Proposed Strategic Housing Development at
Ballymacaula, Drumbiggle, Keelty,
Circular Road, Ennis, Co. Clare

Volume III

List of Appendices

August 2022

Glenveagh
Home of the new.

McCutcheon Halley
CHARTERED PLANNING CONSULTANTS

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Appendix 1.1 Public Consultation

August 2022

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Majella O'Callaghan
Mc Cutcheon Halley
Arran Court
Kreston House,
Arran Quay,
Dublin,
D07 K271
By email mocallaghan@mhplanning.ie

Date/Dáta: 17-02-2022

Re: TII22-117109 - EIS Scoping for Proposed SHD Application in Ennis Co. Clare

Dear Ms. O'Callaghan,

I refer to your letter of 31st of January, relating to the above.

Transport Infrastructure Ireland (TII) safeguards the strategic function of Luas and National Roads to promote the safe and efficient operation of both the national roads and light rail networks.

The approach to be adopted by TII in making submissions or comments will seek to uphold official policy and guidance as outlined in the Spatial Planning and National Roads Guidelines for Planning Authorities (2012). Regard should also be had to other relevant guidance available at www.TII.ie.

With regard to this location and area, TII has made submissions on planning applications file references 18/811 and 17/237 requesting clarification on proposals for surface water disposal which had the potential to impact on the N85, national road, drainage regime.

TII does not support proposals for private development to discharge to national road drainage infrastructure. Such proposals have the potential to impact on the capacity and efficiency of the drainage regime provided for the national road network. It is TII's opinion that adequate surface water drainage proposals need to be presented for development proposals in this area which demonstrate that the drainage regime associated with the N85, national road, is safeguarded and independent from the road.

It is requested that the applicant addressees this matter comprehensively and, where warranted, alternative surface water disposal proposals developed prior to the making of a future planning application.

TII will not be responsible for the costs of any future mitigation, repair or improvement required to the national road and associated drainage regime to remedy any negative impacts arising as a result of private development proposals being facilitated by the planning authority. Such costs will be the responsibility of the Council and/or the applicant.

With respect to General EIAR Scoping issues, the recommendations indicated below provide only general guidance for the preparation of EIAR, which may affect the National Roads Network. The developer should have regard, *inter alia*, to the following;

As set down in the DoECLG Spatial Planning and National Roads Guidelines (2012) it is in the public interest that, in so far as is reasonably practicable, that the national road network continues to serve its intended strategic purpose. The EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network to demonstrate that the development can proceed complementary to safeguarding the capacity, safety and operational efficiency of that network.

1. Consultations should be had with the relevant Local Authority/National Roads Design Office with regard to locations of existing and future national road schemes.

2. The Environmental Assessment should have regard to previous Environmental Assessment Statements/Reports and conditions and/or modifications imposed by An Bord Pleanála regarding road schemes in the area.

3. Where appropriate, subject to meeting the appropriate thresholds and criteria and having regard to best practice, a Traffic and Transport Assessment be carried out in accordance with relevant guidelines, noting construction and operational traffic volumes attending the site and traffic routes to/from the site with reference to impacts on the national road network and junctions of lower category roads with national roads. The Authority's Traffic and Transport Assessment Guidelines (2014) should be referred to in relation to proposed development with potential impacts on the national road network. The scheme promoter is also advised to have regard to Section 2.2 of the TII TTA Guidelines which addresses requirements for sub-threshold TTA.

4. TII Standards should be consulted to determine the requirement for Road Safety Audit (RSA) and Road Safety Impact Assessment (RSIA).

5. Assessments and design and construction and maintenance standards and guidance are available at TII Publications that replaced the NRA Design Manual for Roads and Bridges (DMRB) and the NRA Manual of Contract Documents for Road Works (MCDRW).

6. Environmental Impact Assessment shall include provision for travel planning / mobility management planning in the interests of protecting national roads capacity in the interests of sustainable travel policy.

7. The developer, in conducting Environmental Impact Assessment, should have regard to TII Environment Guidelines that deal with assessment and mitigation measures for varied environmental factors and occurrences. In particular evidenced assessment of the protection of the strategic function of the national road and interface with adjacent land uses in relation to the following matters is required;

   i. TII's Environmental Assessment and Construction Guidelines, including the *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (National Roads Authority, 2006),

   ii. The EIAR should consider the Environmental Noise Regulations 2006 (SI 140 of 2006) and, in particular, how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers and attenuation to reduce noise impacts (see *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (1st Rev., National Roads Authority, 2004)). The Authority will entertain no future claims in respect of impacts on the proposed development, if approved, due to the presence of the existing road or any new road scheme which is currently in planning.

   iii. The Authority requests that the EIAR has regard to the provisions of Chapter 3 of the DoECLG Spatial Planning and National Roads Guidelines in the assessment and determination of the subject planning application. The Authority will entertain no future claims in respect of impacts (e.g. dust , glare visual etc.) on the proposed development, if approved, due to the presence of the existing road or any new road scheme which is currently in planning.

The developer is advised that any additional works/structures required as a result of the Assessment should be funded by the developer.

Notwithstanding, any of the above, the developer should be aware that this list is non-exhaustive, thus site and development specific issues should be addressed in accordance with best practise.
I hope that the above comments are of use in your scoping process.

In the interests of clarity, the issuing of this correspondence is provided as best practice guidance only. This correspondence does not prejudice TII's statutory right to make any observations, requests for further information, objections or appeals following the examination of any valid planning application referred.

Yours sincerely,

Tara Spain
Head of Land Use Planning

UISCE ÉIREANN : IRISH WATER

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Baile Átha Cliath 1
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Éire

Irish Water
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6 Joyce House,
Barrack Square
Ballincollig, Co Cork
P31 YX97

8th February 2022

Re: EIA Scoping Request – Strategic Housing Development at Ballymacaula, Keelty, Drumbiggle, Circular Road, Ennis Co. Clare.

Dear Ms O'Callaghan,

Irish Water has received notification of your Environmental Impact Assessment (EIA) scoping request relating to your Strategic Housing Development (SHD) proposal to construct a "residential development of c. 285 no. residential units" at Ballymacaula, Keelty, Drumbiggle, Circular Road, Ennis Co. Clare.

Please see attached, Irish Water's scoping opinion in relation to Water Services. On receipt of the planning referral, Irish Water will review the finalised Environmental Impact Assessment Report (EIAR) as part of the planning process.

Queries relating to the terms and the EIA scoping opinions below should be directed to planning@water.ie

Yours sincerely,

Signed on behalf of Irish Water:

PP: Ali Robinson

Yvonne Harris
Connections and Development Services

Irish Water's Response to EIA Scoping Requests

At present, Irish Water does not have the capacity to advise on the scoping of individual projects. However, in general the following aspects of Water Services should be considered in the scope of an EIA where relevant;

a) Where the development proposal has the potential to impact an Irish Water Drinking Water Source(s), the applicant shall provide details of measures to be taken to ensure that there will be no negative impact to Irish Waters Drinking Water Source(s) during the construction and operational phases of the development. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified as part of the report.

b) Where the development proposes the backfilling of materials, the applicant is required to include a waste sampling strategy to ensure the material is inert.

c) Mitigations should be proposed for any potential negative impacts on any water source(s) which may be in proximity and included in the environmental management plan and incident response.

d) Any and all potential impacts on the nearby reservoir as public water supply water source(s) are assessed, including any impact on hydrogeology and any groundwater/ surface water interactions.

e) Impacts of the development on the capacity of water services (*i.e. do existing water services have the capacity to cater for the new development*). This is confirmed by Irish Water in the form of a Confirmation of Feasibility (COF). If a development requires a connection to either a public water supply or sewage collection system, the developer is advised to submit a Pre-Connection Enquiry (PCE) enquiry to Irish Water to determine the feasibility of connection to the Irish Water network. All pre-connection enquiry forms are available from https://www.water.ie/connections/connection-steps/.

f) The applicant shall identify any upgrading of water services infrastructure that would be required to accommodate the proposed development.

g) In relation to a development that would discharge trade effluent – any upstream treatment or attenuation of discharges required prior to discharging to an Irish Water collection network.

h) In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks and potential measures to minimise and or / stop surface waters from combined sewers.

i) Any physical impact on Irish Water assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets.

j) When considering a development proposal, the applicant is advised to determine the location of public water services assets, possible connection points from the applicant's site / lands to the public network and any drinking water abstraction catchments to ensure these are included and fully assessed in any pre-planning proposals. Details, where known, can be obtained by emailing an Ordnance Survey map identifying the proposed location of the applicant's intended development to datarequests@water.ie.

k) Other indicators or methodologies for identifying infrastructure located within the applicant's lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc. within the proposed site.

l) Any potential impacts on the assimilative capacity of receiving waters in relation to Irish Water discharge outfalls including changes in dispersion / circulation characterises. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified within the report.

m) Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (*and resultant potential impact on the capacity of the source*) or the potential of the development to influence / present a risk to the quality of the water abstracted by Irish Water for public supply should be identified within the report.

n) Where a development proposes to connect to an Irish Water network and that network either abstracts water from or discharges wastewater to a "protected"/ sensitive area, consideration as to whether the integrity of the site / conservation objectives of the site would be compromised should be identified within the report.

o) Mitigation measures in relation to any of the above ensuring a zero risk to any Irish Water drinking water sources (Surface and Ground water).

This is not an exhaustive list.

Please note;

- Where connection(s) to the public network is required as part of the development proposal, applicants are advised to complete the Pre-Connection Enquiry process and have received a Confirmation of Feasibility letter from Irish Water ahead of any planning application.

- Irish Water will not accept new surface water discharges to combined sewer networks.

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

An tSeirbhís Sláinte Comhshaoil
Feidhmeannacht na Seirbhíse Sláinte,
Ionad 6, Páirc Ghnó Bothar Chuinche,
Inis, Co. An Chlár.

Environmental Health Service,
Health Service Executive,
Unit 6, Quin Road Business Park,
Ennis, Co. Clare.

☎ **(065) 6706660**

Date:	11 February 2022
Name:	Ms. Majella O'Callaghan, McCutcheon Halley, 6 Joyce House, Barrack Square, Ballincollig, Cork
Consultant's reference:	Ennis Development Strategic Housing Development
Re:	Scoping Report
Proposed development:	Proposed 285 no. residential units at Ballymacaula, Keelty, Drumbiggle, Circular Road, Ennis, Co. Clare
Applicant:	Glenveagh Homes Ltd.
EHIS Reference:	2194

Dear Ms. O'Callaghan,

Please find enclosed the HSE Consultation Report in relation to the above proposal.
The following HSE departments were made aware of the consultation request for the proposed development on 25 January 2022

- Emergency Planning –Kay Kennington
- Estates – Helen Maher/Stephen Murphy
- Assistant National Director for Health Protection – National Clinical Director for Health Protection
- CHO – Maria Bridgeman

If you have any queries regarding this report, the initial point of contact is Mr. Gerard Leen, Principal Environmental Health Officer, undersigned, who will refer your query to the appropriate person.

Yours sincerely

Gerard Leen

____
Gerard Leen
Principal Environmental Health Officer

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

An tSeirbhís Sláinte Comhshaoil
Feidhmeannacht na Seirbhíse Sláinte,
Ionad 6, Páirc Ghnó Bothar Chuinche,
Inis, Co. An Chlár.

Environmental Health Service,
Health Service Executive,
Unit 6, Quin Road Business Park,
Ennis, Co. Clare.

☏ **(065) 6706660**

HSE EIAR Scoping Consultation Report
Environmental Health Service Submission Report

Date:	11th February 2022
Our reference:	EHIS 2194
Report to:	Ms Majella O'Callaghan, McCutcheon Halley, 6 Joyce House, Barrack Square, Ballincollig, Cork
Consultant's reference:	Ennis Development Strategic Housing Development
Type of Consultation:	EIA Scoping
Applicant:	Glenveagh Homes Ltd.
Proposed development:	Proposed 285 no. residential units at Ballymacaula, Keelty, Drumbiggle, Circular Road, Ennis, Co. Clare

General
This report only comments on Environmental Health impacts of the proposed development. We have made observations on the following specific areas:

Description of the Project
The EIAR must fully describe the existing physical environment and detail any potential impacts on the existing environment both during the construction and operational phase of the project.
The design characteristics of the project and the reasons for proposing same should be outlined. It is recommended a diverse variety of household types is provided in the residential development to offer people a range of lifestyle, affordability and life stage choices. All residential development should incorporate the 'Universal Design' Principle to ensure the housing can meet the needs of the occupants regardless of their age, size, ability or disability.

It is also recommended that the development proposals are assessed to ensure compliance with the objectives of the Clare County Development Plan 2017-2023 (as varied)

Later Consents Required:
Information on any possible future monitoring requirements for the proposed strategic housing development should be included in the EIAR.
Consideration of Alternatives:
The EIAR should fully describe and consider any alternatives to this project. The applicant should outline a rationale for the site selection and the proposed scheme design.
Public Consultation:
The EIAR should describe measures the applicant took to inform the public about the project. Details of feedback from the public regarding the proposal should be included within the EIAR. Public consultation should be a two way

process between the applicant and the public. The EIAR should clearly demonstrate how the legitimate concerns of the public have been assessed and evaluated and how the outcome of consultation with the public influenced decision making within the environmental impact assessment.

Construction
The construction phase of the development creates the potential for temporary emissions which may have a negative impact on the environment and on the health of local residents. The applicant should assess the impacts of construction works having particular regard to:

- Waste Management
- Pest Control Management
- Emissions to air including noise, dust and vibration
- Emissions to Surface/Groundwater

All sensitive receptors in the vicinity of construction works should be identified and measures implemented to ensure they are protected. It is also recommended a Site Specific Construction Management Plan is prepared and included in the EIAR.

Drainage
Any natural flood plains or wetlands on or in the vicinity of the site should be identified and measures implemented to ensure they are protected. The impact of the proposed Strategic Housing Development on watercourses/wetlands further downstream should be assessed.
An integrated approach to surface water management should be implemented on the site. It is recommended that green space and nature based solutions are provided for the storage and conveyance of rainwater on site and to improve flood mitigation in line with the principals of Sustainable Urban Drainage Systems (SUDS)

Climate
It is recommended the applicant ensures climate considerations are fully integrated into the planning of the strategic housing development and outlines how the proposed buildings contribute to climate action through their design. Specific measures which conserve energy consumption and reduce carbon emissions should be outlined in the EIAR. The applicant should assess the vulnerability of the proposed development against the predicted impacts of a warming climate and they should predict and should outline proactive adaption measures to ensure the long term resilience of the site infrastructure to the impacts of climate change.

Health
Directive 2014/52/EU has an increased requirement to assess potential significant impacts on Population and Human Health. In the experience of the EHS impacts on human health are generally inadequately assessed in EIA in Ireland. It is recommended that the wider determinants of health and wellbeing are considered. Guidance on determinants of health can be found at www.publichealth.ie
The proposed strategic housing development should be explored for any opportunity to promote physical activity and any potential for health gain should be exploited.
It is recommended that measures to promote walking and cycling throughout the development are implemented along with proposals to ensure the connectivity of the site with the wider Ennis urban area. Recreational facilities should be provided to cater specifically for the needs of adolescents and the elderly, along with younger children.
Sustainable transport
The impact of traffic from the proposed Strategic Housing Development should be assessed by carrying out a traffic and transport assessment. An assessment of existing sustainable transport facilities and capacity should also be carried out. It is recommended that the applicant outlines a travel plan for the proposed development which will facilitate and promote the use of public or active transport options for residents.
Landscape
Green recreational space is proven to have positive impacts on health, both physical and mental. The recent global pandemic has highlighted the importance of access to open green space for recreational purposes for the public. The provision of quality, usable, safe urban green space is of paramount importance as housing design becomes more compact.
The applicant should assess the impact the proposed Strategic Housing Development will have on existing biodiversity in the area. The impact of any possible loss of recreational and amenity green area as a result of the proposed development should also be assessed.

It is recommended that green planting is integrated at every opportunity throughout the development to improve the quality of the built environment and the applicant should outline a diverse range of green spaces for the development in the EIAR. The applicant shall also outline proposals to protect and promote biodiversity on the site.

Noise:

The World Health Organisation (WHO) has identified environmental noise as an increasing cause of ill health and detrimental effect on health and wellbeing.

A noise assessment must be undertaken to assess the impact of noise from the proposed Strategic Housing Development on the residents living in the vicinity. Noise from traffic movements or heavy goods vehicles associated with the operation of the development should also be included in the noise assessment.

It is essential that up to date baseline monitoring is undertaken to establish the existing noise environment. All noise sensitive receptors in the vicinity of the facility should be identified. The selection of noise monitoring locations for background noise is of critical importance in the noise survey, therefore the rationale for choosing the number and the positioning of these should be provided by the applicant.

Once the existing noise environment has been established, the predicted increase in noise from the proposed Strategic Housing Development should then be quantified and assessed. It is the opinion of the Environmental Health Service that adherence to specified noise limit values do not always protect sensitive receptors from noise nuisance. Therefore the significance of the predicted change in the noise environment should be fully assessed.

It is requested that this information is outlined and displayed clearly in the EIAR.

Sustainable Development

The significance of the impact the proposed Strategic Housing Development will have on the existing town centre of Ennis should be examined and assessed in the EIAR. The applicant should demonstrate compliance with the Retail Planning Guidelines 2012 5which promote "*town centre vitality through a sequential approach to planning".*

It is imperative that the key infrastructure facilities and amenities currently within the town of Ennis are examined to ensure the town can sustainably accommodate the proposed increase in residential development

The cumulative impacts of any other proposed housing developments in the vicinity should also be assessed.

Rory O'Dea
Senior Environmental Health Officer
HSE West
Unit 6 Quin Road Business Park
Quin Road
Ennis

Caroline Hueston
Environmental Health Officer
Environment OU
Ennistymon Health Centre
Ennistymon
Co. Clare

Emer Sexton
McCutcheon Halley
6 Joyce House
Barrack Square
Ballincollig
Co. Cork

15 February 2022

Re: Proposed Strategic Housing Development, Drumbiggle, Circular Road, Ennis, Co Clare
Your Ref: n/a
Our Ref: 22/28

Dear Emer,

Geological Survey Ireland is the national earth science agency and is a division of the Department of the Environment, Climate and Communications. We provide independent geological information and advice and gather various data for that purpose. Please see our website for data availability. We recommend using these various data sets, when conducting the EIAR, SEA, planning and scoping processes. Use of our data or maps should be attributed correctly to 'Geological Survey Ireland'.

With reference to your email received on the 03 February 2022, concerning the proposed Strategic Housing Development at Drumbiggle, Circular Road, Ennis, Co Clare, Geological Survey Ireland would encourage use of and reference to our datasets. Please find attached a list of our publicly available datasets that may be useful to the environmental assessment and planning process. We recommend that you review this list and refer to any datasets you consider relevant to your assessment. The remainder of this letter and following sections provide more detail on some of these datasets.

Geoheritage

A national inventory of geoheritage sites known as County Geological Sites (CGSs) is managed by the Geoheritage Programme of Geological Survey Ireland. CGSs, as adopted under the National Heritage Plan, include sites that are of national importance which have been selected as the very best examples for NHA (Natural Heritage Areas) designation. NHA designation will be completed in partnership with the National Parks and Wildlife Service (NPWS). CGSs are now routinely included in County Development Plans and in the GIS of planning departments, to ensure the recognition and appropriate protection of geological heritage within the planning system. CGSs can be viewed online under the Geological Heritage tab on the online Map Viewer.

The audit for Co. Clare was completed in 2005. The full report details can be found here. **Our records show that there are no CGSs in the vicinity of the proposed housing development.**

Groundwater

Geological Survey Ireland's Groundwater and Geothermal Unit, provides advice, data and maps relating to groundwater distribution, quality and use, which is especially relevant for safe and secure drinking water supplies and healthy ecosystems.

Proposed developments need to consider any potential impact on specific groundwater abstractions and on groundwater resources in general. We recommend using the groundwater maps on our Map viewer. which should include: wells; drinking water source protection areas; the national map suite - aquifer, groundwater vulnerability, groundwater recharge and subsoil permeability maps. **For areas underlain by limestone, please refer to the karst specific data layers (karst features, tracer test database; turlough water levels (gwlevel.ie).** Background information is also provided in the Groundwater Body Descriptions. Please read all disclaimers carefully when using Geological Survey Ireland data.

The Groundwater Data Viewer indicates a 'Regionally Important Aquifer - Karstified (conduit)' underlies the proposed housing development.

The Groundwater Vulnerability map indicates a range of groundwater vulnerabilities within the area covered is variable. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability and 'Rock at or near surface' in your assessments, as any groundwater-surface water interactions that might occur would be greatest in these areas.

The Groundwater Protection Response overview and link to the main report is here: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater-and-geothermal-unit/projects/protecting-drinking-water/what-is-drinking-water-protection/county-groundwater-protection-schemes/Pages/default.aspx.

GWClimate is a groundwater monitoring and modelling project that aims to investigate the impact of climate change on groundwater in Ireland. This is a follow on from a previous project (GWFlood) and the data may be useful in relation to Flood Risk Assessment (FRA) and management plans. Maps and data are available on the Map viewer.

Geological Mapping
Geological Survey Ireland maintains online datasets of bedrock and subsoils geological mapping that are reliable and accessible. We would encourage you to use these data which can be found here, in your future assessments.

Geotechnical Database Resources
Geological Survey Ireland continues to populate and develop our national geotechnical database and viewer with site investigation data submitted voluntarily by industry. The current database holding is over 7500 reports with 134,000 boreholes; 31,000 of which are digitised which can be accessed through downloads from our Geotechnical Map Viewer. We would encourage the use of this database as part of any baseline geological assessment of the proposed development as it can provide invaluable baseline data for the region or vicinity of proposed development areas. This information may be beneficial and cost saving for any site-specific investigations that may be designed as part of the project.

Natural Resources (Minerals/Aggregates)
Geological Survey Ireland provides data, maps, interpretations and advice on matters related to minerals, their use and their development in our Minerals section of the website. The Active Quarries, Mineral Localities and the Aggregate Potential maps are available on our Map Viewer. **We would recommend use of the Aggregate Potential Mapping viewer to identify areas of High to Very High source aggregate potential within the area.** In keeping with a sustainable approach we would recommend use of our data and mapping viewers to identify and ensure that natural resources used in the proposed housing development are sustainably sourced from properly recognised and licensed facilities, and that consideration of future resource sterilization is considered.

Other Comments
Should development go ahead, all other factors considered, Geological Survey Ireland would much appreciate a copy of reports detailing any site investigations carried out. The data would be added to Geological Survey Ireland's national database of site investigation boreholes, implemented to provide a better service to the civil engineering sector. Data can be sent to the Geological Mapping Unit, at mailto:GeologicalMappingInfo@gsi.ie, 01-678 2795.

I hope that these comments are of assistance, and if we can be of any further help, please do not hesitate to contact me Clare Glanville, or my colleague Trish Smullen at GSIPlanning@gsi.ie.

Yours sincerely,

Clare Glanville
Senior Geologist
Geological Survey Ireland

Enc: Table - Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes.

Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes

following European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018
(S.I. No. 296 of 2018)

Geological Survey Ireland Programme	Dataset	Relevant EIA Topic	Coverage	Description / Notes	Link to Geological Survey Ireland map viewer
Geohazards	Landslide: National landslide database and landslide susceptibility map	Land & Soil/Climate/Landscape	National	Associated guidance documentation relating to the National Landslide Susceptibility Map is also available.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b68cf1e4a9044a5981f950e9b9c5625c
Geohazards	Groundwater Flooding (Historic)	Water	Regional	Provide information of historic flooding, both surface water and groundwater. [A lack of flooding presented in any specific location of the map only indicates that a flood has not been detected. It does not indicate that a flood cannot occur in that location at present or in the future]	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc
Geohazards	Groundwater Flooding (Predictive)	Water	Regional	Provides information on the probability of future karst groundwater flooding (where available). [The maps do not, and are not intended to, constitute advice. Professional or specialist advice should be sought before taking, or refraining from, any action on the basis of the flood maps]	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc
Geohazards	Radon Map	Land & Soils/Air	National		http://www.epa.ie/radiation/radonmap/
Geoheritage	County Geological Sites as adopted by National Heritage Plan and listed in County Development Pla	Land & Soils/Landscape	Regional	All geological heritage sites identified by Geological Survey Ireland are categorised as CGS pending any further NHA designation by NPWS.	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228
Geological Mapping	Bedrock geology:	Land & Soils	National	1:100,000 scale and associated memoirs.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Bedrock geology:	Land & Soils	Regional	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Quaternary geology: Sediments	Land & Soils	National	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Quaternary geology: Geomorphology	Land & Soils	National	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Physiographic units:	Land & Soils	National	Broad-scale physical landscape units mapped at 1:100,000 scale in order to be represented as a cartographic digital map at 1:250,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=afa76a420fc54877843aca1bc075c62b
Geological Mapping	GeoUrban: Spatial geological data for the greater Dublin and Cork areas	Land & Soils	Regional	includes 3D models	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9768f4818b79416093b6b2212a850ce6&scale=0
Geological Mapping	Geotechnical database	Land & Soils	National	Digitised geotechnical and Site Investigation Reports and boreholes which can be accessed through online downloads	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=a2718be1873d47a585a3f0415b4a724c
Goldmine	Historical data sets including geological memoirs and 6" to 1 mile geological mapping records	land & Soils/Water	National	available online	https://secure.dccae.gov.ie/goldmine/index.html
Groundwater & Geothermal	Groundwater resources (aquifers)	Water	National	Data limited to 1:100,000 scale; sites should be investigated at local scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater recharge.	Water	National	Data limited to 1:40,000 scale; sites should be investigated at local scale; long term annual average recharge	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater vulnerability.	Water	National	Data limited to 1:40,000 scale; sites should be investigated at local scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Group scheme and public supply source protection areas.	Water	National	Not all PWS / GWS have SPZ / ZOC. Check with IW / coco / NFGWS for private supplies.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater Protection Schemes	Water	National	Data is limited to scale of 1:40,000. Data does not include all of the source protections areas	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Catchment and WFD management units.	Water	National		https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	karst specific data layers	water	National	For areas underlain by limestone, includes karst features, tracer test database; turlough water levels (gwlevel.ie).	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Wells and Springs	Water	National	Not comprehensive, there may be unrecorded wells and springs	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater body Descriptions	Water	National	Not exhaustive; only those in designated SACs; could be other GWDTEs; for more information contact NPWS / EPA / site investigations	https://www.gsi.ie/en-ie/programmes-and-projects/groundwater-and-geothermal-unit/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx
Groundwater & Geothermal	Geothermal Suitability maps	land & Soils/Water	National	Also, Roadmap for a Policy and Regulatory Framework for Geothermal Energy, November 2020	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9ee46bee08de41278b90a991d60c0b9e
Marine & Coastal Unit	INFOMAR - Ireland's national marine mapping programme; providing key baseline data for Ireland's	Water	National		https://secure.dccae.gov.ie/GSI/INFOMAR_VIEWER/
Marine & Coastal Unit	CHERISH - Coastal change project (Climate, Heritage and Environments of Reefs, Islands, and Headla	Water	Regional		http://www.cherishproject.eu/en/
Marine & Coastal Unit	Coastal Vulnerability Index (CVI).	water /Land & Soils	Regional	Currently the project is being carried out on the east coast and will be rolled out nationally	https://www.gsi.ie/en-ie/programmes-and-projects/marine-and-coastal-unit/projects/Pages/Coastal-Vulnerability-Index.aspx
Minerals	Aggregate potential	Land & Soils/Material Assets	National	Consideration of mineral resources and potential resources as a material asset which should be explicitly recognised within the environmental assessment process	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956
Minerals	Active quarries	Land & Soils	National		https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956
Minerals	Historic mines	Land & Soils/Cultural Heritage	National	Inventory and Risk Classification 2009. Environmental Protection Agency, Economic Minerals Division and Geological Survey Ireland (DECC).	https://gis.epa.ie/EPAMaps/default?easting=?&northing=?&lid=EPA:LEMA_Facilties_Extractive_Facilities https://www.epa.ie/enforcement/mines/
Tellus	Geochemical data: multi-element data for shallow soil, stream sediment and stream water	Land & Soils	Regional	A national mapping programme	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754
Tellus	Airborne geophysical data including radiometrics, electromagnetics and magnetics	Land & Soils	Regional	A national mapping programme	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754
Tellus	urban geochemistry mapping (Dublin SURGE project),	Land & Soils	Regional		https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754

Notes:

1. The maps and data listed above are available on the Geological Survey Ireland map viewer https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx

2. Please read all disclaimers carefully when using Geological Survey Ireland data

3. Geological Survey Ireland and Irish Concrete Federation published guidelines for the treatment of geological heritage in the extractive industry in 2008.

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

Your Ref: ENNIS SHD
Our Ref: G Pre00029/2022 (Please quote in all related correspondence)

22 April 2022

McCutcheon Halley Chartered Planning Consultant
6 Joyce House
Barrack Square
Ballincollig
Co.Cork

Via email: mocallaghan@mhplanning.ie

Proposed Pre Planning Development: Glenveagh Homes LtdEnvironmental Impact Assessment Report (EIAR) for a proposed residential development of c. 285 no. residential units ; at Ballymacaula, Keelty, Drumbiggle, Circular Road, Ennis, Co. Clare

A chara

I refer to correspondence received in connection with the above. Outlined below are heritage-related observations/recommendations co-ordinated by the Development Applications Unit under the stated headings.

<u>Nature Conservation</u>

This submission is made by the Department in its advisory role in relation to biodiversity, nature conservation, and the nature directives (i.e. the Birds and Habitats Directives). The observations are not exhaustive and focus on key issues of potential relevance to European sites, natural habitats and protected species, biodiversity protection, aspects of proper planning and sustainable development, and the scope of the environmental assessments that may be required. The observations are made on the basis of the information provided and are without prejudice to any future recommendation that may be made by the Department if/when a planning application is made.

Assessment of the direct and indirect significant effects of the project on biodiversity should be made, where applicable, and especially with regard to all Species protected under the Wildlife Acts. Regarding survey, assessment and potential mitigation proposals in particular it should be noted that the site is utilised by badgers and other mammals. Good quality ecological corridors occur throughout the site. These are in the form of stone walls with mature hazel scrub alongside which grades to more recent whitethorn/blackthorn scrub which is colonising adjacent open fields. The corridors are suitable for protected mammals (for example stoat in the stone walls) and potentially lizards. It is also possible that Pine Marten could utilise the site considering the range and habitat of the species. It should be noted a golf course and built up area bounds the site to the east whilst the N85 road bounds the site to the west. Use by roosting snipe in the wetter part of the site to the east should also be addressed.

Surveys should be carried out by suitably qualified persons at an appropriate time of the year depending on the species being surveyed for. The Assessments should include the results of the surveys, and detail the survey methodology and timing of such surveys. It is expected by this Department, that in any survey methodology used, best practice will be adhered to and if necessary non-Irish methodology adapted for the Irish situation. CIEEM's recent advice titled 'Advice note on the Lifespan of Ecological Reports and Surveys' should be noted.

Any Mitigation measures proposed for protected species need to be assessed against the adverse effects the project or plan is likely to cause (alone or in combination with other projects or plans). To assess mitigation measures, the following tasks must be completed:

- list each of the measures to be introduced (e.g. habitat compensation, timing of construction works);
- explain how the measures will avoid the adverse impacts on the species
- explain how the measures will reduce the adverse impacts on the species

Then, for each of the listed mitigation measures:

- provide evidence of how they will be secured and implemented and by whom;
- provide evidence of the degree of confidence in their likely success;
- provide a timescale, relative to the project or plan, when they will be implemented;

Where residual impacts remain, further mitigation measures may be required.

Evidence should be provided of how the mitigation measures will be monitored, and, should mitigation failure be identified, how that failure will be rectified. The applicant should not use any proposed post construction monitoring as mitigation to supplement inadequate information in the assessment. The overall approach to mitigation and survey above also applies to habitats.

The National Biodiversity Action Plan 2017- 2021 aims to conserve and restore Ireland's biodiversity. A key objectives of the plan is to achieve; no net contribution to biodiversity loss arising from development projects occurring within the lifetime of the plan. Accordingly consideration should be given to how the project could avoid a net loss of biodiversity. Any losses of biodiversity habitat associated with a proposed development should be mitigated for.

In terms specifically of the stone walls with associated hazel scrub and scrub woodland (in particular the associated scrub with a ground flora, includes species such as lesser celandine, primrose, wood anemone, ground ivy, dog violet, bluebell etc.), areas such as this have a role in relation to the maintenance and restoration of biodiversity, including under Article 10 of the Habitats Directive. Under Article 10 of the Habitats Directive, member states must maintain and where possible enhance landscape features to improve the coherence of the Natura 2000 network.

To ensure there is no net loss of native hedgerows/stone walls due to the development, if removal is absolutely necessary it should be ensured that the same or greater length of compensatory native hedgerow will be planted. A plan to retain, transplant or provide compensatory planting to ensure there is no net loss of such features should be provided with the development proposal.

A constraints-led approach should have been adopted in planning and designing the layout and scale of the development, and in devising mitigation measures, including mitigation by avoidance. In terms of retention and avoidance protection by appropriate setback distances, landscaping and boundary treatments should also be considered. Again in terms both of net loss avoidance/national Biodiversity Action Plan/County Development Plan issues (and regarding any potential annexed habitat issues) the site should be surveyed in particular regarding semi-natural grassland habitat presence (note potential Dry calcareous and neutral grassland habitat presence to the north/north-west of site).

Ecological surveys should be carried out in accordance with recognised methodologies, and should provide a comprehensive description and evaluation of the ecological baseline of the site, and an assessment of the likely direct, indirect and cumulative effects of all aspects of the proposed development.

This consultation relates to EIA but it is presumed Appropriate Assessment screening and potentially Natura Impact Assessment are also being carried out. For example the site is approximately 1km from the Lower River Shannon SAC 2165 and it is also less than 2km from the Newhall and Edenvale Complex SAC 002091. The key concerns in relation to likely significant effects of the project alone and in combination with other plans and projects, on these European sites for example, in view of their conservation objectives, include the following.

- The Conservation Objectives of the latter Lesser Horseshoe Bat SAC site for Extent of potential foraging habitat includes No significant decline within 2.5km of qualifying roosts and for Linear features includes No significant loss within 2.5km of qualifying roosts as linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species within 2.5km around each roost. In terms of its Potential Foraging Grounds potential the proposed development site is mapped within the potential foraging range (for all three roosts within the SAC) in said Conservation Objectives (NPWS (2018) Conservation Objectives: Newhall and Edenvale Complex SAC 002091. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht). The proposed site contains such linear features and potential loss of foraging habitat will need to be assessed.

For the Lower River Shannon SAC any potential negative effects on the water quality of the site will need to be assessed, for example added pressures on existing water services which, in this case, are linked to European sites, e.g. increased water abstraction from, and increased discharges of treated effluent to the SAC.

The above observations/recommendations are based on the papers submitted to this Department on a pre-planning basis and are made without prejudice to any observations that the Minister may make in the context of any consultation arising on foot of any development application referred to the Minister, by the planning authority/ies, in the role as statutory consultee under the Planning and Development Act, 2000, as amended.

You are requested to send further communications to the Development Applications Unit (DAU) at **manager.dau@housing.gov.ie**.

Is mise le meas**,**

Diarmuid Buttimer
Development Applications Unit
Administration

Appendix 1.2 EIA Portal ID Number

August 2022

Aoife Browne

From:	Housing Eiaportal <EIAportal@housing.gov.ie>
Sent:	Tuesday 23 August 2022 15:28
To:	Aoife Browne
Cc:	Tom Halley
Subject:	EIA Portal Confirmation Notice Portal ID 2022161

__NOTE:__ This email originated from outside the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Aoife

An EIA Portal notification was received on 23/08/2022 in respect of this proposed application. The information provided has been uploaded to the EIA Portal on 23/08/2022 under EIA Portal ID number **2022161** and is available to view at http://housinggovie.maps.arcgis.com/apps/webappviewer/index.html?id=d7d5a3d48f104ecbb206e7e5f84b71f1.

Portal ID: 2022161

Competent Authority: An Bord Pleanála

Applicant Name: Glenveagh Homes Ltd.

Location: Ballymacaula, Drumbiggle, Keelty, Circular Road, Ennis, Co. Clare

Description: The proposed development is for a Strategic Housing Development for the construction of 289. no residential units, a crèche, and all ancillary site development works. An EIAR and NIS have been prepared in respect of the proposed development.

Linear Development: No

Date Uploaded to Portal: 23/08/2022

Regards
Grace

EIA Portal team

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

Teach an Chustaim, Baile Átha Cliath 1, D01 W6X0
Custom House, Dublin 1, D01 W6X0

T +353 (0) 1 888 2000

www.gov.ie/housing

Proposed Strategic Housing Development at Ballymacaula, Drumbiggle, Keelty, Circular Road, Ennis, Co. Clare

CHAPTER 4 Landscape and Visual Impact Assessment

Appendix 4.1 Booklet of Photomontages

Volume III

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August 2022

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Appendix 4.1 Booklet of Photomontages

August 2022

Glenveagh
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Verified Photomontages and CGI's of

Proposed Residential Scheme on Lands at

Circular Road, Drumbiggle, Ennis, Co. Clare

August 2022

Photomontage Methodology

Photography

The photos for all the views were taken on the November 24th, 2021. Canon EOS Rebel T5i camera was used for all photography. Leica GS08plus Smart Antenna was used to accurately record the viewpoint coordinates and height levels. Viewpoint locations are indicated in the viewpoint map and at the table to the right.

Modelling

Preparation of an accurate 3D model of the proposed residential development and landscape, including some existing buildings and infrastructure.

Setup

The following information is used to accurately position the model of the proposed development into the photographs:
-Site survey,
-Photographs,
-Verified viewpoint coordinates and height levels are accurately marked on the location OSi map.

To match the 3D camera view with the photograph we take the following steps:
The camera height is taken from information gathered on the levels from where the photos are taken (table below). The height levels of the proposed development are outlined on the site. Focal length is based on the photograph EXIF info.

This data is imported into our 3D software and the 3D camera is matched with the selected photographs. To match the 3D camera accurately we use all the above data and the reference 3D models. The reference 3D models are existing structures i.e. buildings, roads, lamps, etc which are visible on the photographs. These items are modelled based on the survey information. After all the above conditions are fulfilled and we are satisfied that the camera matches correctly, we proceed to the next step.

Rendering

We apply the materials and textures prior to rendering the photomontage images. Light settings are adjusted to match the brightness of the photographs and sun is positioned according to the date and time the photo was taken.

Post processing

This process means incorporating a 3D image of the proposed development into the photograph to achieve the final result.

VIEW No	Easting (m)	Northing (m)	Orthometric Height (m)	Camera Focal Length
VIEW 1	532719.772	677266.487	21.703	35mm
VIEW 2	532409.960	676986.837	26.945	18mm
VIEW 3	532363.053	676923.417	27.549	18mm
VIEW 4	532221.451	676543.437	25.426	18mm
VIEW 5	532061.584	676558.537	26.494	18mm
VIEW 6	531977.482	676507.275	27.826	18mm
VIEW 7	531800.596	676623.891	40.916	35mm
VIEW 8	532099.169	677071.646	11.404	18mm
VIEW 9	532303.690	677566.223	10.003	35mm
VIEW 10	531178.749	677346.078	30.185	35mm

View 1. Existing.

View 1. Proposed.

View 2. Existing.

View 2. Proposed.

View 3. Existing.

View 3. Proposed.

View 4. Existing.

View 4. Proposed.

View 5. Existing.

View 5. Proposed.

View 6. Existing.

View 6. Proposed.

View 7. Existing.

View 7. Proposed.

View 8. Existing.

View 8. Proposed.

View 9. Existing.

View 9. Proposed.

View 10. Existing.

View 10. Proposed.

CGI VIEWPOINT MAP

CGI 1.

CGI 2.

CGI 3.

CGI 4.

CGI 5.

Proposed Strategic Housing Development at Ballymacaula, Drumbiggle, Keelty, Circular Road, Ennis, Co. Clare

CHAPTER 5 **Material Assets: Traffic and Transportation**

Appendix 5.1 Traffic and Transport Statement

Volume III

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August 2022

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Appendix 5.1 Traffic and Transport Statement

August 2022

TOBIN
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BUILT ON KNOWLEDGE

Glenveagh
Homes

RESIDENTIAL DEVELOPMENT
ENNIS

TRAFFIC AND TRANSPORTATION ASSESSMENT

RESIDENTIAL DEVELOPMENT, ENNIS

TRAFFIC AND TRANSPORTATION ASSESSMENT

Document Control Sheet	
Document Reference	TR01- Traffic and Transport Assessment
Report Status	Planning Issue
Report Date	December 2021
Current Revision	P1
Client:	Glenveagh Homes
Client Address:	Block B, Maynooth Business Campus, Maynooth, Co. Kildare Ireland W23W5X7
Project Number	11269

Galway Office	Dublin Office	Castlebar Office
Fairgreen House, Fairgreen Road, Galway, H91 AXK8, Ireland. Tel: +353 (0)91 565 211	Block 10-4, Blanchardstown Corporate Park, Dublin 15, D15 X98N, Ireland. Tel: +353 (0)1 803 0406	Market Square, Castlebar, Mayo, F23 Y427, Ireland. Tel: +353 (0)94 902 1401

Revision	Description	Author:	Date	Reviewed By:	Date	Authorised by:	Date
P0	Stage 2 Submission	JQ	08/12/2021	MG	08/12/2021	TM	08/12/2021
P1	Stage 3 Submission	JQ	10/08/2022	MG	10/08/2022	TM	10/08/2022

TOBIN Consulting Engineers

TOBIN
CONSULTING ENGINEERS

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Appendices

1.0 NON-TECHNICAL SUMMARY

The Non-Technical Summary is a synopsis of the traffic and transportation assessment for the proposed residential development at Drumbiggle, Ennis, Co. Clare. The proposed development is located approximately 1.6km west of Ennis Town Centre. Glenveagh Homes intends to develop an existing greenfield site at Drumbiggle, Ennis, Co. Clare. The development will consist of :

1) The construction of 289 no. residential units comprising a mixture of 12 no. 1 bed apartments, 78 no. 2 bed townhouse/duplex units, 165 no. 3 bed dwelling houses, and 34 no. dwelling houses which will have an option of a 3 or 4 bedroom house-type;
2) A 400.7m2 creche/childcare facility;
3) The provision of landscaping, open space and amenity areas, including play/exercise equipment, a linear amenity walkway, informal play areas and local play areas;
4) The provision 2 no. pedestrian connections to the existing public footpath along the N85, 2 no. pedestrian connections into Ballymacaula View Estate, improvements/upgrades to the pedestrian footpaths along Circular Road including an uncontrolled pedestrian crossing and pedestrian footpath provision along part of the Drumbiggle and Cahercalla Roads;
5) All associated infrastructure and services including 1 no. vehicular access point onto Circular Road, car parking and bin storage, lighting, 2 no. ESB substations, drainage and 1 pumping station, boundary treatments at

Ballymacaula, Drumbiggle, Circular Road, Ennis, Co. ClareThe proposed layout for the development has been reproduced in sketch format in the Figure 1-1 and is detailed in the series of drawings as submitted with this application.

Tobin Consulting Engineers are the consultants appointed to provide Civil and Traffic Engineering design services for the planning stage of the project.

Figure 1-1: Proposed Indicative Site Layout

The N85 national primary road boarders the lands to the immediate south and west of the site and Ennis golf club and on-off housing boarders the lands to the immediate east and north of the site.

The main approaches to the town have footpaths for pedestrian use only. Cyclists currently utilise the existing roadways to access the town centre.

The Table below gives typical cycle and walking distance and times to main attractions from the proposed development.

Attraction	Cycle Distance (km)	Cycle Time (mins)	Walk Distance (km)	Walk Time (mins)
Ennis Ruby Football Club	<0.1	< 1 min	<0.1	<1 min
Ennis Golf Club	0.950	3 min	0.950	11 min
Scoil Chriost Ri	1.60	< 4 min	1.60	19 min
Ennis Health Centre	<1.5	< 5 min	<1.5	<18 min
Ennis Town Centre	1.60	5 min	1.60	19 min

A calculated total of 129 spaces are required for the proposed Development, as outlined in Chapter 7. 140 dedicated bicycle parking spaces have been provided for within the site. These are for the residential units without private direct access to private amenity space, 1 private secure bike space will be provided per Town house units and 1 space per bedroom and 0.5 visitor spaces per apartments. For residential elements with direct access to allocated private amenity space, it is envisaged that the bicycle parking will be accommodated within the curtilage of the dwelling (i.e. within the garden).

A number of bus and train services operate from Ennis Town Centre (refer to Chapter 8 for details) with routes linking locally and nationally.

A review of committed developments in the surrounding area has been carried out and all committed development considered. The summation of the proposed and committed development has been assessed using PICADY and ARCADY analysis software for the base and generated traffic volumes for the expected year of opening of 2024 and the design years 2029 and 2039. The trip rates for the proposed development were generated from the TRICS database.

A number of assumptions were made in this report, as outlined in Section 5, 'Trip Generation and Trip Distribution'.

A summary of the traffic analysis is as follows:

<u>Junction 1 – Roundabout Junction N84 / R474 (Beecher Roundabout)</u>

The ARCADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the roundabout is forecast to operate well within capacity for all Streams in both the morning and evening peak periods for the No Development scenario. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate well within capacity.

Junction 2 - R474 / Drumbiggle Road Priority Junction

The PICADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the junction is forecast to operate well within capacity for all Streams in both the morning and evening peak periods for the No Development scenario. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate well within capacity.

Junction 3 - R474 / Cloughleigh Rd / Davitt Terrace Roundabout Junction

The ARCADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the roundabout is forecast to operate well within capacity for all Streams in both the morning and evening peak periods for the No Development scenario. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate well within capacity.

Junction 4 - R474 / R458 Priority Junction

The PICADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the junction is forecast to operate within capacity for the morning and evening peak periods. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate within capacity. It is projected that Stream D-ABC will have a maximum RFC of 0.84 and a queue length of 4.8 PCU for the morning peak period.

Junction 5 – Proposed Access / R474 Priority Junction

The PICADY analysis results indicate that the junction will operate within capacity for the morning and evening peak periods for the 2024 Opening Year scenario. For the design year 2039, the junction is also forecast to operate within capacity for the morning and evening peak periods. It is projected that Stream B-AC will have a maximum RFC of 0.28 and a queue length of 0.4 PCU for the morning peak period.

