the amount of waste produced, manage the wastes generated responsibly and handle the waste in such a manner as to minimise the effects on the environment.

15.6.1 Construction Phase

A project specific C&D WMP has been prepared in line with the requirements of the *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects* published in 2006 by the Department of Environment Heritage and Local Government (DoEHLG). Adherence to the high level strategy presented in this C&D WMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the construction phase of the Proposed Development. Prior to commencement of construction, the main contractor will be required to refine/update this document to detail specific measures to minimise waste generation and resource consumption and provide details of the proposed waste contractors and destinations of each waste stream.

The project engineers, CSEA, have estimated that 5,500m^3 of excavated material will be generated. Suitable soils and stones will be reused on site as backfill and for landscaping where possible. It is currently envisaged that all of this material will reused on site. If the material has to be removed from site it will be reused offsite where practical and where it cannot be reused, it will be recycled/recovered or disposed.

In addition the following mitigation measures will be implemented:

- On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery – it is anticipated that the following waste types, at a minimum, will be segregated:
  - Soils and stones
  - In addition, the following wastes will be segregated at the site compound:
    - Organic (food) waste
    - Packaging (paper/card/plastic)
    - Mixed dry recyclables
    - Mixed non-recyclable waste
- All excavations will be carefully monitored by a suitably qualified person to ensure that potentially contaminated soil is identified and segregated, if encountered. In

the event that any potentially contaminated material is encountered, it will be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous and further classified as clean, inert, non-hazardous or hazardous in accordance with the EC Council Decision 2003/33/EC, which establishes the criteria for the acceptance of waste at landfills.
- Waste materials generated at the site compound will be stored in suitable receptacles in designated areas of the site compound;
- Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required);
- A waste manager will be appointed by the main contractor to ensure effective management of waste during the excavation and construction works;
- All construction staff will be provided with training regarding the waste management procedures;
- All waste leaving site will be reused, recycled or recovered where possible to avoid material designated for disposal;
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licenced facilities; and
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

If any soils and stones are required to be removed from site, any nearby sites requiring clean fill material will be contacted to investigate reuse opportunities for clean and inert material, which requires removal off-site. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with Article 27 of the *EC (Waste Directive) Regulations (2011)* as previously referred to Section 14.4 and detailed in the C&D WMP (Appendix 14.1).

These mitigation measures will ensure that the waste arising from the construction phase of the development is dealt with in compliance with the provisions of the *Waste Management Act 1996*, as amended, associated Regulations, the *Litter Pollution Act 1997 – 2009* and the *EMR Waste Management Plan (2015 - 2021)*. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved and will encourage sustainable consumption of resources.

15.6.2 Operational Phase

Small volumes of waste will be generated at the proposed GIS substation. No waste will be generated from the operation of the proposed 220kV transmission line.

Any waste materials will be segregated into appropriate categories and will be temporarily stored in appropriate bins or other suitable receptacles in a designated, easily accessible areas of the substation.

In addition, the following mitigation measures will be implemented:

- On-site segregation of all waste materials into appropriate categories including (but not limited to):
    - Dry Mixed Recyclables;
    - Organic food/green waste;
    - Mixed Non-Recyclable Waste;
    - Batteries (non-hazardous and hazardous);
    - Waste electrical and electronic equipment (WEEE) including computers, printers and other ICT equipment; and

  - Cleaning chemicals (solvents, pesticides, paints, adhesives, resins, detergents, etc.).
- All waste materials will be stored in colour coded bins or other suitable receptacles in a designated, easily accessible location. Bins will be clearly labelled with the approved waste type to ensure there is no cross contamination of waste materials;
- All waste collected from the development will be reused, recycled or recovered where possible, with the exception of those waste streams where appropriate facilities are currently not available;
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities; and
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

These mitigation measures will ensure the waste arising from the development is dealt with in compliance with the provisions of the *Waste Management Act 1996*, as amended, associated Regulations, the *Litter Pollution Act 1997* and the *EMR Waste Management Plan (2015 - 2021)*. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved.

15.7 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

The implementation of the mitigation measures outlined in Sections 14.6.1 and 14.6.2 will ensure that a high rate of reuse, recovery and recycling is achieved at the development during the construction phase of the project. It will also ensure that European, National and Regional legislative waste requirements with regard to waste are met and that associated targets for the management of waste are achieved.

15.7.1 Construction Phase

A carefully planned approach to waste management as set out in Section 15.6.1 and adherence to the C&DWMP during the construction and demolition phase will ensure that the impact on the environment will be ***short-term, neutral*** and ***imperceptible***.

15.7.2 Operational Phase

During the operational phase, a structured approach to waste management as set out in Section 15.6.2 will promote resource efficiency and waste minimisation. Provided the mitigation measures are implemented and a high rate of reuse, recycling and recovery is achieved, the predicted impact of the operational phase on the environment will be ***long-term, neutral*** and ***imperceptible***.

15.8 RESIDUAL IMPACTS

Adherence to the mitigation measures outlined in Section 14.6.1 and 14.6.2 will ensure that there are no significant impacts on resource or waste management from the Proposed Development. The management of waste during the construction phase in accordance with the Construction & Demolition Waste Management Plan (C&D WMP) and during the operational phase in accordance with the mitigation measures in Section 14.6.2 will meet the requirements of regional and national waste legislation and promote the management of waste in line with the priorities of the waste hierarchy. The residual impact will be ***neutral*** and ***imperceptible***.