2.0 INTRODUCTION

2.1 INTRODUCTION

TOBIN Consulting Engineers Ltd have been appointed by Glenveagh Homes to provide a Traffic and Transportation Assessment as part of the Planning Application for the proposed Strategic Housing Development at Drumbiggle, Ennis, Co. Clare. The total site area for the proposed development is approximately 11.12 ha.

In preparing this Report, TOBIN Consulting Engineers has made reference to;

- The Clare County Development Plan 2017 – 2023 (CCDP);
- NRA 'Traffic and Transport Assessment Guidelines' (May 2014); and
- NRA Project Appraisal Guidelines for National Roads Unit 5.3: Travel Demand Projections.

2.2 OBJECTIVES

The objective of this Report is to assess the impact the proposed development will have on the existing road network. This Report will calculate the expected volume of traffic that will be generated by the proposed development and assess the impact that this traffic will have on the operational capacity of the road network in the vicinity of the development. The junctions to be analysed as part of this Report are the following:

- Junction 1: Roundabout Junction (Beechpark) N85 / R474
- Junction 2: Priority Junction R474 / Drumbiggle Road
- Junction 3: Roundabout Junction R474 / Cloughleigh Rd / Davitt Terrace
- Junction 4: Priority Junction R474 / R458
- Junction 5: Priority Junction Proposed Access / R474

In accordance with the Traffic and Transport Assessment Guidelines, ways to promote non-car access to the proposed development will also be explored. This will include convenient pedestrian and cycle interconnection between existing and proposed developments and public transport facilities. Existing public transport networks will be examined. A walking and cycling accessibility assessment will also be conducted to determine the distances to main attractions and public transport connections and to also illustrate the benefits of walking or using a bicycle to access a particular development.

2.3 SCOPING

In order to ensure the scope of this report was to the satisfaction of Clare County Council, a scoping document was issued on the 2nd of November 2021 to Ennis Municipal District's Roads Department. This document outlined the proposed approach that the Traffic and Transport Assessment would take and the junctions which would be included in the analysis.

The proposed Development was also discussed at the Stage 1 meeting in October 2021. Items discussed at this meeting were captured in the design and this assessment of the proposed Development.

2.4 STRUCTURE OF THE REPORT

This report is divided into eight chapters:

- Chapter 1 is a Non-Technical Summary.
- Chapter 2 includes this introduction.
- Chapter 3 describes the proposed development, and its location.
- Chapter 4 provides an overview of the existing and proposed traffic conditions, explaining how this information was obtained.
- Chapter 5 outlines the assumptions that have been made in the calculation of traffic generated by the development and the factors used to forecast the future road network traffic.
- Chapter 6 explains the methodology used and the results of the analysis performed on the nominated junctions. An investigation into link capacity is also dealt with in this chapter.
- Chapter 7 addresses issues relating to road safety, parking provision, pedestrians & cyclists.
- Chapter 8 contains the Mobility Statement for the proposed development site.
- Chapter 9 summarises and concludes the Report.

3.0 PROPOSED DEVELOPMENT

3.1 SITE LOCATION

The proposed residential development is located on Circular Road, approximately 1600m south-west of Ennis town centre. The site location is shown in Figure 3-1 below.

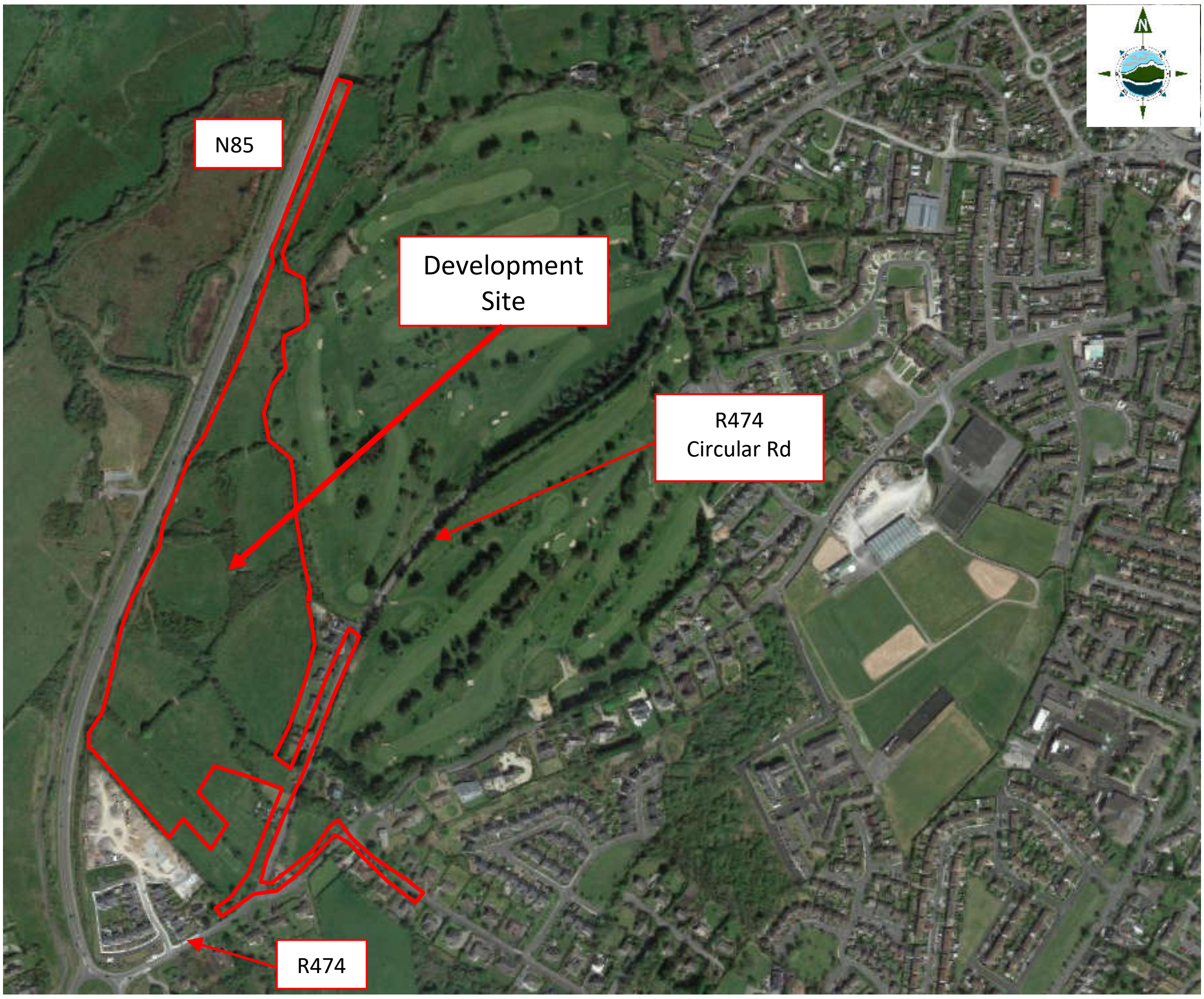


Figure 3-1 Location of Proposed Development ©google

3.2 DESCRIPTION OF PROPOSED DEVELOPMENT

The development will consist of :

1) The construction of 289 no. residential units comprising a mixture of 12 no. 1 bed apartments, 78 no. 2 bed townhouse/duplex units, 165 no. 3 bed dwelling houses, and 34 no. dwelling houses which will have an option of a 3 or 4 bedroom house-type;
2) A 400.7m2 creche/childcare facility;
3) The provision of landscaping, open space and amenity areas, including play/exercise equipment, a linear amenity walkway, informal play areas and local play areas;
4) The provision 2 no. pedestrian connections to the existing public footpath along the N85, 2 no. pedestrian connections into Ballymacaula View Estate, improvements/upgrades to the pedestrian footpaths along Circular Road including an uncontrolled pedestrian crossing and pedestrian footpath provision along part of the Drumbiggle and Cahercalla Roads;

5) All associated infrastructure and services including 1 no. vehicular access point onto Circular Road, car parking and bin storage, lighting, 2 no. ESB substations, drainage and 1 pumping station, boundary treatments at

3.3 CUMULATIVE IMPACTS

Traffic and Transport Assessment shall consider all committed developments within the vicinity of the site. This includes sites which have previously been granted planning permission, but which are yet to become operational.

There are three major committed developments granted planning permission within the immediate vicinity of the proposed development. There is also one-off houses and extensions to existing dwellings in the vicinity of the proposed site. An allowance will be made in the traffic projections for these developments.

See Table 3-1 below for the committed developments within close proximity to the proposed site.

Table 3-1: Committed Developments.

Major Committed Developments			
Planning Ref. No.	Status	Location	Description
21/599	Request for Further Information	Drumbiggle Rd	58 no. residential units
17/237	Conditional	Ballymacaula, Drumbiggle	42 no. residential units

There are also a number granted permissions in the last 5 years for one-off houses and extensions to existing dwellings.

In order to ensure that the junctions on the network in the vicinity of the proposed development can accommodate the projected generated traffic, traffic flows have been assessed as discussed in Sections 5 and 6 of this Report. Impacts of the network improvements have also been applied to the existing baseflow traffic volumes to ensure a robust analysis.

4.0 EXISTING AND PROPOSED TRAFFIC CONDITIONS

4.1 TRAFFIC SURVEYS

In order to determine the magnitude of the existing traffic flows, the results of a manual junction turning count was used. This traffic survey was carried out by Traffinomics Ltd. consisting of a 12-hour count on Tuesday 9th November 2021. Count information was obtained at the following junctions:

- Junction 1: Roundabout Junction (Beechpark) N85 / R474
- Junction 2: Priority Junction R474 / Drumbiggle Road
- Junction 3: Roundabout Junction R474 / Cloughleigh Rd / Davitt Terrace
- Junction 4: Priority Junction R474 / R458
- Junction 5: Priority Junction Proposed Access / R474

This survey distinguished between light good vehicles and heavy good vehicles. The traffic count data obtained by Traffinomics Ltd. is included in **Appendix A** of this Report. The results of this survey indicated that the peak traffic levels through the critical junctions occurred between the hours of 08:00 and 09:00 in the AM period and between 17:00 and 18:00 in the PM period.

Annual growth indices were applied to the 2021 traffic flows to determine background traffic flows for the assessment years.

Figure 4-1: Junction Locations ©Bing Maps

4.2 EXISTING ROAD NETWORK

The proposed Drumbiggle road development can be accessed from the R474 Circular Road which links to both the N85 national road and Ennis Town Centre. The proposed access into the development will be from a newly proposed priority T-junction on the R474 Circular Road. The proposed site access will be situated within an 50km/h default urban speed zone. The N474 Circular Road has a carriageway width of approximately 7.0m to the north and south of the newly proposed access junction.

4.2.1 Link Capacity Analysis

A Link capacity assessment was undertaken with reference to UK DMRB TA 79/99 "Traffic Capacity of Urban Roads". The main junction roads have been classified in accordance with the associated definitions within the DMRB TA 79/99 document. As there is a variation in width for all of the approach roads to the junction, an average width was determined for each link to ensure a robust analysis. The Table below identifies the classification and capacity of each link on the junction in accordance with DMRB TA 77/99.

Table 4-1: Base Year Link Capacity Analysis

UK DMRB TA 79/99 "Traffic Capacity of Urban Roads".					
Link Road	Average Width	Classification	Link Capacity (veh/hr)	AM Peak Hour (veh/hr)	PM Peak Hour (veh/hr)
R474	7.0m	UAP 3	1850	620	423

4.3 PROPOSED SITE ACCESS JUNCTION

Access to the proposed development site will be gained through a new priority T-junction onto the R474 circular road Ennis. There is an existing footpath on the northern side of the R474 which links directly to Ennis Town Centre. The Design Manual for Urban Roads and Streets apply to this development. The design of all new accesses will take account of this design guideline. A minimum sight line of 23m will be provided at all internal access junctions for the development, which is compliant with the 30 kph speed limit.

5.0 TRIP GENERATION AND DISTRIBUTION

5.1 OPENING AND FUTURE YEAR FLOWS AND ENVIRONMENT

The proposed development will be constructed in one phase. For the purpose of the traffic assessment, 2024 was utilised for the opening year. In addition to the opening years and in accordance with TII guidelines, the capacity assessment was also based on traffic conditions forecast for the design years 2029 (+5 years) and 2039 (+ 15 years).

Annual growth indices were updated in 2019 by the TII, with annual indices and cumulative growth forecasts shown for Clare in the Table below. The derived growth factors were applied to 2021 flows to determine background traffic flows for the assessment years. The assessment is split into light vehicles and heavy vehicles.

Table 5-1: Growth Factors for light vehicle (LV) and heavy vehicles (HV)

	2024	2029	2039
LV	1.048	1.132	1.189
HV	1.130	1.387	1.662

5.2 TRIP GENERATION

The volume of traffic expected to be generated during the AM and PM peak hours for the proposed development were established from the Trip Rate Information Computer System (TRICS) database, a computerised database and analysis package for planning and development. TRICS generates rates to represent various land uses. These trip rates are generated from developments of a similar nature. The residential development trip rates are derived from similar developments.

5.2.1 TRIP GENERATION OF PROPOSED DEVELOPMENT

The volume of traffic expected to be generated by the proposed development associated with this planning application is based on the current schedule of accommodation issued by Deady Gahan Architects (289 units) as shown in the following Tables:

Table 5-2: Expected Trip Generation for Proposed Development for AM Peak Hour

EXPECTED TRIP GENERATION FOR PROPOSED DEVELOPMENT FOR AM PEAK HOUR			
Development Type	No. of Units / GFA sqm)	Arrivals	Departures
Residential House	261 units	47	90
Residential Apartment	24 units	8	4
Creche	60 child-capacity	19	12
Total		**74**	**106**

Table 5-3: Expected Trip Generation for Proposed Development for PM Peak Hour

EXPECTED TRIP GENERATION FOR PROPOSED DEVELOPMENT FOR PM PEAK HOUR			
Development Type	No. of Units / GFA sqm)	Arrivals	Departures
Residential House	261 units	84	41
Residential Apartment	24 units	8	4
Creche	60 child-capacity	3	3
Total		**95**	**48**

Table 5-4 AM and PM Peak Hour Trips

Total Numbers of vehicles	Arrivals	Departures
AM	74	106
PM	95	48

5.3 TRIP DISTRIBUTION

5.3.1 TRIP DISTRIBUTION OF COMMITTED DEVELOPMENT

There are a number of committed developments currently in the vicinity of the proposed development site. The committed developments have been included in the analysis of the existing junctions for the future year scenarios.

5.3.2 TRIP DISTRIBUTION OF PROPOSED DEVELOPMENT

It was envisaged the proposed distribution matches the existing traffic distribution at each of the junctions.

5.4 TRIP DISTRIBUTION OF BASEFLOW PLUS GENERATED TRAFFIC

The baseline and baseline plus generated traffic (with both committed and proposed development) for all junctions for the year of opening 2024 and the design year 2039 for both the AM and PM peak hours are shown in the following Figures.

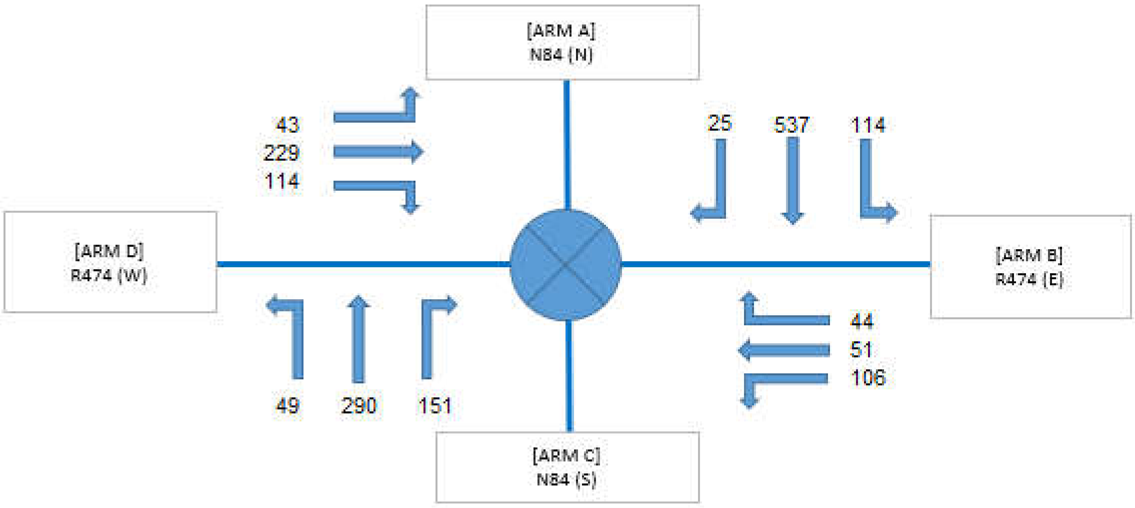


Figure 5-1 Junction 1 – 2021 Base AM Peak

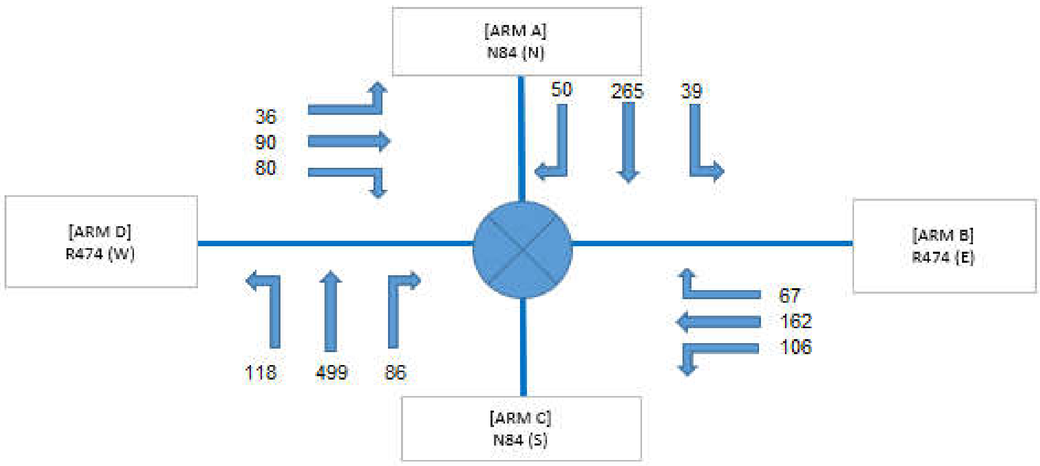


Figure 5-2 Junction 1 – 2021 Base PM Peak

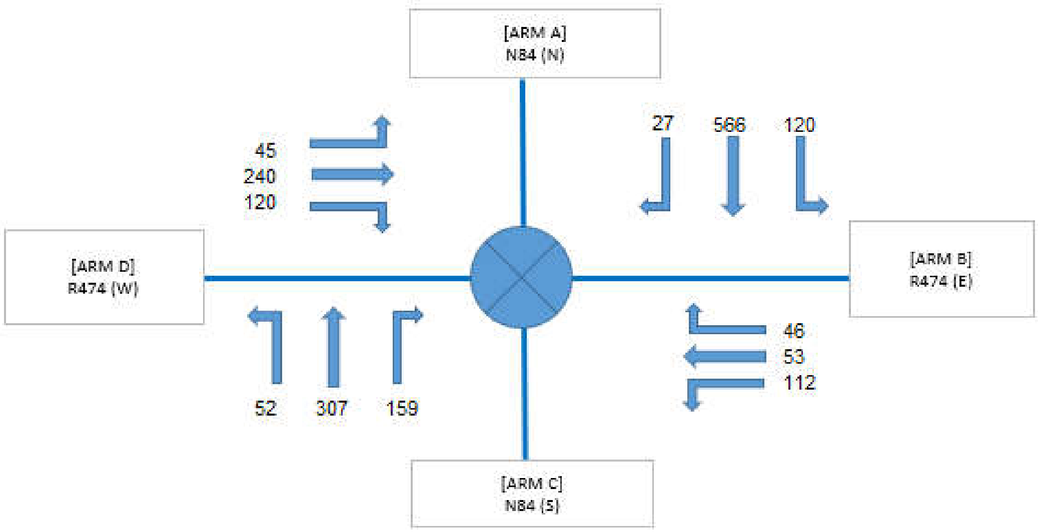


Figure 5-3 Junction 1 – 2024 Base AM Peak

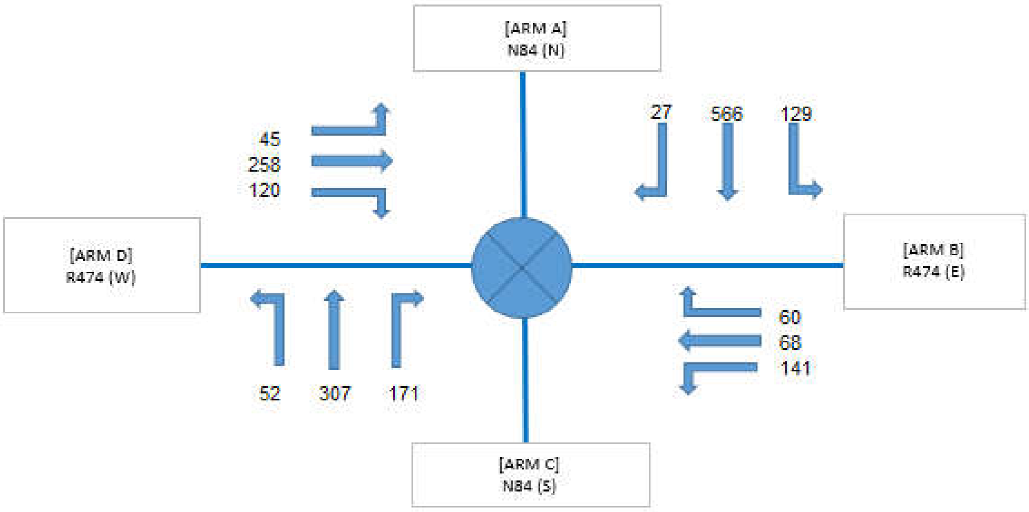


Figure 5-4 Junction 1 – 2024 AM Peak Base with Comm & Prop Development

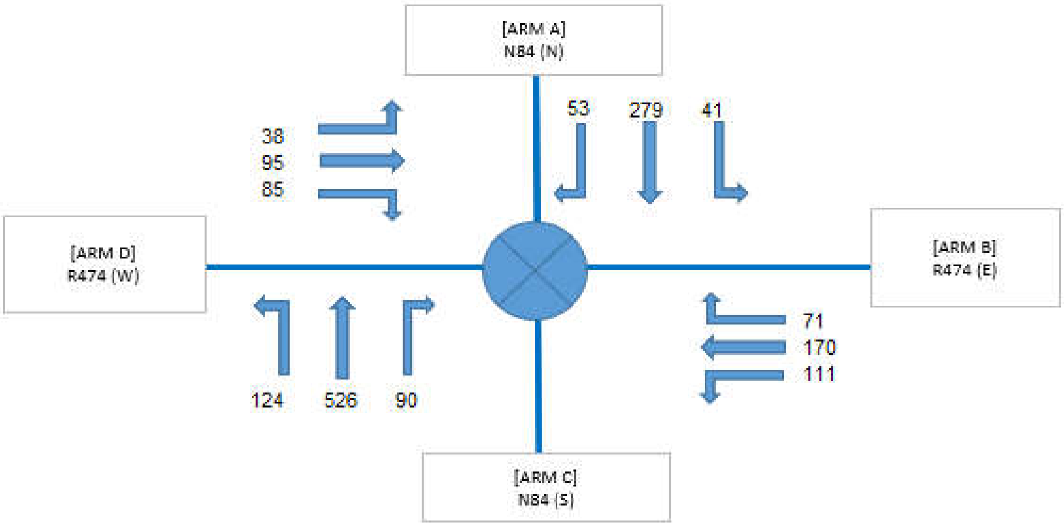


Figure 5-5 Junction 1 – 2024 Base PM Peak

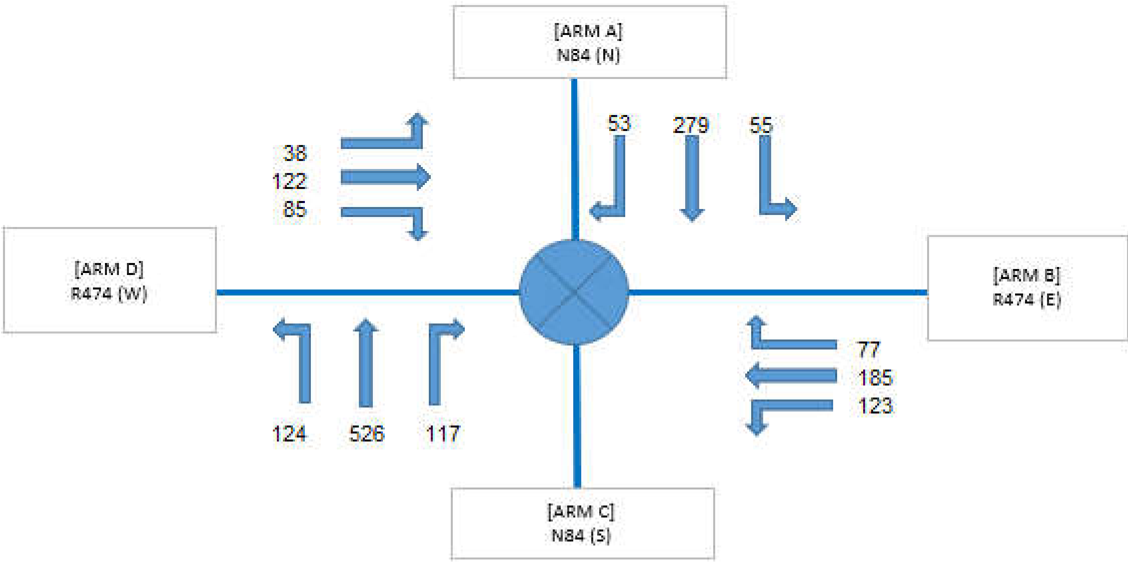


Figure 5-6 Junction 1 – 2024 PM Peak Base with Comm & Prop Development

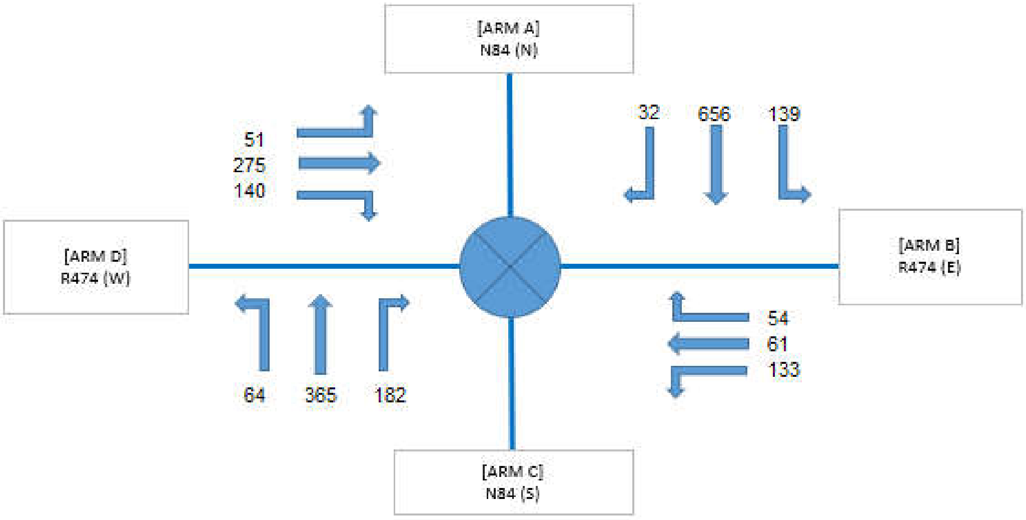


Figure 5-7 Junction 1 – 2039 AM Peak Base

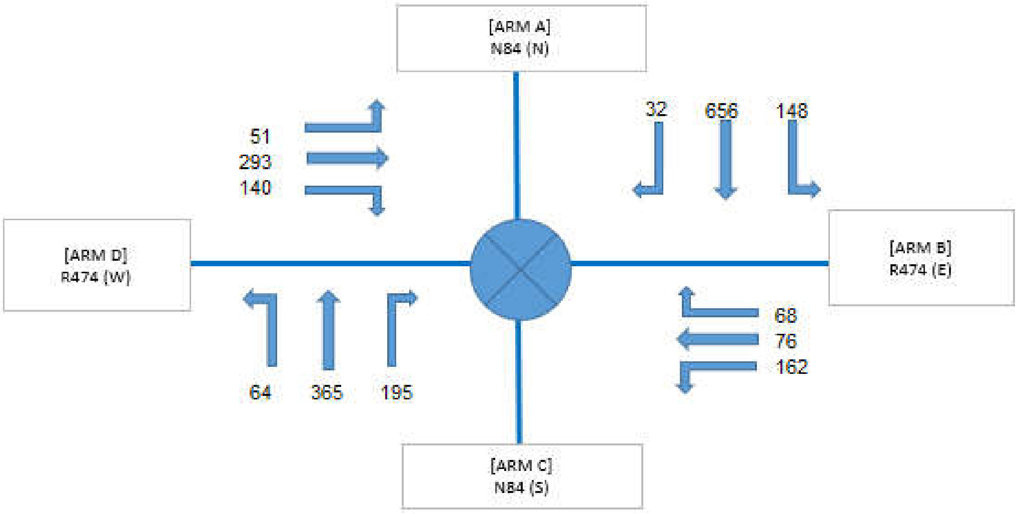


Figure 5-8 Junction 1 – 2039 AM Peak Base with Comm & Prop Development

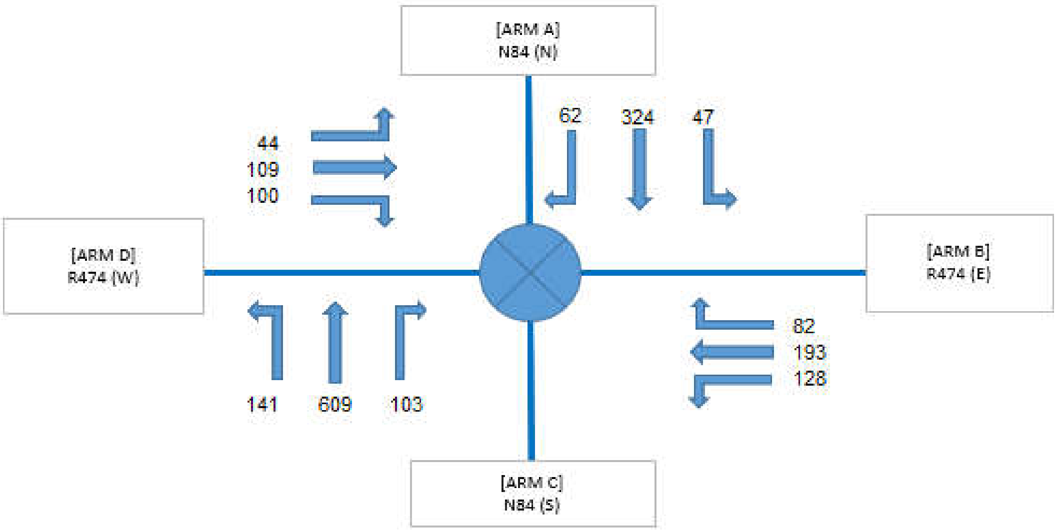


Figure 5-9 Junction 1 – 2039 PM Peak Base (With Bypass)