15.9 REFERENCES

- Waste Management Act 1996 (No. 10 of 1996) as amended. Sub-ordinate and associated legislation include:
    - European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) as amended.
    - Waste Management (Collection Permit) Regulations 2007 (S.I. No. 820 of 2007) as amended.
    - Waste Management (Facility Permit and Registration) Regulations 2007 (S.I No. 821 of 2007) as amended.
    - Waste Management (Licensing) Regulations 2000 (S.I No. 185 of 2000) as amended.
    - European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014) as amended.
    - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997) as amended.
    - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
    - European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
    - European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended.
    - Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009) as amended.
    - European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 430 of 2015)
    - Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) as amended.
    - Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) as amended.
    - The European Communities (Transfrontier Shipment of Hazardous Waste) Regulations 1988 (S.I. No. 248 of 1988)
    - European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations 2011 (S.I. No. 324 of 2011)
    - European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015) as amended
- Protection of the Environment Act 2003, (No. 27 of 2003) as amended.
- Litter Pollution Act 1997 (S.I. No. 12 of 1997) as amended
- Eastern-Midlands Region Waste Management Plan 2015 – 2021 (2015).
- Department of Environment and Local Government (DoELG) Waste Management – Changing Our Ways, A Policy Statement (1998).
- Forum for the Construction Industry – Recycling of Construction and Demolition Waste.
- Department of Environment, Communities and Local Government (DoECLG), A Resource Opportunity - Waste Management Policy in Ireland (2012).
- Department of Environment, Heritage and Local Government, Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (2006).
- FÁS and the Construction Industry Federation (CIF), Construction and Demolition Waste Management – a handbook for Contractors and Site Managers (2002).
- Meath County Council (MCC), Meath County Council Development Plan 2013-2019 (2013)
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APPENDIX 15.1

CONSTRUCTION & DEMOLITION WASTE MANAGEMENT PLAN

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APPENDIX 15.1

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLAN

PROPOSED GIS SUBSTATION, 220KV TRANSMISSION LINES, BRACETOWN, DUNBOYNE, CO. MEATH

Technical Report Prepared By

Chonaill Bradley, Senior Environmental Consultant

Our Reference

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Title	Environmental Consultant	Associate
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CONTENTS

1.0 INTRODUCTION

AWN Consulting Ltd. (AWN) has prepared this Construction and Demolition (C&D) Waste Management Plan (WMP) for a proposed development at Bracetown, Dunboyne, Co Meath. The Proposed Development will compris a new Gas Insulated Substation 220kV GIS substation and two underground 220kV transmission line from the proposed substation to the existing Corduff overground line.

The purpose of this C&D WMP is to provide information necessary to ensure that the management of C&D waste at the site is undertaken in accordance with current legal and industry standards including the *Waste Management Acts 1996-2011* and associated Regulations [1], *Protection of the Environment Act 2003* as amended [2], *Litter Pollution Act 1997* as amended [3] and the *Eastern-Midlands Region Waste Management Plan 2015-2021* [4]. In particular, this C&D WMP aims to ensure maximum recycling, re-use and recovery of waste with diversion from landfill, where possible. It also seeks to provide guidance on the appropriate collection and transport of waste to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil or water resources).

In the preparation of the C&D WMP consideration has been given to the requirements of National and Regional waste policy, legislation and other guidelines (referred to in Section 2.0). However, in determining the structure and content of the document, the following two publications have been referenced in particular:

- Department of the Environment, Heritage and Local Government (DoEHLG)*, Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects* (2006) [5]*.*
- FÁS and the Construction Industry Federation (CIF), *Construction and Demolition Waste Management – a handbook for Contractors and Site Managers,* (2002) [6]*.*

These Guidance Documents are considered to define best practice for C&D projects in Ireland and describe how C&D projects are to be undertaken such that environmental impacts and risks are minimised and maximum levels of waste recycling are achieved.

2.0 OVERVIEW OF WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Government issued a policy statement in September 1998 titled as *'Changing Our Ways'* [7] which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland [7]. The target for C&D waste in this Strategy was to recycle at least 50% of C&D waste within a five-year period (by 2003), with a progressive increase to at least 82% over fifteen years (by 2013) [7].

In response to the *Changing Our Ways* report, a task force (Task Force B4) representing the waste sector of the already established Forum for the Construction Industry, released a report titled *Recycling of Construction and Demolition Waste* [8] concerning the development and implementation of a voluntary construction industry programme to meet the governments objectives for the recovery of construction and demolition waste.

A number of additional National and Regional Waste Policies, Strategies and Reports have been issued in previous years including:

- Department of the Environment, Heritage and Local Government (DoEHLG), *Preventing and Recycling Waste - Delivering Change* (2002);
- DoEHLG, *Making Ireland's Development Sustainable – Review, Assessment and Future Action, World Summit on Sustainable Development* (2002);
- DoEHLG, *Taking Stock and Moving Forward* (2004);
- DoEHLG, *National Strategy on Biodegradable* Waste (2006); and
- DoEHLG, *A Resource Opportunity* (2012).

The most recent national policy document was published in July 2012, entitled *A Resource Opportunity - Waste Management Policy in Ireland* [9]. This document stresses the environmental and economic benefits of better waste management, particularly in relation to waste prevention. The document sets out a number of actions in relation to C&D waste - it commits to undertake a review of specific producer responsibility requirements for C&D projects over a certain threshold.

The National Construction and Demolition Waste Council (NCDWC) was launched in June 2002, as one of the recommendations of the Forum for the Construction Industry, in the Task Force B4 final report. The NCDWC subsequently produced *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects* in July 2006 in conjunction with the Department of the Environment, Heritage and Local Government (DoEHLG).

The guidelines outline the issues that need to be addressed at the pre-planning stage of a development all the way through to its completion. These guidelines have been followed in the preparation of this document and include the following elements:

- Predicted construction and demolition wastes;
- Procedures to prevent and minimise wastes;
- Options for reuse/recycling/recovery/disposal of construction and demolition wastes;
- Provision of training for Waste Manager and site crew;
- Details of proposed record keeping system;
- Details of waste audit procedures and plan; and
- Details of proposed consultation with relevant bodies i.e. waste recycling companies, Meath County Council, etc.

2.2 Regional Level

The proposed development is located in the Local Authority area of Meath County Council (MCC).

The *Eastern-Midlands Region Waste Management Plan 2015 – 2021* is the regional waste management plan for the MCC area published in May 2015.