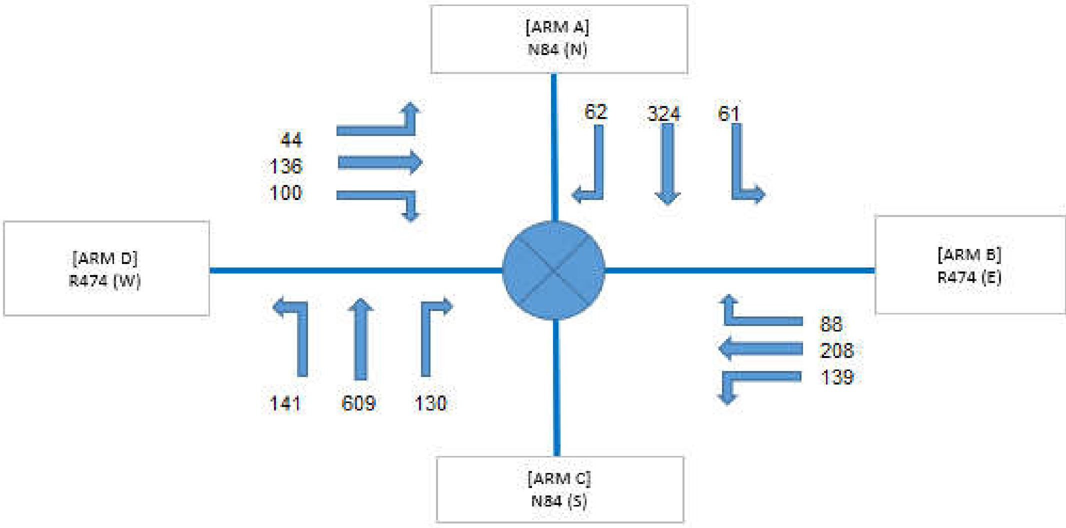


Figure 5-10 Junction 1 – 2039 PM Peak Base with Comm & Prop Development

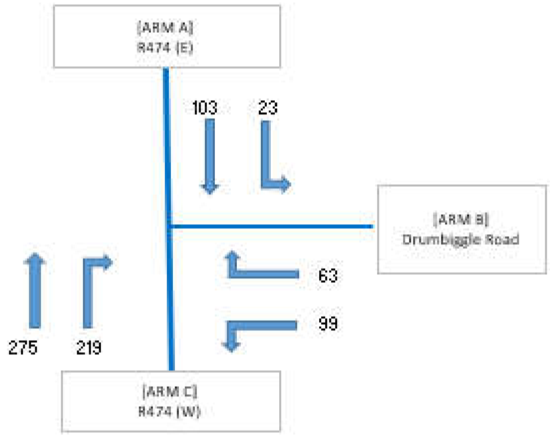


Figure 5-11 Junction 2 – 2021 Base AM Peak

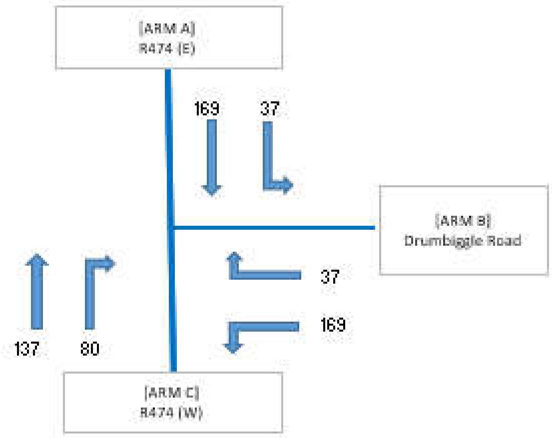


Figure 5-12 Junction 2 – 2021 Base PM Peak

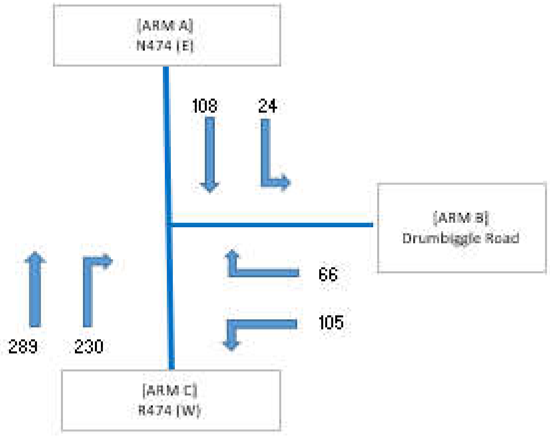


Figure 5-13 Junction 2 – 2024 Base AM Peak

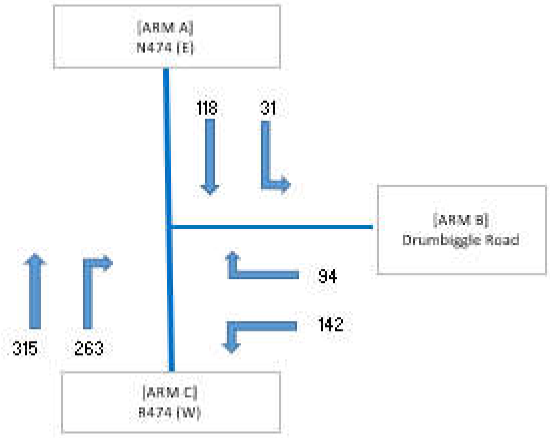


Figure 5-14 Junction 2 – 2024 Base with Comm & Prop Development AM Peak

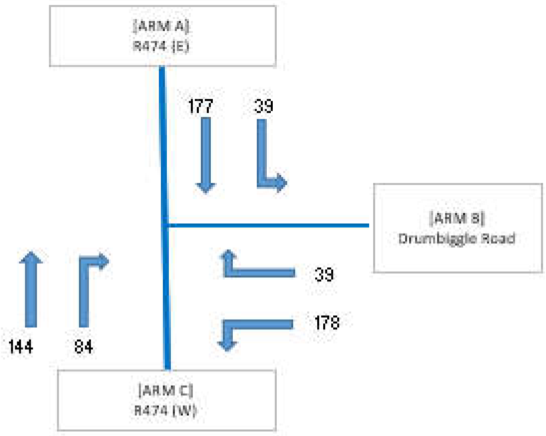


Figure 5-15 Junction 2 – 2024 Base PM Peak

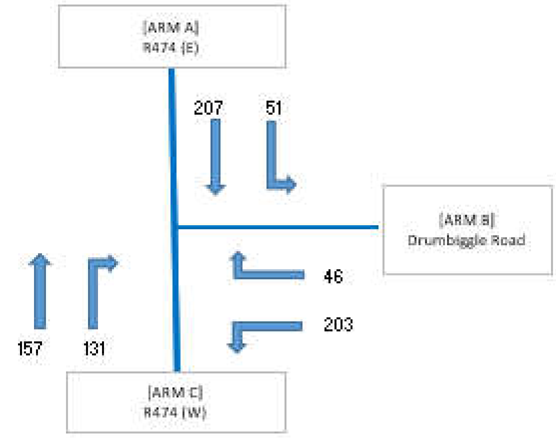


Figure 5-16 Junction 2 – 2024 Base with Comm & Prop Development PM Peak

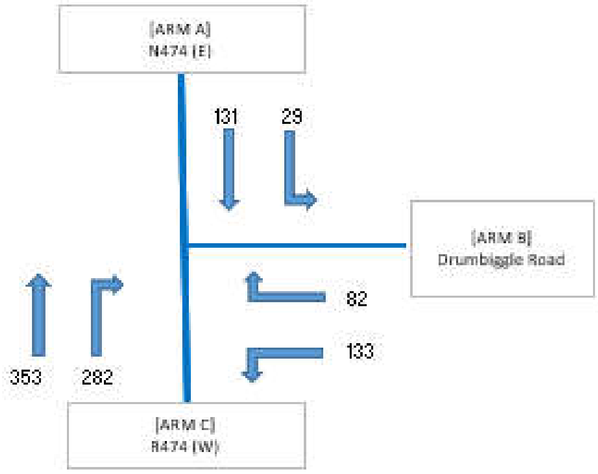


Figure 5-17 Junction 2 – 2039 Base AM Peak

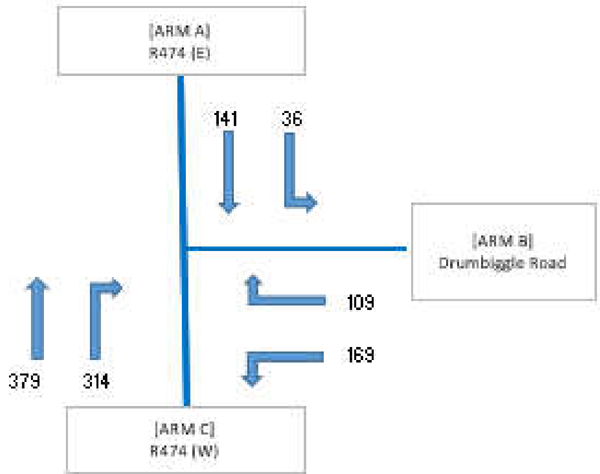


Figure 5-18 Junction 2 – 2039 Base with Comm & Prop Development AM Peak

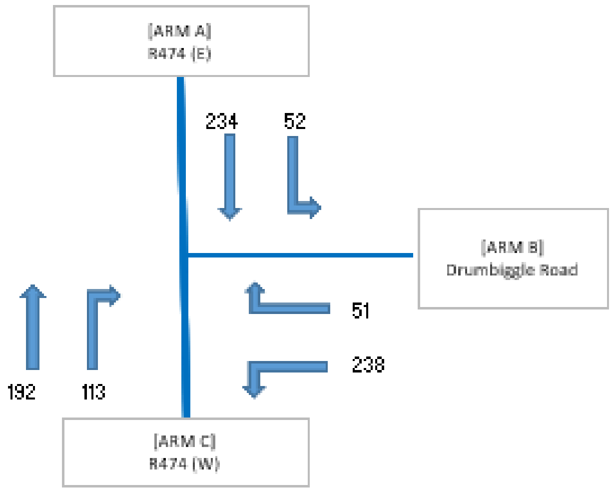


Figure 5-19 Junction 2 – 2039 Base PM Peak

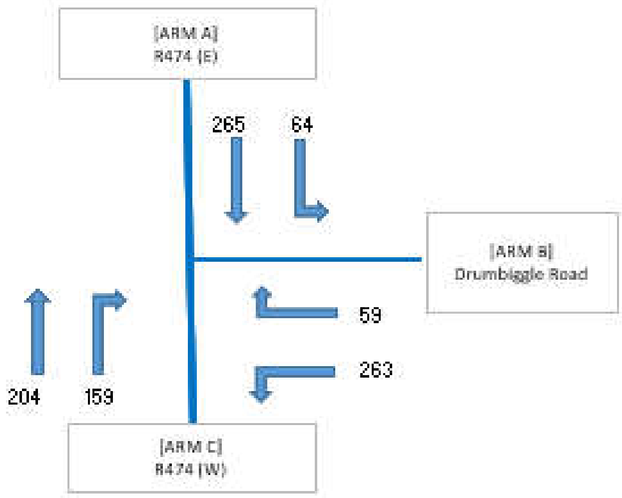


Figure 5-20 Junction 2 – 2039 Base with Comm & Prop Development PM Peak

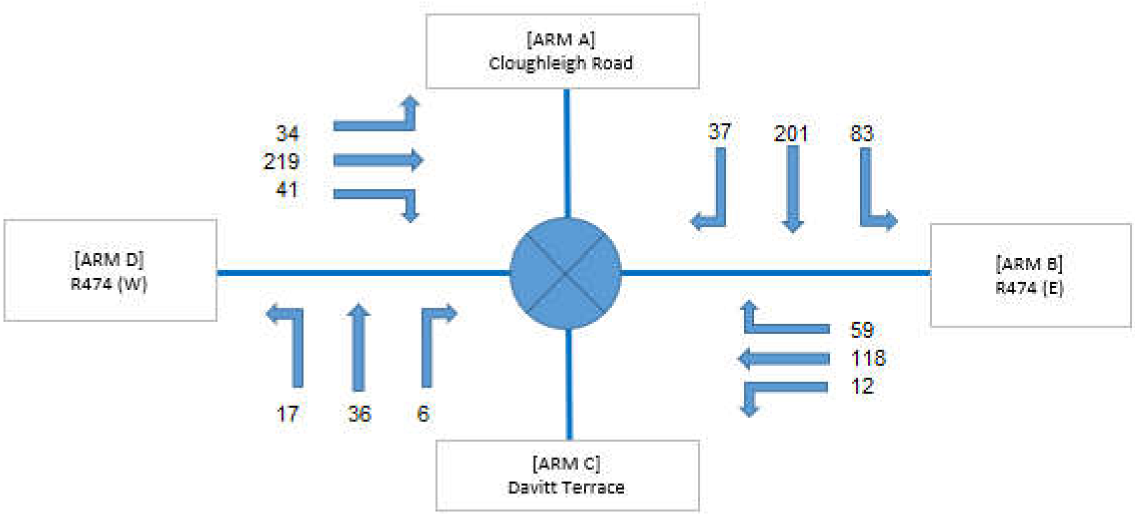


Figure 5-21 Junction 3 – 2021 Base AM Peak

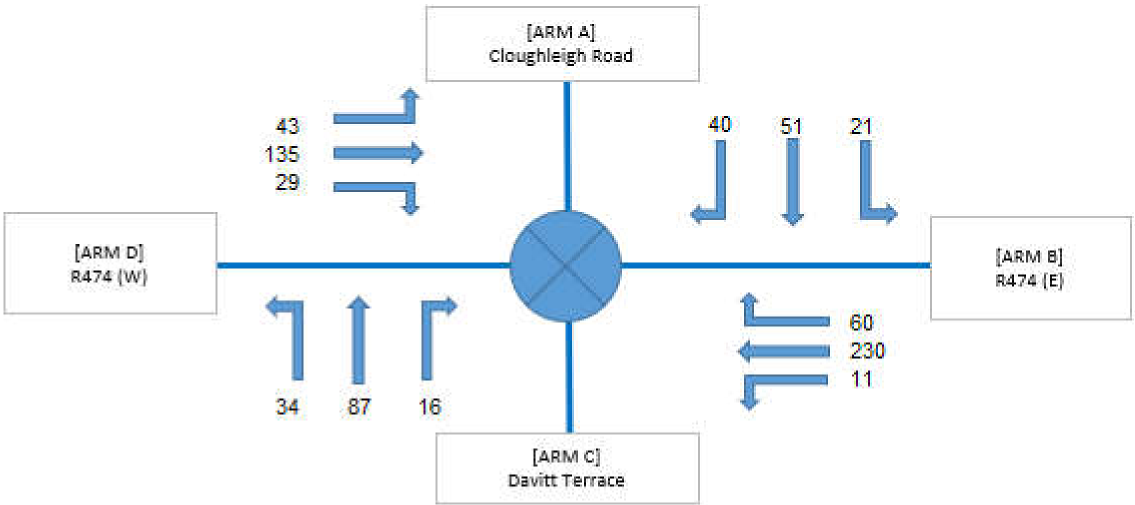


Figure 5-22 Junction 3 – 2021 Base PM Peak

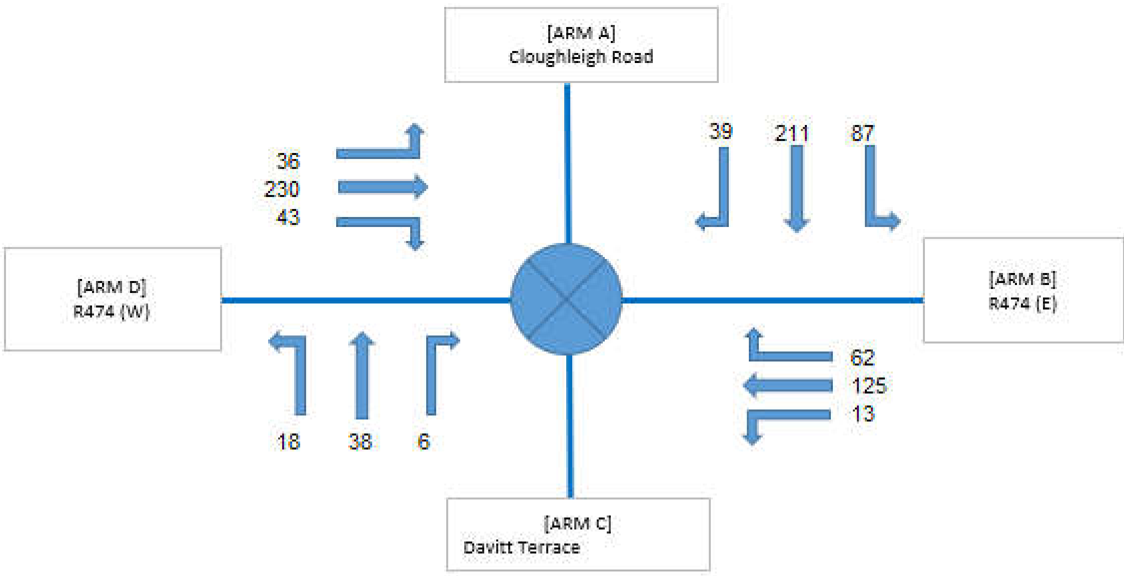


Figure 5-23 Junction 3 – 2024 Base AM Peak

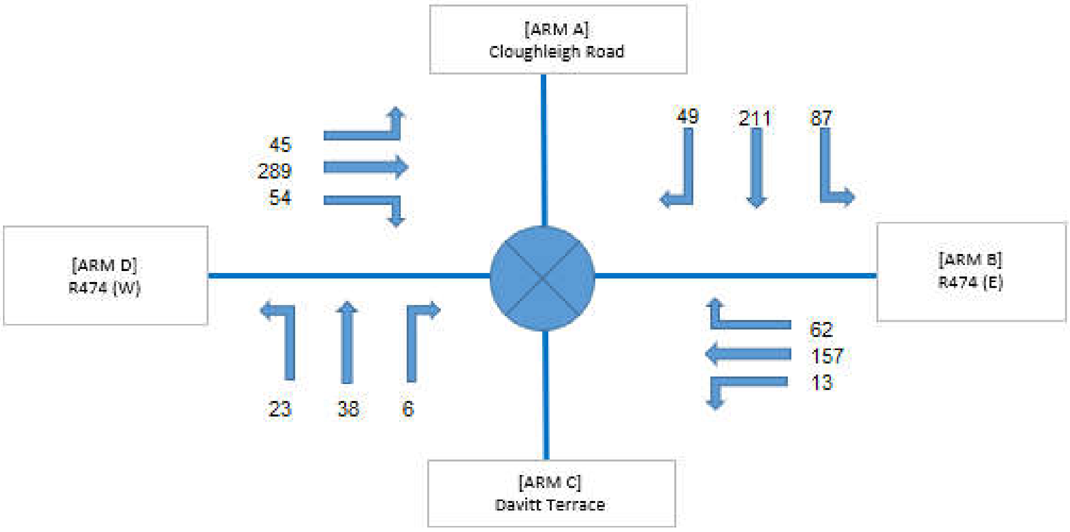


Figure 5-24 Junction 3 – 2024 Base with Comm & Prop Development AM Peak

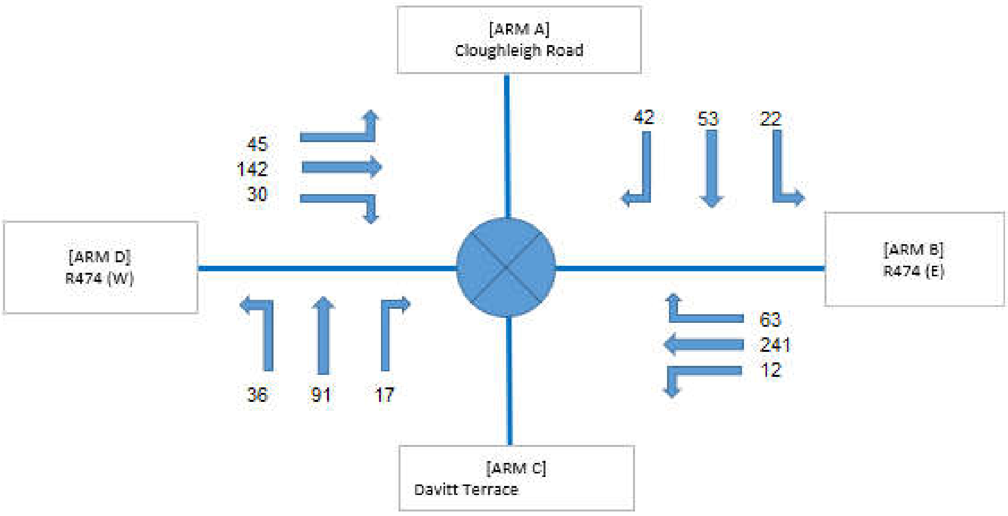


Figure 5-25 Junction 3 – 2024 Base PM Peak

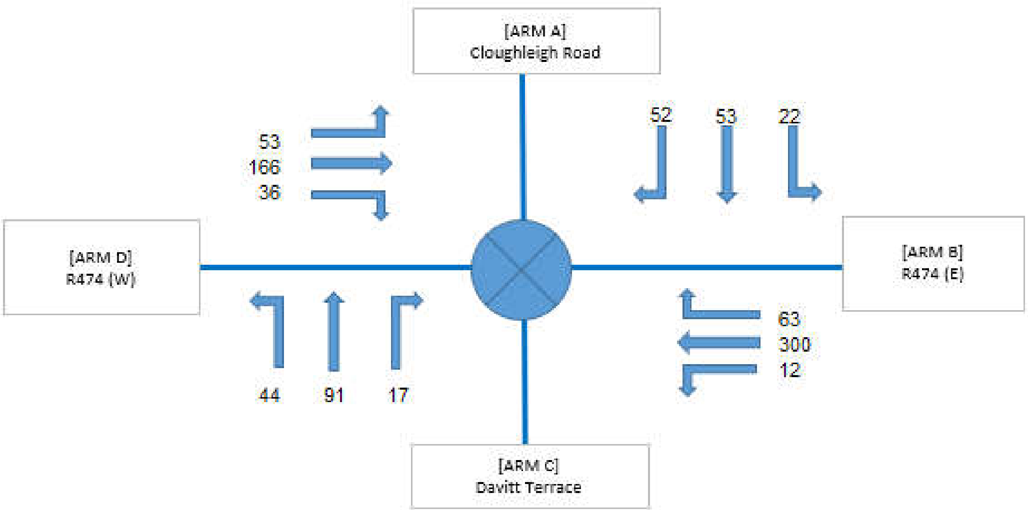


Figure 5-26 Junction 3 – 2024 Base with Comm & Prop Development PM Peak

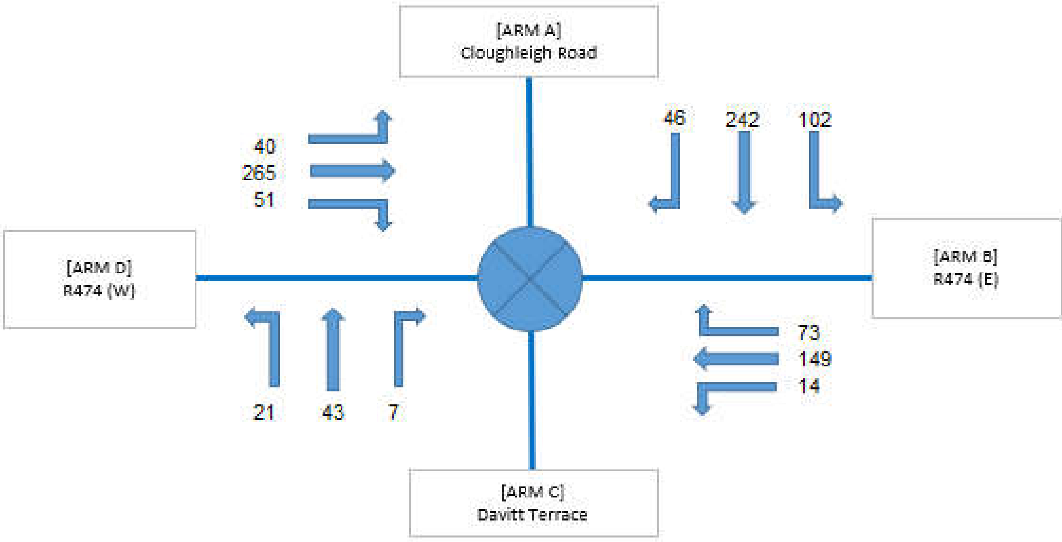


Figure 5-27 Junction 3 – 2039 Base AM Peak

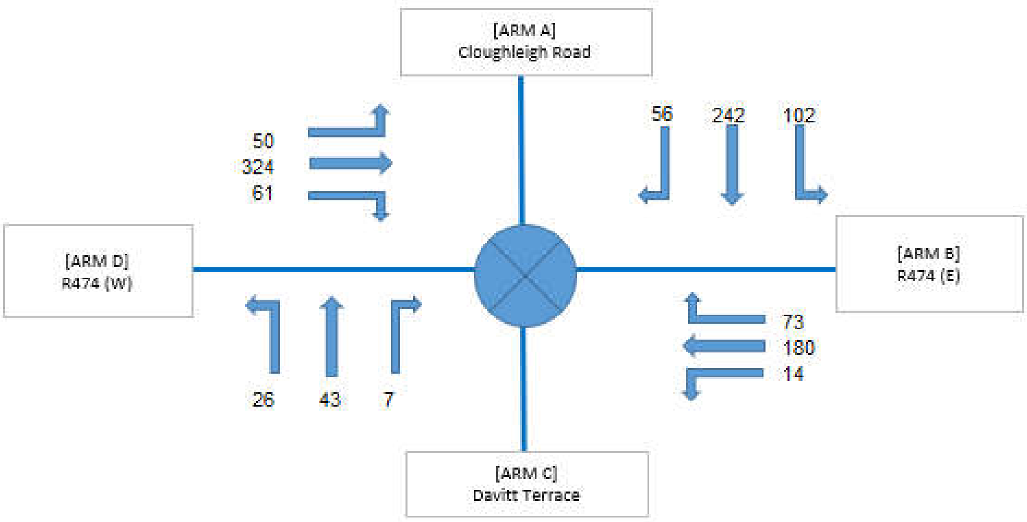


Figure 5-28 Junction 3 – 2039 Base with Comm & Prop Development AM Peak

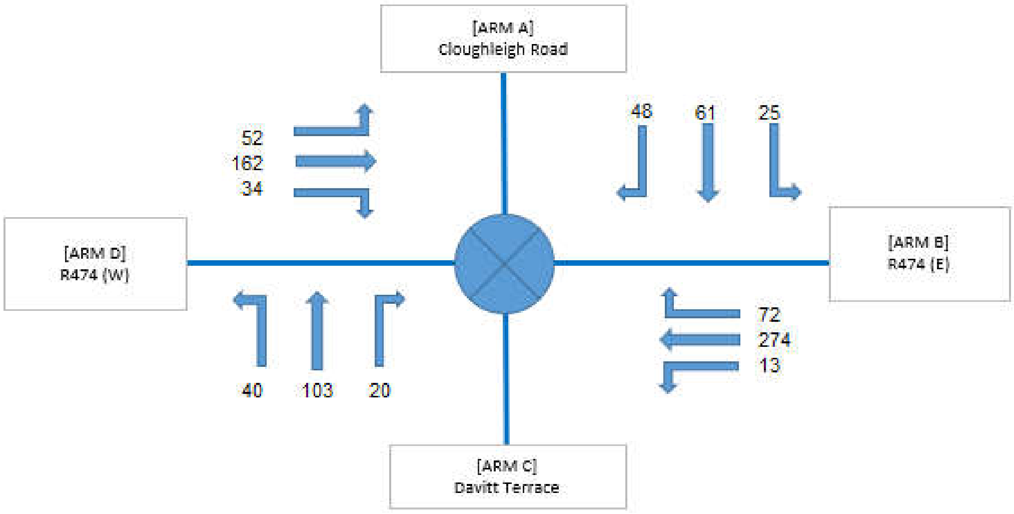


Figure 5-29 Junction 3 – 2039 Base PM Peak

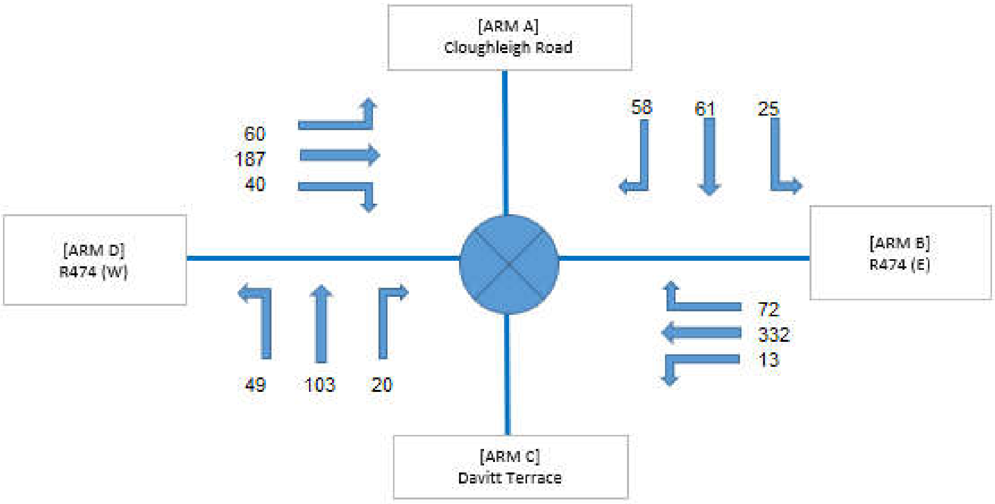


Figure 5-30 Junction 3 – 2039 Base with Comm & Prop Development PM Peak

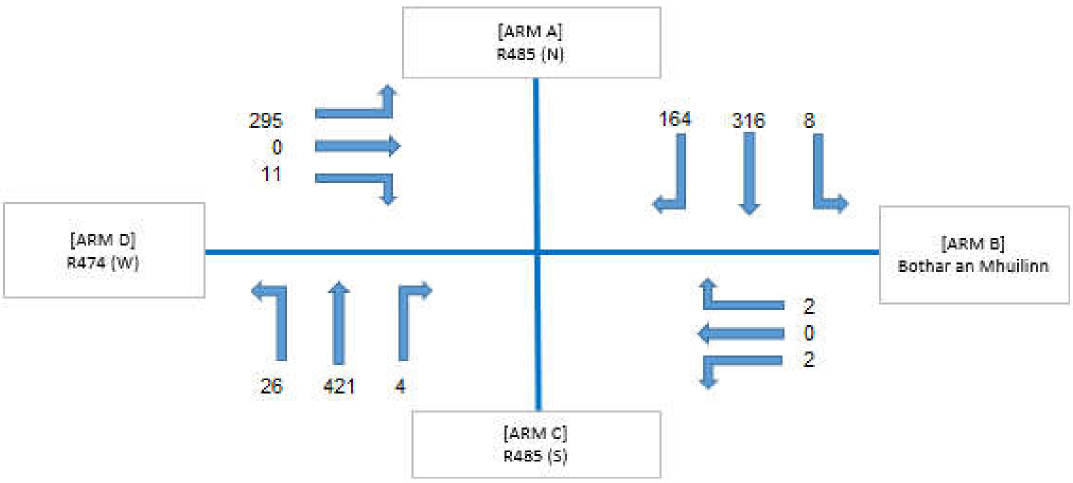


Figure 5-31 Junction 4 – 2021 Base AM Peak

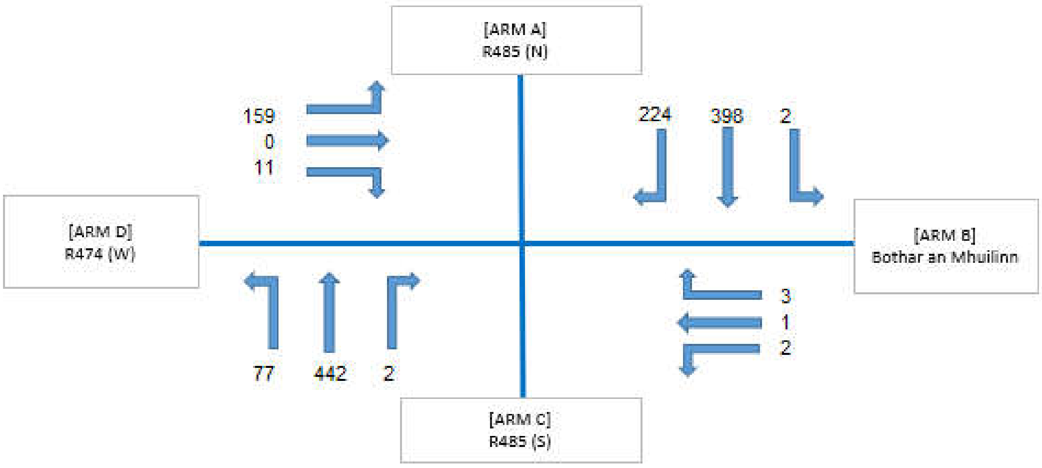


Figure 5-32 Junction 4 – 2021 Base PM Peak

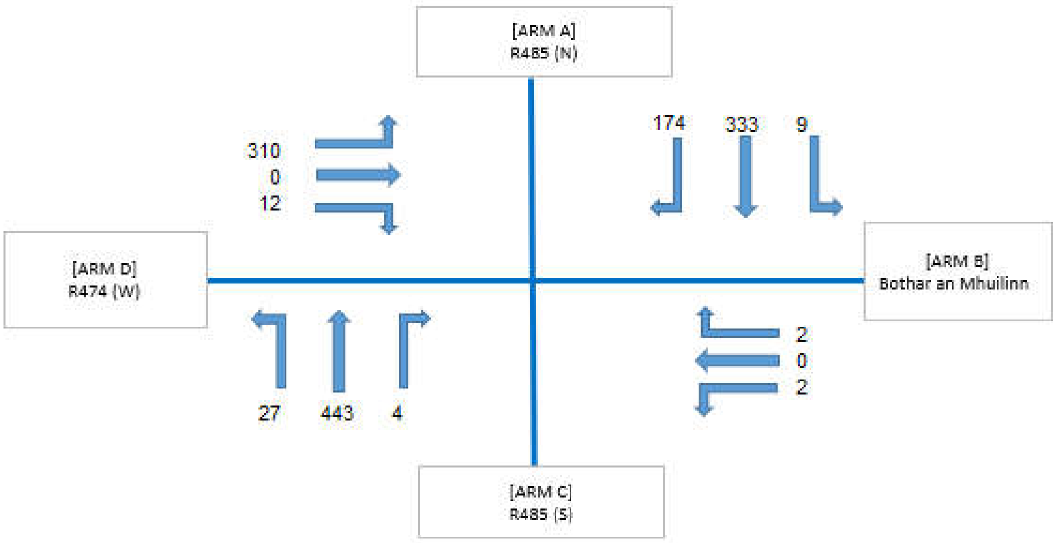


Figure 5-33 Junction 4 – 2024 Base AM Peak

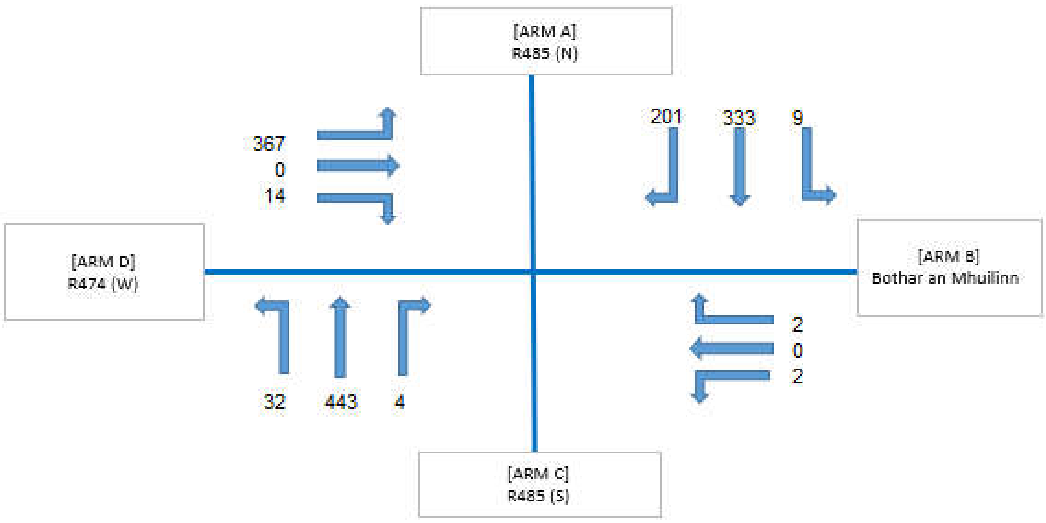


Figure 5-34 Junction 4 – 2024 Base with Comm & Prop Development AM Peak

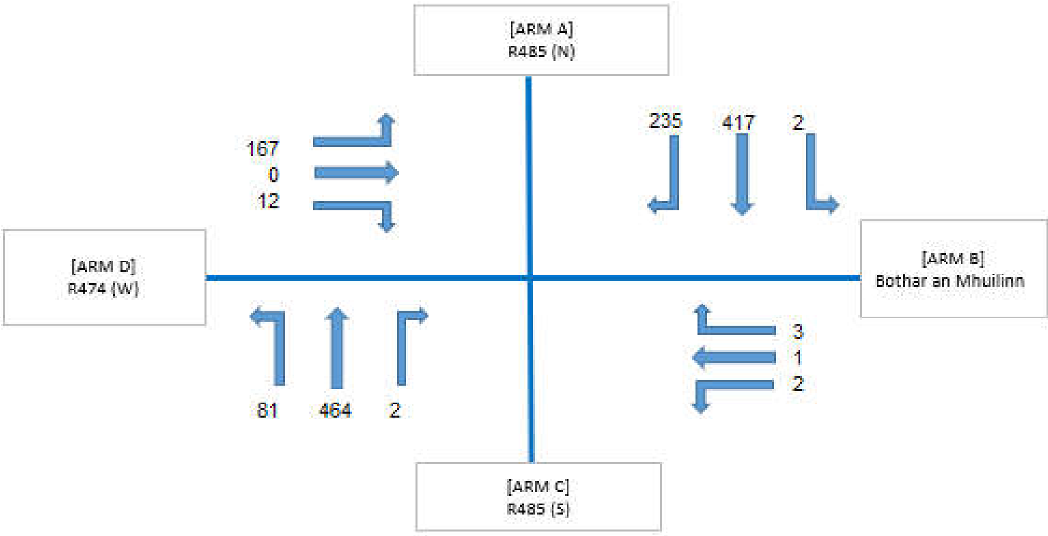


Figure 5-35 Junction 4 – 2024 Base PM Peak

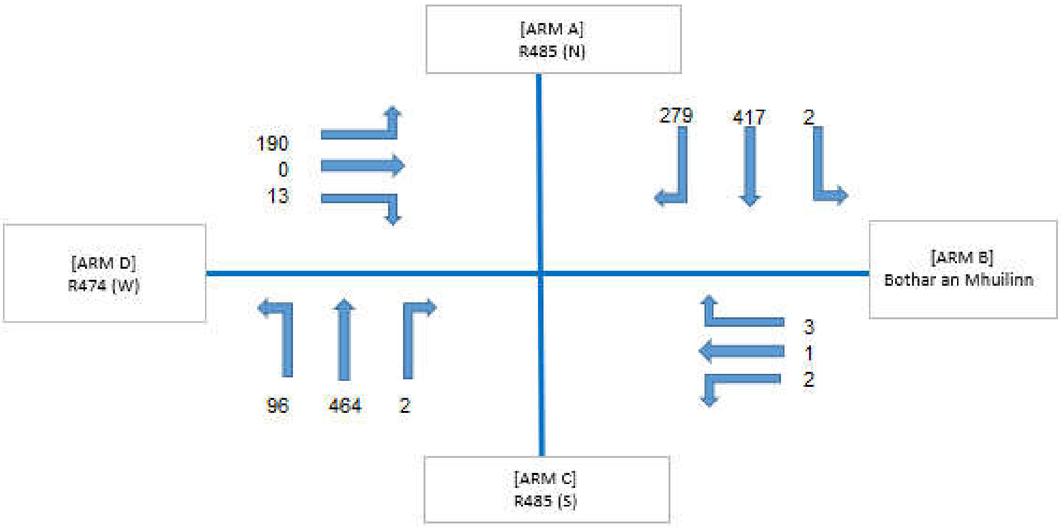


Figure 5-36 Junction 4 – 2024 Base with Comm & Prop Development PM Peak

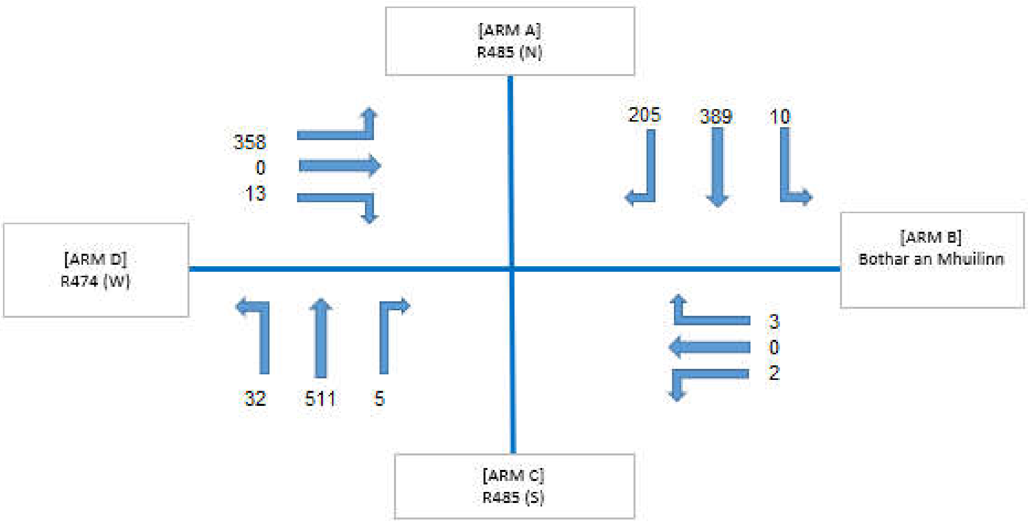


Figure 5-37 Junction 4 – 2039 Base AM Peak

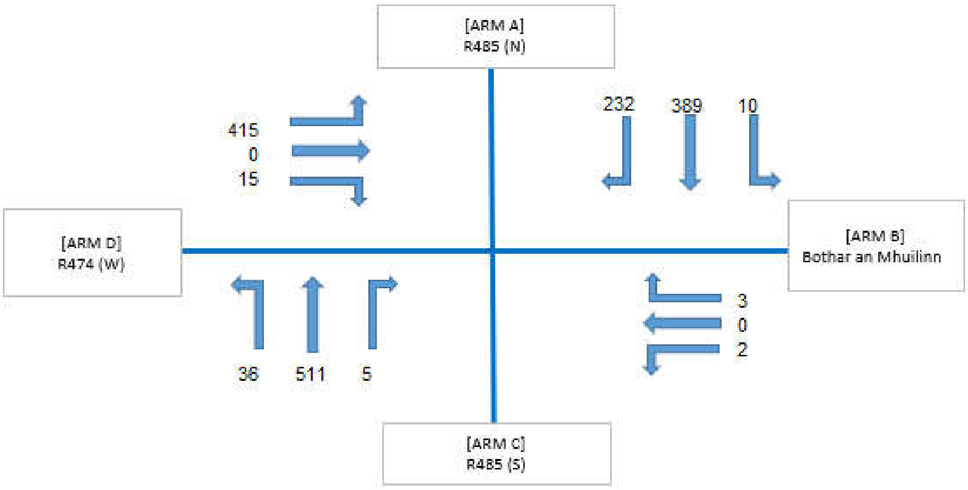


Figure 5-38 Junction 4 – 2039 Base with Comm & Prop Development AM Peak

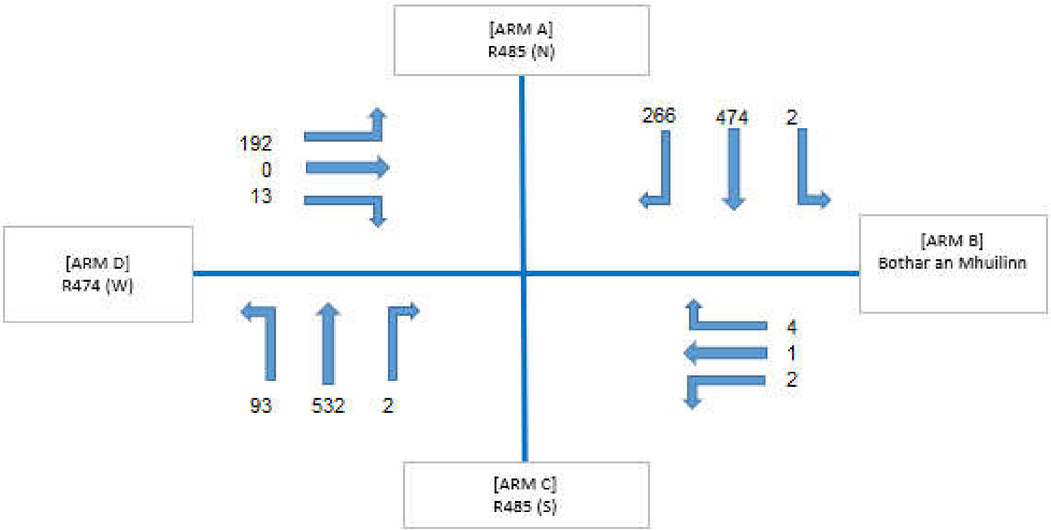


Figure 5-39 Junction 4 – 2039 Base PM Peak

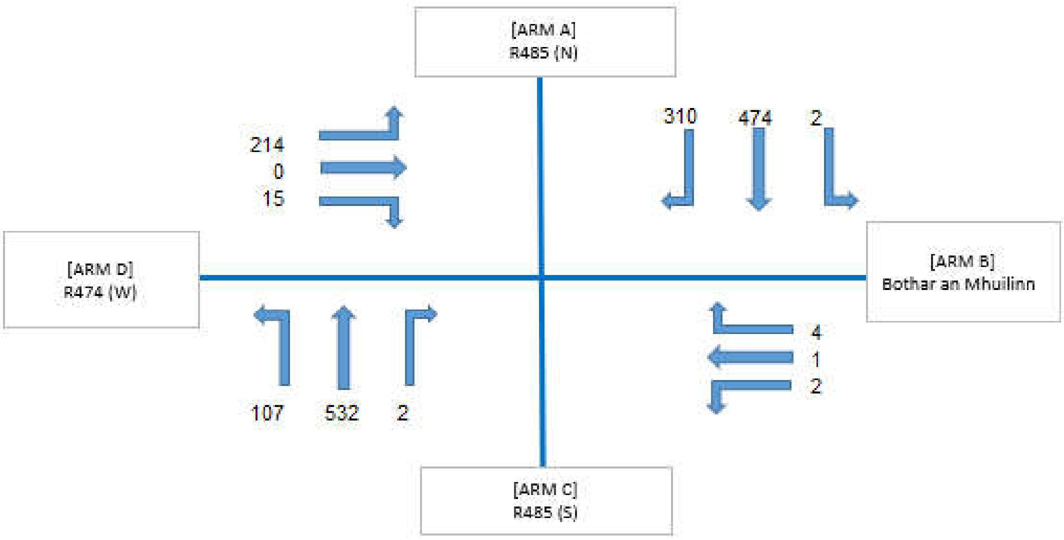


Figure 5-40 Junction 4 – 2039 Base with Comm & Prop Development PM Peak

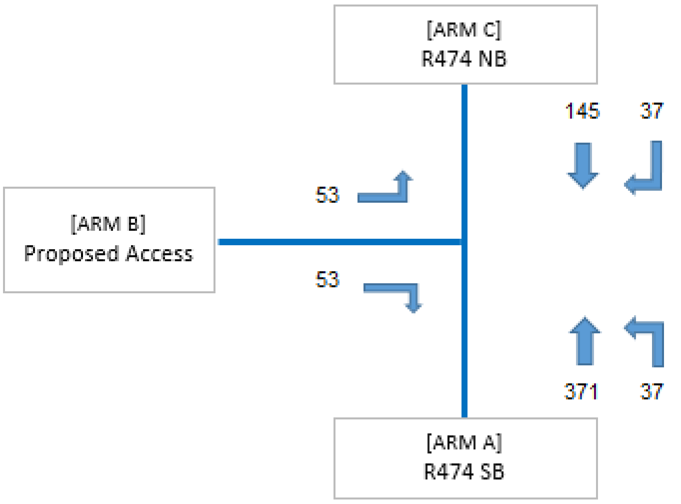


Figure 5-41 Junction 5 – 2024 Base with Comm & Prop Development AM Peak

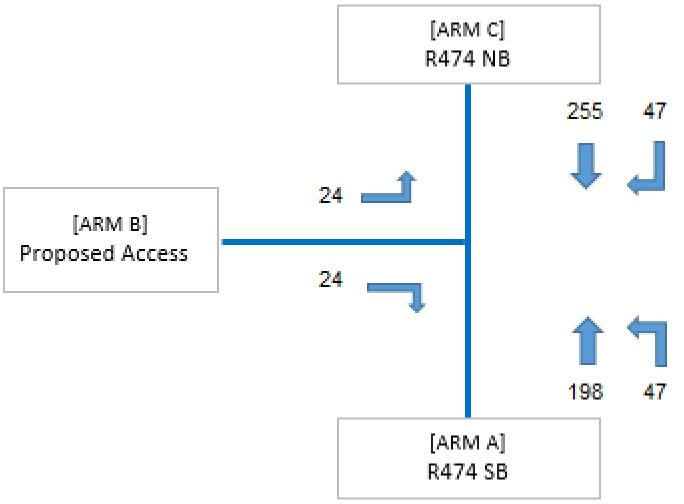


Figure 5-42 Junction 5 – 2024 Base with Comm & Prop Development PM Peak

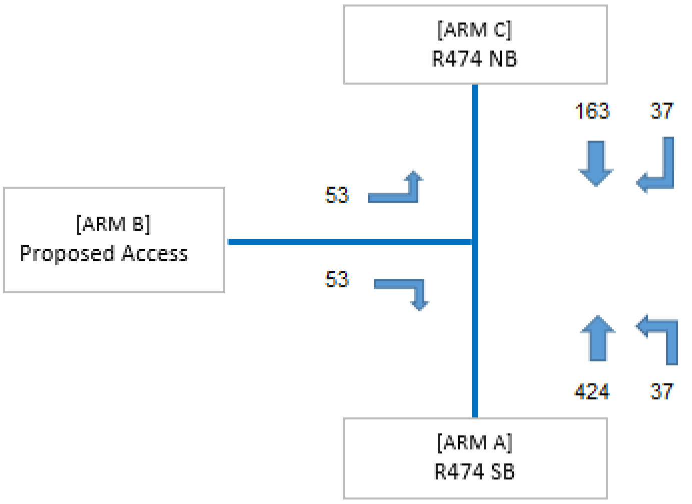


Figure 5-43 Junction 5 – 2039 Base with Comm & Prop Development AM Peak

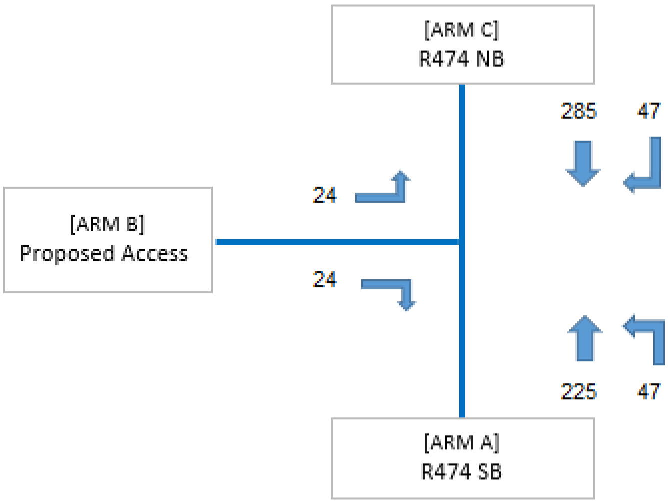


Figure 5-44 Junction 5 – 2039 Base with Comm & Prop Development PM Peak

6.0 JUNCTION ANALYSIS

6.1 INTRODUCTION AND METHODOLOGY

The existing roundabout junction has been analysed using the Transport Research Laboratory (TRL) computer program Junction 9 ARCADY and the priority junctions have been analysed using the TRL computer program JUNCTION 9 PICADY. Both programs are widely accepted tools used for the analysis of roundabout and priority junctions.

The key parameters examined in the results of the analysis are the Ratio of Flow to Capacity Value (RFC value – desirable value for ARCADY and PICADY should be no greater than 0.85 – values over 1.00 indicate the approach arm is over capacity), the maximum queue length on any approach to the junctions and the average delay for each vehicle passing through the junction during the modelled period.

PICADY and ARCADY require the following input data:

- Basic modelling parameters (usually peak hour traffic counts synthesised over a 90-minute model period)
- Geometric parameters (including lane numbers & widths, visibility, storage provision etc)
- Traffic demand data (usually peak hour origin/destination table with composition of heavy goods vehicles input*)

For the purpose of this report, the varying vehicle types have been converted into passenger car units (PCU) prior to input. 1 PCU is equivalent to a car / light vehicle while a large HGV is equivalent to 2.3PCU.

The results of the analysis are presented in the following Sections.

6.2 ASSESSMENT RESULTS

The analysis results for the junctions are outlined in the following Sections. The full results of the PICADY and ARCADY analysis are provided in **Appendix B and C.**

6.2.1 Junction 1 – Roundabout Junction N84 / R474 (Beecher Roundabout)

A summary of the analysis results for the N84 / R474 Roundabout junction for the AM peak and PM peak hours are provided in the Table below. Full outputs from JUNCTION 9 ARCADY are included in **Appendix B**.

Table 6-1: Junction 1- ARCADY Outputs (AM and PM Peak Hours)

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2021 Baseflow									
Arm 1	D1	2.1	10.40	0.68	B	D2	0.4	4.11	0.30	A
Arm 2		0.3	4.39	0.21	A		0.4	4.24	0.30	A
Arm 3		0.6	4.05	0.37	A		1.3	6.07	0.56	A
Arm 4		0.6	5.51	0.39	A		0.3	4.73	0.22	A
	2024 Baseflow									
Arm 1	D3	2.1	9.85	0.68	A	D4	0.5	4.24	0.32	A
Arm 2		0.3	4.56	0.22	A		0.5	4.40	0.32	A
Arm 3		0.7	4.27	0.39	A		1.5	6.60	0.59	A
Arm 4		0.7	5.81	0.41	A		0.3	4.93	0.24	A
	2024 Baseflow + Dev									
Arm 1	D5	2.3	10.57	0.69	B	D6	0.5	4.46	0.34	A
Arm 2		0.4	4.94	0.28	A		0.5	4.60	0.35	A
Arm 3		0.7	4.41	0.40	A		1.7	7.11	0.62	A
Arm 4		0.8	6.13	0.43	A		0.4	5.25	0.28	A
	2039 Baseflow									
Arm 1	D7	2.6	11.96	0.72	B	D8	0.6	4.71	0.37	A
Arm 2		0.4	4.87	0.26	A		0.6	4.95	0.38	A
Arm 3		0.9	4.89	0.46	A		2.3	8.95	0.69	A
Arm 4		1.0	7.06	0.49	A		0.4	5.62	0.30	A
	2039 Baseflow + Dev									
Arm 1	D9	4.9	19.85	0.83	C	D10	0.7	4.99	0.40	A
Arm 2		0.5	5.70	0.34	A		0.7	5.20	0.41	A
Arm 3		1.0	5.08	0.48	A		2.6	9.92	0.72	A
Arm 4		1.1	7.54	0.52	A		0.5	6.05	0.33	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

The ARCADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the roundabout is forecast to operate well within capacity for all Streams in both the morning and evening peak periods for the No Development scenario. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate well within capacity.

6.2.2 Junction 2 – R474 / Drumbiggle Road Priority Junction

A summary of the analysis results for the R474 / Drumbiggle Road Priority Junction for the AM peak and PM peak hours are provided in the Table below. Full outputs from JUNCTION 9 PICADY are included in **Appendix C**.

Table 6-2: Junction 2- PICADY Outputs (AM and PM Peak Hours)

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2021									
Stream B-C	D1	0.2	7.86	0.16	A	D2	0.4	8.32	0.28	A
Stream B-A		0.3	14.23	0.20	B		0.1	13.24	0.13	B
Stream C-AB		1.2	8.94	0.47	A		0.2	6.63	0.16	A
	2024 Baseflow									
Stream B-C	D3	0.2	8.01	0.17	A	D4	0.4	8.58	0.30	A
Stream B-A		0.3	14.80	0.21	B		0.2	13.58	0.14	B
Stream C-AB		1.4	9.36	0.50	A		0.3	6.69	0.17	A
	2024 Baseflow + Dev									
Stream B-C	D5	0.4	9.59	0.26	A	D6	0.6	9.62	0.36	A
Stream B-A		0.5	18.68	0.33	C		0.2	15.50	0.17	C
Stream C-AB		2.0	11.19	0.59	B		0.5	7.68	0.28	A
	2039 Baseflow									
Stream B-C	D7	0.3	8.87	0.22	A	D8	0.7	10.87	0.42	B
Stream B-A		0.4	18.18	0.29	C		0.3	16.72	0.20	C
Stream C-AB		2.5	12.49	0.64	B		0.4	7.10	0.24	A
	2039 Baseflow + Dev									
Stream B-C	D9	0.5	11.34	0.32	B	D10	0.5	9.55	0.35	A
Stream B-A		0.8	24.83	0.43	C		0.2	15.79	0.16	C
Stream C-AB		3.9	17.00	0.74	C		0.5	7.89	0.29	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle

The PICADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the junction is forecast to operate well within capacity for all Streams in both the morning and evening peak periods for the No Development scenario. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate well within capacity.

6.2.3 Junction 3 - Roundabout Junction R474 / Cloughleigh Rd / Davitt Terrace

A summary of the analysis results for the R471 / Cloughleigh Rd / Davitt Terrace Roundabout junction for the AM peak and PM peak hours are provided in the Table below. Full outputs from JUNCTION 9 ARCADY are included in **Appendix B**.

Table 6-3: Junction 3- ARCADY Outputs (AM and PM Peak Hours)

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2021 Baseflow									
Arm 1	D1	0.3	2.88	0.21	A	D2	0.1	2.35	0.07	A
Arm 2		0.2	3.51	0.17	A		0.3	3.53	0.24	A
Arm 3		0.1	4.98	0.08	A		0.2	5.88	0.19	A
Arm 4		0.6	6.40	0.36	A		0.4	5.77	0.26	A
	2024 Baseflow									
Arm 1	D3	0.3	2.94	0.23	A	D4	0.1	2.37	0.08	A
Arm 2		0.2	3.58	0.18	A		0.3	3.60	0.26	A
Arm 3		0.1	5.05	0.08	A		0.3	6.05	0.21	A
Arm 4		0.6	6.62	0.38	A		0.4	5.91	0.28	A
	2024 Baseflow + Dev									
Arm 1	D5	0.3	3.10	0.24	A	D6	0.1	2.43	0.08	A
Arm 2		0.3	3.75	0.21	A		0.4	3.89	0.31	A
Arm 3		0.1	5.28	0.09	A		0.3	6.63	0.23	A
Arm 4		0.9	7.83	0.47	A		0.5	6.34	0.32	A
	2039 Baseflow									
Arm 1	D7	0.4	3.17	0.27	A	D8	0.1	2.43	0.09	A
Arm 2		0.3	3.85	0.21	A		0.4	3.82	0.29	A
Arm 3		0.1	5.29	0.10	A		0.3	6.60	0.24	A
Arm 4		0.8	7.44	0.44	A		0.5	6.40	0.32	A
	2039 Baseflow + Dev									
Arm 1	D9	0.4	3.36	0.28	A	D10	0.1	2.49	0.09	A
Arm 2		0.3	4.04	0.24	A		0.5	4.14	0.34	A
Arm 3		0.1	5.53	0.11	A		0.4	7.33	0.27	A
Arm 4		1.2	9.01	0.54	A		0.6	6.92	0.37	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

The ARCADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the roundabout is forecast to operate well within capacity for all Streams in both the morning and evening peak periods for the No Development scenario. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate well within capacity.

6.2.4 Junction 4 – Priority Junction R474 / R458

A summary of the analysis results for the R474 / R458 Priority Junction for the AM peak and PM peak hours are provided in the Table below. Full outputs from JUNCTION 9 PICADY are included in **Appendix C**.