The Regional Plan sets out the strategic targets for waste management in the region and sets a specific target for C&D waste of *"70% preparing for reuse, recycling and other recovery of construction and demolition waste"* (excluding natural soils and stones and hazardous wastes) to be achieved by 2020.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - 150 per tonne of waste which includes a €75 per tonne landfill levy introduced under the *Waste Management (Landfill Levy) (Amendment) Regulations 2012.*

The *Meath County Development Plan 2013 – 2019* [10] sets out a number of policies and objectives for County Meath in line with the objectives of the regional waste management plan. The plan identifies waste prevention and minimisation will be a priority and there will be increased focus on the schools, community and business sectors to reduce waste arisings. Waste policies and objectives with a particular relevance to the proposed development are:

Policies:

- *WM POL 1: 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.*
- *WM POL 4: To seek in the Council's dealings with private companies that all waste shall be undertaken in compliance with the requirement of the EPA and relevant waste management legislation and policy.*

- *WM POL 7: To encourage the recycling of construction and demolition waste and the reuse of aggregate and other materials in future construction projects.*

Objectives:

- *WM OBJ 2: To continue to expand environmental awareness initiatives designed to create increased public awareness of waste prevention minimisation, reuse and resource efficiency. This should be encouraged at all sectors of society.*
- *WM OBJ 7: To promote the implementation of Waste Management Activities in accordance with 'Best Practice' and national policy.*
- *WM OBJ 8: To facilitate the implementation of national legislation and national and regional waste management policy*

The *Draft Meath County Development Plan 2020 – 2026* [11] is currently under public consultation. This new development plan also sets out a number of new policies and objectives for County Meath in line with the objectives of the regional waste management plan, which is also currently out for public consultation. Waste policies and objectives with a particular relevance to the proposed development are:

Policies:

- *INF POL 65: 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 shall 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.*
- *INF POL 66: 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.*
- *INF POL 70: To encourage the recycling of construction and demolition waste and the reuse of aggregate and other materials in future construction projects.*

Objectives:

- *INF OBJ 68: To require developers to prepare construction and demolition waste management plans for new construction projects over certain thresholds which shall meet the relevant recycling/recovery targets for such waste in accordance with the national legislation and national and regional waste management policy.*

2.3 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

- Waste Management Act 1996 (No. 10 of 1996) as amended. Sub-ordinate legislation includes:
    - European Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended
    - Waste Management (Collection Permit) Regulations (S.I No. 820 of 2007) as amended
    - Waste Management (Facility Permit and Registration) Regulations 2007, (S.I No. 821 of 2007) as amended
    - Waste Management (Licensing) Regulations 2004 (S.I. No. 395 of 2004) as amended
    - Waste Management (Packaging) Regulations 2014 (S.I. 282 of 2014) as amended
    - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997)
    - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
    - European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
    - European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended
    - Waste Management (Food Waste) Regulations 2009 (S.I. 508 of 2009), as amended
    - European Union (Household Food Waste and Bio-waste) Regulation 2015 (S.I. No. 191 of 2015)
    - Waste Management (Hazardous Waste) Regulations, 1998 (S.I. No. 163 of 1998) as amended
    - Waste Management (Shipments of Waste) Regulations, 2007 (S.I. No. 419 of 2007) as amended
    - Waste Management (Movement of Hazardous Waste) Regulations, 1998 (S.I. No. 147 of 1998)
    - European Communities (Transfrontier Shipment of Waste) Regulations 1994 (SI 121 of 1994)
    - European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015) as amended.
- Environmental Protection Act 1992 (No. 7 of 1992) as amended.
- Litter Pollution Act 1997 (No. 12 of 1997) as amended.
- Planning and Development Act 2000 (No. 30 of 2000) as amended.

These Acts and subordinate Regulations enable the transposition of relevant European Union Policy and Directives into Irish law.

One of the guiding principles of European waste legislation, which has in turn been incorporated into the Waste Management Acts 1996 – 2011 and subsequent Irish legislation, is the principle of *"Duty of Care"*. This implies that the waste producer is responsible for waste from the time it is generated through until its legal reuse, recycling, recovery and/or disposal (including its method of reuse, recycling, recovery and/or disposal). As it is not practical in most cases for the waste producer to physically transfer all waste from where it is produced to the final destination, waste contractors will be employed to physically transport waste to the final waste reuse, recycling, recovery and/or disposal site. Following on from this is the concept of *"Polluter Pays"* whereby the waste producer is liable to be prosecuted for pollution incidents, which may arise from the incorrect management of waste produced, including the actions of any contractors engaged (e.g. for transportation and disposal/recovery/recycling of waste).

It is therefore imperative that the appointed construction contractor(s) are legally compliant with respect to waste transportation, reuse, recycling, recovery and disposal. This includes the requirement that a contractor handle, transport and reuse/recycle/recover/dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities.

A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended, or a waste or Industrial Emissions (IE) licence granted by the EPA. The COR/permit/licence held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

3.0 DESCRIPTION OF THE PROJECT

3.1 Location, Size and Scale of the Development

The Proposed Development will consist of:

- 1 no Indoor Gas Insulated Switchgear (GIS) two storey building equipped with 8 no. 220kV bays and rated for the system voltage of 220 kV;
- Approximate Building dimensions (L: 50 metre W: 14.4 metre H: 16.5 metre)
- Two 220kV underground cables which will connect the proposed Substation development to existing transmission system;
- Oil-filled step-down 220/20 kV power transformers positioned within bunded enclosures; (height circa 6 metres);
- 8 no. lightning protection masts (height circa 15 metres);
- Single storey buildings used for control and ancillary;
- Internal access roads;
- A 2.6-metre-high palisade fence;
- Drainage infrastructure; and
- All associated and ancillary site development works.

A detailed description of the development is provided in Chapter 2 (Description of the Proposed Development) of the EIA Report. A description of the characteristics of the development relevant to waste are described in Section 14.4 of Chapter 14 (Waste Management).

3.2 Overview of the Non-Hazardous Wastes to be produced

The construction of foundations for the GIS substation and the installation of ducting for the 220kV transmission line will require the excavation topsoil and potentially subsoil.

The optimum depth of excavation required to facilitate installation of the 220kV ducting for the transmission line is 1.21m below ground level (bgl) but may increase to up to c. 3.5m at utility crossings. The optimum width of each trench is 1.02m, however this may vary depending on ground conditions and existing services.

CSEA have estimated that c. 5,500m^3 of excavated material will be generated, i.e. c. c. 5,500m^3 of soils/stones (refer to Table 14.1). Suitable soils and stones will be reused on site as backfill or landscaping, where possible, it is currently envisaged that all of the excavated material will be reused onsite.

During the construction phase of the proposed substation and installation of cables, waste produced will include surplus steel and other metal materials and broken/off-cuts of timber, plasterboard, concrete etc. Waste from packaging (cardboard, plastic, timber) and oversupply of materials are also likely to be generated.

Waste will also be generated by construction workers. These wastes would generally be organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided at the site compound during the construction phase. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices. The welfare facilities and site office for the proposed development will be located in the site compound for the permitted Building A development, which is targeted to commence construction in Q3 2019.

The contractor will be required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

3.3 Potentially Hazardous Waste

3.3.1 Contaminated Soil

Any surplus material that requires removal from site for offsite reuse, recovery and/or disposal as a waste and any potentially contaminated material (in the unlikely event that it is encountered), should be segregated, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled *'Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous'* using the *HazWasteOnline* application (or similar approved classification method). If the material is to be disposed of to landfill, it will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the *EC Council Decision 2003/33/EC* and landfill specific criteria. This legislation sets limit values on landfills for acceptance of waste material based on properties of the waste including potential pollutant concentrations and leachability.

Excavation works will be carefully monitored by a suitably qualified person to ensure any potentially contaminated soil is identified and segregated in accordance with the above procedure.

Further details on the soil quality at the site is provided in Chapter 6 (Land, Soils, Geology and Hydrogeology).

3.3.2 Fuel/Oils

As fuels and oils are classed as hazardous materials, any on-site storage of fuel/oil, all storage tanks and all draw-off points will be bunded and located in a dedicated, secure area of the site. Provided that these requirements are adhered to and the site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil waste generated at the site.

3.3.3 Other Known Hazardous Substances

Paints, glues, adhesives and other known hazardous substances will be stored in designated areas, if generated. They will generally be present in small volumes only or may not arise at all. If these wastes are generated, storage of these waste types will be kept to a minimum. Wastes will be stored in appropriate receptacles pending collection by an authorised waste contractor.

In addition, waste electrical and electronic equipment (WEEE) containing hazardous components and batteries (Lead, Ni-Cd or Mercury) may be generated from the temporary site office during construction works. These wastes will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor.

3.4 Main Construction and Demolition Waste Categories

The main non-hazardous and hazardous waste streams that may typically be generated by the construction activities at the proposed site are presented in Table 3.1. The List of Waste code (also referred to as the European Waste code or EWC) for each waste stream is also shown.

Table 3.1. Typical waste types generated, and List of Waste Codes (* individual waste type may contain hazardous materials)

Main Waste Material Types	**List of Waste Code**
Soil and stones	17 05
Biodegradable/Green Waste	20 02 01
Bituminous mixtures*	17 03 01/02
Other Waste Types (*which may be generated*)	**List of Waste Code**
Electrical and electronic components	20 01 35 & 36
Paper and cardboard	20 01 01
Mixed municipal waste	23 03 01
Mixed C&D waste	17 09 04
Batteries and accumulators*	20 01 33 & 34
Liquid fuels*	13 07 01, 02 & 03

4.0 ESTIMATED WASTE ARISINGS

4.1 Demolition Waste Generation

No demolition will be required to facilitate the construction of the new development.

4.2 Construction Waste Generation

The quantity of excavated material that will be generated has been estimated by the project engineers, CSEA, to be c. 5,500m^3. It anticipated that all of the material (topsoil) will be reused as backfill and in landscaping. If for some reason material has to be removed offsite it will be taken for the appropriate reuse, recycle/recovery or disposal.

It is expected that wastes generated (other than excavated material and trees/shrubbery) from other construction activities will be negligible and will generally comprise waste generated from construction workers. These wastes would generally be organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided at the site compound during the construction phase. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from the site office.

The welfare facilities and site office for the proposed development will be located in the site compound for the for the main development site

It should be noted that until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with a high level of accuracy the construction waste that will be generated from the proposed works as the exact materials and quantities may be subject to some degree of change and variation during the construction process.

4.3 Proposed Waste Management Options

Waste materials generated will be segregated on-site, where it is practical. Where the on-site segregation of certain wastes types is not practical, off-site segregation will be carried out. There will be skips and receptacles provided to facilitate segregation at source. All waste receptacles leaving site will be covered or enclosed. The appointed waste contractor will collect and transfer the wastes as receptacles are filled.

All waste arisings will be handled by an approved waste contractor holding a current waste collection permit. All waste arisings requiring reuse, recycling, recovery or disposal off-site will be transferred to a facility holding the appropriate COR, permit or licence, as required.

Written records will be maintained by the contractor detailing the waste arising throughout the construction phase, the classification of each waste type, the contact details and waste collection permit number of all waste contractors who collect waste from the site and the end destination details for all waste removed and disposed offsite.

Dedicated storage containers will be provided for hazardous wastes which may arise such as batteries, paints, oils, chemicals etc., as required. The containers used for storing hazardous liquids will be appropriately bunded or will be stored on suitably sized spill pallets.

The management of the main construction waste streams are detailed as follows:

Topsoil
The Waste Management Hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling/recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal. The volume of soil and stone to be excavated is estimated to be 24,300m^3.

It is currently anticipated that majority of the excavated material will be require removal off site, with some being used as backfill in the grassed areas, where possible.

If material needs to be removed offsite it will need to be removed off-site either as a waste or, where appropriate, as a by-product. Where the material is to be reused on another site as a by-product (and not as a waste), this will be done in accordance with Article 27 of the European Communities (Waste Directive) Regulations 2011. EPA agreement will be obtained before re-using the material as a by-product. It is not currently envisaged that any excavated material will be required to be removed offsite.

The next option (beneficial reuse) may be appropriate for the excavated material, subject to environmental testing to classify the material as hazardous or non-hazardous in accordance with the EPA Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous publication. Clean material may be used as fill material in other construction projects or engineering fill for waste licensed sites. Beneficial reuse of surplus excavation material as engineering fill may be subject to further testing to determine if materials meet the specific engineering standards for their proposed end-use.

Any nearby sites requiring clean fill/capping material could be contacted to investigate reuse opportunities for clean and inert material. If any soils/stones are imported onto the site from another construction site as a by-product (and not as a waste), this will also be done in accordance with Article 27. However, it is not expected that this will be necessary.