Table 6-4: Junction 4 - PICADY Outputs (AM and PM Peak Hours)

	AM					PM				
	Set ID	**Queue (PCU)**	**Delay (s)**	**RFC**	**LOS**	**Set ID**	**Queue (PCU)**	**Delay (s)**	**RFC**	**LOS**
	2021 Baseflow									
Stream B-ACD	D1	0.0	0.00	0.00	A	D2	0.0	11.77	0.02	B
Stream A-BCD		0.5	11.15	0.31	B		1.1	15.95	0.50	C
Stream D-ABC		1.4	15.69	0.57	C		0.5	10.82	0.35	B
Stream C-ABD		0.0	7.36	0.01	A		0.0	8.29	0.01	A
	2024 Baseflow									
Stream B-ACD	D3	0.0	0.00	0.00	A	D4	0.0	12.30	0.02	B
Stream A-BCD		0.5	11.57	0.32	B		1.3	17.13	0.53	C
Stream D-ABC		1.6	17.29	0.61	C		0.6	11.45	0.37	B
Stream C-ABD		0.0	7.45	0.01	A		0.0	8.46	0.01	A
	2024 Baseflow + Dev									
Stream B-ACD	D5	0.0	0.00	0.00	A	D6	0.0	13.06	0.02	B
Stream A-BCD		0.7	12.70	0.38	B		2.0	21.37	0.64	C
Stream D-ABC		2.7	24.85	0.73	C		0.8	12.69	0.43	B
Stream C-ABD		0.0	7.61	0.01	A		0.0	8.81	0.01	A
	2039 Baseflow									
Stream B-ACD	D7	0.0	0.00	0.00	A	D8	0.0	14.87	0.03	B
Stream A-BCD		0.7	12.98	0.38	B		1.9	21.31	0.63	C
Stream D-ABC		2.5	24.25	0.71	C		0.8	13.53	0.44	B
Stream C-ABD		0.0	7.76	0.01	A		0.0	9.01	0.01	A
	2039 Baseflow + Dev									
Stream B-ACD	D9	0.0	0.00	0.00	A	D10	0.0	16.12	0.03	C
Stream A-BCD		0.9	14.39	0.44	B		3.2	27.50	0.74	D
Stream D-ABC		4.8	41.03	0.84	E		1.0	15.66	0.51	C
Stream C-ABD		0.0	7.93	0.01	A		0.0	9.42	0.01	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

The PICADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the junction is forecast to operate within capacity for the morning and evening peak periods. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate within capacity. It is projected that Stream D-ABC will have a maximum RFC of 0.84 and a queue length of 4.8 PCU for the morning peak period.

6.2.5 Junction 5– Priority Junction Proposed Access/ R474

A summary of the analysis results for the Proposed Access / R474 Priority Junction for the AM peak and PM peak hours are provided in the Table below. Full outputs from JUNCTION 9 PICADY are included in **Appendix C**.

Table 6-5: Junction 5 - PICADY Outputs (AM and PM Peak Hours)

	AM					PM				
	Set ID	**Queue (PCU)**	**Delay (s)**	**RFC**	**LOS**	**Set ID**	**Queue (PCU)**	**Delay (s)**	**RFC**	**LOS**
	2024 Baseflow + Dev									
Stream B-AC	D1	0.4	12.04	0.27	B	D2	0.1	9.26	0.11	A
Stream C-AB		0.1	6.72	0.09	A		0.2	5.84	0.11	A
	2039 Baseflow + Dev									
Stream B-AC	D3	0.4	12.69	0.28	B	**D4**	**0.1**	**9.51**	**0.12**	**A**
Stream C-AB		0.2	6.73	0.09	A		**0.2**	**5.76**	**0.12**	**A**

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

The PICADY analysis results indicate that the junction will operate within capacity for the morning and evening peak periods for the 2024 Opening Year scenario. For the design year 2039, the junction is also forecast to operate within capacity for the morning and evening peak periods. It is projected that Stream B-AC will have a maximum RFC of 0.28 and a queue length of 0.4 PCU for the morning peak period

7.0 OTHER ROAD ISSUES

7.1 ROAD SAFETY

The site access is located within a 50kph speed limit zone which would require visibility splays of 2.4 x 45 metres Road (in accordance with DMURS 2019 Guidelines at the current posted speed limit of 50kph). However, a speed survey was conducted on the R474 road with the survey point located to the south of the proposed access (just outside the 50 kph speed limit zone). This recorded an 85th percentile speed of 61.72 kph northbound and 61.65 kph southbound.

As the recorded speeds are higher than the posted limit of 50kph, the access junction has been designed with a visibility splay for a 60kph road (2.4 x 59m in accordance with DMURS 2019 Guidelines) to account for traffic increasing speed approaching the 50kph speed limit. The visibility splays are demonstrated on the Figure below which contains an extract from Drawing 11269-2003a which indicates the required visibility splays.

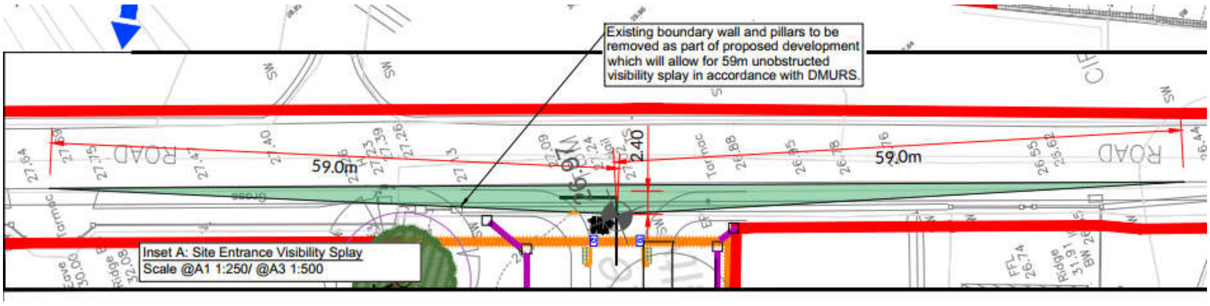


Figure 7-1: Visibility Splays at the main access

The visibility splays of 2.4 x 59 metres are currently achieved both the left and right-hand splay of the proposed access to the development site. Visibility splays of 2.4 x 23m are required for all junctions within the proposed development (for a 30kph speed limit).

A Stage 1 Road Safety Audit has been carried out on the proposed design and is submitted as part of the Stage 3 application. The recommendations of the audit are incorporated into the final scheme design. All points raised by the Road Safety Audit Team to remedy the issues noted were accepted by the Design Team and in addition, all recommendations proposed by the RSA Team were agreed by the Design Team. The RSA Feedback Form was signed by all parties and the process concluded.

An investigation of road collision data from the Road Safety Authority website (source: https://www.rsa.ie/road-safety/statistics/collisions) (see Figure 7-2 for map) indicates that there were no collisions in the vicinity of the Junction since 2005.

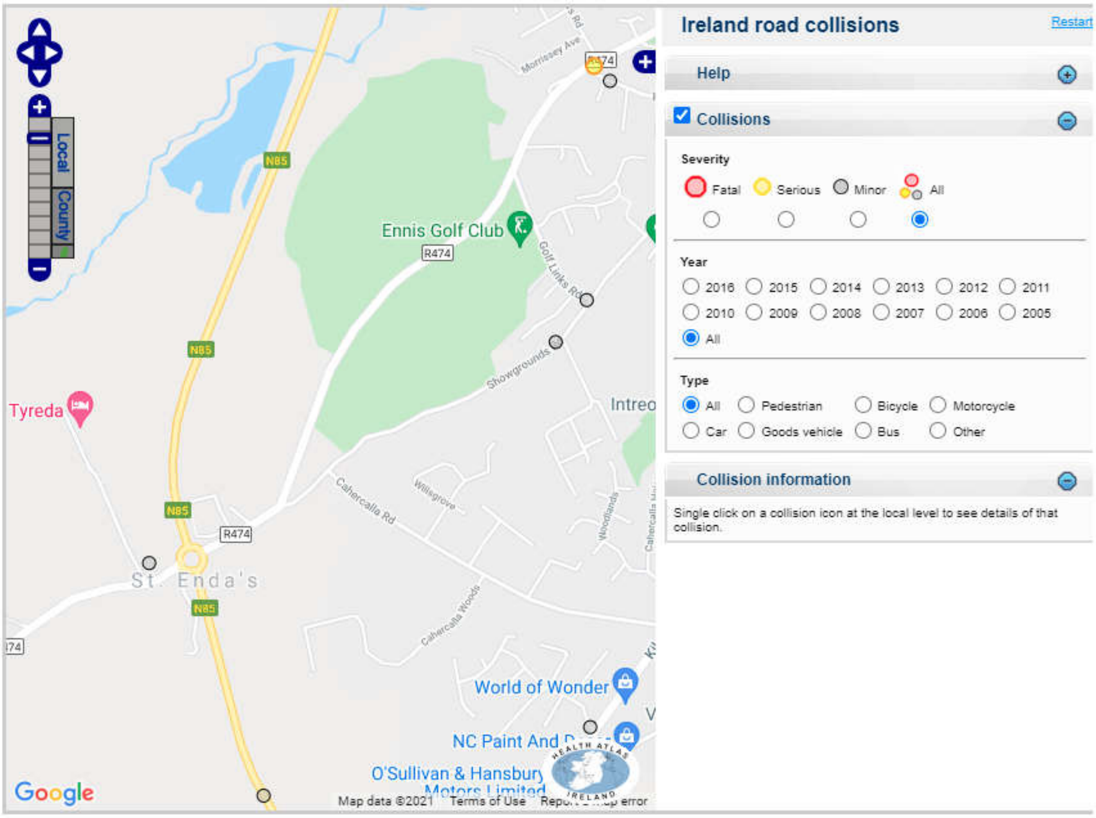


Figure 7-2: RSA Irish Road Collision Statistics

7.2 PARKING PROVISION

7.2.1 Car Parking

The maximum parking provisions at the site have been calculated in accordance with the parking Guidelines set out in the following:

- Clare County Council Development Plan (CCCDP) 2017- 2023

The required and provided car parking breakdown for the proposed development (289 units) is illustrated in Table 7-1 below.

Table 7-1: Car Parking Requirements

Car Parking	CCCDP	No of Units / Staff and Children	Required	Parking Provided
1 & 2 bed houses and apartments	A 1.9.3 – 1 Space Per Unit	90	90	508
≥3 bed houses	A 1.9.3 – 2 Spaces Per Unit	199	398	
Creche (60-child capacity)	A 1.9.3 – 1 per employee and 1 per 4 children	5 / 60	20	11
Totals			508	519

A total of 519 no. car parking spaces will be provided onsite, of which include 4 no. disabled spaces and 10 no of electric charging parking spaces. There are also 2 no. motorcycle parking spaces provided for at the creche. The parking provision is above the required parking for a residential development in County Clare.

7.2.2 Bicycle Parking

The bicycle parking provisions at the site have been calculated in accordance with the parking Guidelines set out within the Clare County Council Development Plan 2017-2023 and Sustainable Urban Housing: Design Standards for New Apartments. For residential elements with direct access to allocated private amenity space, it is envisaged that the bicycle parking will be accommodated within the curtilage of the dwelling (i.e., within the garden). For the residential units without private direct access to private amenity space, 1 private secure bike space will be provided per Town house units and 1 space per bedroom and 0.5 visitor spaces per apartments. A calculated total of 129 spaces are required for the proposed Development, as outlined in Table 7-2.

Table 7-2: Bicycle Parking Requirements

Bicycle Parking	Guidance	Units / Employees	Required	Provided
Residential unit with direct access to allocated private amenity space	Bicycle Parking to be provided in private amenity			
Townhouse Units without direct access to allocated private amenity space	A 1.9.3 - 1 space per unit without garage	113	113	130
Duplex Units without direct access to allocated private amenity space	Section 4.17 - 1 space per bedroom and 0.5 visitor spaces per apartment	6 units / 12 bedrooms	15	
Creche (60-child capacity)	A 1.9.3 – 1 space per 8 employees	6	1	10
Totals			**129**	**140**

7.3 DEVELOPMENT CONSTRUCTION PHASE

The construction works associated with the proposed development are expected to be undertaken in three phases. It is estimated that the construction works will be completed within 36 months of commencement. This will be confirmed upon appointment of a Main Contractor. A comprehensive Traffic Management Plan will be prepared for the construction phases of the works. This will address such items as the volume and approach routes of construction vehicles, onsite parking, construction signage, etc.

The main traffic types expected for the construction phase are envisaged as follows:

- Private light vehicles (cars and vans, etc) driven to and from the site by construction and supervisory staff.
- Larger vehicles (HGVs) which will facilitate material deliveries and removals to and from the site.

It is estimated that for a development of this size, 60 – 70 site operatives will be employed at the height of the construction works. This would equate to an approx. parking requirement for 60 vehicles. Car parking for construction workers and visitors will be located within the construction compound.

Access to the proposed development site is envisaged to be through the new access which will be constructed off the R474 Circular Road. The site entrance will be sufficiently wide for HGVs and construction vehicles to enter the site without causing an obstruction on the main road network. Provision will be made to ensure there is sufficient space within the site for HGVs to turn before joining the public road network.

Signage will be erected on all approaches to the site to notify motorists of the construction works ahead. Signage at the site entrances will be provided to ensure members of the public do not enter the site road mistakenly.

Construction works will be coordinated to ensure construction traffic will have limited impact on the surrounding road network and to have minimum impact on peak morning and evening traffic periods.

Insofar as is possible, ground excavation works will be scheduled during periods of dry weather to minimise potential for silt laden run-off from the works. A wheel wash system will be set up in the event there is a risk of debris deposit on the road. Also, routine cleaning / sweeping of the road and footpaths in the frontage of the site will be required.

8.0 MOBILITY STATEMENT

The Mobility Statement identifies a range of measures which will aim to encourage more sustainable travel modes such as public transport, cycling and walking for users of the residential development at Ennis, Clare.

The focus of the Mobility Statement is to identify a range of measures for the site which will encourage the usage of more sustainable travel modes. It will also aim to meet the following measures and requirements:

- Provide a comprehensive outline of the Public Transport Services available to the future residents, creche employees and users of the development.
- Set out the anticipated targets regarding modal choice for the site
- Outline the various methods which can be employed to facilitate a positive change in travel patterns at the site.

Based on the above, the findings of this Statement can feed into a Workplace Travel Plan for the development which can set targets and objectives alongside the mechanisms which can be put in place to support a positive modal shift for the site.

It should be noted that at this stage, any proposals contained within this Statement are preliminary and should be revised accordingly once the detailed information regarding the final occupiers of the potential sites is ascertained.

The resulting Workplace Travel Plan will then need to be revisited regularly to review progress and implement any changes necessary to respond to any issues that arise and ensure implementation of the objectives of the Plan.

8.1 EXISTING TRANSPORT FACILITIES

8.1.1 WALKING AND CYCLING

The walking network in Ennis is comprised of existing footpaths adjoining public. The main approaches to the town have footpaths for pedestrian use only. There is no dedicated cycling network within the centre of the town and cyclists utilise the existing roadway.

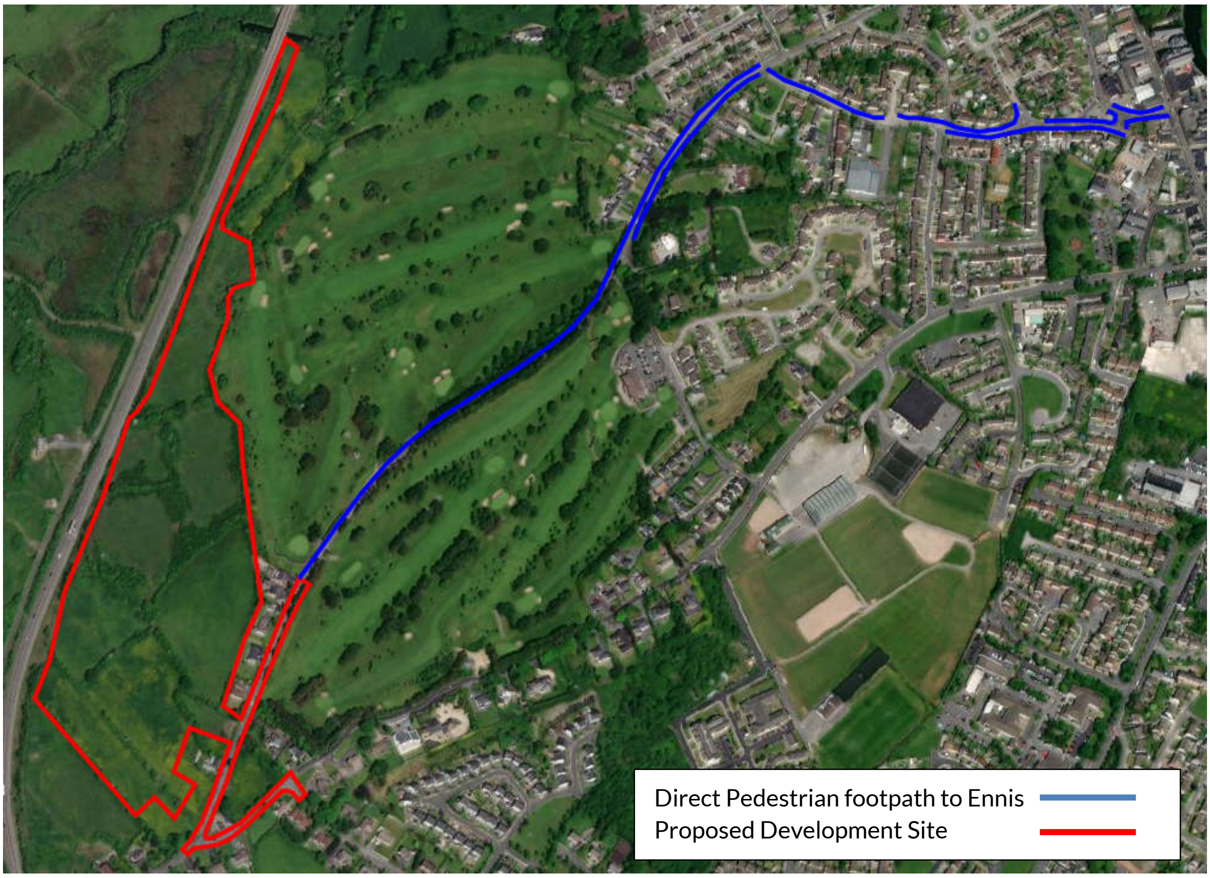


Figure 8-1: Existing Walking Linkages

Given the relatively compact urban form of Ennis there is significant potential for modal shift from the private car to walking and cycling as a mode of transport, particularly if improved linkages between the Town centre and residential areas are realised and new developments focus on connectivity, legibility and permeability.

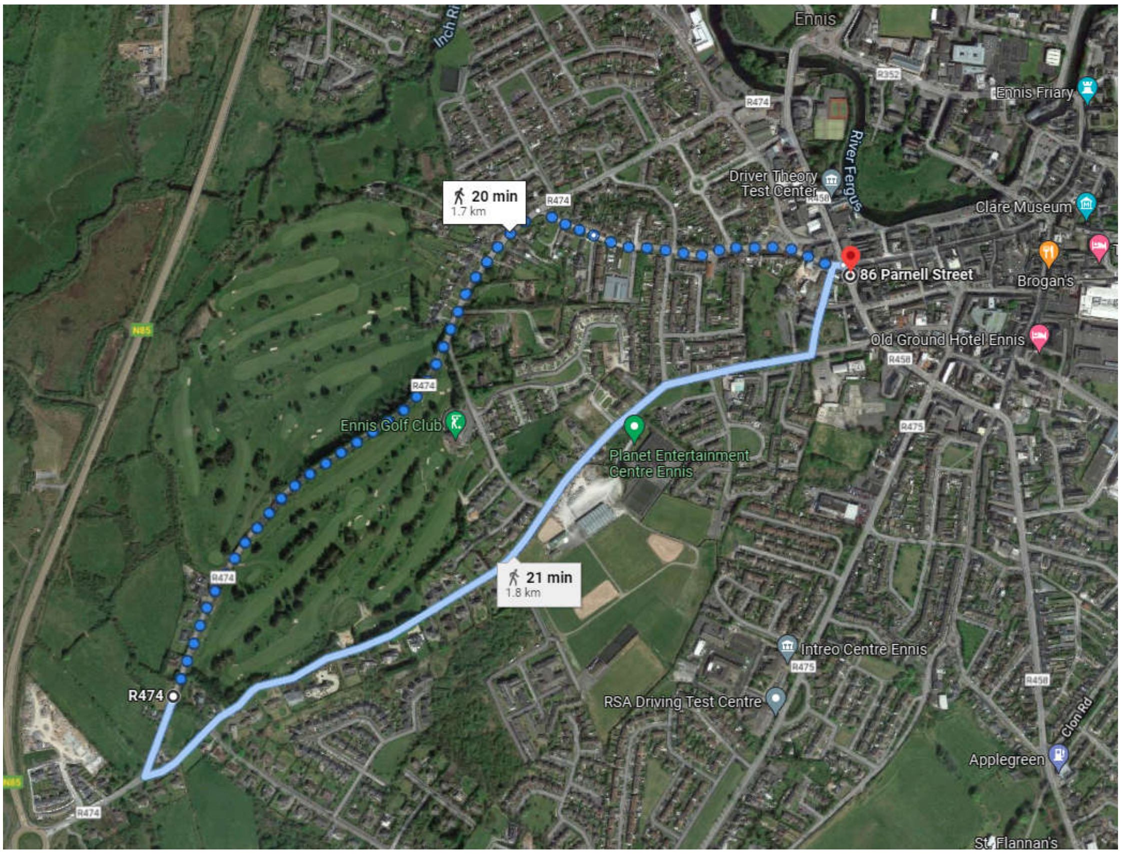


Figure 8-2: Walking Time and Distance to Ennis Town Centre

The Table below gives typical cycle and walking distance and times to main attractions from the proposed development.

Table 8-1 Proposed Development - Typical Cycle & Walking Distances & Time

Attraction	Cycle Distance (km)	Cycle Time (mins)	Walk Distance (km)	Walk Time (mins)
Ennis Ruby Football Club	<0.1	< 1 min	<0.1	<1 min
Ennis Golf Club	0.950	3 min	0.950	11 min
Scoil Chriost Ri	1.60	< 4 min	1.60	19 min
Ennis Health Centre	<1.5	< 5 min	<1.5	<18 min
Ennis Town Centre	1.60	5 min	1.60	19 min

8.1.2 PUBLIC TRANSPORT

8.1.2.1 Bus Routes

Ennis town is served by a number of regional and local bus routes. Local Link operate two local bus routes to Kilrush, Bus Eireann operate a number of local and regional bus routes and Dublin coach operate a bus route to Dublin as detailed below.

8.1.2.2 Local Link Limerick Clare - 335

Bus route 337 stops at the Ennis bus stop, approximately a 32-minute walk from the proposed site. The 337-bus route provides a frequent service between Ennis and Kilrush (via Quilty). This bus route travels from Ennis to Kilrush and runs Monday to Friday from 07:40 to 17:15.

8.1.2.3 Local Link Limerick Clare - 337

Bus route 337 stops at the Top Part bus stop, approximately a 19-minute walk from the proposed site. The 337-bus route provides a frequent service between Ennis and Kilrush. This bus route travels from Kilrush to Ennis and runs Monday to Sunday. Monday to Friday it operates from 08:40 to 17:40. The weekend service runs from 08:40 to 17:40 (Saturday) and from 08:40 to 13:50 (Sunday & Public Holidays).

8.1.2.3.1 Bus Eireann - 343

Bus route 343 stops at the Parnell St Junction, approximately a 21-minute walk from the proposed site. The 343-bus route provides a frequent service between Ennis, Shannon and Limerick. This bus route travels from Limerick to Ennis and runs Monday to Sunday. Monday to Friday it operates from 05:05 to 23:25. The weekend service runs from 05:05 to 23:15 (Saturday) and from 05:05 to 23:25 (Sunday & Public Holidays).

8.1.2.3.2 Bus Eireann - 333

Bus route 333 stops at the Ennis Bus Station, approximately a 32-minute walk from the proposed site. The 333-bus route provides a frequent service between Ennis, Lahinch and Kilkee. This bus route travels from Ennis to Kilkee and runs Monday to Sunday. Monday to Friday it operates from 08:00 to 17:00. The weekend service runs from 08:00 to 17:00 (Saturday) and from 10:00 to 16:00 (Sunday & Public Holidays).

8.1.2.3.3 Bus Eireann - 336

Bus route 336 stops at the Ennis Bus Station, approximately a 32-minute walk from the proposed site. The 336-bus route provides a frequent service between Ennis and Kilkee (via Kilrush). This bus route travels from Ennis to Kilkee and runs Monday to Sunday. Monday to Saturday it operates from 09:00 to 21:30 and on Sundays it operates from 11:00 to 20:00 (Sunday & Public Holidays).

8.1.2.3.4 Bus Eireann - 348

Bus route 348 stops at the Ennis Bus Station, approximately a 32-minute walk from the proposed site. The 348-bus route provides a Thursday service between Ennis and Scariff. This bus route travels from Scariff to Ennis and runs every Thursday at 08:50.

8.1.2.3.5 Bus Eireann - 350

Bus route 350 stops at the Ennis Bus Station, approximately 32-minute walk from the proposed site. The 350-bus route provides a frequent service between Ennis and Galway (via Kinvara, Doolin and the Cliffs of Moher). This bus route travels from Ennis to Galway and runs Monday to Sunday. Monday to Friday it operates from 10:30 to 18:30 and it runs from 08:00 to 18:00 on the weekend service.

8.1.2.3.6 Bus Eireann - 51

Bus route 51 stops at the Ennis Bus station, approximately 32-minute walk from the proposed site. The 51-bus route provides a frequent service between Galway and Cork City. This bus route travels from Ennis to Cork and from 08:20 to 21:20 and Ennis to Galway from 8:25 to 21:25 Monday to Sunday.

8.1.2.3.7 Dublin Coach- 300

Bus route 300 stops at the Ennis Bus station, approximately 32-minute walk from the proposed site. The 300-bus route provides a frequent service between Ennis and Dublin City. This bus route travels from Ennis to Dublin from 01:00 to 20:00 Monday to Sunday.

8.1.2.4 Train Routes

Ennis town is also served by a number of train services which is located approximately 2.7km from the proposed development. Iarnród Eireann operate a number of services from this station of which include Dublin Heuston – Limerick, Galway -Limerick and Waterford – Clonmel – Limerick Junction.

8.1.3 TRAVEL BY CAR

C.S.O. Travel Census data for Ennis was obtained for the 2016 census under the section E6013: Population Usually Resident and Present in the State 2016 by Sex, Means of Travel, Towns by Size, At Work School or College and Census Year. This data is presented in the Figure below. The data excludes the census data for the 'not stated' as these are not relevant to this development – the figures below are adjusted accordingly.

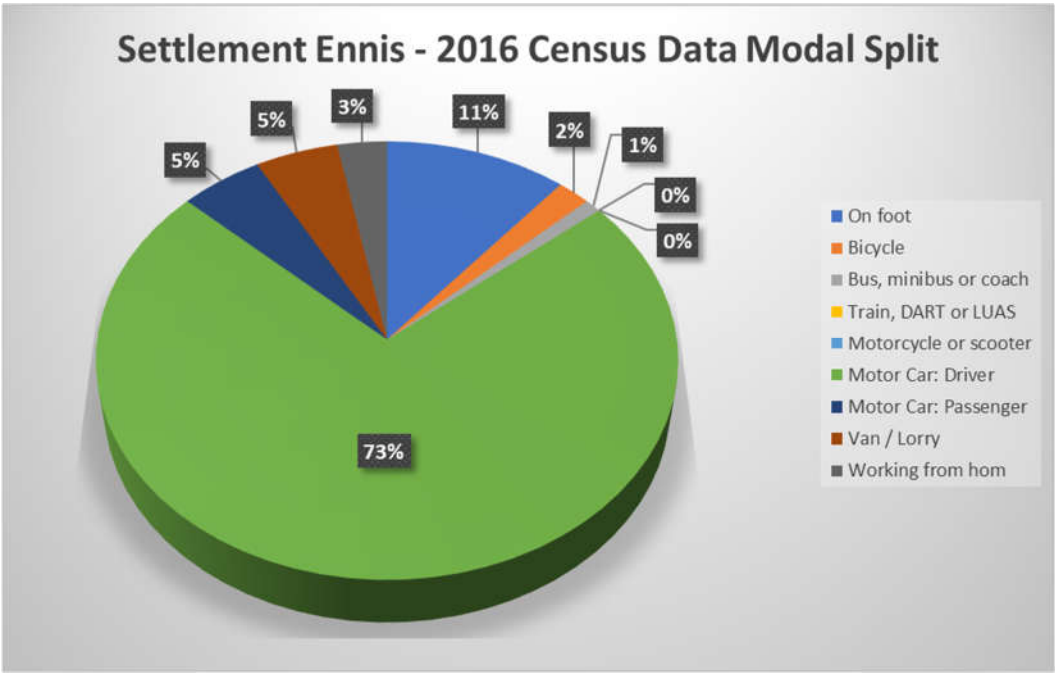


Figure 8-3: Ennis Settlement Zone Commuter Trips - Modal Split (2016 Census)

One of the main objectives for the site will be to reduce the number of car trips and in cases where there is no other option but to travel by car, to increase the number of people carpooling and travelling as passengers.

8.2 TRAVEL MEASURES

Government policy stated in the document published by the Department of Transport entitled, 'Smarter Travel, A Sustainable Transport Future 2009-2020' sets targets for modal split. The first goal is to achieve a modal split of 45% trips by car drivers (maximum) and 55% trips by walking, cycling and public transport and other sustainable modes (minimum targets) for persons in the proposed development who are travelling to work.

Modal share targets should be set for travel to and from the development. Once the users of the development are known, an internal mode share survey should be conducted to ascertain a baseline for the site. The Mobility targets can then be set following on from the collation of this data. These targets should bet set with the Government policy targets outlined above as a benchmark and should aim to achieve a modal split as close as possible to these targets.

Key consideration should be given to the following areas:

8.2.1 Walking

Pedestrian facilities, including 1.8m minimum width footpaths, pedestrian crossings with associated tactile paving, and shared surfaces are also to be provided within the proposed development. The footpaths will link with the surrounding footpath network within Ennis town and its environs. Sufficient street lighting is also to be provided within the site and at the proposed access junction. The facilities provided will encourage residents, visitors and site users to utilise the facilities as it is safe and convenient.

The following initiatives can be implemented to encourage the uptake of walking, mainly focused on residents and site users who reside within 2-3km of the proposed development (namely the vast majority of the town's population):

- The inclusion of sustainable travel information and walking route maps in Residential Brochures for the development and creche Staff recruitment and handover packs.
- The displaying of local walking route maps on staff noticeboards and residential communal areas.
- Encourage residents and site users to take part in walking challenges such as Pedometer Challenges or other incentivised schemes.
- Organise special walking days and walks at lunchtime or after work which can be undertaken in conjunction with national initiatives (i.e. the Irish Healthy Workplace Initiative or campaigns such as Operation Transformation).
- The establishing of a 'Walking Buddy' scheme where people who live close to each other can walk to work together.
- Ensure that the creche facilities provides appropriate Staff changing, and shower facilities (including lockers for Staff) and a drying area for wet clothes or footwear is also provided.

8.2.2 Cycling

Bicycle facilities are provided within the proposed development for secure parking of bicycles onsite. Cycling can be promoted in a similar way to Walking. The following initiatives can also be implemented to encourage the uptake of cycling, mainly focused on residents and site users who reside less than 6km of the proposed development:

- Sustainable travel information and maps, changing and shower facilities, route maps and online maps similar to the Walking initiatives above.
- Promotion of the National Cycle Journey Planner website
- www.journeyplanner.transportforireland.ie/ - on the College websites and displayed on internal noticeboards.
- Promotion of the proposed cycle parking facilities onsite which will be covered and secure.
- The provision of shower and changing facilities for creche Staff.
- The provision of Staff lockers for creche employees and a drying area for wet clothes/footwear/cycling equipment.
- Provide a bike maintenance kit onsite (containing puncture repair kits, bike pump, etc).
- Organisation of special events such as 'National Bike Week' and Lunchtime Cycle Rides, where creche employees and volunteers are rewarded for their participation through small incentives.
- Set up a 'Buddy' scheme where people who live close to each other can cycle to work together.
- Promotion of Clare County Council Cycling initiatives.

8.2.3 Public Transport

The following initiatives can be implemented to encourage the uptake of commuting by public transport, with an emphasis on staff who live within 10-15km of the proposed development:

- Inclusion of sustainable travel information and maps (including public transport) in Residential Brochures for the development and creche staff recruitment and handover packs.
- Inclusion of sustainable travel information and maps (including public transport) in online site information and displayed on Staff noticeboards and communal residential areas.
- Promotion of the national Public Transport Journey Planner: (www.journeyplanner.transportforireland.ie) in online site information and displayed on building noticeboards.
- Promotion of the availability of Real Time Information (www.transportforireland.ie) which provides site users with live information on bus departure times for all journeys.
- Promotion of new bus service routes as and when they become available.
- Continued incentivisation for site users to buy public transport tickets through the Tax Saver Commuter Scheme.
- Continue to encourage the use of public transport for business travel.
- Marketing of the benefits of public transport for health and well-being and the financial savings for journeys as part of overall internal communications.

As already mentioned, the proposed development is located within close proximity to local bus routes. The footpaths and pedestrian facilities would provide a safe means of access to these bus stops. The Leap card is an ideal amenity for the proposed development where a saving of 20-28% for each fare can be made.

8.3 TRAVEL MANAGEMENT – AWARENESS

An implementation and awareness campaign should be carried out as soon as possible to encourage the implementation of the initiates identified in the previous sections. The campaign should target Staff, residents and site users of the proposed Development once implemented.

An information leaflet can be compiled which contains all relevant travel information and outlines the benefits of opting for sustainable travel modes.

The Sustainable Travel Information Pack should also be distributed to all occupiers of the development as an additional measure to highlight the benefits of choosing sustainable travel modes. The packs can include information on schemes such as 'Bike to Work', Leap Card and the Tax Saver ticket schemes.

8.4 IMPLEMENTATION OF THE WORKPLACE TRAVEL PLAN

A Workplace Travel Plan will require ongoing implementation of the measures outlined in the previous sections. It will also require management and monitoring of the initiates and targets identified.

8.5 RECOMMENDATIONS

To ensure the implementation of the Workplace Travel Plan, the following recommendations are made:

- The Management company is to establish a Mobility Co-ordinator and a Steering Group who will be responsible for the establishment of the Workplace Travel Plan for the site and who will actively promote the Plan within the proposed development on an ongoing basis.
- Secure bicycle parking facilities are to be provided onsite - with onsite changing / shower facilities within the creche.
- Implementation of the Leap Card Scheme and its promotion to be made available to creche employees.
- Implementation of the TaxSaver Travel Ticket Scheme and its promotion to be made available to all eligible creche employees.
- Implement an internal awareness campaign for creche staff, residents, and site users to promote the Mobility Plan measures i.e.
- Promotion of measures through the use of leaflets and posters, mobile apps, etc.
- Implement an awareness campaign for Staff and residents to promote the Mobility Plan measures i.e.
- Promotion of measures through the use of leaflets, posters, through social media and the press.
- Liaison with Travel Operators such as Bus Éireann and the Private Operators to promote fares to encourage higher utilisation of Public Transport by all.
- Ongoing monitoring and review by the Steering Group of the targets set out in the Workplace Travel Plan. A main review should be carried out annually to include a full survey of all creche staff, residents, and site users (which would include modal splits and trip origins).

The Workplace Travel Plan is a continuous and evolving document. It requires monitoring, review and revision to ensure that it remains relevant. The key to the success of the Workplace Travel Plan will be the appointment of the Travel Plan Coordinator and the Steering Group who will manage Travel to and from the site. These should be assisted and supported by Management company and all staff residents to ensure the actions and measures identified are implemented and that the number of those who use sustainable modes of travel can be increased as per the targets once identified.

8.6 ACCESS FOR PEOPLE WITH DISABILITIES

As recommended dropped kerbing and tactile paving slabs will be installed at all crossing points, in accordance with "Guidance on the Use of Tactile Paving Slabs".

It is further recommended that disabled parking spaces, in accordance with the Clare County Development Plan, be provided and located in accordance with the National Disability Authorities "Building for Everyone". 5% of the proposed parking provisions have been designated for disabled parking as per Building for Everyone.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS

The main approaches to the town have footpaths for pedestrian use only. Cyclists currently utilise the existing roadways to access the town centre. The Table below gives typical cycle and walking distance and times to main attractions from the proposed development.

Attraction	Cycle Distance (km)	Cycle Time (mins)	Walk Distance (km)	Walk Time (mins)
Ennis Ruby Football Club	<0.1	< 1 min	<0.1	<1 min
Ennis Golf Club	0.950	3 min	0.950	11 min
Scoil Chriost Ri	1.60	< 4 min	1.60	19 min
Ennis Health Centre	<1.5	< 5 min	<1.5	<18 min
Ennis Town Centre	1.60	5 min	1.60	19 min

A calculated total of 129 spaces are required for the proposed Development, as outlined in Chapter 7. 140 dedicated bicycle parking spaces have been provided for within the site. These are for the residential units without private direct access to private amenity space, 1 private secure bike space will be provided per Town house units and 1 space per bedroom and 0.5 visitor spaces per apartments. For residential elements with direct access to allocated private amenity space, it is envisaged that the bicycle parking will be accommodated within the curtilage of the dwelling (i.e., within the garden).

A number of bus and train services operate from Ennis Town Centre (refer to Chapter 8 for details) with routes linking locally and nationally.

The existing junctions in the vicinity of the proposed development were analysed to ascertain the potential impact of the proposed development on the surrounding road network. The resulting assessment is summarised as follows:

<u>Junction 1 – Roundabout Junction N84 / R474 (Beecher Roundabout)</u>

The ARCADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the roundabout is forecast to operate well within capacity for all Streams in both the morning and evening peak periods for the No Development scenario. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate well within capacity.

<u>Junction 2 - R474 / Drumbiggle Road Priority Junction</u>

The PICADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the junction is forecast to operate well within capacity for all Streams in both the morning and evening peak periods for the No Development scenario. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate well within capacity.

Junction 3 - R474 / Cloughleigh Rd / Davitt Terrace Roundabout Junction

The ARCADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the roundabout is forecast to operate well within capacity for all Streams in both the morning and evening peak periods for the No Development scenario. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate well within capacity.

Junction 4 - R474 / R458 Priority Junction

The PICADY analysis results indicate that the junction is currently operating well within capacity for all traffic Streams in both the morning and evening peak periods. This will continue to be the case for the 2024 Opening Year scenario with slight increases projected in the RFC and queue lengths for both the morning and evening peak periods.

For the design year 2039, the junction is forecast to operate within capacity for the morning and evening peak periods. The inclusion of the potential development traffic will result in a minor increase in both delays and queueing for all traffic Streams, but the Junction is projected to continue to operate within capacity. It is projected that Stream D-ABC will have a maximum RFC of 0.84 and a queue length of 4.8 PCU for the morning peak period.

Junction 5 – Proposed Access / R474 Priority Junction

The PICADY analysis results indicate that the junction will operate within capacity for the morning and evening peak periods for the 2024 Opening Year scenario. For the design year 2039, the junction is also forecast to operate within capacity for the morning and evening peak periods. It is projected that Stream B-AC will have a maximum RFC of 0.28 and a queue length of 0.4 PCU for the morning peak period.

9.2 General

A total of 519 no. car parking spaces and 140 bicycle parking spaces will be provided onsite.

9.3 RECOMMENDATIONS

This Report recommends that:

- Site access junction visibility splays should provide at minimum 2.4m x 59m visibility splay for traffic leaving the development onto the R474 (for a 60kph design speed limit). Visibility splays of 2.4 x 23m are required for all the internal development junctions (for a 30kph speed limit).

- Visibility splays should be kept free of all restrictions including signage.
- Stop markings and a stop sign should be installed at the main entrance.
- Pedestrian footway links with associated dropped kerbing and tactile paving to be provided at all pedestrian crossing points internally. Raised tables are being provided for the future junctions along the length of the main access road to further slow traffic and provide safer crossing points for pedestrians and cyclists.
- The recommendations of the Mobility Chapter be implemented in full to ensure that mobility targets for the proposed development are achieved.