If the material is deemed to be a waste, then removal and reuse/recycling/ recovery/disposal of the material will be carried out in accordance with the Waste Management Acts 1996 – 2011 as amended, the Waste Management (Collection Permit) Regulations 2007 as amended and the Waste Management (Facility Permit & Registration) Regulations 2007 as amended. The volume of waste removed will dictate whether a COR, permit or licence is required by the receiving facility. Once all available beneficial reuse options have been exhausted, the options of recycling and recovery at waste permitted and licensed sites will be considered.

In the unlikely event that contaminated material is encountered and subsequently classified as hazardous, this material will be stored separately to any inert/non-hazardous material. It will require off-site treatment at a suitable facility or disposal abroad via Transfrontier Shipment of Wastes (TFS).

Tarmacadam

Tarmacadam excavated will be segregated and transferred off site for appropriate reuse, recycling, recovery and/or disposal.

Concrete

Concrete will be segregated and transferred off site for appropriate reuse, recycling, recovery and/or disposal.

Biodegradable/Green Waste

Trees and shrubbery removed will be transferred off site for appropriate reuse and/or recovery.

Waste Electrical and Electronic Equipment (WEEE)

Any WEEE generated in the site office will be stored in a dedicated container in the site office pending collection for recycling.

Batteries
Any waste batteries generated in the site office will be stored in a dedicated container in the site office pending collection for recycling.

Other Recyclables
Where any other recyclable wastes such as cardboard and soft plastic are generated at the site compound, these will be segregated at source into dedicated receptacles and removed off-site.

Non-Recyclable Waste
C&D waste which is not suitable for reuse or recovery, such as polystyrene, some plastics and some cardboards, will be placed in separate receptacles in the site compound. Prior to removal from site, the non-recyclable waste receptacle will be examined by a member of the waste team (see Section 7.0) to determine if recyclable materials have been placed in there by mistake. If this is the case, efforts will be made to determine the cause of the waste not being segregated correctly and recyclable waste will be removed and placed into the appropriate receptacle.

Other Hazardous Wastes
On-site storage of any hazardous wastes produced e.g. contaminated soil during excavations or waste fuels at the site compound will be kept to a minimum, with removal off-site organised on a regular basis. Storage of all hazardous wastes will be undertaken so as to minimise exposure to on-site personnel and the public and to also minimise potential for environmental impacts. Hazardous wastes will be recovered, wherever possible, and failing this, disposed of appropriately.

It should be noted that it is not possible to provide information on the specific destinations of each waste stream at this stage of the project. Prior to commencement of construction and removal of any construction waste offsite, details of the proposed destination of each waste stream will be provided to MCC for approval.

4.4 Tracking and Documentation Procedures for Off-Site Waste

All waste will be documented prior to leaving the site. Waste will be weighed by the waste contractor, either by weighing mechanism on the truck or at the receiving facility. These waste records will be maintained on site by the contractor.

All movement of waste and the use of waste contractors will be undertaken in accordance with the *Waste Management Acts 1996 – 2011* as amended, *Waste Management (Collection Permit) Regulations 2007* as amended and *Waste Management (Facility Permit & Registration) Regulations 2007* as amended. This includes the requirement for all waste contractors to have a waste collection permit issued by the NWCPO. The nominated project Waste Manager (see Section 6.0) will maintain a copy of all waste collection permits on-site.

If the waste is being transported to another site, a copy of the Local Authority COR, waste permit or EPA Waste/IE Licence for that site will be provided to the nominated project Waste Manager. If the waste is being shipped abroad, a copy of the TFS document will be obtained from Dublin City Council (as the relevant authority on behalf of all local authorities in Ireland) and kept on-site along with details of the final destination (permits, licences etc.). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

All information will be entered in a waste management recording system to be maintained on site.

5.0 ESTIMATED COST OF WASTE MANAGEMENT

An outline of the costs associated with different aspects of waste management is provided below. The total cost of construction waste management will be measured and will take into account handling costs, storage costs, transportation costs, revenue from rebates and disposal costs.

5.1 Reuse

By reusing materials on site, there will be a reduction in the transport and offsite recycling/recovery/disposal costs associated with the requirement for a waste contractor to take the material away to landfill.

Clean and inert excavated material which cannot be reused on site may be used as capping material for landfill sites, or for the reinstatement of quarries, etc. as previously discussed. This material is often taken free of charge for such purposes, reducing final waste disposal costs.

5.2 Recycling

Salvageable metals will earn a rebate which can be offset against the costs of collection and transportation of the skips. Clean uncontaminated cardboard and certain hard plastics can also be recycled. Waste contractors will typically charge less to take segregated wastes, such as recyclable waste, from a site than mixed waste streams.

5.3 Disposal

Landfill charges in the Eastern-Midlands region are currently at around €130-150 per tonne (which includes a €75 per tonne landfill levy specified in the *Waste Management (Landfill Levy) Regulations 2015*. In addition to disposal costs, waste contractors will also charge a fee for provision and collection of skips.

Collection of segregated construction waste usually costs less than municipal waste. Specific C&D waste contractors take the waste off-site to a registered, permitted or licensed facility and, where possible, remove salvageable items from the waste stream before disposing of the remainder to landfill.

6.0 TRAINING PROVISIONS

A member of the construction team will be appointed as the Waste Manager to ensure commitment, operational efficiency and accountability during the construction phase of the project.

6.1 Waste Manager Training and Responsibilities

The nominated Waste Manager will be given responsibility and authority to select a waste team if required, i.e. members of the site crew that will aid him/her in the organisation, operation and recording of the waste management system implemented on site. The Waste Manager will have overall responsibility to oversee, record and provide feedback to the Project Manager on everyday waste management at the site. Authority will be given to the Waste Manager to delegate responsibility to subcontractors, where necessary, and to coordinate with suppliers, service providers and sub-contractors to prioritise waste prevention and material salvage.

The Waste Manager will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on site. The Waste Manager will also be trained in the best methods for segregation and storage of recyclable materials, have information on the materials that can be reused on site and be knowledgeable in how to implement this C&D WMP.

6.2 Site Crew Training

Training of the site crew is the responsibility of the Waste Manager and, as such, a waste training program should be organised. A basic awareness course will be held for all site crew to outline the C&DWMP and to detail the segregation of waste materials at source. This may be incorporated with other site training needs such as general site induction, health and safety awareness and manual handling.