Appendix A. Traffic Count Data

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 01 DATE: 9th November 2021

LOCATION: N85/R474 Beechpark Roundabout DAY: Tuesday

	MOVEMENT 1							MOVEMENT 2							MOVEMENT 3							MOVEMENT 4						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
07:00	1	0	0	0	0	1	1	68	19	2	3	1	93	99	0	0	0	0	0	0	0	1	0	0	0	0	1	1
07:15	1	1	0	1	0	3	4	59	24	0	5	0	88	95	0	0	0	0	0	0	0	1	0	0	0	0	1	1
07:30	3	2	1	0	0	6	7	89	25	1	5	2	122	131	0	0	0	0	0	0	0	2	0	0	0	0	2	2
07:45	9	4	1	0	0	14	15	70	20	1	5	0	96	103	0	0	0	0	0	0	0	1	2	0	0	0	3	3
H/TOT	14	7	2	1	0	24	26	286	88	4	18	3	399	427	0	0	0	0	0	0	0	5	2	0	0	0	7	7
08:00	6	4	1	0	0	11	12	105	15	1	1	0	122	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	19	1	0	0	1	21	22	109	5	2	3	0	119	124	0	0	0	0	0	0	0	5	1	0	0	0	6	6
08:30	36	2	0	0	1	39	40	134	13	1	5	1	154	162	0	0	0	0	0	0	0	8	3	0	0	2	13	15
08:45	35	3	0	0	1	39	40	108	12	1	3	0	124	128	0	0	0	0	0	0	0	4	0	0	0	0	4	4
H/TOT	96	10	1	0	3	110	114	456	45	5	12	1	519	538	0	0	0	0	0	0	0	17	4	0	0	2	23	25
09:00	10	3	1	0	0	14	15	64	8	2	5	0	79	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	10	3	0	0	0	13	13	46	9	3	3	2	63	70	0	0	0	0	0	0	0	4	0	0	1	0	5	6
09:30	11	0	0	0	0	11	11	43	10	3	2	0	58	62	0	0	0	0	0	0	0	0	0	1	0	0	1	2
09:45	8	0	2	0	0	10	11	26	7	1	3	0	37	41	0	0	0	0	0	0	0	2	1	1	0	0	4	5
H/TOT	39	6	3	0	0	48	50	179	34	9	13	2	237	260	0	0	0	0	0	0	0	6	1	2	1	0	10	12
10:00	6	1	0	1	0	8	9	37	3	2	3	2	47	54	0	0	0	0	0	0	0	1	0	0	0	0	1	1
10:15	3	1	0	0	0	4	4	30	6	2	2	2	42	48	0	0	0	0	0	0	0	1	0	0	0	0	1	1
10:30	3	4	1	0	0	8	9	31	9	1	1	0	42	44	0	0	0	0	0	0	0	3	0	0	0	0	3	3
10:45	5	3	0	0	0	8	8	22	10	1	5	0	38	45	0	0	0	0	0	0	0	0	2	0	0	1	3	4
H/TOT	17	9	1	1	0	28	30	120	28	6	11	4	169	190	0	0	0	0	0	0	0	5	2	0	0	1	8	9
11:00	6	0	1	0	0	7	8	33	3	2	1	1	40	43	0	0	0	0	0	0	0	4	1	0	0	0	5	5
11:15	4	0	0	0	0	4	4	28	4	1	2	0	35	38	0	0	0	0	0	0	0	6	1	0	0	0	7	7
11:30	7	0	0	0	0	7	7	41	8	0	2	0	51	54	0	0	0	0	0	0	0	3	0	0	0	0	3	3
11:45	5	1	0	0	0	6	6	38	4	2	2	2	48	54	0	0	0	0	0	0	0	4	0	0	0	0	4	4
H/TOT	22	1	1	0	0	24	25	140	19	5	7	3	174	189	0	0	0	0	0	0	0	17	2	0	0	0	19	19
12:00	8	0	2	0	0	10	11	30	5	3	2	0	40	44	0	0	0	0	0	0	0	3	0	0	1	0	4	5
12:15	7	1	0	0	0	8	8	25	6	3	3	0	37	42	0	0	0	0	0	0	0	2	0	1	1	0	4	6
12:30	6	0	0	0	0	6	6	38	7	1	0	0	46	47	0	0	0	0	0	0	0	1	1	0	0	0	2	2
12:45	9	1	2	0	0	12	13	29	5	1	2	1	38	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	30	2	4	0	0	36	38	122	23	8	7	1	161	175	0	0	0	0	0	0	0	6	1	1	2	0	10	13

TRAFFINOMICS LIMITED

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 01 DATE: 9th November 2021

LOCATION: N85/R474 Beechpark Roundabout DAY: Tuesday

	MOVEMENT 1							MOVEMENT 2							MOVEMENT 3							MOVEMENT 4						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
13:00	7	2	0	0	0	9	9	62	5	1	3	1	72	77	0	0	0	0	0	0	0	3	1	0	0	0	4	4
13:15	11	4	0	0	0	15	15	44	7	1	4	1	57	64	0	0	0	0	0	0	0	3	1	0	0	0	4	4
13:30	4	0	2	0	0	6	7	45	7	0	1	2	55	58	0	0	0	0	0	0	0	2	1	0	0	0	3	3
13:45	7	0	0	0	0	7	7	46	4	2	2	2	56	62	0	0	0	0	0	0	0	3	1	0	0	0	4	4
H/TOT	29	6	2	0	0	37	38	197	23	4	10	6	240	261	0	0	0	0	0	0	0	11	4	0	0	0	15	15
14:00	9	0	0	0	0	9	9	47	8	7	5	2	69	81	0	0	0	0	0	0	0	1	0	0	0	0	1	1
14:15	12	0	0	0	0	12	12	54	7	1	3	0	65	69	0	0	0	0	0	0	0	1	2	0	0	0	3	3
14:30	13	0	0	0	0	13	13	47	4	5	1	3	60	67	0	0	0	0	0	0	0	2	0	0	1	0	3	4
14:45	6	0	0	1	0	7	8	57	9	1	5	0	72	79	0	0	0	0	0	0	0	1	0	0	0	0	1	1
H/TOT	40	0	0	1	0	41	42	205	28	14	14	5	266	296	0	0	0	0	0	0	0	5	2	0	1	0	8	9
15:00	5	4	1	0	0	10	11	39	5	6	3	0	53	60	0	0	0	0	0	0	0	4	0	0	1	1	6	8
15:15	7	3	0	1	0	11	12	38	8	0	6	1	53	62	0	0	0	0	0	0	0	2	0	1	0	0	3	4
15:30	10	1	0	0	0	11	11	52	9	1	1	2	65	69	0	0	0	0	0	0	0	5	0	0	0	0	5	5
15:45	17	2	0	0	0	19	19	74	7	1	1	0	83	85	0	0	0	0	0	0	0	4	1	0	1	0	6	7
H/TOT	39	10	1	1	0	51	53	203	29	8	11	3	254	275	0	0	0	0	0	0	0	15	1	1	2	1	20	24
16:00	10	1	1	0	2	14	17	60	12	2	2	1	77	82	0	0	0	0	0	0	0	6	0	0	0	0	6	6
16:15	12	1	0	0	1	14	15	60	9	2	2	3	76	83	0	0	0	0	0	0	0	4	0	1	1	0	6	8
16:30	14	2	0	0	1	17	18	50	12	2	3	3	70	78	0	0	0	0	0	0	0	4	2	0	0	0	6	6
16:45	15	1	1	0	1	18	20	70	18	1	3	3	95	102	0	0	0	0	0	0	0	4	1	0	0	0	5	5
H/TOT	51	5	2	0	5	63	69	240	51	7	10	10	318	345	0	0	0	0	0	0	0	18	3	1	1	0	23	25
17:00	7	2	0	0	0	9	9	57	17	4	1	1	80	84	0	0	0	0	0	0	0	11	1	0	0	0	12	12
17:15	12	0	1	0	0	13	14	50	18	0	0	1	69	70	0	0	0	0	0	0	0	9	2	1	1	0	13	15
17:30	6	0	0	0	0	6	6	44	7	0	0	0	51	51	0	0	0	0	0	0	0	7	2	0	0	1	10	11
17:45	10	0	0	0	0	10	10	49	5	2	0	0	56	57	0	0	0	0	0	0	0	11	1	0	0	0	12	12
H/TOT	35	2	1	0	0	38	39	200	47	6	1	2	256	262	0	0	0	0	0	0	0	38	6	1	1	1	47	50
18:00	4	0	0	0	0	4	4	64	10	1	0	0	75	76	0	0	0	0	0	0	0	5	0	0	0	0	5	5
18:15	7	2	1	0	0	10	11	38	8	0	1	1	48	50	0	0	0	0	0	0	0	16	2	0	0	0	18	18
18:30	9	0	0	0	0	9	9	33	2	0	1	0	36	37	0	0	0	0	0	0	0	6	0	1	0	0	7	8
18:45	6	2	0	0	0	8	8	32	3	1	1	0	37	39	0	0	0	0	0	0	0	3	0	0	0	0	3	3
H/TOT	26	4	1	0	0	31	32	167	23	2	3	1	196	202	0	0	0	0	0	0	0	30	2	1	0	0	33	34
P/TOT	438	62	19	4	8	531	554	2515	438	78	117	41	3189	3421	0	0	0	0	0	0	0	173	30	7	8	5	223	242

TRAFFINOMICS LIMITED

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**
MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 01 DATE: 9th November 2021

LOCATION: N85/R474 Beechpark Roundabout DAY: Tuesday

	MOVEMENT 5							MOVEMENT 6							MOVEMENT 7							MOVEMENT 8						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
07:00	7	3	0	0	0	10	10	10	1	0	0	0	11	11	27	6	1	1	0	35	37	0	0	0	0	0	0	0
07:15	4	0	0	0	0	4	4	7	7	0	0	0	14	14	17	9	0	2	0	28	31	0	0	0	0	0	0	0
07:30	2	2	1	0	0	5	6	26	8	1	0	0	35	36	23	14	0	1	0	38	39	0	0	0	0	0	0	0
07:45	4	0	0	0	0	4	4	21	14	1	0	0	36	37	23	8	0	0	0	31	31	0	0	0	0	0	0	0
H/TOT	17	5	1	0	0	23	24	64	30	2	0	0	96	97	90	37	1	4	0	132	138	0	0	0	0	0	0	0
08:00	8	3	0	0	0	11	11	29	14	0	0	1	44	45	31	2	1	0	0	34	35	0	0	0	0	0	0	0
08:15	6	0	0	0	0	6	6	61	9	0	0	1	71	72	28	2	1	0	0	31	32	0	0	0	0	0	0	0
08:30	12	1	0	0	0	13	13	55	8	1	0	0	64	65	24	4	1	0	0	29	30	0	0	0	0	0	0	0
08:45	10	3	0	0	0	13	13	41	6	0	0	0	47	47	11	2	0	2	0	15	18	0	0	0	0	0	0	0
H/TOT	36	7	0	0	0	43	43	186	37	1	0	2	226	229	94	10	3	2	0	109	113	0	0	0	0	0	0	0
09:00	9	1	0	0	0	10	10	30	13	3	0	0	46	48	9	3	2	0	0	14	15	0	0	0	0	0	0	0
09:15	2	0	0	0	0	2	2	30	4	0	0	0	34	34	11	5	2	1	0	19	21	0	0	0	0	0	0	0
09:30	9	0	1	0	0	10	11	21	7	0	0	0	28	28	14	1	2	1	0	18	20	0	0	0	0	0	0	0
09:45	3	1	0	0	0	4	4	10	4	1	0	0	15	16	3	1	1	1	0	6	8	0	0	0	0	0	0	0
H/TOT	23	2	1	0	0	26	27	91	28	4	0	0	123	125	37	10	7	3	0	57	64	0	0	0	0	0	0	0
10:00	4	4	0	0	0	8	8	15	3	0	0	0	18	18	4	0	1	0	0	5	6	0	0	0	0	0	0	0
10:15	3	0	0	0	1	4	5	17	5	0	0	0	22	22	2	3	1	0	0	6	7	0	0	0	0	0	0	0
10:30	3	1	0	0	0	4	4	13	2	0	0	0	15	15	6	1	0	1	0	8	9	0	0	0	0	0	0	0
10:45	3	3	0	0	0	6	6	18	1	2	0	0	21	22	7	0	0	1	0	8	9	0	0	0	0	0	0	0
H/TOT	13	8	0	0	1	22	23	63	11	2	0	0	76	77	19	4	2	2	0	27	31	0	0	0	0	0	0	0
11:00	3	0	0	0	0	3	3	12	4	0	0	0	16	16	5	1	2	1	0	9	11	0	0	0	0	0	0	0
11:15	3	0	1	0	0	4	5	20	4	2	0	0	26	27	6	3	0	2	0	11	14	0	0	0	0	0	0	0
11:30	1	0	0	1	0	2	3	12	4	0	1	0	17	18	6	1	1	0	0	8	9	0	0	0	0	0	0	0
11:45	2	0	0	0	0	2	2	12	4	1	0	0	17	18	4	1	1	0	0	6	7	0	0	0	0	0	0	0
H/TOT	9	0	1	1	0	11	13	56	16	3	1	0	76	79	21	6	4	3	0	34	40	0	0	0	0	0	0	0
12:00	4	2	2	0	0	8	9	10	4	0	0	0	14	14	4	1	1	1	0	7	9	0	0	0	0	0	0	0
12:15	3	0	0	0	0	3	3	14	4	1	0	0	19	20	4	0	0	0	0	4	4	0	0	0	0	0	0	0
12:30	2	1	0	0	0	3	3	13	2	1	0	1	17	19	6	3	0	0	0	9	9	0	0	0	0	0	0	0
12:45	3	2	0	0	0	5	5	15	5	0	0	0	20	20	6	2	0	0	0	8	8	0	0	0	0	0	0	0
H/TOT	12	5	2	0	0	19	20	52	15	2	0	1	70	72	20	6	1	1	0	28	30	0	0	0	0	0	0	0

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**
MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 01 DATE: 9th November 2021

LOCATION: N85/R474 Beechpark Roundabout DAY: Tuesday

	MOVEMENT 5							MOVEMENT 6							MOVEMENT 7							MOVEMENT 8						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
13:00	3	0	0	0	0	3	3	12	4	2	0	0	18	19	6	1	0	4	0	11	16	0	0	0	0	0	0	0
13:15	2	0	0	0	0	2	2	10	0	0	0	0	10	10	2	1	1	0	0	4	5	0	0	0	0	0	0	0
13:30	2	3	0	0	0	5	5	9	1	0	0	0	10	10	10	4	0	0	0	14	14	0	0	0	0	0	0	0
13:45	4	0	0	0	0	4	4	23	3	1	0	1	28	30	10	2	0	1	0	13	14	0	0	0	0	0	0	0
H/TOT	11	3	0	0	0	14	14	54	8	3	0	1	66	69	28	8	1	5	0	42	49	0	0	0	0	0	0	0
14:00	5	0	2	1	0	8	10	20	6	0	0	0	26	26	12	1	0	0	0	13	13	0	0	0	0	0	0	0
14:15	3	0	0	0	0	3	3	8	3	0	0	0	11	11	11	2	1	3	0	17	21	0	0	0	0	0	0	0
14:30	1	1	1	0	0	3	4	17	2	0	0	0	19	19	7	3	1	2	0	13	16	0	0	0	0	0	0	0
14:45	7	2	0	0	0	9	9	12	4	1	0	0	17	18	11	2	1	1	1	16	19	0	0	0	0	0	0	0
H/TOT	16	3	3	1	0	23	26	57	15	1	0	0	73	74	41	8	3	6	1	59	69	0	0	0	0	0	0	0
15:00	2	3	0	0	0	5	5	20	3	0	0	0	23	23	7	3	1	0	0	11	12	0	0	0	0	0	0	0
15:15	6	1	1	0	0	8	9	18	1	0	0	1	20	21	13	1	0	1	1	16	18	0	0	0	0	0	0	0
15:30	2	0	1	0	0	3	4	25	3	0	0	0	28	28	12	2	0	1	0	15	16	0	0	0	0	0	0	0
15:45	2	0	0	0	0	2	2	26	1	0	0	0	27	27	10	3	1	0	1	15	17	0	0	0	0	0	0	0
H/TOT	12	4	2	0	0	18	19	89	8	0	0	1	98	99	42	9	2	2	2	57	63	0	0	0	0	0	0	0
16:00	7	0	0	0	0	7	7	15	2	0	0	0	17	17	6	1	0	0	0	7	7	0	0	0	0	0	0	0
16:15	4	2	0	1	0	7	8	10	2	0	0	0	12	12	7	2	0	0	0	9	9	0	0	0	0	0	0	0
16:30	9	3	0	0	0	12	12	20	5	0	0	0	25	25	6	3	0	1	0	10	11	0	0	0	0	0	0	0
16:45	3	0	0	0	0	3	3	13	3	0	1	0	17	18	9	3	0	0	0	12	12	0	0	0	0	0	0	0
H/TOT	23	5	0	1	0	29	30	58	12	0	1	0	71	72	28	9	0	1	0	38	39	0	0	0	0	0	0	0
17:00	11	2	1	0	0	14	15	28	6	0	0	0	34	34	17	12	0	1	0	30	31	0	0	0	0	0	0	0
17:15	6	1	0	0	0	7	7	10	1	0	1	0	12	13	9	4	2	0	0	15	16	0	0	0	0	0	0	0
17:30	5	0	0	0	0	5	5	19	2	1	0	0	22	23	12	1	1	1	0	15	17	0	0	0	0	0	0	0
17:45	7	2	0	0	0	9	9	19	1	0	0	0	20	20	14	1	0	0	0	15	15	0	0	0	0	0	0	0
H/TOT	29	5	1	0	0	35	36	76	10	1	1	0	88	90	52	18	3	2	0	75	79	0	0	0	0	0	0	0
18:00	16	1	0	0	0	17	17	13	4	0	0	0	17	17	11	1	0	0	0	12	12	0	0	0	0	0	0	0
18:15	4	1	0	0	0	5	5	8	1	0	0	0	9	9	7	1	0	0	0	8	8	0	0	0	0	0	0	0
18:30	6	1	0	0	0	7	7	8	3	1	0	0	12	13	12	1	0	0	0	13	13	0	0	0	0	0	0	0
18:45	6	1	0	0	0	7	7	13	2	0	0	0	15	15	5	1	0	0	0	6	6	0	0	0	0	0	0	0
H/TOT	32	4	0	0	0	36	36	42	10	1	0	0	53	54	35	4	0	0	0	39	39	0	0	0	0	0	0	0
P/TOT	233	51	11	3	1	299	309	888	200	20	3	5	1116	1135	507	129	27	31	3	697	754	0	0	0	0	0	0	0

TRAFFINOMICS LIMITED

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 01 DATE: 9th November 2021

LOCATION: N85/R474 Beechpark Roundabout DAY: Tuesday

	MOVEMENT 9							**MOVEMENT 10**							**MOVEMENT 11**							**MOVEMENT 12**						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	3	0	0	0	0	0	0	0
12:00	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1
12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
H/TOT	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	2	0	0	0	0	2	2

TRAFFINOMICS LIMITED

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 01 DATE: 9th November 2021

LOCATION: N85/R474 Beechpark Roundabout DAY: Tuesday

	MOVEMENT 9							MOVEMENT 10							MOVEMENT 11							MOVEMENT 12						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0
13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	1	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	1	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
18:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
18:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:45	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	1	0	0	0	0	1	1	3	0	0	0	0	3	3	0	0	0	0	0	0	0
P/TOT	2	0	0	0	0	2	2	3	0	0	0	0	3	3	10	1	0	0	0	11	11	2	0	0	0	0	2	2

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 01 DATE: 9th November 2021

LOCATION: N85/R474 Beechpark Roundabout DAY: Tuesday

	MOVEMENT 13							MOVEMENT 14							MOVEMENT 15							MOVEMENT 16						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
07:00	0	0	0	0	0	0	0	1	3	0	0	0	4	4	17	4	0	5	2	28	37	3	0	0	0	0	3	3
07:15	0	0	0	0	0	0	0	4	7	1	1	0	13	15	22	9	4	3	3	41	50	2	1	0	0	0	3	3
07:30	0	0	0	0	0	0	0	8	0	0	0	0	8	8	13	10	1	4	2	30	38	9	2	0	0	0	11	11
07:45	0	0	0	0	0	0	0	5	1	0	0	0	6	6	28	11	2	4	0	45	51	9	4	0	0	0	13	13
H/TOT	0	0	0	0	0	0	0	18	11	1	1	0	31	33	80	34	7	16	7	144	175	23	7	0	0	0	30	30
08:00	0	0	0	0	0	0	0	4	3	0	0	0	7	7	25	11	1	3	2	42	48	17	1	0	0	0	18	18
08:15	0	0	0	0	0	0	0	7	1	1	1	0	10	12	54	7	2	2	2	67	73	39	4	0	2	0	45	48
08:30	0	0	0	0	0	0	0	9	2	1	1	1	14	17	71	7	1	2	2	83	88	46	11	0	0	0	57	57
08:45	0	0	0	0	0	0	0	9	2	1	0	0	12	13	68	5	0	2	2	77	82	21	6	1	0	0	28	29
H/TOT	0	0	0	0	0	0	0	29	8	3	2	1	43	48	218	30	4	9	8	269	291	123	22	1	2	0	148	151
09:00	0	0	0	0	0	0	0	7	0	0	0	0	7	7	54	11	3	0	0	68	70	21	2	1	1	0	25	27
09:15	0	0	0	0	0	0	0	0	3	0	2	0	5	8	31	12	0	4	1	48	54	10	1	0	1	0	12	13
09:30	0	0	0	0	0	0	0	3	2	0	0	0	5	5	28	5	3	4	0	40	47	8	0	1	0	0	9	10
09:45	0	0	0	0	0	0	0	9	0	3	4	0	16	23	28	4	3	1	3	39	45	11	2	0	0	0	13	13
H/TOT	0	0	0	0	0	0	0	19	5	3	6	0	33	42	141	32	9	9	4	195	215	50	5	2	2	0	59	63
10:00	0	0	0	0	0	0	0	6	3	1	0	0	10	11	28	8	0	1	4	41	46	7	5	0	0	0	12	12
10:15	0	0	0	0	0	0	0	6	5	0	1	0	12	13	32	8	3	1	1	45	49	3	1	0	2	0	6	9
10:30	0	0	0	0	0	0	0	3	1	0	0	0	4	4	27	6	2	1	1	37	40	5	0	0	0	0	5	5
10:45	0	0	0	0	0	0	0	2	1	2	0	0	5	6	29	8	3	1	1	42	46	6	2	0	0	0	8	8
H/TOT	0	0	0	0	0	0	0	17	10	3	1	0	31	34	116	30	8	4	7	165	181	21	8	0	2	0	31	34
11:00	0	0	0	0	0	0	0	5	2	1	0	0	8	9	37	8	1	7	0	53	63	10	4	1	0	0	15	16
11:15	0	0	0	0	0	0	0	2	2	0	0	0	4	4	45	9	3	2	1	60	65	14	2	1	0	0	17	18
11:30	0	0	0	0	0	0	0	8	2	1	2	0	13	16	28	3	2	2	1	36	41	9	1	0	1	0	11	12
11:45	0	0	0	0	0	0	0	5	0	0	0	0	5	5	28	7	0	3	2	40	46	10	1	0	0	0	11	11
H/TOT	0	0	0	0	0	0	0	20	6	2	2	0	30	34	138	27	6	14	4	189	214	43	8	2	1	0	54	56
12:00	0	0	0	0	0	0	0	1	2	0	1	0	4	5	38	10	1	2	0	51	54	11	2	2	0	0	15	16
12:15	1	0	0	0	0	1	1	8	2	0	1	0	11	12	37	0	3	2	0	42	46	6	2	0	0	0	8	8
12:30	0	0	0	0	0	0	0	5	2	0	1	0	8	9	54	7	1	2	1	65	69	13	2	2	0	0	17	18
12:45	0	0	0	0	0	0	0	6	4	1	3	0	14	18	27	4	0	1	0	32	33	16	1	0	0	0	17	17
H/TOT	1	0	0	0	0	1	1	20	10	1	6	0	37	45	156	21	5	7	1	190	203	46	7	4	0	0	57	59

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 01 DATE: 9th November 2021

LOCATION: N85/R474 Beechpark Roundabout DAY: Tuesday

	MOVEMENT 13							MOVEMENT 14							MOVEMENT 15							MOVEMENT 16						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
13:00	0	0	0	0	0	0	0	6	0	0	1	0	7	8	41	8	1	4	0	54	60	7	3	0	0	0	10	10
13:15	0	0	0	0	0	0	0	9	3	1	1	0	14	16	37	7	0	0	1	45	46	9	1	1	0	0	11	12
13:30	0	0	0	0	0	0	0	9	1	3	0	0	13	15	36	4	0	1	0	41	42	10	1	0	0	0	11	11
13:45	0	0	0	0	0	0	0	10	2	0	0	0	12	12	46	3	0	1	0	50	51	19	1	0	0	0	20	20
H/TOT	0	0	0	0	0	0	0	34	6	4	2	0	46	51	160	22	1	6	1	190	199	45	6	1	0	0	52	53
14:00	0	0	0	0	0	0	0	9	1	0	1	0	11	12	63	8	1	3	2	77	83	17	1	0	0	0	18	18
14:15	0	0	0	0	0	0	0	6	1	0	2	0	9	12	29	4	1	3	1	38	43	11	3	1	0	0	15	16
14:30	0	0	0	0	0	0	0	11	1	0	0	0	12	12	35	8	1	0	2	46	49	12	0	0	0	0	12	12
14:45	0	0	0	0	0	0	0	9	3	0	0	0	12	12	53	7	2	5	1	68	77	13	3	0	0	0	16	16
H/TOT	0	0	0	0	0	0	0	35	6	0	3	0	44	48	180	27	5	11	6	229	252	53	7	1	0	0	61	62
15:00	0	0	0	0	0	0	0	13	3	1	0	0	17	18	64	2	1	0	0	67	68	14	1	1	0	0	16	17
15:15	0	0	0	0	0	0	0	14	4	2	0	0	20	21	58	10	2	1	1	72	75	13	1	0	0	0	14	14
15:30	0	0	0	0	0	0	0	12	0	0	1	0	13	14	40	6	0	1	2	49	52	20	2	0	0	0	22	22
15:45	0	0	0	0	0	0	0	8	3	0	2	0	13	16	74	6	2	3	1	86	92	20	6	0	0	0	26	26
H/TOT	0	0	0	0	0	0	0	47	10	3	3	0	63	68	236	24	5	5	4	274	287	67	10	1	0	0	78	79
16:00	0	0	0	0	0	0	0	18	1	0	1	0	20	21	86	14	2	2	1	105	110	14	4	3	0	0	21	23
16:15	0	0	0	0	0	0	0	18	3	3	1	0	25	28	97	19	0	1	0	117	118	12	6	0	0	0	18	18
16:30	0	0	0	0	0	0	0	15	4	0	0	0	19	19	73	21	1	8	1	104	116	22	2	0	1	0	25	26
16:45	1	0	0	0	0	1	1	27	11	0	0	0	38	38	91	13	0	1	1	106	108	29	3	1	0	0	33	34
H/TOT	1	0	0	0	0	1	1	78	19	3	2	0	102	106	347	67	3	12	3	432	452	77	15	4	1	0	97	100
17:00	0	0	0	0	0	0	0	20	4	0	0	0	24	24	93	28	2	3	0	126	131	14	6	0	0	0	20	20
17:15	0	0	0	0	0	0	0	20	8	0	0	0	28	28	83	14	1	2	0	100	103	20	4	0	0	1	25	26
17:30	0	0	0	0	0	0	0	24	8	0	0	0	32	32	91	28	2	2	3	126	133	22	3	0	0	0	25	25
17:45	0	0	0	0	0	0	0	27	5	1	0	0	33	34	114	14	1	1	0	130	132	12	3	0	0	0	15	15
H/TOT	0	0	0	0	0	0	0	91	25	1	0	0	117	118	381	84	6	8	3	482	498	68	16	0	0	1	85	86
18:00	0	0	0	0	0	0	0	22	12	0	0	0	34	34	65	18	0	3	2	88	94	20	0	0	1	0	21	22
18:15	0	0	0	0	0	0	0	22	4	0	1	0	27	28	68	8	4	1	0	81	84	16	0	0	0	0	16	16
18:30	0	0	0	0	0	0	0	14	2	0	0	0	16	16	54	8	1	0	0	63	64	11	0	0	0	0	11	11
18:45	0	0	0	0	0	0	0	12	1	0	0	0	13	13	72	4	1	3	0	80	84	19	0	0	0	0	19	19
H/TOT	0	0	0	0	0	0	0	70	19	0	1	0	90	91	259	38	6	7	2	312	326	66	0	0	1	0	67	68
P/TOT	2	0	0	0	0	2	2	478	135	24	29	1	667	718	2412	436	65	108	50	3071	3294	682	111	16	9	1	819	840

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 01 DATE: 9th November 2021

LOCATION: N85/R474 Beechpark Roundabout DAY: Tuesday

	MOVEMENT 17							**MOVEMENT 18**							**MOVEMENT 19**							**MOVEMENT 20**						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
07:00	6	0	0	0	0	6	6	0	0	0	0	0	0	0	2	3	0	0	0	5	5	1	0	0	0	0	1	1
07:15	5	1	1	0	0	7	8	0	0	0	0	0	0	0	4	2	1	0	0	7	8	3	1	0	0	0	4	4
07:30	15	4	0	0	0	19	19	0	0	0	0	0	0	0	2	0	0	0	0	2	2	2	1	0	0	0	3	3
07:45	11	2	0	0	0	13	13	0	0	0	0	0	0	0	6	1	0	0	0	7	7	3	1	0	0	0	4	4
H/TOT	37	7	1	0	0	45	46	0	0	0	0	0	0	0	14	6	1	0	0	21	22	9	3	0	0	0	12	12
08:00	13	5	1	0	1	20	22	0	0	0	0	0	0	0	11	5	0	0	0	16	16	6	0	1	0	0	7	8
08:15	14	4	0	0	1	19	20	0	0	0	0	0	0	0	7	1	0	0	0	8	8	4	2	0	0	0	6	6
08:30	29	3	2	1	1	36	39	0	0	0	0	0	0	0	9	4	0	0	0	13	13	11	1	0	0	0	12	12
08:45	19	5	0	0	0	24	24	1	0	0	0	0	1	1	9	5	0	0	0	14	14	15	1	1	0	0	17	18
H/TOT	75	17	3	1	3	99	105	1	0	0	0	0	1	1	36	15	0	0	0	51	51	36	4	2	0	0	42	43
09:00	8	1	2	0	0	11	12	0	0	0	0	0	0	0	12	3	3	0	0	18	20	7	1	0	0	0	8	8
09:15	6	10	2	0	2	20	23	0	0	0	0	0	0	0	9	3	1	0	0	13	14	3	4	1	0	0	8	9
09:30	1	3	0	0	0	4	4	0	0	0	0	0	0	0	8	2	0	0	0	10	10	1	2	0	0	0	3	3
09:45	7	3	0	1	0	11	12	0	0	0	0	0	0	0	5	3	1	0	0	9	10	5	3	0	0	0	8	8
H/TOT	22	17	4	1	2	46	51	0	0	0	0	0	0	0	34	11	5	0	0	50	53	16	10	1	0	0	27	28
10:00	3	1	1	1	1	7	10	0	0	0	0	0	0	0	3	4	1	0	0	8	9	6	1	0	0	0	7	7
10:15	7	4	0	0	0	11	11	0	0	0	0	0	0	0	13	0	1	0	0	14	15	10	2	0	0	0	12	12
10:30	10	4	0	0	0	14	14	0	0	0	0	0	0	0	8	5	1	0	0	14	15	2	2	1	0	0	5	6
10:45	6	2	0	0	0	8	8	0	0	0	0	0	0	0	8	4	1	0	1	14	16	5	1	0	0	0	6	6
H/TOT	26	11	1	1	1	40	43	0	0	0	0	0	0	0	32	13	4	0	1	50	53	23	6	1	0	0	30	31
11:00	11	1	0	0	0	12	12	0	0	0	0	0	0	0	7	1	0	0	0	8	8	8	0	1	1	0	10	12
11:15	9	4	1	0	0	14	15	1	0	0	0	0	1	1	8	1	2	0	0	11	12	6	1	0	0	0	7	7
11:30	4	1	0	0	0	5	5	1	0	0	0	0	1	1	7	3	0	0	0	10	10	2	0	0	0	0	2	2
11:45	10	1	0	0	0	11	11	2	0	0	0	0	2	2	12	2	0	0	0	14	14	2	0	0	0	0	2	2
H/TOT	34	7	1	0	0	42	43	4	0	0	0	0	4	4	34	7	2	0	0	43	44	18	1	1	1	0	21	23
12:00	10	4	0	0	0	14	14	0	0	0	0	0	0	0	12	2	0	0	0	14	14	8	2	1	0	0	11	12
12:15	11	2	0	0	0	13	13	0	0	0	0	0	0	0	15	0	0	0	0	15	15	4	0	1	0	0	5	6
12:30	11	0	1	0	0	12	13	0	0	0	0	0	0	0	16	1	1	0	0	18	19	6	1	0	0	0	7	7
12:45	14	4	1	0	0	19	20	0	0	0	0	0	0	0	12	2	1	0	0	15	16	10	2	0	0	0	12	12
H/TOT	46	10	2	0	0	58	59	0	0	0	0	0	0	0	55	5	2	0	0	62	63	28	5	2	0	0	35	36

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 01 DATE: 9th November 2021

LOCATION: N85/R474 Beechpark Roundabout DAY: Tuesday

	MOVEMENT 17							MOVEMENT 18							MOVEMENT 19							MOVEMENT 20						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
13:00	17	4	0	0	0	21	21	0	0	0	0	0	0	0	16	2	0	0	0	18	18	12	1	1	0	0	14	15
13:15	16	4	1	0	0	21	22	0	0	0	0	0	0	0	15	6	1	0	0	22	23	9	1	0	0	0	10	10
13:30	15	1	0	0	0	16	16	0	0	0	0	0	0	0	21	4	0	0	0	25	25	9	2	0	0	0	11	11
13:45	23	2	2	0	0	27	28	0	0	0	0	0	0	0	10	2	0	0	0	12	12	8	1	1	0	0	10	11
H/TOT	71	11	3	0	0	85	87	0	0	0	0	0	0	0	62	14	1	0	0	77	78	38	5	2	0	0	45	46
14:00	19	1	0	0	0	20	20	0	0	0	0	0	0	0	9	4	0	0	0	13	13	8	0	0	0	0	8	8
14:15	19	5	1	0	0	25	26	0	0	0	0	0	0	0	20	4	0	0	0	24	24	13	1	2	0	0	16	17
14:30	22	3	0	0	0	25	25	1	0	0	0	0	1	1	20	3	0	0	0	23	23	8	1	2	0	0	11	12
14:45	22	3	0	0	1	26	27	0	0	0	0	0	0	0	18	3	1	1	0	23	25	9	1	1	0	0	11	12
H/TOT	82	12	1	0	1	96	98	1	0	0	0	0	1	1	67	14	1	1	0	83	85	38	3	5	0	0	46	49
15:00	11	0	0	0	0	11	11	0	0	0	0	0	0	0	18	3	1	0	0	22	23	11	0	0	1	0	12	13
15:15	23	4	0	0	0	27	27	0	0	0	0	0	0	0	14	4	1	0	0	19	20	10	2	1	0	1	14	16
15:30	23	5	0	0	0	28	28	0	0	0	0	0	0	0	15	4	0	0	0	19	19	11	1	1	0	0	13	14
15:45	20	3	0	0	0	23	23	0	0	0	0	0	0	0	15	4	0	0	0	19	19	6	1	0	0	0	7	7
H/TOT	77	12	0	0	0	89	89	0	0	0	0	0	0	0	62	15	2	0	0	79	80	38	4	2	1	1	46	49
16:00	40	2	0	0	0	42	42	0	0	0	0	0	0	0	38	5	1	0	0	44	45	30	3	1	1	0	35	37
16:15	34	5	2	0	1	42	44	0	0	0	0	0	0	0	30	7	1	0	2	40	43	17	0	0	0	0	17	17
16:30	25	4	0	0	0	29	29	0	0	0	0	0	0	0	29	7	0	0	0	36	36	9	7	0	0	0	16	16
16:45	34	8	2	0	0	44	45	0	0	0	0	0	0	0	23	6	0	0	0	29	29	12	3	1	0	0	16	17
H/TOT	133	19	4	0	1	157	160	0	0	0	0	0	0	0	120	25	2	0	2	149	152	68	13	2	1	0	84	86
17:00	25	5	0	0	0	30	30	1	0	0	0	0	1	1	37	4	0	0	0	41	41	14	3	2	0	0	19	20
17:15	24	4	2	0	0	30	31	0	0	0	0	0	0	0	40	10	0	0	0	50	50	16	3	0	0	0	19	19
17:30	23	1	0	0	0	24	24	0	0	0	0	0	0	0	38	4	0	0	0	42	42	10	1	0	0	0	11	11
17:45	18	2	0	0	0	20	20	2	0	0	0	0	2	2	27	2	0	0	0	29	29	15	1	0	0	0	16	16
H/TOT	90	12	2	0	0	104	105	3	0	0	0	0	3	3	142	20	0	0	0	162	162	55	8	2	0	0	65	66
18:00	21	0	0	0	0	21	21	0	0	0	0	0	0	0	31	1	0	0	0	32	32	10	0	0	0	0	10	10
18:15	13	1	0	0	0	14	14	0	0	0	0	0	0	0	23	2	0	0	0	25	25	2	0	1	0	0	3	4
18:30	13	2	0	0	0	15	15	0	0	0	0	0	0	0	16	4	0	0	0	20	20	5	1	0	0	0	6	6
18:45	6	1	0	0	0	7	7	1	0	0	0	0	1	1	14	1	0	0	0	15	15	13	1	0	0	0	14	14
H/TOT	53	4	0	0	0	57	57	1	0	0	0	0	1	1	84	8	0	0	0	92	92	30	2	1	0	0	33	34
P/TOT	746	139	22	3	8	918	941	10	0	0	0	0	10	10	742	153	20	1	3	919	933	397	64	21	3	1	486	501

PCU's Through Junction
214
235
301
286
1036
345
427
550
429
1752
316
267
212
195
990
190
194
167
185
736
205
216
182
182
784
209
184
219
205
817

PCU's Through Junction
261
227
217
254
959
295
257
257
301
1110
267
298
282
339
1185
412
402
392
434
1640
452
392
380
371
1595
345
273
218
233
1069
13672

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 02 DATE: 9th November 2021

LOCATION: R474 Circular Road/Drumbiggle Road DAY: Tuesday

	MOVEMENT 1							MOVEMENT 2							MOVEMENT 3						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
07:00	0	0	0	0	0	0	0	7	2	0	0	0	9	9	9	0	0	0	0	9	9
07:15	1	1	0	0	0	2	2	5	1	1	0	0	7	8	4	5	0	1	0	10	11
07:30	4	0	0	0	0	4	4	14	3	0	0	0	17	17	32	6	0	0	0	38	38
07:45	4	0	0	0	0	4	4	12	1	0	0	0	13	13	19	4	1	0	0	24	25
H/TOT	9	1	0	0	0	10	10	38	7	1	0	0	46	47	64	15	1	1	0	81	83
08:00	1	3	0	0	0	4	4	19	7	0	0	1	27	28	35	7	1	0	1	44	46
08:15	6	0	0	0	0	6	6	14	3	0	0	0	17	17	84	5	0	1	1	91	93
08:30	9	0	0	0	0	9	9	27	4	0	0	0	31	31	70	13	0	0	0	83	83
08:45	4	0	0	0	0	4	4	21	6	0	0	0	27	27	44	7	1	0	0	52	53
H/TOT	20	3	0	0	0	23	23	81	20	0	0	1	102	103	233	32	2	1	2	270	274
09:00	5	0	0	0	0	5	5	15	3	3	0	0	21	23	43	8	5	1	0	57	61
09:15	6	1	0	0	0	7	7	9	14	0	0	2	25	27	27	2	0	1	0	30	31
09:30	2	1	0	0	0	3	3	4	2	0	0	0	6	6	25	4	0	0	0	29	29
09:45	4	1	0	0	0	5	5	8	7	1	1	0	17	19	11	3	1	0	0	15	16
H/TOT	17	3	0	0	0	20	20	36	26	4	1	2	69	74	106	17	6	2	0	131	137
10:00	6	1	0	0	0	7	7	2	2	1	1	1	7	10	12	6	0	0	0	18	18
10:15	7	1	0	0	0	8	8	15	5	1	0	0	21	22	17	2	0	1	0	20	21
10:30	1	1	0	0	0	2	2	10	7	1	0	0	18	19	8	2	1	0	0	11	12
10:45	7	0	0	0	0	7	7	7	5	0	0	0	12	12	16	3	1	0	0	20	21
H/TOT	21	3	0	0	0	24	24	34	19	3	1	1	58	62	53	13	2	1	0	69	71
11:00	6	3	0	0	0	9	9	16	1	1	0	0	18	19	10	7	0	0	0	17	17
11:15	4	3	0	0	0	7	7	11	5	2	0	0	18	19	23	3	3	0	0	29	31
11:30	8	0	0	0	0	8	8	10	2	0	0	0	12	12	14	4	0	1	0	19	20
11:45	9	1	0	0	0	10	10	18	3	0	0	0	21	21	19	3	1	0	0	23	24
H/TOT	27	7	0	0	0	34	34	55	11	3	0	0	69	71	66	17	4	1	0	88	91
12:00	14	4	1	0	0	19	20	17	4	0	0	0	21	21	9	1	0	0	0	10	10
12:15	20	0	0	0	0	20	20	16	2	0	0	0	18	18	4	2	0	0	0	6	6
12:30	8	1	0	0	0	9	9	23	0	1	0	0	24	25	14	3	1	0	0	18	19
12:45	12	1	0	0	0	13	13	19	5	1	0	0	25	26	26	3	0	0	0	29	29
H/TOT	54	6	1	0	0	61	62	75	11	2	0	0	88	89	53	9	1	0	0	63	64

TRAFFINOMICS LIMITED

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 02 DATE: 9th November 2021

LOCATION: R474 Circular Road/Drumbiggle Road DAY: Tuesday

	MOVEMENT 1							**MOVEMENT 2**							**MOVEMENT 3**						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
13:00	8	0	0	0	0	8	8	23	4	0	0	0	27	27	14	5	2	0	0	21	22
13:15	6	0	0	0	0	6	6	28	7	1	0	0	36	37	12	1	1	0	0	14	15
13:30	12	0	0	0	0	12	12	24	4	0	0	0	28	28	14	1	1	0	0	16	17
13:45	13	2	0	0	0	15	15	22	3	1	0	0	26	27	26	2	1	0	1	30	32
H/TOT	39	2	0	0	0	41	41	97	18	2	0	0	117	118	66	9	5	0	1	81	85
14:00	5	0	0	0	0	5	5	18	3	0	0	0	21	21	29	6	0	0	0	35	35
14:15	12	1	0	0	0	13	13	31	4	2	0	0	37	38	10	4	1	0	0	15	16
14:30	12	0	0	0	0	12	12	33	3	1	0	0	37	38	23	1	0	0	0	24	24
14:45	13	2	0	1	0	16	17	30	4	2	1	1	38	41	20	3	1	0	0	24	25
H/TOT	42	3	0	1	0	46	47	112	14	5	1	1	133	138	82	14	2	0	0	98	99
15:00	8	1	0	0	1	10	11	20	0	1	1	0	22	24	29	1	1	0	0	31	32
15:15	5	0	0	0	0	5	5	29	3	0	0	0	32	32	18	1	0	0	1	20	21
15:30	10	1	1	0	0	12	13	31	8	0	0	0	39	39	33	5	0	0	0	38	38
15:45	11	0	0	0	1	12	13	27	4	0	0	0	31	31	31	2	0	0	0	33	33
H/TOT	34	2	1	0	2	39	42	107	15	1	1	0	124	126	111	9	1	0	1	122	124
16:00	14	0	0	0	0	14	14	59	3	1	0	0	63	64	20	3	0	0	1	24	25
16:15	11	1	1	0	0	13	14	47	8	3	0	3	61	66	16	5	0	0	0	21	21
16:30	10	1	0	0	0	11	11	33	11	0	0	0	44	44	25	0	0	1	1	27	29
16:45	11	2	1	0	1	15	17	44	11	2	0	0	57	58	37	3	0	1	1	42	44
H/TOT	46	4	2	0	1	53	55	183	33	6	0	3	225	231	98	11	0	2	3	114	120
17:00	10	0	0	0	1	11	12	40	6	0	0	0	46	46	34	9	0	0	0	43	43
17:15	9	2	0	0	0	11	11	44	4	0	0	0	48	48	22	4	0	1	1	28	30
17:30	7	0	0	0	0	7	7	37	1	0	0	0	38	38	31	3	0	0	0	34	34
17:45	6	1	0	0	0	7	7	35	2	0	0	0	37	37	27	3	0	0	0	30	30
H/TOT	32	3	0	0	1	36	37	156	13	0	0	0	169	169	114	19	0	1	1	135	137
18:00	5	2	0	0	0	7	7	35	0	0	0	0	35	35	27	0	0	1	0	28	29
18:15	6	2	0	0	0	8	8	19	3	0	0	0	22	22	21	0	0	0	0	21	21
18:30	6	0	0	0	0	6	6	22	3	0	0	0	25	25	13	0	0	0	0	13	13
18:45	1	2	0	0	0	3	3	7	0	0	0	0	7	7	26	2	0	0	0	28	28
H/TOT	18	6	0	0	0	24	24	83	6	0	0	0	89	89	87	2	0	1	0	90	91
P/TOT	359	43	4	1	4	411	418	1057	193	27	4	8	1289	1316	1133	167	24	10	8	1342	1375

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 02 DATE: 9th November 2021

LOCATION: R474 Circular Road/Drumbiggle Road DAY: Tuesday

	MOVEMENT 4							MOVEMENT 5							MOVEMENT 6							PCU's Through Junction
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	
07:00	5	1	0	0	0	6	6	2	1	0	0	0	3	3	1	0	0	0	0	1	1	28
07:15	6	4	0	0	0	10	10	7	3	1	0	0	11	12	0	1	0	0	1	2	3	45
07:30	6	6	2	0	0	14	15	5	2	0	0	0	7	7	1	3	0	0	0	4	4	85
07:45	20	18	1	0	0	39	40	8	3	0	0	0	11	11	4	0	0	0	0	4	4	96
H/TOT	37	29	3	0	0	69	71	22	9	1	0	0	32	33	6	4	0	0	1	11	12	254
08:00	17	12	0	0	0	29	29	11	3	2	0	0	16	17	9	0	0	0	0	9	9	133
08:15	35	9	0	1	1	46	48	11	4	0	0	1	16	17	16	1	0	0	0	17	17	199
08:30	67	8	1	0	1	77	79	22	4	2	1	1	30	33	19	0	0	0	0	19	19	254
08:45	53	8	0	0	1	62	63	23	5	1	0	0	29	30	13	1	0	0	2	16	18	194
H/TOT	172	37	1	1	3	214	219	67	16	5	1	2	91	97	57	2	0	0	2	61	63	779
09:00	18	10	0	0	0	28	28	12	2	2	0	0	16	17	10	0	0	0	0	10	10	143
09:15	23	6	0	0	0	29	29	9	3	4	0	0	16	18	8	1	1	0	0	10	11	123
09:30	15	3	1	0	0	19	20	6	5	0	0	0	11	11	7	0	0	0	0	7	7	76
09:45	18	3	2	0	0	23	24	9	2	0	0	0	11	11	5	0	0	0	0	5	5	79
H/TOT	74	22	3	0	0	99	101	36	12	6	0	0	54	57	30	1	1	0	0	32	33	421
10:00	16	3	0	1	0	20	21	10	4	1	0	0	15	16	4	0	0	0	0	4	4	76
10:15	6	5	0	1	0	12	13	15	1	0	0	0	16	16	4	1	0	0	0	5	5	85
10:30	13	4	0	0	0	17	17	10	4	1	0	0	15	16	3	0	0	0	0	3	3	68
10:45	14	3	1	0	0	18	19	12	2	1	0	1	16	18	5	0	0	0	0	5	5	81
H/TOT	49	15	1	2	0	67	70	47	11	3	0	1	62	65	16	1	0	0	0	17	17	309
11:00	18	1	2	0	0	21	22	10	1	0	1	0	12	13	10	1	0	0	0	11	11	91
11:15	16	3	0	0	0	19	19	13	1	1	0	0	15	16	5	2	1	0	0	8	9	100
11:30	15	1	0	1	0	17	18	4	2	0	0	0	6	6	7	0	0	0	0	7	7	72
11:45	9	3	0	0	0	12	12	8	0	0	0	0	8	8	7	1	0	0	0	8	8	83
H/TOT	58	8	2	1	0	69	71	35	4	1	1	0	41	43	29	4	1	0	0	34	35	344
12:00	20	5	4	0	0	29	31	13	4	1	0	0	18	19	2	2	0	0	0	4	4	104
12:15	23	5	1	0	0	29	30	14	0	1	0	0	15	16	5	0	0	0	0	5	5	94
12:30	18	1	2	0	1	22	24	10	2	1	0	0	13	14	11	2	0	0	0	13	13	103
12:45	14	4	2	0	0	20	21	17	3	1	0	0	21	22	1	1	0	0	0	2	2	112
H/TOT	75	15	9	0	1	100	106	54	9	4	0	0	67	69	19	5	0	0	0	24	24	413

TRAFFINOMICS LIMITED

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 02 DATE: 9th November 2021

LOCATION: R474 Circular Road/Drumbiggle Road DAY: Tuesday

	MOVEMENT 4							MOVEMENT 5							MOVEMENT 6							PCU's Through Junction
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	
13:00	12	5	0	0	0	17	17	22	3	1	0	0	26	27	8	0	0	0	0	8	8	109
13:15	18	4	0	0	0	22	22	12	4	1	0	0	17	18	10	1	0	0	0	11	11	108
13:30	9	1	1	0	0	11	12	21	3	0	0	0	24	24	6	0	0	0	0	6	6	98
13:45	23	2	0	0	0	25	25	19	2	2	0	0	23	24	13	1	0	0	0	14	14	136
H/TOT	62	12	1	0	0	75	76	74	12	4	0	0	90	92	37	2	0	0	0	39	39	450
14:00	17	1	0	0	0	18	18	18	2	0	0	0	20	20	8	3	0	0	0	11	11	110
14:15	21	2	0	0	0	23	23	21	6	1	0	0	28	29	12	1	0	0	1	14	15	133
14:30	20	1	0	0	0	21	21	18	4	1	0	0	23	24	10	2	0	0	0	12	12	130
14:45	11	4	0	1	0	16	17	19	3	0	0	0	22	22	11	2	0	0	0	13	13	135
H/TOT	69	8	0	1	0	78	79	76	15	2	0	0	93	94	41	8	0	0	1	50	51	508
15:00	10	7	1	0	0	18	19	20	3	0	0	0	23	23	17	1	1	0	0	19	20	127
15:15	20	4	0	1	0	25	26	18	7	2	0	1	28	30	9	0	0	0	0	9	9	123
15:30	22	1	0	0	0	23	23	18	2	1	0	0	21	22	12	1	0	0	0	13	13	147
15:45	32	7	0	0	0	39	39	14	4	0	0	0	18	18	5	0	0	0	0	5	5	139
H/TOT	84	19	1	1	0	105	107	70	16	3	0	1	90	93	43	2	1	0	0	46	47	537
16:00	19	4	4	0	1	28	31	49	7	1	1	0	58	60	16	0	0	0	0	16	16	209
16:15	18	4	0	0	1	23	24	34	4	0	0	0	38	38	9	0	1	0	0	10	11	173
16:30	31	9	0	0	0	40	40	30	7	0	0	0	37	37	14	0	0	0	0	14	14	175
16:45	20	4	2	0	0	26	27	25	6	1	0	0	32	33	14	0	0	0	0	14	14	192
H/TOT	88	21	6	0	2	117	122	138	24	2	1	0	165	167	53	0	1	0	0	54	55	749
17:00	15	5	0	0	0	20	20	37	6	2	0	0	45	46	10	4	0	0	0	14	14	181
17:15	20	1	1	0	0	22	23	36	13	2	0	0	51	52	8	1	0	0	0	9	9	173
17:30	17	2	1	0	0	20	21	34	5	0	0	0	39	39	3	1	0	0	0	4	4	143
17:45	15	1	0	0	0	16	16	27	3	0	0	0	30	30	8	2	0	0	0	10	10	130
H/TOT	67	9	2	0	0	78	79	134	27	4	0	0	165	167	29	8	0	0	0	37	37	626
18:00	11	4	0	0	0	15	15	27	1	0	0	0	28	28	6	0	0	0	0	6	6	120
18:15	11	3	1	0	0	15	16	19	0	1	0	0	20	21	5	0	0	0	0	5	5	92
18:30	15	3	1	0	0	19	20	12	4	0	0	0	16	16	4	0	0	0	0	4	4	84
18:45	13	2	0	0	0	15	15	27	3	0	0	0	30	30	7	0	0	0	0	7	7	90
H/TOT	50	12	2	0	0	64	65	85	8	1	0	0	94	95	22	0	0	0	0	22	22	386
P/TOT	885	207	31	6	6	1135	1164	838	163	36	3	4	1044	1070	382	37	4	0	4	427	433	5776

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 03 DATE: 9th November 2021

LOCATION: Cloughleigh Road/R474 Circular Road/Davitt Terrace DAY: Tuesday

	MOVEMENT 1							MOVEMENT 2							MOVEMENT 3						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
07:00	2	0	0	0	0	2	2	1	0	0	0	0	1	1	1	0	0	0	0	1	1
07:15	2	0	0	0	0	2	2	4	3	0	0	0	7	7	2	0	0	0	0	2	2
07:30	2	0	0	0	0	2	2	5	5	0	0	0	10	10	1	0	0	0	0	1	1
07:45	2	0	0	0	0	2	2	9	8	0	0	0	17	17	2	0	2	0	0	4	5
H/TOT	8	0	0	0	0	8	8	19	16	0	0	0	35	35	6	0	2	0	0	8	9
08:00	4	0	0	0	0	4	4	19	2	1	0	0	22	23	1	4	0	0	1	6	7
08:15	23	2	0	0	0	25	25	27	2	0	0	1	30	31	3	2	0	0	0	5	5
08:30	17	2	0	0	0	19	19	73	3	0	0	1	77	78	8	0	1	0	0	9	10
08:45	28	1	0	0	3	32	35	60	9	0	0	0	69	69	13	2	0	0	0	15	15
H/TOT	72	5	0	0	3	80	83	179	16	1	0	2	198	201	25	8	1	0	1	35	37
09:00	12	5	0	0	0	17	17	30	4	1	0	0	35	36	7	1	0	0	0	8	8
09:15	11	0	0	0	0	11	11	7	1	1	0	0	9	10	6	1	1	0	0	8	9
09:30	6	2	1	0	0	9	10	15	2	1	0	0	18	19	2	2	0	0	0	4	4
09:45	7	1	1	1	0	10	12	12	3	0	0	0	15	15	3	1	0	0	0	4	4
H/TOT	36	8	2	1	0	47	49	64	10	3	0	0	77	79	18	5	1	0	0	24	25
10:00	9	0	0	0	0	9	9	12	1	0	0	0	13	13	8	0	0	0	0	8	8
10:15	8	1	0	0	0	9	9	15	1	0	0	0	16	16	6	2	0	0	0	8	8
10:30	5	0	1	0	0	6	7	13	0	0	0	0	13	13	6	2	0	0	0	8	8
10:45	5	0	0	0	0	5	5	6	5	0	0	0	11	11	7	0	1	0	0	8	9
H/TOT	27	1	1	0	0	29	30	46	7	0	0	0	53	53	27	4	1	0	0	32	33
11:00	6	0	0	0	0	6	6	8	5	0	0	0	13	13	3	2	0	0	0	5	5
11:15	10	0	0	0	0	10	10	9	1	0	0	0	10	10	8	1	0	0	0	9	9
11:30	4	1	0	0	0	5	5	9	1	1	0	0	11	12	4	0	0	0	0	4	4
11:45	4	0	0	0	0	4	4	10	5	0	0	0	15	15	2	0	0	0	0	2	2
H/TOT	24	1	0	0	0	25	25	36	12	1	0	0	49	50	17	3	0	0	0	20	20
12:00	4	0	0	0	0	4	4	8	2	0	0	0	10	10	4	2	0	1	0	7	8
12:15	4	0	0	0	0	4	4	7	2	0	1	0	10	11	3	1	0	0	0	4	4
12:30	4	2	0	0	0	6	6	11	4	0	0	0	15	15	6	1	0	0	0	7	7
12:45	5	1	0	0	0	6	6	6	7	0	0	0	13	13	1	3	0	0	0	4	4
H/TOT	17	3	0	0	0	20	20	32	15	0	1	0	48	49	14	7	0	1	0	22	23

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 03 DATE: 9th November 2021

LOCATION: Cloughleigh Road/R474 Circular Road/Davitt Terrace DAY: Tuesday

	MOVEMENT 1							MOVEMENT 2							MOVEMENT 3						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
13:00	0	1	0	0	0	1	1	6	2	0	0	0	8	8	4	1	1	0	0	6	7
13:15	2	1	0	0	0	3	3	9	1	0	0	0	10	10	7	0	0	0	0	7	7
13:30	10	0	0	0	0	10	10	10	1	0	0	0	11	11	10	2	0	0	0	12	12
13:45	16	0	0	0	0	16	16	18	2	1	0	0	21	22	8	2	1	0	0	11	12
H/TOT	28	2	0	0	0	30	30	43	6	1	0	0	50	51	29	5	2	0	0	36	37
14:00	4	2	0	0	0	6	6	13	2	0	0	0	15	15	6	0	0	0	0	6	6
14:15	12	3	0	0	0	15	15	17	1	0	0	0	18	18	10	0	1	0	0	11	12
14:30	11	0	0	0	0	11	11	13	2	0	0	0	15	15	11	0	0	0	0	11	11
14:45	13	1	0	0	0	14	14	19	1	0	0	0	20	20	12	1	0	0	0	13	13
H/TOT	40	6	0	0	0	46	46	62	6	0	0	0	68	68	39	1	1	0	0	41	42
15:00	10	1	0	0	0	11	11	14	1	1	0	0	16	17	6	0	0	0	0	6	6
15:15	5	0	0	0	0	5	5	10	1	0	0	0	11	11	7	1	0	0	0	8	8
15:30	13	2	0	0	0	15	15	21	2	0	0	0	23	23	9	0	0	0	1	10	11
15:45	8	2	0	0	0	10	10	8	2	0	0	0	10	10	14	0	0	0	0	14	14
H/TOT	36	5	0	0	0	41	41	53	6	1	0	0	60	61	36	1	0	0	1	38	39
16:00	10	1	0	0	0	11	11	22	5	0	0	0	27	27	25	1	0	0	0	26	26
16:15	6	0	0	0	0	6	6	14	1	0	0	0	15	15	10	3	0	0	0	13	13
16:30	4	0	0	0	0	4	4	7	1	0	0	0	8	8	7	0	0	0	0	7	7
16:45	3	2	0	0	0	5	5	23	2	0	0	0	25	25	7	1	1	0	0	9	10
H/TOT	23	3	0	0	0	26	26	66	9	0	0	0	75	75	49	5	1	0	0	55	56
17:00	3	0	0	0	0	3	3	12	0	0	0	0	12	12	8	0	0	0	0	8	8
17:15	3	1	0	0	0	4	4	14	2	0	0	0	16	16	9	2	0	0	0	11	11
17:30	8	0	0	0	0	8	8	13	1	0	0	0	14	14	12	1	0	0	0	13	13
17:45	5	1	0	0	0	6	6	8	1	0	0	0	9	9	7	1	0	0	0	8	8
H/TOT	19	2	0	0	0	21	21	47	4	0	0	0	51	51	36	4	0	0	0	40	40
18:00	5	2	0	0	0	7	7	12	2	0	0	0	14	14	10	1	0	0	0	11	11
18:15	6	1	0	0	0	7	7	14	1	0	0	0	15	15	11	0	0	0	0	11	11
18:30	5	2	0	0	0	7	7	6	0	0	0	0	6	6	6	0	0	0	0	6	6
18:45	7	0	0	0	0	7	7	16	0	0	0	0	16	16	6	0	0	0	0	6	6
H/TOT	23	5	0	0	0	28	28	48	3	0	0	0	51	51	33	1	0	0	0	34	34
P/TOT	353	41	3	1	3	401	407	695	110	7	1	2	815	822	329	44	9	1	2	385	393

SITE: 03 DATE: 9th November 2021

LOCATION: Cloughleigh Road/R474 Circular Road/Davitt Terrace DAY: Tuesday

	MOVEMENT 4							MOVEMENT 5							MOVEMENT 6						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
07:00	0	0	0	0	0	0	0	7	1	0	0	0	8	8	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	10	4	0	0	1	15	16	0	1	0	0	0	1	1
07:30	0	2	0	0	0	2	2	19	7	1	0	0	27	28	3	0	0	0	0	3	3
07:45	3	1	0	0	0	4	4	30	3	0	0	0	33	33	3	0	0	0	0	3	3
H/TOT	3	3	0	0	0	6	6	66	15	1	0	1	83	85	6	1	0	0	0	7	7
08:00	2	0	0	0	0	2	2	25	1	0	0	0	26	26	4	0	0	0	0	4	4
08:15	7	1	0	0	0	8	8	69	2	0	0	2	73	75	7	1	0	0	0	8	8
08:30	11	1	0	0	0	12	12	61	0	0	1	0	62	63	13	0	0	0	0	13	13
08:45	11	1	0	0	0	12	12	48	3	0	0	2	53	55	8	4	0	2	0	14	17
H/TOT	31	3	0	0	0	34	34	203	6	0	1	4	214	219	32	5	0	2	0	39	42
09:00	4	1	0	0	1	6	7	46	0	1	0	0	47	48	10	1	0	0	0	11	11
09:15	7	1	1	0	0	9	10	39	3	3	0	0	45	47	1	0	0	0	0	1	1
09:30	4	1	0	0	0	5	5	26	2	0	0	0	28	28	6	0	0	0	0	6	6
09:45	3	1	0	0	0	4	4	24	1	1	0	0	26	27	5	3	0	0	0	8	8
H/TOT	18	4	1	0	1	24	26	135	6	5	0	0	146	149	22	4	0	0	0	26	26
10:00	4	2	0	0	0	6	6	12	2	0	0	0	14	14	3	0	0	0	0	3	3
10:15	2	1	0	0	1	4	5	19	0	3	0	0	22	24	8	1	0	0	0	9	9
10:30	2	0	0	0	0	2	2	18	3	1	0	0	22	23	7	1	0	0	0	8	8
10:45	3	1	1	0	0	5	6	24	2	1	0	0	27	28	7	1	0	0	0	8	8
H/TOT	11	4	1	0	1	17	19	73	7	5	0	0	85	88	25	3	0	0	0	28	28
11:00	5	1	0	0	0	6	6	21	0	0	1	0	22	23	5	1	0	0	0	6	6
11:15	4	1	0	0	0	5	5	38	3	2	1	0	44	46	7	0	0	0	0	7	7
11:30	6	0	0	0	0	6	6	26	2	0	1	0	29	30	2	1	0	0	0	3	3
11:45	4	0	0	0	0	4	4	30	0	0	0	0	30	30	1	0	0	0	0	1	1
H/TOT	19	2	0	0	0	21	21	115	5	2	3	0	125	130	15	2	0	0	0	17	17
12:00	2	0	0	0	0	2	2	20	2	0	0	0	22	22	3	0	0	0	0	3	3
12:15	4	0	0	0	0	4	4	21	2	0	0	0	23	23	7	2	0	0	0	9	9
12:30	6	1	0	0	0	7	7	24	1	0	0	0	25	25	5	1	1	0	0	7	8
12:45	4	1	0	0	0	5	5	20	3	0	0	0	23	23	9	2	0	0	0	11	11
H/TOT	16	2	0	0	0	18	18	85	8	0	0	0	93	93	24	5	1	0	0	30	31

SITE: 03 DATE: 9th November 2021

LOCATION: Cloughleigh Road/R474 Circular Road/Davitt Terrace DAY: Tuesday

	MOVEMENT 4							MOVEMENT 5							MOVEMENT 6						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
13:00	2	0	0	0	0	2	2	19	3	1	0	0	23	24	4	0	0	0	0	4	4
13:15	4	0	0	0	0	4	4	24	4	1	0	0	29	30	3	0	0	0	0	3	3
13:30	7	2	0	0	0	9	9	24	4	0	0	0	28	28	8	0	0	0	0	8	8
13:45	5	0	0	0	0	5	5	34	2	1	0	0	37	38	5	2	1	0	0	8	9
H/TOT	18	2	0	0	0	20	20	101	13	3	0	0	117	119	20	2	1	0	0	23	24
14:00	2	1	0	0	0	3	3	38	4	0	0	0	42	42	6	0	0	0	0	6	6
14:15	10	0	0	0	0	10	10	35	3	0	0	2	40	42	4	2	0	0	0	6	6
14:30	4	1	1	0	0	6	7	25	3	1	0	0	29	30	3	0	0	0	0	3	3
14:45	5	0	0	0	0	5	5	33	2	1	0	0	36	37	6	2	0	0	0	8	8
H/TOT	21	2	1	0	0	24	25	131	12	2	0	2	147	150	19	4	0	0	0	23	23
15:00	7	0	1	0	0	8	9	31	5	1	0	0	37	38	6	1	0	0	0	7	7
15:15	5	0	0	0	0	5	5	28	1	1	0	0	30	31	8	0	0	0	0	8	8
15:30	3	2	0	0	0	5	5	38	3	0	0	0	41	41	7	0	0	0	0	7	7
15:45	3	0	0	0	0	3	3	35	0	0	0	0	35	35	2	2	0	0	0	4	4
H/TOT	18	2	1	0	0	21	22	132	9	2	0	0	143	144	23	3	0	0	0	26	26
16:00	6	1	0	0	0	7	7	35	1	0	0	0	36	36	7	2	0	0	0	9	9
16:15	4	1	0	0	0	5	5	29	5	1	0	0	35	36	3	1	0	0	0	4	4
16:30	9	1	0	0	0	10	10	27	3	0	1	0	31	32	8	1	0	0	0	9	9
16:45	7	2	0	0	0	9	9	24	2	0	1	0	27	28	4	2	0	0	0	6	6
H/TOT	26	5	0	0	0	31	31	115	11	1	2	0	129	132	22	6	0	0	0	28	28
17:00	6	0	0	0	0	6	6	28	6	0	0	0	34	34	7	1	0	0	0	8	8
17:15	11	2	0	0	1	14	15	25	1	1	1	0	28	30	8	1	0	0	0	9	9
17:30	10	2	0	0	0	12	12	35	2	0	0	0	37	37	4	3	0	0	0	7	7
17:45	9	1	0	0	0	10	10	34	0	0	0	0	34	34	5	0	0	0	0	5	5
H/TOT	36	5	0	0	1	42	43	122	9	1	1	0	133	135	24	5	0	0	0	29	29
18:00	5	1	0	0	0	6	6	22	4	0	1	0	27	28	3	0	0	0	0	3	3
18:15	8	0	0	0	0	8	8	30	1	0	0	0	31	31	7	0	0	0	0	7	7
18:30	9	0	0	0	0	9	9	17	3	0	0	0	20	20	4	0	0	0	0	4	4
18:45	5	0	0	0	0	5	5	24	2	0	0	0	26	26	4	0	0	0	0	4	4
H/TOT	27	1	0	0	0	28	28	93	10	0	1	0	104	105	18	0	0	0	0	18	18
P/TOT	244	35	4	0	3	286	291	1371	111	22	8	7	1519	1547	250	40	2	2	0	294	298

SITE: 03 DATE: 9th November 2021

LOCATION: Cloughleigh Road/R474 Circular Road/Davitt Terrace DAY: Tuesday

	MOVEMENT 7							MOVEMENT 8							MOVEMENT 9						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	0	1	0	0	0	1	1	1	0	0	0	0	1	1	1	0	0	0	0	1	1
07:30	0	0	0	0	0	0	0	2	0	0	0	0	2	2	2	0	0	0	0	2	2
07:45	0	0	0	0	0	0	0	3	0	0	0	0	3	3	1	0	0	0	0	1	1
H/TOT	0	1	0	0	0	1	1	6	0	0	0	0	6	6	4	0	0	0	0	4	4
08:00	4	0	0	0	0	4	4	3	1	0	0	0	4	4	2	0	0	0	0	2	2
08:15	2	0	0	0	0	2	2	1	1	0	0	0	2	2	0	0	0	0	0	0	0
08:30	3	0	1	0	0	4	5	11	4	0	0	0	15	15	1	0	0	0	0	1	1
08:45	4	2	0	0	0	6	6	11	4	0	0	0	15	15	1	2	0	0	0	3	3
H/TOT	13	2	1	0	0	16	17	26	10	0	0	0	36	36	4	2	0	0	0	6	6
09:00	1	0	0	0	0	1	1	13	4	0	0	0	17	17	0	2	0	0	0	2	2
09:15	3	2	0	0	0	5	5	5	2	0	0	0	7	7	1	1	0	0	0	2	2
09:30	2	1	0	0	0	3	3	2	1	0	0	0	3	3	5	1	2	0	0	8	9
09:45	3	0	0	0	0	3	3	7	0	1	0	0	8	9	5	2	1	0	0	8	9
H/TOT	9	3	0	0	0	12	12	27	7	1	0	0	35	36	11	6	3	0	0	20	22
10:00	2	1	0	0	0	3	3	1	0	0	0	0	1	1	2	0	0	0	0	2	2
10:15	7	2	1	0	0	10	11	5	4	0	0	0	9	9	2	2	0	0	0	4	4
10:30	3	0	0	0	0	3	3	8	1	0	0	0	9	9	2	2	0	0	0	4	4
10:45	1	1	0	0	0	2	2	4	3	1	0	0	8	9	2	0	0	0	0	2	2
H/TOT	13	4	1	0	0	18	19	18	8	1	0	0	27	28	8	4	0	0	0	12	12
11:00	6	1	0	0	0	7	7	3	1	0	0	0	4	4	5	2	0	0	0	7	7
11:15	2	0	0	0	0	2	2	6	4	1	0	0	11	12	5	1	0	0	0	6	6
11:30	4	1	0	0	0	5	5	9	1	0	0	0	10	10	4	2	1	1	0	8	10
11:45	3	2	0	0	0	5	5	9	1	0	0	0	10	10	3	2	1	0	0	6	7
H/TOT	15	4	0	0	0	19	19	27	7	1	0	0	35	36	17	7	2	1	0	27	29
12:00	5	1	1	0	0	7	8	12	3	1	0	0	16	17	4	3	0	0	0	7	7
12:15	3	1	0	0	0	4	4	6	2	0	0	0	8	8	4	2	0	0	0	6	6
12:30	2	0	0	0	0	2	2	6	1	0	0	0	7	7	2	1	0	0	0	3	3
12:45	6	0	0	0	0	6	6	4	1	0	0	0	5	5	6	1	0	0	0	7	7
H/TOT	16	2	1	0	0	19	20	28	7	1	0	0	36	37	16	7	0	0	0	23	23

SITE: 03 DATE: 9th November 2021

LOCATION: Cloughleigh Road/R474 Circular Road/Davitt Terrace DAY: Tuesday

	MOVEMENT 7							MOVEMENT 8							MOVEMENT 9						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
13:00	4	3	0	0	0	7	7	11	3	1	0	0	15	16	7	1	0	0	0	8	8
13:15	3	1	0	0	0	4	4	7	6	0	0	0	13	13	5	3	0	0	0	8	8
13:30	5	2	0	0	0	7	7	9	3	0	0	0	12	12	4	1	0	0	0	5	5
13:45	3	2	0	0	0	5	5	8	6	0	1	0	15	16	8	0	1	0	0	9	10
H/TOT	15	8	0	0	0	23	23	35	18	1	1	0	55	57	24	5	1	0	0	30	31
14:00	1	0	0	0	0	1	1	8	2	1	0	0	11	12	4	2	0	0	0	6	6
14:15	5	0	0	0	0	5	5	16	2	1	0	0	19	20	4	0	1	0	0	5	6
14:30	3	0	0	0	0	3	3	16	0	0	0	0	16	16	7	3	2	0	0	12	13
14:45	5	1	0	0	0	6	6	13	2	0	0	0	15	15	3	2	0	0	0	5	5
H/TOT	14	1	0	0	0	15	15	53	6	2	0	0	61	62	18	7	3	0	0	28	30
15:00	6	0	1	0	0	7	8	11	1	0	0	0	12	12	3	0	1	0	1	5	7
15:15	5	2	0	0	0	7	7	15	3	0	0	0	18	18	3	1	0	0	1	5	6
15:30	9	3	0	0	0	12	12	11	2	0	0	0	13	13	7	0	1	0	0	8	9
15:45	4	2	0	0	0	6	6	13	4	0	0	0	17	17	3	0	0	0	1	4	5
H/TOT	24	7	1	0	0	32	33	50	10	0	0	0	60	60	16	1	2	0	3	22	26
16:00	4	2	0	0	0	6	6	13	3	0	0	0	16	16	5	2	0	0	0	7	7
16:15	3	3	1	0	0	7	8	17	4	0	0	0	21	21	2	1	0	0	0	3	3
16:30	5	1	0	0	0	6	6	14	4	0	0	0	18	18	6	1	0	0	0	7	7
16:45	3	2	1	0	0	6	7	13	4	0	0	0	17	17	4	2	0	0	0	6	6
H/TOT	15	8	2	0	0	25	26	57	15	0	0	0	72	72	17	6	0	0	0	23	23
17:00	10	2	0	0	0	12	12	15	4	0	0	0	19	19	4	2	0	0	0	6	6
17:15	4	2	0	0	0	6	6	23	3	0	0	0	26	26	4	1	1	0	0	6	7
17:30	4	2	0	0	0	6	6	20	2	0	0	0	22	22	3	0	0	0	0	3	3
17:45	8	2	0	0	0	10	10	18	2	0	0	0	20	20	0	0	0	0	0	0	0
H/TOT	26	8	0	0	0	34	34	76	11	0	0	0	87	87	11	3	1	0	0	15	16
18:00	6	0	0	0	0	6	6	19	2	0	0	0	21	21	4	0	0	0	0	4	4
18:15	3	0	0	0	0	3	3	14	2	0	0	0	16	16	1	0	0	0	0	1	1
18:30	3	1	0	0	0	4	4	12	0	0	0	0	12	12	0	0	0	0	0	0	0
18:45	6	0	0	0	0	6	6	14	0	0	0	0	14	14	1	0	0	0	0	1	1
H/TOT	18	1	0	0	0	19	19	59	4	0	0	0	63	63	6	0	0	0	0	6	6
P/TOT	178	49	6	0	0	233	236	462	103	7	1	0	573	578	152	48	12	1	3	216	226

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 03 DATE: 9th November 2021

LOCATION: Cloughleigh Road/R474 Circular Road/Davitt Terrace DAY: Tuesday

	MOVEMENT 10							MOVEMENT 11							MOVEMENT 12							PCU's Through Junction
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	
07:00	0	0	0	0	0	0	0	6	4	0	0	0	10	10	1	3	0	0	0	4	4	26
07:15	0	0	0	0	0	0	0	9	1	0	0	0	10	10	3	0	0	0	0	3	3	44
07:30	0	0	0	0	0	0	0	7	4	1	0	0	12	13	2	0	0	0	0	2	2	64
07:45	0	0	0	0	0	0	0	20	5	0	0	0	25	25	1	0	1	0	0	2	3	96
H/TOT	0	0	0	0	0	0	0	42	14	1	0	0	57	58	7	3	1	0	0	11	12	230
08:00	3	0	0	0	0	3	3	13	4	0	0	1	18	19	7	1	0	0	0	8	8	106
08:15	0	0	0	0	0	0	0	23	5	2	0	2	32	35	14	2	1	0	2	19	22	213
08:30	4	0	0	0	0	4	4	30	1	2	0	0	33	34	13	0	0	0	0	13	13	266
08:45	3	2	0	0	0	5	5	23	1	1	0	1	26	28	16	0	0	0	0	16	16	275
H/TOT	10	2	0	0	0	12	12	89	11	5	0	4	109	116	50	3	1	0	2	56	59	859
09:00	4	0	1	0	0	5	6	25	1	0	1	2	29	32	12	1	0	0	0	13	13	197
09:15	3	1	0	0	0	4	4	24	5	2	0	2	33	36	11	1	0	0	0	12	12	152
09:30	3	0	0	0	0	3	3	21	3	0	0	0	24	24	4	0	0	0	0	4	4	117
09:45	2	0	0	0	0	2	2	19	4	1	1	0	25	27	4	1	0	0	0	5	5	123
H/TOT	12	1	1	0	0	14	15	89	13	3	2	4	111	119	31	3	0	0	0	34	34	589
10:00	1	0	0	0	0	1	1	15	1	0	0	0	16	16	5	1	0	0	0	6	6	82
10:15	1	1	0	0	0	2	2	24	1	1	0	0	26	27	6	0	0	0	0	6	6	129
10:30	6	0	0	0	0	6	6	22	2	1	0	0	25	26	4	1	0	0	0	5	5	113
10:45	3	1	0	0	0	4	4	31	1	0	0	0	32	32	7	1	0	0	0	8	8	122
H/TOT	11	2	0	0	0	13	13	92	5	2	0	0	99	100	22	3	0	0	0	25	25	445
11:00	9	1	0	0	0	10	10	35	2	2	0	0	39	40	6	2	0	0	0	8	8	135
11:15	1	0	0	0	0	1	1	29	2	0	0	0	31	31	3	1	0	0	0	4	4	143
11:30	5	1	0	0	0	6	6	32	2	0	0	0	34	34	7	0	0	0	0	7	7	132
11:45	5	1	1	0	0	7	8	40	4	2	0	0	46	47	11	0	0	0	0	11	11	143
H/TOT	20	3	1	0	0	24	25	136	10	4	0	0	150	152	27	3	0	0	0	30	30	553
12:00	3	3	0	0	0	6	6	28	2	1	0	0	31	32	9	1	0	0	0	10	10	128
12:15	1	1	0	0	0	2	2	39	2	1	0	0	42	43	5	1	0	0	0	6	6	124
12:30	5	0	0	0	0	5	5	41	2	0	0	0	43	43	6	1	0	0	0	7	7	135
12:45	3	1	0	0	0	4	4	28	2	1	0	0	31	32	4	1	0	0	0	5	5	121
H/TOT	12	5	0	0	0	17	17	136	8	3	0	0	147	149	24	4	0	0	0	28	28	507

SITE: 03 DATE: 9th November 2021

LOCATION: Cloughleigh Road/R474 Circular Road/Davitt Terrace DAY: Tuesday

	MOVEMENT 10							MOVEMENT 11							MOVEMENT 12							PCU's Through Junction
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	
13:00	3	0	0	0	0	3	3	33	2	0	0	0	35	35	3	1	0	0	0	4	4	118
13:15	3	2	0	0	0	5	5	35	1	0	0	0	36	36	4	2	1	0	0	7	8	130
13:30	3	2	1	0	0	6	7	43	4	0	0	0	47	47	8	0	0	0	0	8	8	164
13:45	6	0	0	0	0	6	6	35	2	2	1	0	40	42	11	2	0	0	0	13	13	192
H/TOT	15	4	1	0	0	20	21	146	9	2	1	0	158	160	26	5	1	0	0	32	33	603
14:00	6	0	0	0	0	6	6	30	5	0	0	0	35	35	9	0	0	0	0	9	9	147
14:15	2	0	0	0	0	2	2	38	2	0	0	0	40	40	15	0	0	0	0	15	15	190
14:30	3	2	0	0	0	5	5	43	7	0	0	0	50	50	12	0	0	0	0	12	12	175
14:45	5	0	0	0	0	5	5	29	4	0	1	0	34	35	7	2	0	0	0	9	9	172
H/TOT	16	2	0	0	0	18	18	140	18	0	1	0	159	160	43	2	0	0	0	45	45	683
15:00	6	0	0	0	0	6	6	34	8	1	0	4	47	52	15	3	0	0	2	20	22	192
15:15	2	0	0	0	0	2	2	29	4	2	0	0	35	36	7	0	0	0	0	7	7	144
15:30	5	0	0	0	0	5	5	54	0	0	0	0	54	54	12	0	0	0	0	12	12	207
15:45	4	2	0	0	0	6	6	23	5	2	0	0	30	31	14	0	0	0	0	14	14	155
H/TOT	17	2	0	0	0	19	19	140	17	5	0	4	166	173	48	3	0	0	2	53	55	697
16:00	3	2	0	0	0	5	5	58	6	0	0	0	64	64	10	0	0	0	0	10	10	224
16:15	4	1	0	0	0	5	5	49	4	1	0	3	57	61	21	1	0	0	0	22	22	198
16:30	6	1	0	0	0	7	7	56	5	1	0	1	63	65	12	0	0	0	0	12	12	185
16:45	2	0	0	0	0	2	2	52	2	0	0	0	54	54	9	1	0	0	0	10	10	178
H/TOT	15	4	0	0	0	19	19	215	17	2	0	4	238	243	52	2	0	0	0	54	54	785
17:00	4	0	0	0	0	4	4	53	7	0	0	0	60	60	11	4	0	0	0	15	15	187
17:15	1	0	0	0	0	1	1	53	10	0	0	0	63	63	12	0	0	0	0	12	12	199
17:30	3	0	0	0	0	3	3	47	9	0	0	0	56	56	20	1	1	0	0	22	23	204
17:45	3	0	0	0	0	3	3	39	12	0	0	0	51	51	9	1	0	0	0	10	10	166
H/TOT	11	0	0	0	0	11	11	192	38	0	0	0	230	230	52	6	1	0	0	59	60	756
18:00	3	0	0	0	0	3	3	50	10	0	0	0	60	60	8	0	0	0	0	8	8	171
18:15	2	0	0	0	0	2	2	47	5	0	0	0	52	52	7	0	0	0	0	7	7	160
18:30	5	1	0	0	0	6	6	24	2	0	0	0	26	26	13	2	0	0	0	15	15	115
18:45	4	0	0	0	0	4	4	25	2	0	0	0	27	27	9	0	0	0	0	9	9	125
H/TOT	14	1	0	0	0	15	15	146	19	0	0	0	165	165	37	2	0	0	0	39	39	571
P/TOT	153	26	3	0	0	182	184	1563	179	27	4	16	1789	1824	419	39	4	0	4	466	472	7277

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**
MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 04 DATE: 9th November 2021

LOCATION: R458 Mill Road/R474 Circular Road/Bothar an Mhuilinn DAY: Tuesday

	MOVEMENT 1							MOVEMENT 2							MOVEMENT 3						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
07:00	0	0	0	0	0	0	0	22	7	0	0	0	29	29	4	5	0	0	0	9	9
07:15	0	0	0	0	0	0	0	22	15	1	1	0	39	41	9	0	0	0	0	9	9
07:30	0	0	0	0	0	0	0	32	22	2	2	1	59	64	7	3	0	0	0	10	10
07:45	0	0	0	0	0	0	0	44	15	1	0	0	60	61	20	5	1	0	0	26	27
H/TOT	0	0	0	0	0	0	0	120	59	4	3	1	187	194	40	13	1	0	0	54	55
08:00	0	0	0	0	0	0	0	43	10	2	1	2	58	62	17	4	0	0	1	22	23
08:15	2	0	0	0	0	2	2	65	10	1	0	5	81	87	30	6	3	0	3	42	47
08:30	1	0	0	0	0	1	1	65	14	1	0	0	80	81	42	1	2	0	0	45	46
08:45	3	0	1	0	0	4	5	71	10	2	0	0	83	84	40	2	1	0	1	44	46
H/TOT	6	0	1	0	0	7	8	244	44	6	1	7	302	313	129	13	6	0	5	153	161
09:00	0	1	0	0	0	1	1	68	11	1	0	2	82	85	25	2	0	1	2	30	33
09:15	3	0	0	0	0	3	3	76	17	2	0	1	96	98	31	7	2	0	2	42	45
09:30	1	0	0	0	0	1	1	82	14	6	0	1	103	107	16	2	0	0	0	18	18
09:45	0	0	0	0	0	0	0	71	8	3	0	0	82	84	24	4	1	0	0	29	30
H/TOT	4	1	0	0	0	5	5	297	50	12	0	4	363	373	96	15	3	1	4	119	126
10:00	0	1	0	0	0	1	1	58	7	3	0	0	68	70	17	0	0	0	0	17	17
10:15	4	0	0	0	0	4	4	60	15	2	0	0	77	78	20	2	1	0	0	23	24
10:30	1	0	0	0	0	1	1	66	10	1	0	0	77	78	28	2	1	0	0	31	32
10:45	0	0	0	0	0	0	0	67	13	4	0	1	85	88	33	3	0	0	0	36	36
H/TOT	5	1	0	0	0	6	6	251	45	10	0	1	307	313	98	7	2	0	0	107	108
11:00	1	0	0	0	0	1	1	110	7	1	0	1	119	121	35	3	1	0	0	39	40
11:15	0	0	0	0	0	0	0	78	21	0	0	0	99	99	31	3	0	0	0	34	34
11:30	0	0	0	0	0	0	0	96	15	2	0	0	113	114	38	3	0	0	0	41	41
11:45	0	0	0	0	0	0	0	82	15	3	0	0	100	102	47	3	3	0	0	53	55
H/TOT	1	0	0	0	0	1	1	366	58	6	0	1	431	435	151	12	4	0	0	167	169
12:00	1	0	0	0	0	1	1	92	13	2	0	0	107	108	36	4	1	0	0	41	42
12:15	1	0	0	0	0	1	1	88	10	3	0	0	101	103	37	3	1	0	0	41	42
12:30	1	0	0	0	0	1	1	79	20	0	0	0	99	99	30	2	0	0	0	32	32
12:45	2	0	0	0	0	2	2	92	10	2	0	0	104	105	29	3	1	0	0	33	34
H/TOT	5	0	0	0	0	5	5	351	53	7	0	0	411	415	132	12	3	0	0	147	149

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 04 DATE: 9th November 2021

LOCATION: R458 Mill Road/R474 Circular Road/Bothar an Mhuilinn DAY: Tuesday

	MOVEMENT 1							MOVEMENT 2							MOVEMENT 3						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
13:00	0	0	0	0	0	0	0	99	11	1	1	0	112	114	31	3	0	0	0	34	34
13:15	0	0	0	0	0	0	0	102	12	0	1	1	116	118	38	3	1	0	0	42	43
13:30	0	0	0	0	0	0	0	110	13	0	0	0	123	123	43	4	1	0	0	48	49
13:45	0	0	1	0	0	1	2	97	14	2	0	1	114	116	45	4	0	1	0	50	51
H/TOT	0	0	1	0	0	1	2	408	50	3	2	2	465	471	157	14	2	1	0	174	176
14:00	1	0	0	0	0	1	1	91	19	3	0	2	115	119	36	2	0	0	0	38	38
14:15	1	0	0	0	0	1	1	80	9	1	0	0	90	91	46	4	0	0	0	50	50
14:30	1	0	0	0	0	1	1	91	11	3	0	1	106	109	52	4	0	0	0	56	56
14:45	1	0	0	0	0	1	1	97	10	2	0	0	109	110	40	5	0	1	0	46	47
H/TOT	4	0	0	0	0	4	4	359	49	9	0	3	420	428	174	15	0	1	0	190	191
15:00	0	0	0	0	0	0	0	87	11	0	0	3	101	104	35	6	1	0	6	48	55
15:15	2	0	0	0	0	2	2	79	14	2	0	0	95	96	32	1	2	0	0	35	36
15:30	1	0	0	0	0	1	1	99	14	2	0	2	117	120	48	1	0	0	0	49	49
15:45	1	0	0	0	0	1	1	67	12	1	0	0	80	81	41	7	2	0	0	50	51
H/TOT	4	0	0	0	0	4	4	332	51	5	0	5	393	401	156	15	5	0	6	182	191
16:00	1	0	0	0	0	1	1	98	5	1	0	3	107	111	63	6	0	0	0	69	69
16:15	0	0	0	0	0	0	0	106	9	2	0	0	117	118	55	5	1	0	3	64	68
16:30	1	0	0	0	0	1	1	97	10	2	0	0	109	110	54	6	1	0	1	62	64
16:45	3	0	0	0	0	3	3	79	14	2	0	3	98	102	51	2	0	0	0	53	53
H/TOT	5	0	0	0	0	5	5	380	38	7	0	6	431	441	223	19	2	0	4	248	253
17:00	1	0	0	0	0	1	1	109	12	0	0	0	121	121	55	7	0	0	0	62	62
17:15	0	0	0	0	0	0	0	89	12	0	0	0	101	101	52	8	0	0	0	60	60
17:30	1	0	0	0	0	1	1	78	9	1	0	0	88	89	48	7	0	0	0	55	55
17:45	0	0	0	0	0	0	0	81	6	0	0	0	87	87	39	8	0	0	0	47	47
H/TOT	2	0	0	0	0	2	2	357	39	1	0	0	397	398	194	30	0	0	0	224	224
18:00	1	0	0	0	0	1	1	79	9	3	0	0	91	93	54	6	0	0	0	60	60
18:15	3	0	0	0	0	3	3	86	11	2	0	0	99	100	31	5	0	0	0	36	36
18:30	4	0	0	0	0	4	4	61	8	0	0	0	69	69	20	2	0	0	0	22	22
18:45	1	0	0	0	0	1	1	75	3	1	0	0	79	80	39	3	0	0	0	42	42
H/TOT	9	0	0	0	0	9	9	301	31	6	0	0	338	341	144	16	0	0	0	160	160
P/TOT	45	2	2	0	0	49	50	3766	567	76	6	30	4445	4521	1694	181	28	3	19	1925	1962

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**
MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 04 DATE: 9th November 2021

LOCATION: R458 Mill Road/R474 Circular Road/Bothar an Mhuilinn DAY: Tuesday

	MOVEMENT 4							MOVEMENT 5							MOVEMENT 6						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
07:00	6	1	0	0	0	7	7	0	0	0	0	0	0	0	2	0	0	0	0	2	2
07:15	13	5	0	0	1	19	20	0	0	0	0	0	0	0	1	0	0	0	0	1	1
07:30	22	4	1	0	0	27	28	0	0	0	0	0	0	0	0	1	0	0	0	1	1
07:45	38	4	0	0	0	42	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	79	14	1	0	1	95	97	0	0	0	0	0	0	0	3	1	0	0	0	4	4
08:00	28	1	0	0	0	29	29	0	0	0	0	0	0	0	2	0	0	0	0	2	2
08:15	88	2	0	0	2	92	94	0	0	0	0	0	0	0	4	2	0	0	0	6	6
08:30	77	2	0	1	0	80	81	0	0	0	0	0	0	0	1	0	0	0	0	1	1
08:45	75	6	0	0	5	86	91	0	0	0	0	0	0	0	2	0	0	0	0	2	2
H/TOT	268	11	0	1	7	287	295	0	0	0	0	0	0	0	9	2	0	0	0	11	11
09:00	56	5	0	0	0	61	61	0	0	0	0	0	0	0	3	2	0	0	0	5	5
09:15	43	4	2	0	0	49	50	0	0	0	0	0	0	0	5	0	1	0	0	6	7
09:30	29	5	4	1	0	39	42	0	0	0	0	0	0	0	6	0	0	0	0	6	6
09:45	32	2	2	0	0	36	37	1	0	0	0	0	1	1	6	2	1	0	0	9	10
H/TOT	160	16	8	1	0	185	190	1	0	0	0	0	1	1	20	4	2	0	0	26	27
10:00	22	2	0	0	0	24	24	0	0	0	0	0	0	0	3	0	0	0	0	3	3
10:15	24	2	3	0	0	29	31	0	0	0	0	0	0	0	6	1	0	0	0	7	7
10:30	22	5	2	0	0	29	30	0	0	0	0	0	0	0	4	0	0	0	0	4	4
10:45	23	1	1	0	0	25	26	0	0	0	0	0	0	0	3	1	0	0	0	4	4
H/TOT	91	10	6	0	0	107	110	0	0	0	0	0	0	0	16	2	0	0	0	18	18
11:00	31	2	0	1	0	34	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	46	4	2	1	0	53	55	0	0	0	0	0	0	0	5	0	0	0	0	5	5
11:30	31	3	0	1	0	35	36	0	0	0	0	0	0	0	2	2	0	1	0	5	6
11:45	33	1	1	0	0	35	36	0	0	0	0	0	0	0	4	0	0	0	0	4	4
H/TOT	141	10	3	3	0	157	162	0	0	0	0	0	0	0	11	2	0	1	0	14	15
12:00	23	4	0	0	0	27	27	0	0	0	0	0	0	0	8	0	0	0	0	8	8
12:15	27	5	0	0	0	32	32	0	0	0	0	0	0	0	1	0	0	0	0	1	1
12:30	29	0	0	0	0	29	29	0	0	0	0	0	0	0	3	2	0	0	0	5	5
12:45	22	5	0	0	0	27	27	1	0	0	0	0	1	1	2	1	0	0	0	3	3
H/TOT	101	14	0	0	0	115	115	1	0	0	0	0	1	1	14	3	0	0	0	17	17

SITE: 04 DATE: 9th November 2021

LOCATION: R458 Mill Road/R474 Circular Road/Bothar an Mhuilinn DAY: Tuesday

	MOVEMENT 4							MOVEMENT 5							MOVEMENT 6						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
13:00	28	2	1	0	0	31	32	0	0	0	0	0	0	0	3	0	0	0	0	3	3
13:15	29	7	0	0	0	36	36	0	0	0	0	0	0	0	2	0	1	0	0	3	4
13:30	26	6	0	0	0	32	32	0	0	0	0	0	0	0	5	0	0	0	0	5	5
13:45	58	1	3	0	0	62	64	0	0	0	0	0	0	0	4	0	0	0	0	4	4
H/TOT	141	16	4	0	0	161	163	0	0	0	0	0	0	0	14	0	1	0	0	15	16
14:00	43	7	0	0	0	50	50	0	0	0	0	0	0	0	1	1	0	0	0	2	2
14:15	50	3	0	0	2	55	57	0	0	0	0	0	0	0	3	1	1	0	0	5	6
14:30	29	2	2	0	0	33	34	0	0	0	0	0	0	0	4	0	1	0	0	5	6
14:45	53	4	1	0	0	58	59	0	0	0	0	0	0	0	4	1	0	0	0	5	5
H/TOT	175	16	3	0	2	196	200	0	0	0	0	0	0	0	12	3	2	0	0	17	18
15:00	36	5	2	0	1	44	46	0	0	0	0	0	0	0	4	1	0	0	0	5	5
15:15	38	2	1	0	1	42	44	0	0	0	0	0	0	0	5	0	0	0	0	5	5
15:30	52	4	0	0	0	56	56	0	0	0	0	0	0	0	4	1	1	0	0	6	7
15:45	42	2	0	0	1	45	46	0	0	0	0	0	0	0	1	0	0	0	0	1	1
H/TOT	168	13	3	0	3	187	192	0	0	0	0	0	0	0	14	2	1	0	0	17	18
16:00	42	2	0	0	0	44	44	1	0	0	0	0	1	1	1	2	0	0	0	3	3
16:15	36	6	1	0	0	43	44	0	0	0	0	0	0	0	3	0	0	0	0	3	3
16:30	34	4	0	1	0	39	40	0	0	0	0	0	0	0	4	0	0	0	0	4	4
16:45	29	6	0	1	0	36	37	0	0	0	0	0	0	0	1	0	0	0	0	1	1
H/TOT	141	18	1	2	0	162	165	1	0	0	0	0	1	1	9	2	0	0	0	11	11
17:00	37	7	0	0	0	44	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	27	2	2	1	0	32	34	0	0	0	0	0	0	0	2	2	0	0	0	4	4
17:30	43	2	0	0	0	45	45	0	0	0	0	0	0	0	3	0	0	0	0	3	3
17:45	35	0	0	0	0	35	35	0	0	0	0	0	0	0	3	1	0	0	0	4	4
H/TOT	142	11	2	1	0	156	158	0	0	0	0	0	0	0	8	3	0	0	0	11	11
18:00	25	5	0	1	0	31	32	1	0	0	0	0	1	1	3	1	0	0	0	4	4
18:15	30	1	0	0	0	31	31	0	0	0	0	0	0	0	8	1	0	0	0	9	9
18:30	18	4	0	0	0	22	22	1	0	0	0	0	1	1	6	1	0	0	0	7	7
18:45	25	1	0	0	0	26	26	0	0	0	0	0	0	0	4	1	0	0	0	5	5
H/TOT	98	11	0	1	0	110	111	2	0	0	0	0	2	2	21	4	0	0	0	25	25
P/TOT	1705	160	31	9	13	1918	1958	5	0	0	0	0	5	5	151	28	6	1	0	186	190

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**

MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 04 DATE: 9th November 2021

LOCATION: R458 Mill Road/R474 Circular Road/Bothar an Mhuilinn DAY: Tuesday

	MOVEMENT 7							MOVEMENT 8							MOVEMENT 9						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
07:00	3	2	0	0	0	5	5	20	6	2	1	0	29	31	0	0	0	0	0	0	0
07:15	3	1	0	0	0	4	4	33	8	1	0	1	43	45	0	0	0	0	0	0	0
07:30	2	1	1	0	0	4	5	44	10	2	1	2	59	63	0	0	0	0	0	0	0
07:45	1	0	0	0	0	1	1	75	14	2	0	2	93	96	0	0	0	0	0	0	0
H/TOT	9	4	1	0	0	14	15	172	38	7	2	5	224	235	0	0	0	0	0	0	0
08:00	5	1	0	0	0	6	6	55	14	1	0	0	70	71	0	1	0	0	0	1	1
08:15	7	1	0	0	1	9	10	108	14	2	1	2	127	131	1	0	0	0	0	1	1
08:30	5	0	0	0	0	5	5	89	7	1	0	2	99	102	1	0	0	0	0	1	1
08:45	4	1	0	0	0	5	5	102	10	1	0	1	114	116	1	0	0	0	0	1	1
H/TOT	21	3	0	0	1	25	26	354	45	5	1	5	410	419	3	1	0	0	0	4	4
09:00	12	0	0	0	0	12	12	87	9	1	0	1	98	100	2	0	0	0	0	2	2
09:15	10	0	1	0	0	11	12	73	10	3	0	0	86	88	0	0	0	0	0	0	0
09:30	10	1	0	0	0	11	11	68	15	3	1	1	88	92	1	0	0	0	0	1	1
09:45	4	1	0	1	0	6	7	88	6	4	0	0	98	100	1	0	0	0	0	1	1
H/TOT	36	2	1	1	0	40	42	316	40	11	1	2	370	379	4	0	0	0	0	4	4
10:00	4	2	0	0	0	6	6	63	12	6	0	0	81	84	0	0	0	0	0	0	0
10:15	9	0	0	0	0	9	9	79	14	3	0	0	96	98	0	0	0	0	0	0	0
10:30	5	1	0	0	0	6	6	66	5	2	0	1	74	76	0	0	0	0	0	0	0
10:45	8	0	0	0	0	8	8	63	6	4	0	0	73	75	0	0	0	0	0	0	0
H/TOT	26	3	0	0	0	29	29	271	37	15	0	1	324	333	0	0	0	0	0	0	0
11:00	12	0	1	0	0	13	14	85	12	4	0	0	101	103	0	0	0	0	0	0	0
11:15	4	0	0	0	0	4	4	72	10	4	0	0	86	88	0	0	0	0	0	0	0
11:30	10	1	0	0	0	11	11	74	9	2	0	0	85	86	0	0	0	0	0	0	0
11:45	6	3	0	0	0	9	9	79	5	2	0	1	87	89	0	0	0	0	0	0	0
H/TOT	32	4	1	0	0	37	38	310	36	12	0	1	359	366	0	0	0	0	0	0	0
12:00	8	0	0	0	0	8	8	95	10	2	0	0	107	108	0	0	0	0	0	0	0
12:15	9	1	0	0	0	10	10	87	8	1	1	0	97	99	0	0	0	0	0	0	0
12:30	13	2	0	0	0	15	15	78	9	3	1	0	91	94	1	0	0	0	0	1	1
12:45	6	1	0	0	0	7	7	92	10	0	0	1	103	104	0	0	0	0	0	0	0
H/TOT	36	4	0	0	0	40	40	352	37	6	2	1	398	405	1	0	0	0	0	1	1