This basic course will describe the materials to be segregated, the storage methods and the location of the waste storage areas. A sub-section on hazardous wastes will be incorporated into the training program and the particular dangers of each hazardous waste will be explained.

7.0 RECORD KEEPING

Records should be kept for all waste material which leaves the site, either for reuse on another site, recycling or disposal. A recording system will be put in place to record the waste arising's on site.

A waste tracking log should be used to track each waste movement from the site. On exit from the site the waste collection vehicle driver should stop at the site office and sign out as a visitor and provide the security personnel or waste manager with a waste docket (or WTF for hazardous waste) for the waste load collected. At this time, the security personnel should complete and sign the Waste Tracking Register with the following information:

- Date
- Time
- Waste Contractor
- Company waste contractor appointed by e.g. Contractor or subcontractor name
- Collection Permit No.
- Vehicle Reg.
- Driver Name
- Docket No.
- Waste Type
- EWC/LoW

The waste transfer dockets will be transferred to the site waste manager on a weekly basis and can be placed in the Waste Tracking Log file. This information will be forwarded onto the MCC Waste Regulation Unit, when requested.

Alternatively, each subcontractor that has engaged their own waste contractor will be required to maintain a similar waste tracking log with the waste dockets/WTF maintained on file and available for inspection on site by the main contractor as required.

A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be maintained on site at all times. Subcontractors who have engaged their own waste contractors, should provide the main contractor with a copy of the waste collection permits and COR/permit/licence for the receiving waste facilities and maintain a copy on file available for inspection on site as required.

8.0 OUTLINE WASTE AUDIT PROCEDURE

8.1 Responsibility for Waste Audit

The appointed Waste Manager will be responsible for auditing the site during the construction and demolition phases of the project.

8.2 Review of Records and Identification of Corrective Actions

A review of all the records for the waste generated and transported on or off-site should be undertaken mid-way through the project. If waste movements are not accounted for, the reasons for this should be established in order to see if and why the record keeping system has not been maintained. The waste records will be compared with the established reuse/recovery/recycling/disposal targets for the site.

Each material type will be examined, in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved. Waste management costs will also be reviewed.

Upon completion of the construction phase, a final report will be prepared, summarising the outcomes of waste management processes adopted and the total reuse, recycling, recovery and disposal figures for the development.

9.0 CONSULTATION WITH RELEVANT BODIES

9.1 Local Authority

Once the main contractor has been appointed and prior to removal of any waste materials offsite, details of the proposed destination of each waste stream will be provided to MCC for their approval.

MCC will also be consulted, as required, throughout the construction phase in order to ensure that all available waste reduction, reuse and recycling opportunities are identified and utilised and that compliant waste management practices are carried out.

9.2 Recycling/Salvage Companies

Companies that specialise in C&D waste management will be contacted to determine their suitability for engagement. Where a waste contractor is engaged, each company will be audited in order to ensure that relevant and up-to-date waste collection permits and facility COR/permits/licences are held. In addition, information regarding individual construction materials will be obtained, including the feasibility of recycling each material, the costs of recycling/reclamation, the means by which the wastes will be collected and transported off-site and the recycling/reclamation process each material will undergo off site.

10.0 REFERENCES

1. Waste Management Act 1996 (No. 10 of 1996) as amended 2001 (No. 36 of 2001), 2003 (No. 27 of 2003) and 2011 (No. 20 of 2011). Subordinate and associated legislation includes:
    - European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) as amended 2011 (S.I. No. 323 of 2011)
    - Waste Management (Collection Permit) Regulations 2007 (S.I No. 820 of 2007) as amended 2008 (S.I. No. 87 of 2008) and 2016 (S.I. No. 24 of 2016)
    - Waste Management (Facility Permit and Registration) Regulations 2007 (S.I. No. 821 of 2007) as amended 2008 (S.I. No. 86 of 2008), 2014 (S.I. No. 310 and S.I. No. 546 of 2014) and 2015 (S.I. No. 198 of 2015)
    - Waste Management (Licensing) Regulations 2000 (S.I. No. 185 of 2000) as amended 2004 (S.I. No. 395 of 2004) and 2010 (S.I. No. 350 of 2010)
    - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997) as amended 1998 (S.I. No. 164 of 1998), 2001 (S.I. No. 356 of 2002) and 2011 (S.I. No. 126 and No. 192 of 2011)
    - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
    - European Communities (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
    - Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009) as amended 2015 (S.I. No. 190 of 2015)
    - European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 191 of 2015)
    - European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014) as amended 2015 (S.I. No. 542 of 2015)
    - European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
    - European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended 2014 (S.I. No. 349 of 2014) and 2015 (S.I. No. 347 of 2015)
    - Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) as amended 2000 (S.I. No. 73 of 2000)
    - Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) as amended by European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations 2011 (S.I. No. 324 of 2011)
    - The European Communities (Trans frontier Shipment of Hazardous Waste) Regulations 1988 (S.I. No. 248 of 1988) ○ European Union (Properties of Waste Which Render It Hazardous) Regulations 2015 (S.I. No. 233 of 2015)
2. Environmental Protection Act 1992 (Act No. 7 of 1992) as amended by the Protection of the Environment Act 2003 (Act No. 27 and S.I. No. 413 of 2003) and amended by the Planning and Development Act 2000 (Act No. 30 of 2000) as amended.
3. Litter Pollution Act 1997 (Act No. 12 of 1997) as amended by the Litter Pollution Regulations 1999 (S.I. No. 359 of 1999) and Protection of the Environment Act 2003, as amended.
4. Eastern-Midlands Waste Region, *Eastern-Midlands Region Waste Management Plan 2015 – 2021* (2015).

5. Department of the Environment, Heritage and Local Government (DoEHLG), *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects*, (2006).
6. FÁS and the Construction Industry Federation (CIF), *Construction and Demolition Waste Management – a handbook for Contractors and Site Managers*, (2002).
7. Department of Environment and Local Government (DoELG) *Waste Management – Changing Our Ways, A Policy Statement* (1998).
8. Forum for the Construction Industry, *Recycling of Construction and Demolition Waste* (1999).
9. Department of Environment, Communities and Local Government (DoECLG), *A Resource Opportunity - Waste Management Policy in Ireland* (2012).
10. Meath County Council (MCC), *Meath Development Plan 2013-2019* (2012).
11. MCC, *Draft Meath Development Plan 2020-2026 (2020).*
12. Environmental Protection Agency (EPA), *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* (2015).
13. EPA, *National Waste Database Reports 1998 – 2012*.
14. EPA and Galway-Mayo Institute of Technology (GMIT), EPA Research Report 146 – A Review of Design and Construction Waste Management Practices in Selected Case Studies – Lessons Learned (2015).