SITE: 04 DATE: 9th November 2021

LOCATION: R458 Mill Road/R474 Circular Road/Bothar an Mhuilinn DAY: Tuesday

	MOVEMENT 7							MOVEMENT 8							MOVEMENT 9						
TIME	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**	**CAR**	**LGV**	**OGV1**	**OGV2**	**BUS**	**TOT**	**PCU**
13:00	5	0	0	0	0	5	5	88	13	0	0	0	101	101	1	0	0	0	0	1	1
13:15	6	2	0	0	0	8	8	73	12	5	0	0	90	93	0	0	0	0	0	0	0
13:30	8	2	0	0	0	10	10	70	15	0	0	1	86	87	0	0	0	0	0	0	0
13:45	10	0	2	0	0	12	13	92	12	1	0	0	105	106	0	0	0	0	0	0	0
H/TOT	29	4	2	0	0	35	36	323	52	6	0	1	382	386	1	0	0	0	0	1	1
14:00	9	1	0	0	0	10	10	81	18	5	0	0	104	107	0	0	0	0	0	0	0
14:15	5	0	0	0	0	5	5	99	8	1	0	1	109	111	0	1	0	0	0	1	1
14:30	9	2	0	0	0	11	11	83	9	1	0	3	96	100	0	0	0	0	0	0	0
14:45	3	3	0	0	0	6	6	100	13	1	1	0	115	117	4	0	0	0	0	4	4
H/TOT	26	6	0	0	0	32	32	363	48	8	1	4	424	433	4	1	0	0	0	5	5
15:00	18	5	0	0	0	23	23	86	7	2	0	0	95	96	0	0	0	0	0	0	0
15:15	6	2	0	0	0	8	8	73	10	1	0	1	85	87	0	0	0	0	0	0	0
15:30	12	1	0	0	0	13	13	84	9	1	0	2	96	99	0	0	0	0	0	0	0
15:45	8	0	0	0	0	8	8	90	12	2	0	0	104	105	2	0	0	0	0	2	2
H/TOT	44	8	0	0	0	52	52	333	38	6	0	3	380	386	2	0	0	0	0	2	2
16:00	10	2	0	0	0	12	12	89	12	0	0	1	102	103	0	0	0	0	0	0	0
16:15	21	1	0	0	0	22	22	86	13	0	0	1	100	101	0	0	0	0	0	0	0
16:30	13	1	0	0	0	14	14	98	7	4	0	0	109	111	0	0	0	0	0	0	0
16:45	14	0	0	0	0	14	14	102	11	0	1	1	115	117	4	0	0	0	0	4	4
H/TOT	58	4	0	0	0	62	62	375	43	4	1	3	426	432	4	0	0	0	0	4	4
17:00	16	4	0	0	0	20	20	78	20	2	0	2	102	105	1	0	0	0	0	1	1
17:15	11	2	0	0	0	13	13	93	18	2	0	0	113	114	1	0	0	0	0	1	1
17:30	21	3	1	0	0	25	26	94	11	0	1	0	106	107	0	0	0	0	0	0	0
17:45	13	5	0	0	0	18	18	97	17	0	0	0	114	114	0	0	0	0	0	0	0
H/TOT	61	14	1	0	0	76	77	362	66	4	1	2	435	440	2	0	0	0	0	2	2
18:00	16	3	0	0	0	19	19	95	14	2	0	0	111	112	1	0	0	0	0	1	1
18:15	8	1	0	0	0	9	9	102	7	0	0	0	109	109	2	0	0	0	0	2	2
18:30	12	3	0	0	0	15	15	84	12	1	0	0	97	98	0	0	0	0	0	0	0
18:45	14	0	0	0	0	14	14	80	6	0	0	0	86	86	0	0	0	0	0	0	0
H/TOT	50	7	0	0	0	57	57	361	39	3	0	0	403	405	3	0	0	0	0	3	3
P/TOT	428	63	6	1	1	499	504	3892	519	87	9	28	4535	4618	24	2	0	0	0	26	26

GLENVEAGH, ENNIS TRAFFIC COUNTS **NOVEMBER 2021**
MANUAL CLASSIFIED JUNCTION TURNING COUNTS **TRA/21/205**

SITE: 04 DATE: 9th November 2021

LOCATION: R458 Mill Road/R474 Circular Road/Bothar an Mhuilinn DAY: Tuesday

	MOVEMENT 10							MOVEMENT 11							MOVEMENT 12							PCU's Through Junction
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	
07:00	0	1	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	85
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	120
07:30	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	171
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	226
H/TOT	1	1	0	0	0	2	2	0	0	0	0	0	0	0	2	0	0	0	0	2	2	603
08:00	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195
08:15	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	378
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	317
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	350
H/TOT	1	1	0	0	0	2	2	0	0	0	0	0	0	0	0	0	1	0	0	1	2	1240
09:00	0	1	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	300
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	302
09:30	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	279
09:45	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	270
H/TOT	2	1	0	0	0	3	3	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1151
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	205
10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	2	252
10:30	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	227
10:45	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0	0	1	1	239
H/TOT	0	0	0	0	0	0	0	2	0	0	0	0	2	2	2	1	0	0	0	3	3	922
11:00	2	0	0	0	0	2	2	0	0	0	0	0	0	0	2	0	0	0	0	2	2	317
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	285
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	295
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	294
H/TOT	2	0	0	0	0	2	2	0	0	0	0	0	0	0	2	0	0	0	0	2	2	1190
12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	303
12:15	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	288
12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	276
12:45	2	0	0	0	0	2	2	1	0	0	0	0	1	1	0	0	0	0	0	0	0	286
H/TOT	3	0	0	0	0	3	3	1	0	0	0	0	1	1	1	0	0	0	0	1	1	1152

SITE: 04 DATE: 9th November 2021

LOCATION: R458 Mill Road/R474 Circular Road/Bothar an Mhuilinn DAY: Tuesday

	MOVEMENT 10							MOVEMENT 11							MOVEMENT 12							PCU's Through Junction
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	
13:00	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	291
13:15	2	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	303
13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	3	309
13:45	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	356
H/TOT	3	0	1	0	0	4	5	0	0	0	0	0	0	0	4	0	0	0	0	4	4	1259
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	326
14:15	1	1	0	0	0	2	2	1	0	0	0	0	1	1	1	0	0	0	0	1	1	325
14:30	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	317
14:45	2	0	0	0	0	2	2	0	0	0	0	0	0	0	1	0	0	0	0	1	1	352
H/TOT	4	1	0	0	0	5	5	1	0	0	0	0	1	1	2	0	0	0	0	2	2	1319
15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	329
15:15	3	0	0	0	0	3	3	1	0	0	0	0	1	1	0	0	0	0	0	0	0	281
15:30	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	345
15:45	3	0	0	0	0	3	3	2	0	0	0	0	2	2	2	0	0	0	0	2	2	302
H/TOT	6	0	0	0	0	6	6	4	0	0	0	0	4	4	2	0	0	0	0	2	2	1256
16:00	2	0	0	0	0	2	2	2	0	0	0	0	2	2	2	1	0	0	0	3	3	351
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	355
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	345
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	332
H/TOT	2	0	0	0	0	2	2	2	0	0	0	0	2	2	3	1	0	0	0	4	4	1382
17:00	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	356
17:15	1	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	329
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	326
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	306
H/TOT	2	0	0	0	0	2	2	1	0	0	0	0	1	1	3	0	0	0	0	3	3	1318
18:00	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	325
18:15	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0	0	1	1	301
18:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	240
18:45	1	0	0	0	0	1	1	1	0	0	0	0	1	1	1	0	0	0	0	1	1	257
H/TOT	2	0	0	0	0	2	2	2	0	0	0	0	2	2	5	0	0	0	0	5	5	1122
P/TOT	28	4	1	0	0	33	34	13	0	0	0	0	13	13	27	2	1	0	0	30	31	13912

Appendix B. JUNCTION 9 ARCADY Detailed Output

Junctions 9

ARCADY 9 - Roundabout Module

Filename: 11093 Junction 1 - ARCADY.j9
Path: J:\Projects\11269 – Glenveagh Residential - Ennis\05-Design\01-Calculations\Traffic
Report generation date: 08/12/2021 08:22:35

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2021 Baseflow									
Arm 1	D1	2.1	10.40	0.68	B	D2	0.4	4.11	0.30	A
Arm 2		0.3	4.39	0.21	A		0.4	4.24	0.30	A
Arm 3		0.6	4.05	0.37	A		1.3	6.07	0.56	A
Arm 4		0.6	5.51	0.39	A		0.3	4.73	0.22	A
	2024 Baseflow									
Arm 1	D3	2.1	9.85	0.68	A	D4	0.5	4.24	0.32	A
Arm 2		0.3	4.56	0.22	A		0.5	4.40	0.32	A
Arm 3		0.7	4.27	0.39	A		1.5	6.60	0.59	A
Arm 4		0.7	5.81	0.41	A		0.3	4.93	0.24	A
	2024 Baseflow + Dev									
Arm 1	D5	2.3	10.57	0.69	B	D6	0.5	4.46	0.34	A
Arm 2		0.4	4.94	0.28	A		0.5	4.60	0.35	A
Arm 3		0.7	4.41	0.40	A		1.7	7.11	0.62	A
Arm 4		0.8	6.13	0.43	A		0.4	5.25	0.28	A
	2039 Baseflow									
Arm 1	D7	2.6	11.96	0.72	B	D8	0.6	4.71	0.37	A
Arm 2		0.4	4.87	0.26	A		0.6	4.95	0.38	A
Arm 3		0.9	4.89	0.46	A		2.3	8.95	0.69	A
Arm 4		1.0	7.06	0.49	A		0.4	5.62	0.30	A
	2039 Baseflow + Dev									
Arm 1	D9	4.9	19.85	0.83	C	D10	0.7	4.99	0.40	A
Arm 2		0.5	5.70	0.34	A		0.7	5.20	0.41	A
Arm 3		1.0	5.08	0.48	A		2.6	9.92	0.72	A
Arm 4		1.1	7.54	0.52	A		0.5	6.05	0.33	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

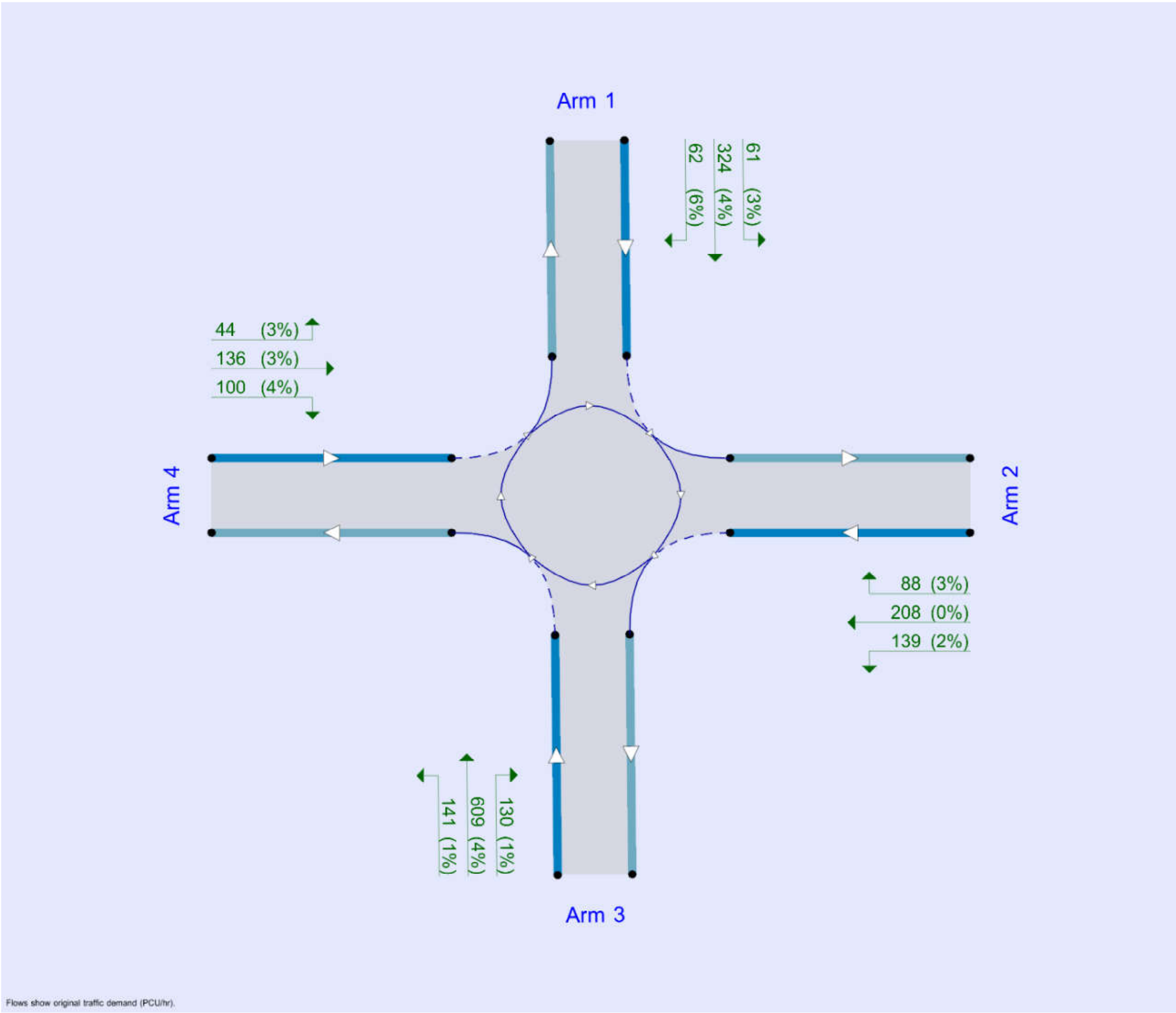
File Description

Title	Resident Development
Location	R474, Ennis
Site number	Site 1 - R/A N85/R474
Date	07/05/2021
Version	

Status	(new file)
Identifier	
Client	Glenveagh
Jobnumber	11269
Enumerator	TOBIN\Micheal Geraghty
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin



The junction diagram reflects the last run of Junctions.

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021 Baseflow	AM	ONE HOUR	07:45	09:15	15
D2	2021 Baseflow	PM	ONE HOUR	16:45	18:15	15
D3	2024 Baseflow	AM	ONE HOUR	07:45	09:15	15
D4	2024 Baseflow	PM	ONE HOUR	16:45	18:15	15
D5	2024 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15
D6	2024 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15
D7	2039 Baseflow	AM	ONE HOUR	07:45	09:15	15
D8	2039 Baseflow	PM	ONE HOUR	16:45	18:15	15
D9	2039 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15
D10	2039 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2021 Baseflow , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	6.86	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	N84 (N)	
2	R474 (E)	
3	N84 (S)	
4	R474 (W)	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	3.00	6.00	15.0	20.0	65.0	35.0	
2	3.00	6.00	15.0	20.0	65.0	35.0	
3	3.00	6.00	25.0	20.0	65.0	35.0	
4	3.00	6.00	10.0	20.0	65.0	35.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.482	1438
2	0.482	1438
3	0.499	1539
4	0.468	1349

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021 Baseflow	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	676	100.000
2		✓	201	100.000
3		✓	490	100.000
4		✓	386	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	114	537	25
	2	44	0	106	51
	3	151	290	0	49
	4	43	229	114	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	4	3	10
	2	5	0	7	0
	3	8	2	0	14
	4	0	4	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
07:45-08:00	1	509	509
	2	151	151
	3	369	369
	4	291	291
08:00-08:15	1	608	608
	2	181	181
	3	440	440
	4	347	347
08:15-08:30	1	744	744
	2	221	221
	3	540	540
	4	425	425
08:30-08:45	1	744	744
	2	221	221
	3	540	540
	4	425	425
08:45-09:00	1	608	608
	2	181	181
	3	440	440
	4	347	347
09:00-09:15	1	509	509
	2	151	151
	3	369	369
	4	291	291

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.68	10.40	2.1	B
2	0.21	4.39	0.3	A
3	0.37	4.05	0.6	A
4	0.39	5.51	0.6	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	509	475	1209	0.421	506	0.7	5.273	A
2	151	506	1194	0.127	151	0.2	3.611	A
3	369	90	1494	0.247	368	0.3	3.348	A
4	291	364	1179	0.247	289	0.3	4.172	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	608	568	1164	0.522	606	1.1	6.660	A
2	181	606	1145	0.158	181	0.2	3.906	A
3	440	108	1485	0.297	440	0.4	3.615	A
4	347	436	1145	0.303	347	0.4	4.652	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	744	696	1102	0.675	740	2.1	10.178	B
2	221	741	1081	0.205	221	0.3	4.384	A
3	540	132	1473	0.366	539	0.6	4.041	A
4	425	533	1100	0.387	424	0.6	5.496	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	744	697	1102	0.676	744	2.1	10.398	B
2	221	744	1079	0.205	221	0.3	4.394	A
3	540	132	1473	0.366	539	0.6	4.046	A
4	425	534	1099	0.387	425	0.6	5.511	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	608	570	1163	0.523	612	1.1	6.800	A
2	181	611	1143	0.158	181	0.2	3.918	A
3	440	108	1485	0.297	441	0.4	3.623	A
4	347	437	1145	0.303	348	0.5	4.669	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	509	477	1208	0.421	510	0.8	5.352	A
2	151	510	1192	0.127	152	0.2	3.623	A
3	369	90	1493	0.247	369	0.3	3.359	A
4	291	366	1178	0.247	291	0.3	4.192	A

2021 Baseflow, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	5.08	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2021 Baseflow	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	354	100.000
2		✓	335	100.000
3		✓	703	100.000
4		✓	206	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	39	265	50
	2	67	0	106	162
	3	499	86	0	118
	4	36	90	80	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	3	4	6
	2	3	0	2	0
	3	4	1	0	1
	4	3	3	4	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
16:45-17:00	1	267	267
	2	252	252
	3	529	529

	4	155	155
17:00-17:15	1	318	318
	2	301	301
	3	632	632
	4	185	185
17:15-17:30	1	390	390
	2	369	369
	3	774	774
	4	227	227
17:30-17:45	1	390	390
	2	369	369
	3	774	774
	4	227	227
17:45-18:00	1	318	318
	2	301	301
	3	632	632
	4	185	185
18:00-18:15	1	267	267
	2	252	252
	3	529	529
	4	155	155

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.30	4.11	0.4	A
2	0.30	4.24	0.4	A
3	0.56	6.07	1.3	A
4	0.22	4.73	0.3	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	267	192	1345	0.198	265	0.3	3.469	A
2	252	296	1295	0.195	251	0.2	3.487	A
3	529	209	1434	0.369	527	0.6	4.080	A
4	155	489	1120	0.138	154	0.2	3.850	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	318	230	1327	0.240	318	0.3	3.716	A
2	301	355	1267	0.238	301	0.3	3.772	A
3	632	251	1414	0.447	631	0.8	4.736	A
4	185	585	1075	0.172	185	0.2	4.179	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	390	281	1302	0.299	389	0.4	4.106	A
2	369	434	1228	0.300	368	0.4	4.235	A
3	774	307	1386	0.559	772	1.3	6.033	A
4	227	716	1014	0.224	226	0.3	4.723	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	390	282	1302	0.299	390	0.4	4.110	A
2	369	435	1228	0.300	369	0.4	4.240	A
3	774	307	1385	0.559	774	1.3	6.070	A
4	227	718	1013	0.224	227	0.3	4.731	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	318	231	1327	0.240	319	0.3	3.721	A
2	301	356	1266	0.238	302	0.3	3.780	A
3	632	251	1413	0.447	634	0.8	4.774	A
4	185	588	1074	0.172	186	0.2	4.189	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	267	193	1345	0.198	267	0.3	3.478	A
2	252	298	1294	0.195	252	0.2	3.500	A
3	529	210	1434	0.369	530	0.6	4.112	A
4	155	492	1119	0.139	155	0.2	3.862	A

2024 Baseflow , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	6.80	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2024 Baseflow	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	713	100.000
2		✓	211	100.000
3		✓	518	100.000
4		✓	405	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	120	566	27
	2	46	0	112	53
	3	307	159	0	52
	4	45	240	120	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	4	3	10
	2	5	0	7	0
	3	8	2	0	14
	4	0	4	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
07:45-08:00	1	537	537
	2	159	159
	3	390	390

	4	305	305
08:00-08:15	1	641	641
	2	190	190
	3	466	466
	4	364	364
08:15-08:30	1	785	785
	2	232	232
	3	570	570
	4	446	446
08:30-08:45	1	785	785
	2	232	232
	3	570	570
	4	446	446
08:45-09:00	1	641	641
	2	190	190
	3	466	466
	4	364	364
09:00-09:15	1	537	537
	2	159	159
	3	390	390
	4	305	305

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.68	9.85	2.1	A
2	0.22	4.56	0.3	A
3	0.39	4.27	0.7	A
4	0.41	5.81	0.7	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	537	389	1250	0.429	534	0.8	5.174	A
2	159	534	1180	0.135	158	0.2	3.686	A
3	390	94	1492	0.261	388	0.4	3.476	A
4	305	384	1169	0.261	303	0.4	4.285	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	641	466	1213	0.528	639	1.1	6.472	A
2	190	640	1129	0.168	189	0.2	4.009	A
3	466	113	1482	0.314	465	0.5	3.772	A
4	364	460	1134	0.321	364	0.5	4.821	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	785	570	1163	0.675	781	2.1	9.661	A
2	232	782	1061	0.219	232	0.3	4.544	A
3	570	138	1470	0.388	570	0.7	4.262	A
4	446	563	1086	0.411	445	0.7	5.792	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	785	571	1162	0.675	785	2.1	9.853	A
2	232	785	1059	0.219	232	0.3	4.558	A
3	570	139	1469	0.388	570	0.7	4.269	A
4	446	564	1085	0.411	446	0.7	5.811	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	641	468	1212	0.529	645	1.2	6.600	A
2	190	644	1127	0.168	190	0.2	4.024	A
3	466	114	1482	0.314	466	0.5	3.781	A
4	364	461	1133	0.321	365	0.5	4.842	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	537	391	1249	0.430	538	0.8	5.250	A
2	159	538	1178	0.135	159	0.2	3.698	A
3	390	95	1491	0.262	390	0.4	3.488	A
4	305	386	1169	0.261	305	0.4	4.308	A

2024 Baseflow, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	5.40	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2024 Baseflow	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	373	100.000
2		✓	352	100.000
3		✓	740	100.000
4		✓	218	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	41	279	53
	2	71	0	111	170
	3	526	90	0	124
	4	38	95	85	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	3	4	6
	2	3	0	2	0
	3	4	1	0	1
	4	3	3	4	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
16:45-17:00	1	281	281
	2	265	265
	3	557	557

	4	164	164
17:00-17:15	1	335	335
	2	316	316
	3	665	665
	4	196	196
17:15-17:30	1	411	411
	2	388	388
	3	815	815
	4	240	240
17:30-17:45	1	411	411
	2	388	388
	3	815	815
	4	240	240
17:45-18:00	1	335	335
	2	316	316
	3	665	665
	4	196	196
18:00-18:15	1	281	281
	2	265	265
	3	557	557
	4	164	164

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.32	4.24	0.5	A
2	0.32	4.40	0.5	A
3	0.59	6.60	1.5	A
4	0.24	4.93	0.3	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	281	202	1340	0.210	280	0.3	3.533	A
2	265	313	1287	0.206	264	0.3	3.558	A
3	557	220	1429	0.390	554	0.7	4.234	A
4	164	515	1108	0.148	163	0.2	3.937	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	335	242	1321	0.254	335	0.4	3.803	A
2	316	375	1257	0.252	316	0.3	3.871	A
3	665	264	1407	0.473	664	0.9	4.990	A
4	196	617	1061	0.185	196	0.2	4.302	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	411	297	1295	0.317	410	0.5	4.237	A
2	388	459	1217	0.319	387	0.5	4.389	A
3	815	323	1377	0.592	813	1.5	6.545	A
4	240	754	996	0.241	240	0.3	4.917	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	411	297	1295	0.317	411	0.5	4.242	A
2	388	459	1216	0.319	388	0.5	4.395	A
3	815	324	1377	0.592	815	1.5	6.599	A
4	240	756	995	0.241	240	0.3	4.927	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	335	243	1321	0.254	336	0.4	3.809	A
2	316	375	1257	0.252	317	0.3	3.879	A
3	665	265	1407	0.473	667	0.9	5.038	A
4	196	620	1059	0.185	196	0.2	4.316	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	281	204	1340	0.210	281	0.3	3.542	A
2	265	314	1286	0.206	265	0.3	3.572	A
3	557	222	1428	0.390	558	0.7	4.274	A
4	164	518	1107	0.148	164	0.2	3.950	A

2024 Baseflow + Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	7.15	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2024 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	722	100.000
2		✓	269	100.000
3		✓	530	100.000
4		✓	423	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	129	566	27
	2	60	0	141	68
	3	307	171	0	52
	4	45	258	120	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	4	3	10
	2	5	0	7	0
	3	8	2	0	14
	4	0	4	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
07:45-08:00	1	544	544
	2	203	203
	3	399	399

	4	318	318
08:00-08:15	1	649	649
	2	242	242
	3	476	476
	4	380	380
08:15-08:30	1	795	795
	2	296	296
	3	584	584
	4	466	466
08:30-08:45	1	795	795
	2	296	296
	3	584	584
	4	466	466
08:45-09:00	1	649	649
	2	242	242
	3	476	476
	4	380	380
09:00-09:15	1	544	544
	2	203	203
	3	399	399
	4	318	318

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.69	10.57	2.3	B
2	0.28	4.94	0.4	A
3	0.40	4.41	0.7	A
4	0.43	6.13	0.8	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	544	411	1239	0.439	540	0.8	5.301	A
2	203	534	1181	0.172	202	0.2	3.847	A
3	399	116	1481	0.269	397	0.4	3.536	A
4	318	403	1160	0.274	317	0.4	4.400	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	649	493	1200	0.541	647	1.2	6.718	A
2	242	640	1129	0.214	242	0.3	4.244	A
3	476	139	1469	0.324	476	0.5	3.859	A
4	380	483	1123	0.339	380	0.5	4.999	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	795	603	1147	0.693	791	2.3	10.328	B
2	296	781	1061	0.279	296	0.4	4.921	A
3	584	170	1454	0.401	583	0.7	4.400	A
4	466	592	1072	0.434	465	0.8	6.108	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	795	604	1146	0.693	795	2.3	10.574	B
2	296	785	1059	0.280	296	0.4	4.938	A
3	584	171	1453	0.401	584	0.7	4.407	A
4	466	592	1072	0.434	466	0.8	6.131	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	649	495	1199	0.541	653	1.2	6.869	A
2	242	645	1127	0.215	242	0.3	4.262	A
3	476	140	1469	0.324	477	0.5	3.870	A
4	380	484	1122	0.339	381	0.5	5.022	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	544	414	1238	0.439	545	0.8	5.385	A
2	203	538	1178	0.172	203	0.2	3.864	A
3	399	117	1480	0.270	399	0.4	3.548	A
4	318	406	1159	0.275	319	0.4	4.428	A

2024 Baseflow + Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	5.74	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2024 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	387	100.000
2		✓	385	100.000
3		✓	767	100.000
4		✓	245	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	55	279	53
	2	77	0	123	185
	3	526	117	0	124
	4	38	122	85	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	3	4	6
	2	3	0	2	0
	3	4	1	0	1
	4	3	3	4	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
16:45-17:00	1	291	291
	2	290	290
	3	577	577

	4	184	184
17:00-17:15	1	348	348
	2	346	346
	3	690	690
	4	220	220
17:15-17:30	1	426	426
	2	424	424
	3	844	844
	4	270	270
17:30-17:45	1	426	426
	2	424	424
	3	844	844
	4	270	270
17:45-18:00	1	348	348
	2	346	346
	3	690	690
	4	220	220
18:00-18:15	1	291	291
	2	290	290
	3	577	577
	4	184	184

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.34	4.46	0.5	A
2	0.35	4.60	0.5	A
3	0.62	7.11	1.7	A
4	0.28	5.25	0.4	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	291	243	1321	0.221	290	0.3	3.634	A
2	290	313	1287	0.225	289	0.3	3.647	A
3	577	236	1421	0.406	575	0.7	4.370	A
4	184	539	1097	0.168	184	0.2	4.071	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	348	291	1298	0.268	348	0.4	3.945	A
2	346	374	1257	0.275	346	0.4	3.995	A
3	690	283	1398	0.493	688	1.0	5.222	A
4	220	646	1047	0.210	220	0.3	4.499	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	426	356	1266	0.337	426	0.5	4.456	A
2	424	458	1217	0.348	423	0.5	4.585	A
3	844	346	1366	0.618	842	1.6	7.044	A
4	270	790	979	0.275	269	0.4	5.236	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	426	357	1266	0.337	426	0.5	4.463	A
2	424	459	1216	0.348	424	0.5	4.597	A
3	844	347	1366	0.618	844	1.7	7.114	A
4	270	793	978	0.276	270	0.4	5.250	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	348	292	1297	0.268	348	0.4	3.955	A
2	346	376	1257	0.275	347	0.4	4.008	A
3	690	284	1397	0.494	692	1.0	5.281	A
4	220	650	1045	0.211	221	0.3	4.514	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	291	244	1320	0.221	292	0.3	3.648	A
2	290	314	1286	0.225	290	0.3	3.661	A
3	577	237	1420	0.407	579	0.7	4.415	A
4	184	543	1095	0.168	185	0.2	4.088	A

2039 Baseflow , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	7.90	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2039 Baseflow	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	736	100.000
2		✓	248	100.000
3		✓	611	100.000
4		✓	466	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	139	565	32
	2	54	0	133	61
	3	365	182	0	64
	4	51	275	140	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	4	3	10
	2	5	0	7	0
	3	8	2	0	14
	4	0	4	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
07:45-08:00	1	554	554
	2	187	187
	3	460	460

	4	351	351
08:00-08:15	1	662	662
	2	223	223
	3	549	549
	4	419	419
08:15-08:30	1	810	810
	2	273	273
	3	673	673
	4	513	513
08:30-08:45	1	810	810
	2	273	273
	3	673	673
	4	513	513
08:45-09:00	1	662	662
	2	223	223
	3	549	549
	4	419	419
09:00-09:15	1	554	554
	2	187	187
	3	460	460
	4	351	351

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.72	11.96	2.6	B
2	0.26	4.87	0.4	A
3	0.46	4.89	0.9	A
4	0.49	7.06	1.0	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	554	447	1222	0.453	551	0.8	5.520	A
2	187	552	1172	0.159	186	0.2	3.821	A
3	460	110	1484	0.310	458	0.5	3.740	A
4	351	451	1138	0.308	349	0.5	4.699	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	662	536	1179	0.561	660	1.3	7.145	A
2	223	661	1119	0.199	223	0.3	4.206	A
3	549	132	1473	0.373	549	0.6	4.154	A
4	419	540	1097	0.382	418	0.6	5.473	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	810	656	1122	0.722	805	2.6	11.586	B
2	273	807	1049	0.260	273	0.4	4.857	A
3	673	161	1458	0.461	672	0.9	4.877	A
4	513	661	1040	0.493	512	1.0	7.017	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	810	657	1121	0.723	810	2.6	11.961	B
2	273	811	1047	0.261	273	0.4	4.874	A
3	673	162	1458	0.461	673	0.9	4.892	A
4	513	662	1040	0.494	513	1.0	7.059	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	662	538	1178	0.562	667	1.3	7.353	A
2	223	667	1116	0.200	223	0.3	4.226	A
3	549	133	1472	0.373	550	0.6	4.172	A
4	419	541	1096	0.382	420	0.6	5.515	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	554	450	1221	0.454	556	0.9	5.621	A
2	187	557	1169	0.160	187	0.2	3.841	A
3	460	111	1483	0.310	461	0.5	3.760	A
4	351	453	1137	0.309	352	0.5	4.737	A

2039 Baseflow , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	6.74	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2039 Baseflow	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	433	100.000
2		✓	403	100.000
3		✓	853	100.000
4		✓	253	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	47	324	62
	2	82	0	128	193
	3	609	103	0	141
	4	44	109	100	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	3	4	6
	2	3	0	2	0
	3	4	1	0	1
	4	3	3	4	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
16:45-17:00	1	326	326
	2	303	303
	3	642	642

	4	190	190
17:00-17:15	1	389	389
	2	362	362
	3	767	767
	4	227	227
17:15-17:30	1	477	477
	2	444	444
	3	939	939
	4	279	279
17:30-17:45	1	477	477
	2	444	444
	3	939	939
	4	279	279
17:45-18:00	1	389	389
	2	362	362
	3	767	767
	4	227	227
18:00-18:15	1	326	326
	2	303	303
	3	642	642
	4	190	190

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.37	4.71	0.6	A
2	0.38	4.95	0.6	A
3	0.69	8.95	2.3	A
4	0.30	5.62	0.4	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	326	234	1325	0.246	325	0.3	3.743	A
2	303	364	1262	0.240	302	0.3	3.791	A
3	642	253	1413	0.455	639	0.9	4.776	A
4	190	595	1071	0.178	190	0.2	4.219	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	389	280	1303	0.299	389	0.4	4.101	A
2	362	436	1227	0.295	362	0.4	4.208	A
3	767	303	1388	0.553	765	1.3	5.948	A
4	227	712	1016	0.224	227	0.3	4.718	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	477	343	1273	0.375	476	0.6	4.703	A
2	444	534	1180	0.376	443	0.6	4.937	A
3	939	370	1354	0.694	935	2.3	8.781	A
4	279	871	942	0.296	278	0.4	5.602	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	477	343	1272	0.375	477	0.6	4.713	A
2	444	535	1180	0.376	444	0.6	4.950	A
3	939	371	1354	0.694	939	2.3	8.948	A
4	279	874	940	0.296	279	0.4	5.624	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	389	281	1302	0.299	390	0.4	4.115	A
2	362	438	1227	0.295	363	0.4	4.223	A
3	767	304	1387	0.553	771	1.3	6.061	A
4	227	717	1014	0.224	228	0.3	4.742	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	326	235	1324	0.246	326	0.3	3.758	A
2	303	366	1261	0.241	304	0.3	3.810	A
3	642	254	1412	0.455	644	0.9	4.846	A
4	190	599	1069	0.178	191	0.2	4.242	A

2039 Baseflow + Dev , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	11.18	B

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2039 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	836	100.000
2		✓	306	100.000
3		✓	624	100.000
4		✓	484	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	148	656	32
	2	68	0	162	76
	3	365	195	0	64
	4	51	293	140	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	4	3	10
	2	5	0	7	0
	3	8	2	0	14
	4	0	4	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
07:45-08:00	1	629	629
	2	230	230
	3	470	470

	4	364	364
08:00-08:15	1	752	752
	2	275	275
	3	561	561
	4	435	435
08:15-08:30	1	920	920
	2	337	337
	3	687	687
	4	533	533
08:30-08:45	1	920	920
	2	337	337
	3	687	687
	4	533	533
08:45-09:00	1	752	752
	2	275	275
	3	561	561
	4	435	435
09:00-09:15	1	629	629
	2	230	230
	3	470	470
	4	364	364

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.83	19.85	4.9	C
2	0.34	5.70	0.5	A
3	0.48	5.08	1.0	A
4	0.52	7.54	1.1	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	629	470	1211	0.520	625	1.1	6.308	A
2	230	619	1139	0.202	229	0.3	4.139	A
3	470	132	1473	0.319	468	0.5	3.810	A
4	364	471	1129	0.323	362	0.5	4.840	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	752	564	1166	0.645	749	1.8	8.857	A
2	275	742	1080	0.255	275	0.4	4.679	A
3	561	158	1460	0.384	560	0.7	4.264	A
4	435	564	1085	0.401	434	0.7	5.704	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	920	690	1105	0.833	909	4.6	18.046	C
2	337	902	1003	0.336	336	0.5	5.649	A
3	687	193	1442	0.476	686	1.0	5.065	A
4	533	690	1026	0.519	531	1.1	7.485	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	920	691	1104	0.833	919	4.9	19.847	C
2	337	911	999	0.337	337	0.5	5.697	A
3	687	194	1442	0.476	687	1.0	5.083	A
4	533	691	1026	0.520	533	1.1	7.543	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	752	566	1165	0.645	763	1.9	9.531	A
2	275	754	1074	0.256	276	0.4	4.728	A
3	561	159	1459	0.384	562	0.7	4.283	A
4	435	566	1084	0.401	437	0.7	5.754	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	629	474	1209	0.520	633	1.1	6.488	A
2	230	626	1136	0.203	231	0.3	4.167	A
3	470	133	1472	0.319	470	0.5	3.832	A
4	364	473	1128	0.323	365	0.5	4.881	A

2039 Baseflow + Dev , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	7.31	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2039 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	447	100.000
2		✓	435	100.000
3		✓	880	100.000
4		✓	280	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	61	324	62
	2	88	0	139	208
	3	609	130	0	141
	4	44	136	100	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	3	4	6
	2	3	0	2	0
	3	4	1	0	1
	4	3	3	4	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
16:45-17:00	1	337	337
	2	327	327
	3	663	663

	4	211	211
17:00-17:15	1	402	402
	2	391	391
	3	791	791
	4	252	252
17:15-17:30	1	492	492
	2	479	479
	3	969	969
	4	308	308
17:30-17:45	1	492	492
	2	479	479
	3	969	969
	4	308	308
17:45-18:00	1	402	402
	2	391	391
	3	791	791
	4	252	252
18:00-18:15	1	337	337
	2	327	327
	3	663	663
	4	211	211

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.40	4.99	0.7	A
2	0.41	5.20	0.7	A
3	0.72	9.92	2.6	A
4	0.33	6.05	0.5	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	337	274	1306	0.258	335	0.4	3.857	A
2	327	364	1262	0.259	326	0.4	3.887	A
3	663	268	1405	0.472	659	0.9	4.951	A
4	211	619	1059	0.199	210	0.3	4.373	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	402	328	1279	0.314	401	0.5	4.267	A
2	391	436	1227	0.319	391	0.5	4.353	A
3	791	321	1378	0.574	789	1.4	6.278	A
4	252	742	1002	0.251	251	0.3	4.954	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	492	402	1244	0.396	491	0.7	4.974	A
2	479	534	1180	0.406	478	0.7	5.183	A
3	969	393	1342	0.722	964	2.6	9.683	A
4	308	906	925	0.333	308	0.5	6.019	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	492	403	1244	0.396	492	0.7	4.988	A
2	479	535	1180	0.406	479	0.7	5.198	A
3	969	394	1342	0.722	969	2.6	9.923	A
4	308	910	923	0.334	308	0.5	6.049	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	402	330	1279	0.314	403	0.5	4.284	A
2	391	438	1227	0.319	392	0.5	4.371	A
3	791	323	1378	0.574	796	1.4	6.430	A
4	252	748	999	0.252	252	0.4	4.985	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	337	276	1305	0.258	337	0.4	3.875	A
2	327	366	1261	0.260	328	0.4	3.906	A
3	663	270	1404	0.472	664	0.9	5.031	A
4	211	624	1057	0.199	211	0.3	4.402	A

Junctions 9

ARCADY 9 - Roundabout Module

Filename: 11093 Junction 3 - ARCADY.j9
Path: J:\Projects\11269 – Glenveagh Residential - Ennis\05-Design\01-Calculations\Traffic
Report generation date: 08/12/2021 09:12:46

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2021 Baseflow									
Arm 1	D1	0.3	2.88	0.21	A	D2	0.1	2.35	0.07	A
Arm 2		0.2	3.51	0.17	A		0.3	3.53	0.24	A
Arm 3		0.1	4.98	0.08	A		0.2	5.88	0.19	A
Arm 4		0.6	6.40	0.36	A		0.4	5.77	0.26	A
	2024 Baseflow									
Arm 1	D3	0.3	2.94	0.23	A	D4	0.1	2.37	0.08	A
Arm 2		0.2	3.58	0.18	A		0.3	3.60	0.26	A
Arm 3		0.1	5.05	0.08	A		0.3	6.05	0.21	A
Arm 4		0.6	6.62	0.38	A		0.4	5.91	0.28	A
	2024 Baseflow + Dev									
Arm 1	D5	0.3	3.10	0.24	A	D6	0.1	2.43	0.08	A
Arm 2		0.3	3.75	0.21	A		0.4	3.89	0.31	A
Arm 3		0.1	5.28	0.09	A		0.3	6.63	0.23	A
Arm 4		0.9	7.83	0.47	A		0.5	6.34	0.32	A
	2039 Baseflow									
Arm 1	D7	0.4	3.17	0.27	A	D8	0.1	2.43	0.09	A
Arm 2		0.3	3.85	0.21	A		0.4	3.82	0.29	A
Arm 3		0.1	5.29	0.10	A		0.3	6.60	0.24	A
Arm 4		0.8	7.44	0.44	A		0.5	6.40	0.32	A
	2039 Baseflow + Dev									
Arm 1	D9	0.4	3.36	0.28	A	D10	0.1	2.49	0.09	A
Arm 2		0.3	4.04	0.24	A		0.5	4.14	0.34	A
Arm 3		0.1	5.53	0.11	A		0.4	7.33	0.27	A
Arm 4		1.2	9.01	0.54	A		0.6	6.92	0.37	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

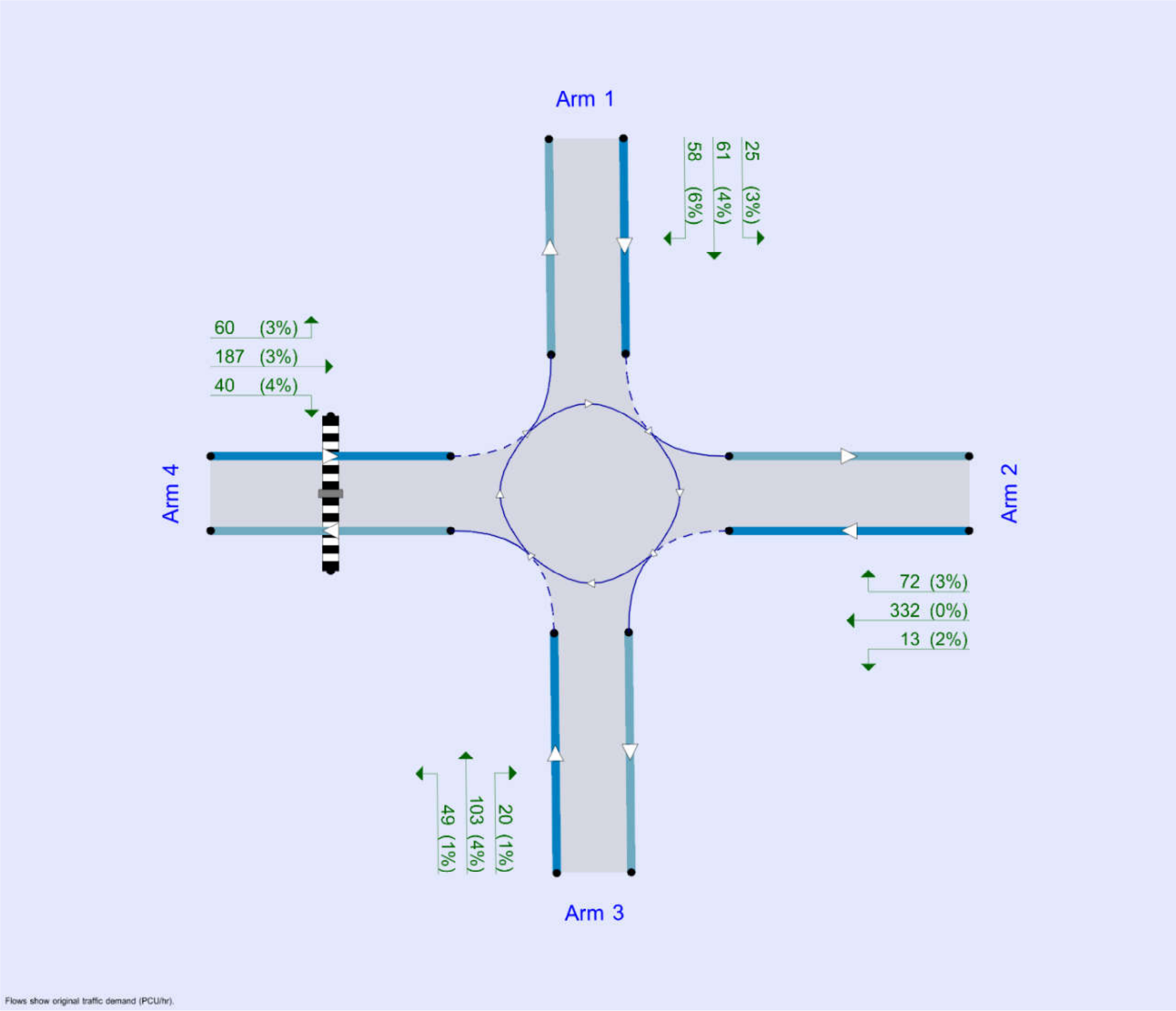
File Description

Title	Residental Development
Location	R474, Ennis
Site number	Site 3 - R/A R474/Cloughleigh Rd/Davitt Terrace
Date	07/05/2021
Version	

Status	(new file)
Identifier	
Client	Glenveagh
Jobnumber	11269
Enumerator	TOBIN\Micheal Geraghty
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin



The junction diagram reflects the last run of Junctions.