16.0 INTERACTIONS – INTERRELATIONSHIPS BETWEEN THE ASPECTS

16.1 INTRODUCTION

This chapter has been produced following the guidance within the EIA Directive, the *Planning and Development Act 2000* (as amended), the *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2017) and EPA Draft *Advice Notes for Preparing Environmental Impact Statements* (EPA, 2015).

In accordance with the guidance not only are the individual significant impacts required to be considered when assessing the impact of a development on the environment, but so must the interrelationships between these factors be identified and assessed.

The majority of the EIA Report chapters have already included and described assessments of potential interactions between aspects, considered by the various specialists contributing to this impact assessment. The quality, magnitude and duration of potential impacts are defined in accordance with the criteria provided in the EPA 2017 Guidance as outlined in Chapter 1 (Introduction). This section of the assessment presents a summary and assessment of the identified interactions.

Section 171A of the Planning and Development Act requires that the interactions between the following be assessed:

- Population and human health;
- Land, soil, water, air and climate;
- Biodiversity, with particular attention to species and habitats protected under the Habitats Directive and the Birds Directive; and
- Material assets, cultural heritage, and the landscape;

16.2 DISCUSSION – POSITIVE IMPACTS

The reasoning behind the interactions that are considered to have a positive effect (i.e. a change which improves the quality of the environment) is outlined in this section.

16.2.1 Planning and Alternatives; and:

Population and Human Health

The proposed development which supports the concurrent development will create significant temporary direct and indirect employment during the construction phase, additionally, in the longer term the proposed development will provide permanent direct and indirect employment. This will support economic development within the hinterland in which the development is located.

16.3 DISCUSSION – NEUTRAL IMPACTS

The reasoning behind the interactions that are considered to have a neutral effect (i.e. no effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error) is outlined in this section.

16.3.1 Population and Human Health; and:

Land, Soils, Geology and Hydrogeology

There will be a loss of soil available for agricultural use due to the development. However, within the overall context of Ireland's available farmland, the loss is considered negligible. The employment created by the construction and operation of the proposed development counterbalances this economic loss to some extent and so the impact is ***moderate*** and ***neutral***.

Hydrology

The proposed development represents an increase in hardstand, will impact on stormwater and foul wastewater which have the potential to impact on human health if not adequately managed.

Stormwater generated on site will be discharged at greenfield rates through the use of sustainable urban drainage systems (SuDS) which will reduce the risk of flooding and management of water quality as a result of the development. The foul sewer will discharge to the wastewater treatment plant at Ringsend. The Ringsend treatment plant is licenced by Irish Water and is expected to provide appropriate treatment for wastewater emissions.

The proposed development presents no perceived risk or hazard to populations. There are no other interactions. The impact is considered to be ***imperceptible, and long-term.***

Air Quality and Climate

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the impact of construction of the proposed development is likely to be **neutral, short-term and imperceptible** with respect to human health.

Landscape and Visual Impact

The impacts in terms of landscape and visual of the wider views in the vicinity of Dunboyne and the rural and agricultural lands. imperceptible to slight. As the proposed is either screened by intervening built or landscape elements, or if partially visible, will be absorbed within the larger concurrent data storage development.

In closer proximity to the development lands, at the existing business parks, along the R147 and the motorway, the proposed substation will be more distinct, but will nonetheless be seen as part of the larger scale data storage development and will not give rise to any additional adverse landscape and visual effects. Gunnocks House benefits from the enclosure of its own strong woodland setting, and is secluded from contemporary development, and the proposed development will not give rise to any significant landscape and visual effects from the property.

The interaction between human health and populations, and landscape and visual impact is neutral.

Archaeological, Architectural and Cultural Heritage

The construction phase of the proposed development will not impact directly on any sites included in the Record of Monuments and Places. However, it is possible that ground disturbance in greenfield areas will impact on previously unrecorded sub-surface archaeological features. The ability to excavate these sites through the construction phase will provide data to the archaeological community from the potential subsurface sites. The potential to gain knowledge outweighs the negative impact.

Material Assets, including Transport and Waste

The Proposed Development will have an impact on material assets such as water supply, power supply, and road infrastructure. The proposed development will have a not significant impact on waste. The predicted interaction between the connection to utilities and the populations and businesses in the surrounding area is ***imperceptible*** to ***not significant*** and ***neutral***.

The traffic assessment shows that the additional traffic movements associated with the proposed development ***neutral, imperceptible,*** and ***long term*** for the operational phase.

16.3.2 Hydrology; and:

Land, Soils, Geology and Hydrogeology

There is a potential impact on soil through poorly managed surface water run-off during the construction phase of the proposed development; however, this will be managed through the implementation of a Construction and Environmental Management Plan (CEMP) to ensure management of any accidental discharges to ground. Any interactions between hydrology and land and soils will be short-term, imperceptible and neutral.

Biodiversity

The proposed development will result in increased surface water run-off. Any surface water run-off will be attenuated to the greenfield runoff rate for the site. Surface water will be discharged offsite to the Pace Stream via hydrocarbon interceptor(s) and suitably designed SuDS to ensure any accidental emissions are controlled. Natura 2000 sites that are located downstream are over 30km away and an appropriate assessment screening has confirmed there is no likely impact on habitat requirements as a result of this development. The predicted effect of this will be long-term and neutral.

Air Quality and Climate

Mitigation measures implemented during the construction phase will ensure that the deposition of dust is minimised and therefore the predicted effect from air (including dust) on the hydrological environment during construction is ***short-term, imperceptible*** and ***neutral***.

Material Assets, including Transport and Waste

There is the potential for leaks and spills of waste during construction, it is envisioned the construction stage will be managed through a detailed CEMP that will be sufficient to minimise these impacts.

The Proposed Development will result in changes to surface water drainage, water supply and wastewater networks. However, a combination of mitigation measures to be implemented as detailed in Chapter 7 (Hydrology), as well as the capacity already built into these networks, will ensure that these changes will result in a ***long-term, imperceptible*** and ***neutral*** impact.

16.3.3 Land, Soils, Geology and Hydrogeology; and:

Biodiversity

The construction and operational phase will alter the existing agricultural habitat to a built environment, it is not envisioned that there will be any long-term impact on overall biodiversity. Appropriate mitigations have been implemented to reduce the impact on indigenous flora and fauna. The development is located in an area of low local ecological value and, as such, is predicted to have a **neutral** and **imperceptible** effect on biodiversity.

Air Quality and Climate

There is a potential for the construction activity to impact on air quality in terms of dust generated but mitigation measures outlined in both Chapter 6 (Land, Soils, Geology & Hydrogeology) and Chapter 9 (Air Quality & Climate) of this EIA Report, implemented through the CEMP, will ensure a short-term, imperceptible and neutral effect. There is no expected ongoing interaction during operation.

Landscape and Visual Impact

There will be periods of time during construction that will involve the excavation, movement and storage of soils on the site resulting in potentially unsightly soil / spoil areas. This will have a short-term and neutral impact.

Material Assets, including Transport and Waste

As detailed in the Chapter 14 (Material Assets and Waste), c. 6,100m3 is likely to be imported to the site for the site preparation, excavations and levelling works required to facilitate construction. Any spoil which cannot be reused on site will be removed off site for reuse or recovery, where practical, with disposal as last resort. Adherence to the mitigation measures and the requirements C&D Waste Management Plan, will ensure the effect is long-term, imperceptible and neutral.

16.3.4 Biodiversity; and:

Air Quality and Climate*:*

There is a potential for the construction activity to impact on air quality in terms of dust generated but mitigation measures outlined in both Chapter 6 (Land, Soils, Geology & Hydrogeology) and Chapter 9 (Air Quality & Climate) of this EIA Report, implemented through the CEMP, will ensure a that the impact on biodiversity is neutral.

Air dispersion modelling was undertaken as set out in Chapter 9 (Air Quality and Climate) the results from the modelling during the operational phase show that the emissions from the facility will comply with the relevant air quality limits.

Landscape and Visual Impact

The construction of the proposed development will involve the removal of some of the existing landscaping. However, this will be off-set and replaced by other suitable landscaping treatments and overall will have a long-term, imperceptible and neutral impact.

16.3.5 Landscape and Visual; and:

Archaeological, Architectural and Cultural Heritage

As stated in Chapter 12 (Archaeological, Architectural and Cultural Heritage) there is the potential for disturbance on sub-surface archaeological features within the site. Appropriate measures will be implemented during construction to ensure that the effect is neutral and imperceptible through assessment and recording.

The operational phase of the development will not impact directly on any sites included in the Record of Monuments and Places.

16.4 DISCUSSION – NEGATIVE IMPACTS

The reasoning behind the interactions that are considered to have a negative effect (i.e. a change which reduces the quality of the environment) is outlined in this section.

16.4.1 Population and Human Health, and:

Air quality and climate

An air quality assessment was undertaken as set out in Chapter 9 (Air Quality and Climate) to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health.

The potential for dust during construction will be managed through dust control measures to minimise the impact on human health. Therefore the impact of the proposed development in terms of dust soiling or particulate matter emissions will be ***negative, imperceptible*** and ***short-term*** at nearby receptors.

Noise and Vibration

During the construction phase of the proposed development there will be some impact on nearby noise sensitive properties due to noise emissions from construction site works. The application of noise limits and hours of operation, along with implementation of appropriate noise and vibration control, will ensure that noise and vibration impact is kept to a minimum. Also, it is reiterated that any construction noise impacts will be ***negative***, ***moderate,*** and ***temporary*** in nature.

Proprietary noise and vibration control measures will be employed in order to ensure that noise emissions from building services plant do not exceed the adopted criterion at the façade of any nearby noise sensitive locations. In addition, noise emissions should be broadband in nature and should not contain any tonal or impulsive elements. The resultant noise impact is ***negative***, ***moderate*** and ***long-term***.

There will be no significant noise or vibration emissions from the operation of the underground cable. Consequently, there are no expected operational noise impacts.

Material Assets, including Transport and Waste

Traffic modelling (Chapter 13) for the worst-case construction traffic impact for the proposed development has been assessed. The impact of the construction phase of the development was found to be ***negative, not significant,*** and ***short-term*** for the during peak construction.

Any change in noise levels associated with vehicles at road junctions in the vicinity of the proposed development is expected to be ***imperceptible*****.** The resultant noise impact is ***negative, imperceptible*** and ***long-term.***

16.5 SUMMARY

In summary, the interactions between the environmental factors and impacts discussed in this EIA Report have been assessed and the majority of interactions are neutral.

The worst-case scenario for traffic and noise during construction phase are considered negative in relation to local population. During operation although noise impact will be greater than in the current agricultural environment, and therefore negative, it will not result in a significant impact on human health.

The proposed development and concurrent development will create significant temporary direct and indirect employment This will have a positive benefit on the economic development within the hinterland in which the development is located.

16.6 TABLE OF INTERACTIONS

	Planning and Development		Population & Human Health		Hydrology		Land, Soils and Hydrogeology		Biodiversity		Air Quality and Climate		Noise and Vibration		Landscape and Visual Impact		Cultural Heritage		Material Assets, transport, and Waste	
	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Planning and Development			+	+	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕
Population & Human Health					o	o	o	o	✕	✕	-	✕	-	-	o	o	o	o	o / -	o / -
Hydrology							o	o	o	o	o	✕	✕	✕	✕	✕	✕	✕	o	o
Land, Soils and Hydrogeology									o	o	o	✕	✕	✕	o	✕	✕	✕	o	o
Biodiversity											o	✕	-	✕	✕	✕	✕	✕	✕	✕
Air Quality and Climate													✕	✕	✕	✕	✕	✕	✕	✕
Noise and Vibration															✕	✕	✕	✕	✕	✕
Landscape and Visual Impact																	o	o	✕	✕
Cultural Heritage																			✕	✕
Material Assets and Waste																				

Con.	Construction Phase
Op.	Operational Phase
✕	No Interaction

+	Positive Interaction
o	Neutral Interaction
-	Negative Interaction