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021 Baseflow	AM	ONE HOUR	07:45	09:15	15
D2	2021 Baseflow	PM	ONE HOUR	16:45	18:15	15
D3	2024 Baseflow	AM	ONE HOUR	07:45	09:15	15
D4	2024 Baseflow	PM	ONE HOUR	16:45	18:15	15
D5	2024 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15
D6	2024 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15
D7	2039 Baseflow	AM	ONE HOUR	07:45	09:15	15
D8	2039 Baseflow	PM	ONE HOUR	16:45	18:15	15
D9	2039 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15
D10	2039 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2021 Baseflow , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	4.36	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Cloughleigh Rd	
2	R474 (E)	
3	Davitt Terrace	
4	R474 (W)	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	5.00	6.00	15.0	35.0	27.0	20.0	
2	3.00	6.00	15.0	20.0	26.0	35.0	
3	3.00	3.50	10.0	10.0	26.0	35.0	
4	3.00	3.25	10.0	20.0	26.0	35.0	

Zebra Crossings

Arm	Space between crossing and junction entry (Zebra) (PCU)	Vehicles queueing on exit (Zebra) (PCU)	Central Refuge	Crossing data type	Crossing length (entry side) (m)	Crossing time (entry side) (s)	Crossing length (exit side) (m)	Crossing time (exit side) (s)
4	1.00	1.00	✓	Distance	3.00	2.14	3.00	2.14

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.711	1863
2	0.602	1438
3	0.491	971
4	0.504	962

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021 Baseflow	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	321	100.000

2		✓	189	100.000
3		✓	59	100.000
4		✓	294	100.000

Demand overview (Pedestrians)

Arm	Average pedestrian flow (Ped/hr)
1	
2	
3	
4	30.00

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	83	201	37
	2	59	0	12	118
	3	36	6	0	17
	4	34	219	41	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	4	3	10
	2	5	0	7	0
	3	8	2	0	14
	4	0	4	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)	Pedestrian Demand (Ped/hr)
07:45-08:00	1	242	242	
	2	142	142	
	3	44	44	
	4	221	221	22.59
08:00-08:15	1	289	289	
	2	170	170	
	3	53	53	
	4	264	264	26.97
08:15-08:30	1	353	353	
	2	208	208	
	3	65	65	
	4	324	324	33.03
08:30-08:45	1	353	353	
	2	208	208	
	3	65	65	
	4	324	324	33.03
08:45-09:00	1	289	289	
	2	170	170	
	3	53	53	
	4	264	264	26.97
09:00-09:15	1	242	242	
	2	142	142	
	3	44	44	
	4	221	221	22.59

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS

1	0.21	2.88	0.3	A
2	0.17	3.51	0.2	A
3	0.08	4.98	0.1	A
4	0.36	6.40	0.6	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	242	199		1721	0.140	241	0.2	2.528	A
2	142	209		1312	0.108	142	0.1	3.134	A
3	44	161		891	0.050	44	0.1	4.634	A
4	221	76	22.59	924	0.240	220	0.3	5.280	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	289	239		1693	0.170	288	0.2	2.665	A
2	170	251		1287	0.132	170	0.2	3.284	A
3	53	192		875	0.061	53	0.1	4.775	A
4	264	91	26.97	916	0.289	264	0.4	5.706	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	353	292		1655	0.214	353	0.3	2.876	A
2	208	307		1253	0.166	208	0.2	3.510	A
3	65	235		852	0.076	65	0.1	4.983	A
4	324	111	33.03	905	0.358	323	0.6	6.385	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	353	293		1655	0.214	353	0.3	2.877	A
2	208	307		1253	0.166	208	0.2	3.511	A
3	65	236		852	0.076	65	0.1	4.983	A
4	324	111	33.03	905	0.358	324	0.6	6.398	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	289	240		1692	0.171	289	0.2	2.667	A
2	170	251		1287	0.132	170	0.2	3.286	A
3	53	193		874	0.061	53	0.1	4.779	A
4	264	91	26.97	916	0.289	265	0.4	5.724	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	242	201		1720	0.140	242	0.2	2.532	A
2	142	210		1311	0.109	142	0.1	3.139	A
3	44	161		890	0.050	44	0.1	4.638	A
4	221	76	22.59	923	0.240	222	0.3	5.306	A

2021 Baseflow, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	4.39	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2021 Baseflow	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	112	100.000
2		✓	301	100.000
3		✓	137	100.000
4		✓	207	100.000

Demand overview (Pedestrians)

Arm	Average pedestrian flow (Ped/hr)
1	
2	
3	
4	25.00

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	21	51	40
	2	60	0	11	230
	3	87	16	0	34
	4	43	135	29	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	3	4	6
	2	3	0	2	0
	3	4	1	0	1
	4	3	3	4	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)	Pedestrian Demand (Ped/hr)
16:45-17:00	1	84	84	
	2	227	227	
	3	103	103	
	4	156	156	18.82
17:00-17:15	1	101	101	
	2	271	271	
	3	123	123	
	4	186	186	22.47
17:15-17:30	1	123	123	
	2	331	331	
	3	151	151	
	4	228	228	27.53
17:30-17:45	1	123	123	
	2	331	331	
	3	151	151	
	4	228	228	27.53
17:45-18:00	1	101	101	
	2	271	271	
	3	123	123	
	4	186	186	22.47
18:00-18:15	1	84	84	
	2	227	227	
	3	103	103	
	4	156	156	18.82

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.07	2.35	0.1	A
2	0.24	3.53	0.3	A
3	0.19	5.88	0.2	A
4	0.26	5.77	0.4	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	84	135		1767	0.048	84	0.1	2.235	A
2	227	90		1384	0.164	226	0.2	3.128	A
3	103	248		845	0.122	103	0.1	4.989	A
4	156	122	18.82	900	0.173	155	0.2	4.977	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	101	162		1748	0.058	101	0.1	2.283	A
2	271	108		1373	0.197	270	0.2	3.286	A
3	123	296		818	0.151	123	0.2	5.327	A
4	186	146	22.47	888	0.210	186	0.3	5.287	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	123	198		1722	0.072	123	0.1	2.352	A
2	331	132		1358	0.244	331	0.3	3.527	A

3	151	363		781	0.193	151	0.2	5.870	A
4	228	179	27.53	871	0.262	228	0.4	5.765	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	123	198		1722	0.072	123	0.1	2.353	A
2	331	132		1358	0.244	331	0.3	3.527	A
3	151	363		781	0.193	151	0.2	5.877	A
4	228	179	27.53	871	0.262	228	0.4	5.771	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	101	162		1748	0.058	101	0.1	2.286	A
2	271	108		1373	0.197	271	0.2	3.288	A
3	123	297		818	0.151	123	0.2	5.335	A
4	186	147	22.47	888	0.210	186	0.3	5.298	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	84	136		1766	0.048	84	0.1	2.236	A
2	227	90		1383	0.164	227	0.2	3.135	A
3	103	249		844	0.122	103	0.1	5.001	A
4	156	123	18.82	900	0.173	156	0.2	4.994	A

2024 Baseflow , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	4.48	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2024 Baseflow	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	337	100.000
2		✓	200	100.000
3		✓	62	100.000
4		✓	309	100.000

Demand overview (Pedestrians)

Arm	Average pedestrian flow (Ped/hr)
1	
2	
3	
4	35.00

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	87	211	39
	2	62	0	13	125
	3	38	6	0	18
	4	36	230	43	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	4	3	10
	2	5	0	7	0
	3	8	2	0	14
	4	0	4	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)	Pedestrian Demand (Ped/hr)
07:45-08:00	1	254	254	
	2	151	151	
	3	47	47	
	4	233	233	26.35
08:00-08:15	1	303	303	
	2	180	180	
	3	56	56	
	4	278	278	31.46
08:15-08:30	1	371	371	
	2	220	220	
	3	68	68	
	4	340	340	38.54
08:30-08:45	1	371	371	
	2	220	220	
	3	68	68	
	4	340	340	38.54
08:45-09:00	1	303	303	
	2	180	180	
	3	56	56	
	4	278	278	31.46
09:00-09:15	1	254	254	
	2	151	151	
	3	47	47	
	4	233	233	26.35

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.23	2.94	0.3	A
2	0.18	3.58	0.2	A
3	0.08	5.05	0.1	A
4	0.38	6.62	0.6	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	254	209		1714	0.148	253	0.2	2.561	A
2	151	220		1306	0.115	150	0.1	3.174	A
3	47	170		886	0.053	46	0.1	4.673	A
4	233	79	26.35	922	0.252	231	0.3	5.380	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	303	250		1685	0.180	303	0.2	2.709	A
2	180	263		1279	0.141	180	0.2	3.336	A
3	56	203		869	0.064	56	0.1	4.826	A
4	278	95	31.46	913	0.304	277	0.4	5.847	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	371	307		1645	0.226	371	0.3	2.939	A
2	220	322		1244	0.177	220	0.2	3.583	A

3	68	249		845	0.081	68	0.1	5.050	A
4	340	117	38.54	902	0.377	340	0.6	6.604	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	371	307		1644	0.226	371	0.3	2.940	A
2	220	323		1244	0.177	220	0.2	3.584	A
3	68	249		845	0.081	68	0.1	5.051	A
4	340	117	38.54	902	0.377	340	0.6	6.620	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	303	251		1684	0.180	303	0.2	2.714	A
2	180	264		1279	0.141	180	0.2	3.341	A
3	56	203		869	0.064	56	0.1	4.828	A
4	278	95	31.46	913	0.304	278	0.5	5.869	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	254	210		1713	0.148	254	0.2	2.565	A
2	151	221		1305	0.115	151	0.1	3.178	A
3	47	170		886	0.053	47	0.1	4.678	A
4	233	80	26.35	921	0.252	233	0.4	5.411	A

2024 Baseflow, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	4.49	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2024 Baseflow	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	117	100.000
2		✓	316	100.000
3		✓	144	100.000
4		✓	217	100.000

Demand overview (Pedestrians)

Arm	Average pedestrian flow (Ped/hr)
1	
2	
3	
4	30.00

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	22	53	42
	2	63	0	12	241
	3	91	17	0	36
	4	45	142	30	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	3	4	6
	2	3	0	2	0
	3	4	1	0	1
	4	3	3	4	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)	Pedestrian Demand (Ped/hr)
16:45-17:00	1	88	88	
	2	238	238	
	3	108	108	
	4	163	163	22.59
17:00-17:15	1	105	105	
	2	284	284	
	3	129	129	
	4	195	195	26.97
17:15-17:30	1	129	129	
	2	348	348	
	3	159	159	
	4	239	239	33.03
17:30-17:45	1	129	129	
	2	348	348	
	3	159	159	
	4	239	239	33.03
17:45-18:00	1	105	105	
	2	284	284	
	3	129	129	
	4	195	195	26.97
18:00-18:15	1	88	88	
	2	238	238	
	3	108	108	
	4	163	163	22.59

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.08	2.37	0.1	A
2	0.26	3.60	0.3	A
3	0.21	6.05	0.3	A
4	0.28	5.91	0.4	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	88	141		1762	0.050	88	0.1	2.247	A
2	238	94		1381	0.172	237	0.2	3.165	A
3	108	260		838	0.129	108	0.2	5.067	A
4	163	128	22.59	897	0.182	162	0.2	5.047	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	105	170		1742	0.060	105	0.1	2.298	A
2	284	112		1370	0.207	284	0.3	3.335	A
3	129	311		810	0.160	129	0.2	5.438	A
4	195	154	26.97	884	0.221	195	0.3	5.384	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	129	208		1715	0.075	129	0.1	2.371	A
2	348	138		1355	0.257	348	0.3	3.597	A

3	159	381		771	0.206	158	0.3	6.040	A
4	239	188	33.03	867	0.276	239	0.4	5.906	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	129	208		1715	0.075	129	0.1	2.371	A
2	348	138		1355	0.257	348	0.3	3.597	A
3	159	381		771	0.206	159	0.3	6.046	A
4	239	188	33.03	867	0.276	239	0.4	5.915	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	105	170		1742	0.060	105	0.1	2.300	A
2	284	112		1370	0.207	284	0.3	3.337	A
3	129	311		810	0.160	130	0.2	5.447	A
4	195	154	26.97	884	0.221	195	0.3	5.396	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	88	143		1762	0.050	88	0.1	2.249	A
2	238	94		1381	0.172	238	0.2	3.172	A
3	108	261		837	0.129	109	0.2	5.083	A
4	163	129	22.59	897	0.182	164	0.2	5.065	A

2024 Baseflow + Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	5.16	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2024 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	347	100.000
2		✓	232	100.000
3		✓	67	100.000
4		✓	388	100.000

Demand overview (Pedestrians)

Arm	Average pedestrian flow (Ped/hr)
1	
2	
3	
4	35.00

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	87	211	49
	2	62	0	13	157
	3	38	6	0	23
	4	45	289	54	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	4	3	10
	2	5	0	7	0
	3	8	2	0	14
	4	0	4	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)	Pedestrian Demand (Ped/hr)
07:45-08:00	1	261	261	
	2	175	175	
	3	50	50	
	4	292	292	26.35
08:00-08:15	1	312	312	
	2	209	209	
	3	60	60	
	4	349	349	31.46
08:15-08:30	1	382	382	
	2	255	255	
	3	74	74	
	4	427	427	38.54
08:30-08:45	1	382	382	
	2	255	255	
	3	74	74	
	4	427	427	38.54
08:45-09:00	1	312	312	
	2	209	209	
	3	60	60	
	4	349	349	31.46
09:00-09:15	1	261	261	
	2	175	175	
	3	50	50	
	4	292	292	26.35

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.24	3.10	0.3	A
2	0.21	3.75	0.3	A
3	0.09	5.28	0.1	A
4	0.47	7.83	0.9	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	261	261		1677	0.156	260	0.2	2.646	A
2	175	236		1296	0.135	174	0.2	3.260	A
3	50	201		870	0.058	50	0.1	4.804	A
4	292	79	26.35	922	0.317	290	0.5	5.877	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	312	313		1640	0.190	312	0.2	2.823	A
2	209	282		1268	0.164	208	0.2	3.453	A
3	60	241		849	0.071	60	0.1	4.992	A
4	349	95	31.46	913	0.382	348	0.6	6.577	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	382	383		1590	0.240	382	0.3	3.103	A
2	255	345		1230	0.208	255	0.3	3.754	A

3	74	295		820	0.090	74	0.1	5.274	A
4	427	117	38.54	902	0.473	426	0.9	7.795	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	382	384		1590	0.240	382	0.3	3.105	A
2	255	346		1230	0.208	255	0.3	3.755	A
3	74	295		820	0.090	74	0.1	5.275	A
4	427	117	38.54	902	0.473	427	0.9	7.831	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	312	315		1639	0.190	312	0.2	2.827	A
2	209	283		1268	0.165	209	0.2	3.456	A
3	60	241		849	0.071	60	0.1	4.997	A
4	349	95	31.46	913	0.382	350	0.6	6.620	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	261	263		1676	0.156	261	0.2	2.654	A
2	175	237		1295	0.135	175	0.2	3.268	A
3	50	202		869	0.058	51	0.1	4.809	A
4	292	80	26.35	921	0.317	293	0.5	5.926	A

2024 Baseflow + Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	4.83	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2024 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	127	100.000
2		✓	375	100.000
3		✓	152	100.000
4		✓	255	100.000

Demand overview (Pedestrians)

Arm	Average pedestrian flow (Ped/hr)
1	
2	
3	
4	30.00

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	22	53	52
	2	63	0	12	300
	3	91	17	0	44
	4	53	166	36	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	3	4	6
	2	3	0	2	0
	3	4	1	0	1
	4	3	3	4	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)	Pedestrian Demand (Ped/hr)
16:45-17:00	1	96	96	
	2	282	282	
	3	114	114	
	4	192	192	22.59
17:00-17:15	1	114	114	
	2	337	337	
	3	137	137	
	4	229	229	26.97
17:15-17:30	1	140	140	
	2	413	413	
	3	167	167	
	4	281	281	33.03
17:30-17:45	1	140	140	
	2	413	413	
	3	167	167	
	4	281	281	33.03
17:45-18:00	1	114	114	
	2	337	337	
	3	137	137	
	4	229	229	26.97
18:00-18:15	1	96	96	
	2	282	282	
	3	114	114	
	4	192	192	22.59

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.08	2.43	0.1	A
2	0.31	3.89	0.4	A
3	0.23	6.63	0.3	A
4	0.32	6.34	0.5	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	96	164		1746	0.055	95	0.1	2.281	A
2	282	106		1374	0.205	281	0.3	3.309	A
3	114	311		809	0.141	114	0.2	5.316	A
4	192	128	22.59	897	0.214	191	0.3	5.240	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	114	197		1723	0.066	114	0.1	2.340	A
2	337	127		1362	0.248	337	0.3	3.532	A
3	137	373		775	0.176	136	0.2	5.796	A
4	229	154	26.97	884	0.259	229	0.4	5.663	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	140	241		1692	0.083	140	0.1	2.426	A
2	413	155		1345	0.307	412	0.4	3.882	A

3	167	456		726	0.231	167	0.3	6.615	A
4	281	188	33.03	867	0.324	280	0.5	6.326	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	140	241		1691	0.083	140	0.1	2.427	A
2	413	155		1344	0.307	413	0.4	3.885	A
3	167	457		726	0.231	167	0.3	6.627	A
4	281	188	33.03	867	0.324	281	0.5	6.337	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	114	197		1723	0.066	114	0.1	2.343	A
2	337	127		1361	0.248	338	0.3	3.536	A
3	137	374		774	0.177	137	0.2	5.811	A
4	229	154	26.97	884	0.259	230	0.4	5.681	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	96	165		1745	0.055	96	0.1	2.282	A
2	282	106		1374	0.205	283	0.3	3.319	A
3	114	313		808	0.142	115	0.2	5.335	A
4	192	129	22.59	897	0.214	192	0.3	5.272	A

2039 Baseflow , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	4.91	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2039 Baseflow	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	390	100.000
2		✓	236	100.000
3		✓	71	100.000
4		✓	356	100.000

Demand overview (Pedestrians)

Arm	Average pedestrian flow (Ped/hr)
1	
2	
3	
4	50.00

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	102	242	46
	2	73	0	14	149
	3	43	7	0	21
	4	40	265	51	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	4	3	10
	2	5	0	7	0
	3	8	2	0	14
	4	0	4	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)	Pedestrian Demand (Ped/hr)
07:45-08:00	1	294	294	
	2	178	178	
	3	53	53	
	4	268	268	37.64
08:00-08:15	1	351	351	
	2	212	212	
	3	64	64	
	4	320	320	44.95
08:15-08:30	1	429	429	
	2	260	260	
	3	78	78	
	4	392	392	55.05
08:30-08:45	1	429	429	
	2	260	260	
	3	78	78	
	4	392	392	55.05
08:45-09:00	1	351	351	
	2	212	212	
	3	64	64	
	4	320	320	44.95
09:00-09:15	1	294	294	
	2	178	178	
	3	53	53	
	4	268	268	37.64

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.27	3.17	0.4	A
2	0.21	3.85	0.3	A
3	0.10	5.29	0.1	A
4	0.44	7.44	0.8	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	294	242		1691	0.174	293	0.2	2.677	A
2	178	254		1285	0.138	177	0.2	3.309	A
3	53	201		870	0.061	53	0.1	4.805	A
4	268	92	37.64	915	0.293	266	0.4	5.726	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	351	290		1657	0.212	350	0.3	2.867	A
2	212	304		1255	0.169	212	0.2	3.518	A
3	64	241		849	0.075	64	0.1	4.997	A
4	320	110	44.95	905	0.354	319	0.6	6.351	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	429	355		1611	0.267	429	0.4	3.170	A
2	260	373		1213	0.214	260	0.3	3.844	A

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
3	78	295		821	0.095	78	0.1	5.285	A
4	392	135	55.05	892	0.439	391	0.8	7.416	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	429	356		1610	0.267	429	0.4	3.171	A
2	260	373		1213	0.214	260	0.3	3.847	A
3	78	295		821	0.095	78	0.1	5.286	A
4	392	135	55.05	892	0.439	392	0.8	7.444	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	351	291		1656	0.212	351	0.3	2.870	A
2	212	305		1254	0.169	212	0.2	3.521	A
3	64	241		849	0.075	64	0.1	5.001	A
4	320	111	44.95	905	0.354	321	0.6	6.385	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	294	244		1690	0.174	294	0.2	2.685	A
2	178	255		1284	0.138	178	0.2	3.315	A
3	53	202		870	0.061	54	0.1	4.813	A
4	268	93	37.64	914	0.293	269	0.4	5.767	A

2039 Baseflow , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	4.82	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2039 Baseflow	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	134	100.000
2		✓	359	100.000
3		✓	163	100.000
4		✓	248	100.000

Demand overview (Pedestrians)

Arm	Average pedestrian flow (Ped/hr)
1	
2	
3	
4	40.00

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	25	61	48
	2	72	0	13	274
	3	103	20	0	40
	4	52	162	34	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	3	4	6
	2	3	0	2	0
	3	4	1	0	1
	4	3	3	4	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)	Pedestrian Demand (Ped/hr)
16:45-17:00	1	101	101	
	2	270	270	
	3	123	123	
	4	187	187	30.11
17:00-17:15	1	120	120	
	2	323	323	
	3	147	147	
	4	223	223	35.96
17:15-17:30	1	148	148	
	2	395	395	
	3	179	179	
	4	273	273	44.04
17:30-17:45	1	148	148	
	2	395	395	
	3	179	179	
	4	273	273	44.04
17:45-18:00	1	120	120	
	2	323	323	
	3	147	147	
	4	223	223	35.96
18:00-18:15	1	101	101	
	2	270	270	
	3	123	123	
	4	187	187	30.11

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.09	2.43	0.1	A
2	0.29	3.82	0.4	A
3	0.24	6.60	0.3	A
4	0.32	6.40	0.5	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	101	162		1748	0.058	101	0.1	2.284	A
2	270	107		1373	0.197	269	0.2	3.279	A
3	123	296		819	0.150	122	0.2	5.311	A
4	187	146	30.11	888	0.210	186	0.3	5.280	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	120	194		1725	0.070	120	0.1	2.344	A
2	323	128		1361	0.237	322	0.3	3.490	A
3	147	354		786	0.186	146	0.2	5.786	A
4	223	175	35.96	873	0.255	223	0.4	5.705	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	148	237		1694	0.087	147	0.1	2.432	A
2	395	157		1343	0.294	395	0.4	3.818	A

3	179	433		741	0.242	179	0.3	6.588	A
4	273	214	44.04	853	0.320	273	0.5	6.391	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	148	238		1694	0.087	148	0.1	2.432	A
2	395	157		1343	0.294	395	0.4	3.822	A
3	179	434		741	0.242	179	0.3	6.599	A
4	273	215	44.04	853	0.320	273	0.5	6.403	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	120	195		1725	0.070	121	0.1	2.345	A
2	323	129		1360	0.237	323	0.3	3.494	A
3	147	355		786	0.186	147	0.2	5.799	A
4	223	176	35.96	873	0.255	223	0.4	5.721	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	101	163		1747	0.058	101	0.1	2.285	A
2	270	108		1373	0.197	271	0.2	3.289	A
3	123	297		818	0.150	123	0.2	5.332	A
4	187	147	30.11	887	0.210	187	0.3	5.305	A

2039 Baseflow + Dev , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	5.74	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2039 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	400	100.000
2		✓	267	100.000
3		✓	76	100.000
4		✓	435	100.000

Demand overview (Pedestrians)

Arm	Average pedestrian flow (Ped/hr)
1	
2	
3	
4	50.00

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	102	242	56
	2	73	0	14	180
	3	43	7	0	26
	4	50	324	61	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	4	3	10
	2	5	0	7	0
	3	8	2	0	14
	4	0	4	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)	Pedestrian Demand (Ped/hr)
07:45-08:00	1	301	301	
	2	201	201	
	3	57	57	
	4	327	327	37.64
08:00-08:15	1	360	360	
	2	240	240	
	3	68	68	
	4	391	391	44.95
08:15-08:30	1	440	440	
	2	294	294	
	3	84	84	
	4	479	479	55.05
08:30-08:45	1	440	440	
	2	294	294	
	3	84	84	
	4	479	479	55.05
08:45-09:00	1	360	360	
	2	240	240	
	3	68	68	
	4	391	391	44.95
09:00-09:15	1	301	301	
	2	201	201	
	3	57	57	
	4	327	327	37.64

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.28	3.36	0.4	A
2	0.24	4.04	0.3	A
3	0.11	5.53	0.1	A
4	0.54	9.01	1.2	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	301	293		1654	0.182	300	0.2	2.768	A
2	201	269		1276	0.158	200	0.2	3.402	A
3	57	232		854	0.067	57	0.1	4.941	A
4	327	92	37.64	915	0.358	325	0.6	6.290	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	360	352		1613	0.223	359	0.3	2.992	A
2	240	322		1244	0.193	240	0.2	3.645	A
3	68	278		830	0.082	68	0.1	5.171	A
4	391	110	44.95	905	0.432	390	0.8	7.217	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	440	430		1557	0.283	440	0.4	3.355	A
2	294	395		1200	0.245	294	0.3	4.037	A

3	84	340		796	0.105	84	0.1	5.527	A
4	479	135	55.05	892	0.537	477	1.2	8.941	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	440	432		1556	0.283	440	0.4	3.361	A
2	294	395		1200	0.245	294	0.3	4.039	A
3	84	340		796	0.105	84	0.1	5.529	A
4	479	135	55.05	892	0.537	479	1.2	9.008	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	360	354		1611	0.223	360	0.3	3.000	A
2	240	323		1243	0.193	240	0.2	3.649	A
3	68	278		829	0.082	68	0.1	5.177	A
4	391	111	44.95	905	0.432	393	0.8	7.285	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	301	296		1652	0.182	301	0.2	2.776	A
2	201	271		1275	0.158	201	0.2	3.408	A
3	57	233		853	0.067	57	0.1	4.949	A
4	327	93	37.64	914	0.358	328	0.6	6.362	A

2039 Baseflow + Dev , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4	5.23	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2039 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	144	100.000
2		✓	417	100.000
3		✓	172	100.000
4		✓	287	100.000

Demand overview (Pedestrians)

Arm	Average pedestrian flow (Ped/hr)
1	
2	
3	
4	50.00

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	25	61	58
	2	72	0	13	332
	3	103	20	0	49
	4	60	187	40	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	3	4	6
	2	3	0	2	0
	3	4	1	0	1
	4	3	3	4	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)	Pedestrian Demand (Ped/hr)
16:45-17:00	1	108	108	
	2	314	314	
	3	129	129	
	4	216	216	37.64
17:00-17:15	1	129	129	
	2	375	375	
	3	155	155	
	4	258	258	44.95
17:15-17:30	1	159	159	
	2	459	459	
	3	189	189	
	4	316	316	55.05
17:30-17:45	1	159	159	
	2	459	459	
	3	189	189	
	4	316	316	55.05
17:45-18:00	1	129	129	
	2	375	375	
	3	155	155	
	4	258	258	44.95
18:00-18:15	1	108	108	
	2	314	314	
	3	129	129	
	4	216	216	37.64

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.09	2.49	0.1	A
2	0.34	4.14	0.5	A
3	0.27	7.33	0.4	A
4	0.37	6.92	0.6	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	108	185		1731	0.063	108	0.1	2.320	A
2	314	119		1366	0.230	313	0.3	3.434	A
3	129	347		789	0.164	129	0.2	5.592	A
4	216	146	37.64	888	0.243	215	0.3	5.509	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	129	222		1705	0.076	129	0.1	2.389	A
2	375	143		1352	0.277	375	0.4	3.704	A
3	155	415		750	0.206	154	0.3	6.208	A
4	258	175	44.95	873	0.296	258	0.4	6.033	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	159	271		1670	0.095	158	0.1	2.491	A
2	459	175		1333	0.345	459	0.5	4.139	A

3	189	508		695	0.273	189	0.4	7.312	A
4	316	214	55.05	852	0.371	315	0.6	6.904	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	159	272		1670	0.095	159	0.1	2.492	A
2	459	175		1333	0.345	459	0.5	4.145	A
3	189	509		694	0.273	189	0.4	7.328	A
4	316	215	55.05	852	0.371	316	0.6	6.923	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	129	223		1705	0.076	130	0.1	2.390	A
2	375	143		1352	0.277	375	0.4	3.709	A
3	155	416		750	0.206	155	0.3	6.228	A
4	258	176	44.95	872	0.296	259	0.4	6.059	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	108	186		1730	0.063	108	0.1	2.321	A
2	314	120		1366	0.230	314	0.3	3.443	A
3	129	348		788	0.164	130	0.2	5.620	A
4	216	147	37.64	887	0.244	216	0.3	5.539	A

Appendix C. JUNCTION 9 PICADY Detailed Output

Junctions 9

PICADY 9 - Priority Intersection Module

Filename: 11269 Junction 2 - PICADY.j9
Path: J:\Projects\11269 – Glenveagh Residential - Ennis\05-Design\01-Calculations\Traffic
Report generation date: 08/12/2021 11:37:26

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
2021										
Stream B-C	D1	0.2	7.86	0.16	A	D2	0.4	8.32	0.28	A
Stream B-A		0.3	14.23	0.20	B		0.1	13.24	0.13	B
Stream C-AB		1.2	8.94	0.47	A		0.2	6.63	0.16	A
2024 Baseflow										
Stream B-C	D3	0.2	8.01	0.17	A	D4	0.4	8.58	0.30	A
Stream B-A		0.3	14.80	0.21	B		0.2	13.58	0.14	B
Stream C-AB		1.4	9.36	0.50	A		0.3	6.69	0.17	A
2024 Baseflow + Dev										
Stream B-C	D5	0.4	9.59	0.26	A	D6	0.6	9.62	0.36	A
Stream B-A		0.5	18.68	0.33	C		0.2	15.50	0.17	C
Stream C-AB		2.0	11.19	0.59	B		0.5	7.68	0.28	A
2039 Baseflow										
Stream B-C	D7	0.3	8.87	0.22	A	D8	0.7	10.87	0.42	B
Stream B-A		0.4	18.18	0.29	C		0.3	16.72	0.20	C
Stream C-AB		2.5	12.49	0.64	B		0.4	7.10	0.24	A
2039 Baseflow + Dev										
Stream B-C	D9	0.5	11.34	0.32	B	D10	0.5	9.55	0.35	A
Stream B-A		0.8	24.83	0.43	C		0.2	15.79	0.16	C
Stream C-AB		3.9	17.00	0.74	C		0.5	7.89	0.29	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

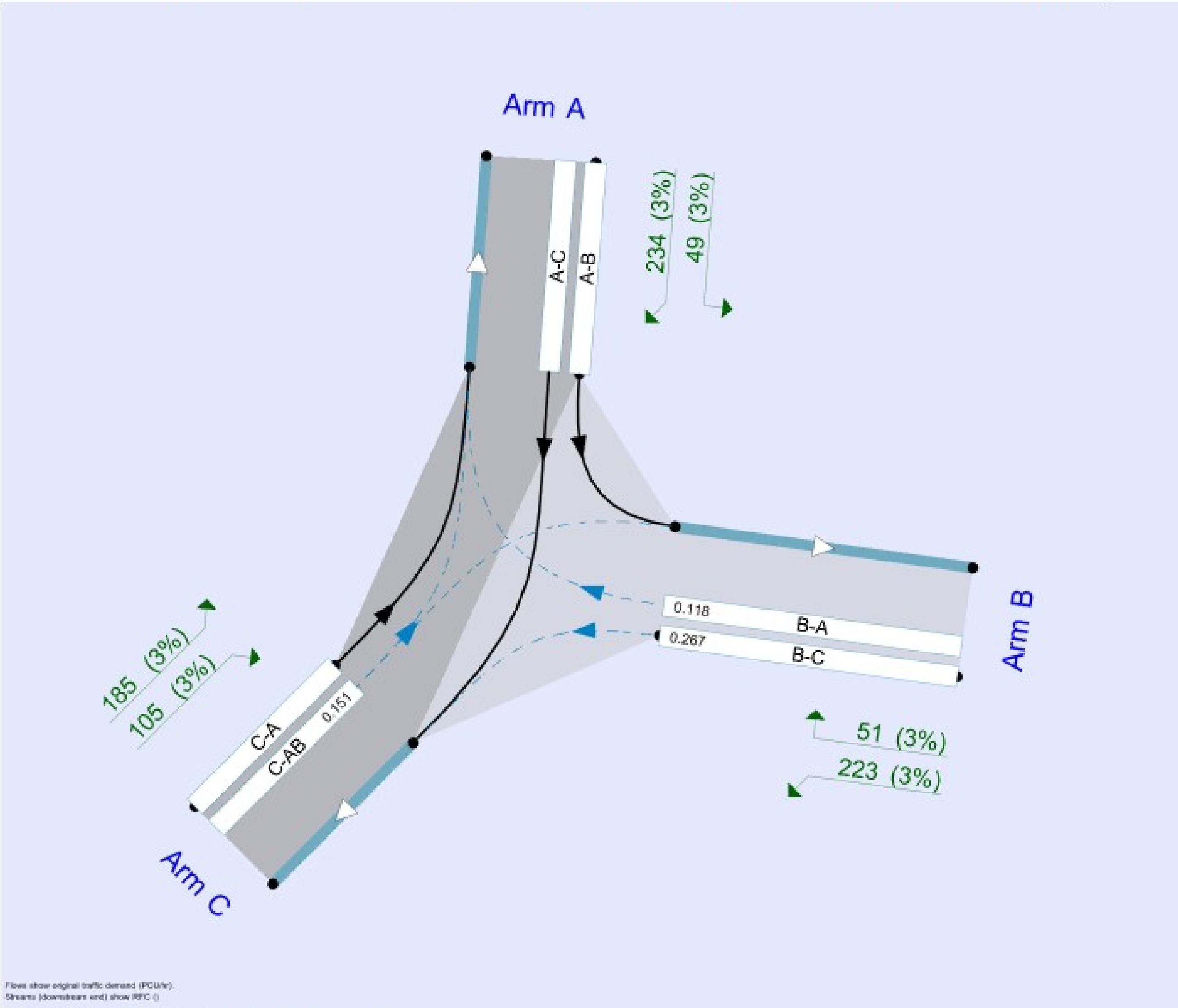
File summary

File Description

Title	Drumbiggle Residential Development
Location	R474 Circular Road/Drumbiggle Road
Site number	2
Date	07/05/2021
Version	
Status	(new file)
Identifier	
Client	Leadland Ltd
Jobnumber	11093
Enumerator	TOBIN\Micheal Geraghty
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin



The junction diagram reflects the last run of Junctions.

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021	AM	ONE HOUR	07:45	09:15	15
D2	2021	PM	ONE HOUR	16:45	18:15	15
D3	2024 Baseflow	AM	ONE HOUR	07:45	09:15	15
D4	2024 Baseflow	PM	ONE HOUR	16:45	18:15	15
D5	2024 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15
D6	2024 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15
D7	2039 Baseflow	AM	ONE HOUR	07:45	09:15	15
D8	2039 Baseflow	PM	ONE HOUR	16:45	18:15	15
D9	2039 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15
D10	2039 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2021, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		5.79	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	untitled		Major
B	untitled		Minor
C	untitled		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	6.00			80.0	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B	One lane plus flare	5.00	4.20	3.00	3.00	3.00		1.00	80	15

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	464	0.084	0.213	0.134	0.305
B-C	628	0.096	0.244	-	-
C-B	620	0.240	0.240	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	124	100.000
B		✓	142	100.000
C		✓	474	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	23	101
	B	59	0	83
	C	265	209	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	3	3
	B	3	0	3
	C	3	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
07:45-08:00	A	93	93
	B	107	107
	C	357	357
08:00-08:15	A	111	111
	B	128	128
	C	426	426
08:15-08:30	A	137	137
	B	156	156
	C	522	522
08:30-08:45	A	137	137
	B	156	156
	C	522	522
08:45-09:00	A	111	111
	B	128	128
	C	426	426
09:00-09:15	A	93	93
	B	107	107
	C	357	357

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.16	7.86	0.2	A
B-A	0.20	14.23	0.3	B
C-AB	0.47	8.94	1.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	62	589	0.106	62	0.1	7.031	A
B-A	44	370	0.120	44	0.1	11.333	B
C-AB	216	731	0.296	214	0.5	7.158	A
C-A	140			140			
A-B	17			17			
A-C	76			76			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	75	579	0.129	74	0.2	7.349	A
B-A	53	352	0.151	53	0.2	12.401	B
C-AB	276	754	0.366	275	0.8	7.750	A
C-A	151			151			
A-B	21			21			
A-C	91			91			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	91	564	0.162	91	0.2	7.844	A
B-A	65	326	0.199	65	0.3	14.179	B
C-AB	368	785	0.469	366	1.2	8.870	A
C-A	154			154			
A-B	25			25			
A-C	111			111			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	91	563	0.162	91	0.2	7.857	A
B-A	65	326	0.200	65	0.3	14.226	B
C-AB	368	785	0.469	368	1.2	8.941	A
C-A	153			153			
A-B	25			25			
A-C	111			111			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	75	578	0.129	75	0.2	7.369	A
B-A	53	351	0.151	53	0.2	12.452	B
C-AB	276	754	0.366	278	0.8	7.834	A
C-A	150			150			
A-B	21			21			
A-C	91			91			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	62	588	0.106	63	0.1	7.057	A
B-A	44	370	0.120	45	0.1	11.401	B
C-AB	217	732	0.297	218	0.6	7.247	A
C-A	140			140			
A-B	17			17			
A-C	76			76			

2021, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		4.01	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2021	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	204	100.000
B		✓	198	100.000
C		✓	209	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	35	169
	B	37	0	161
	C	133	76	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	3	3
	B	3	0	3
	C	3	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
16:45-17:00	A	154	154
	B	149	149
	C	157	157
17:00-17:15	A	183	183
	B	178	178
	C	188	188
17:15-17:30	A	225	225
	B	218	218
	C	230	230
17:30-17:45	A	225	225
	B	218	218
	C	230	230
17:45-18:00	A	183	183
	B	178	178
	C	188	188
18:00-18:15	A	154	154
	B	149	149
	C	157	157

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.28	8.32	0.4	A
B-A	0.13	13.24	0.1	B
C-AB	0.16	6.63	0.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	121	650	0.187	120	0.2	6.993	A
B-A	28	350	0.080	28	0.1	11.478	B
C-AB	68	651	0.104	67	0.1	6.344	A
C-A	90			90			
A-B	26			26			
A-C	127			127			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	145	639	0.227	144	0.3	7.500	A
B-A	33	338	0.098	33	0.1	12.144	B
C-AB	84	658	0.127	83	0.2	6.459	A
C-A	104			104			
A-B	31			31			
A-C	152			152			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	177	623	0.284	177	0.4	8.301	A
B-A	41	321	0.127	41	0.1	13.222	B
C-AB	107	667	0.161	107	0.2	6.628	A
C-A	123			123			
A-B	39			39			
A-C	186			186			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	177	623	0.285	177	0.4	8.319	A
B-A	41	321	0.127	41	0.1	13.238	B
C-AB	107	667	0.161	107	0.2	6.635	A
C-A	123			123			
A-B	39			39			
A-C	186			186			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	145	638	0.227	145	0.3	7.522	A
B-A	33	338	0.098	33	0.1	12.168	B
C-AB	84	658	0.127	84	0.2	6.468	A
C-A	104			104			
A-B	31			31			
A-C	152			152			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	121	649	0.187	121	0.2	7.031	A
B-A	28	350	0.080	28	0.1	11.509	B
C-AB	68	651	0.104	68	0.1	6.360	A
C-A	90			90			
A-B	26			26			
A-C	127			127			

2024 Baseflow, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		6.11	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2024 Baseflow	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	130	100.000
B		✓	149	100.000
C		✓	497	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	24	106
	B	62	0	87
	C	278	219	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	3	3
	B	3	0	3
	C	3	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
07:45-08:00	A	98	98
	B	112	112
	C	374	374
08:00-08:15	A	117	117
	B	134	134
	C	447	447
08:15-08:30	A	143	143
	B	164	164
	C	547	547
08:30-08:45	A	143	143
	B	164	164
	C	547	547
08:45-09:00	A	117	117
	B	134	134
	C	447	447
09:00-09:15	A	98	98
	B	112	112
	C	374	374

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.17	8.01	0.2	A
B-A	0.21	14.80	0.3	B
C-AB	0.50	9.36	1.4	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	65	586	0.112	65	0.1	7.106	A
B-A	47	366	0.128	46	0.1	11.568	B
C-AB	230	737	0.313	228	0.6	7.270	A
C-A	144			144			
A-B	18			18			
A-C	80			80			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	78	576	0.136	78	0.2	7.451	A
B-A	56	346	0.161	56	0.2	12.744	B
C-AB	294	760	0.387	293	0.8	7.946	A
C-A	153			153			
A-B	22			22			
A-C	95			95			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	96	559	0.171	96	0.2	8.000	A
B-A	68	319	0.214	68	0.3	14.745	B
C-AB	394	793	0.497	392	1.3	9.267	A
C-A	153			153			
A-B	26			26			
A-C	117			117			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	96	558	0.172	96	0.2	8.014	A
B-A	68	319	0.214	68	0.3	14.804	B
C-AB	395	794	0.498	395	1.4	9.359	A
C-A	152			152			
A-B	26			26			
A-C	117			117			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	78	575	0.136	78	0.2	7.471	A
B-A	56	346	0.161	56	0.2	12.810	B
C-AB	295	761	0.388	297	0.9	8.049	A
C-A	152			152			
A-B	22			22			
A-C	95			95			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	65	585	0.112	66	0.1	7.136	A
B-A	47	366	0.128	47	0.2	11.645	B
C-AB	231	737	0.314	232	0.6	7.370	A
C-A	143			143			
A-B	18			18			
A-C	80			80			

2024 Baseflow, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		4.13	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2024 Baseflow	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	214	100.000
B		✓	208	100.000
C		✓	219	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	37	177
	B	39	0	169
	C	139	80	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	3	3
	B	3	0	3
	C	3	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
16:45-17:00	A	161	161
	B	157	157
	C	165	165
17:00-17:15	A	192	192
	B	187	187
	C	197	197
17:15-17:30	A	236	236
	B	229	229
	C	241	241
17:30-17:45	A	236	236
	B	229	229
	C	241	241
17:45-18:00	A	192	192
	B	187	187
	C	197	197
18:00-18:15	A	161	161
	B	157	157
	C	165	165

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.30	8.58	0.4	A
B-A	0.14	13.58	0.2	B
C-AB	0.17	6.69	0.3	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	127	647	0.197	126	0.2	7.110	A
B-A	29	347	0.085	29	0.1	11.630	B
C-AB	72	652	0.110	71	0.2	6.374	A
C-A	93			93			
A-B	28			28			
A-C	133			133			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	152	635	0.239	152	0.3	7.664	A
B-A	35	335	0.105	35	0.1	12.361	B
C-AB	89	659	0.135	89	0.2	6.500	A
C-A	108			108			
A-B	33			33			
A-C	159			159			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	186	619	0.301	186	0.4	8.555	A
B-A	43	316	0.136	43	0.2	13.559	B
C-AB	114	669	0.171	114	0.3	6.686	A
C-A	127			127			
A-B	41			41			
A-C	195			195			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	186	618	0.301	186	0.4	8.576	A
B-A	43	316	0.136	43	0.2	13.579	B
C-AB	114	669	0.171	114	0.3	6.694	A
C-A	127			127			
A-B	41			41			
A-C	195			195			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	152	635	0.239	152	0.3	7.692	A
B-A	35	335	0.105	35	0.1	12.388	B
C-AB	89	659	0.135	89	0.2	6.512	A
C-A	108			108			
A-B	33			33			
A-C	159			159			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	127	646	0.197	128	0.3	7.150	A
B-A	29	347	0.085	29	0.1	11.665	B
C-AB	72	653	0.110	72	0.2	6.394	A
C-A	93			93			
A-B	28			28			
A-C	133			133			

2024 Baseflow + Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		8.00	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2024 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	147	100.000
B		✓	213	100.000
C		✓	555	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	31	116
	B	89	0	124
	C	304	251	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	3	3
	B	3	0	3
	C	3	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
07:45-08:00	A	111	111
	B	160	160
	C	418	418
08:00-08:15	A	132	132
	B	191	191
	C	499	499
08:15-08:30	A	162	162
	B	235	235
	C	611	611
08:30-08:45	A	162	162
	B	235	235
	C	611	611
08:45-09:00	A	132	132
	B	191	191
	C	499	499
09:00-09:15	A	111	111
	B	160	160
	C	418	418

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.26	9.59	0.4	A
B-A	0.33	18.68	0.5	C
C-AB	0.59	11.19	2.0	B
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	93	571	0.163	93	0.2	7.731	A
B-A	67	353	0.190	66	0.2	12.878	B
C-AB	272	747	0.365	269	0.7	7.737	A
C-A	145			145			
A-B	23			23			
A-C	87			87			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	111	554	0.201	111	0.3	8.367	A
B-A	80	330	0.243	80	0.3	14.803	B
C-AB	350	773	0.453	349	1.1	8.756	A
C-A	149			149			
A-B	28			28			
A-C	104			104			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	137	524	0.260	136	0.4	9.539	A
B-A	98	297	0.330	97	0.5	18.503	C
C-AB	474	809	0.586	471	1.9	10.980	B
C-A	137			137			
A-B	34			34			
A-C	128			128			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	137	523	0.261	137	0.4	9.586	A
B-A	98	296	0.331	98	0.5	18.680	C
C-AB	475	810	0.587	475	2.0	11.190	B
C-A	136			136			
A-B	34			34			
A-C	128			128			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	111	553	0.202	112	0.3	8.419	A
B-A	80	329	0.243	81	0.3	14.972	B
C-AB	352	775	0.454	355	1.2	8.949	A
C-A	147			147			
A-B	28			28			
A-C	104			104			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	93	570	0.164	94	0.2	7.790	A
B-A	67	352	0.190	67	0.2	13.032	B
C-AB	274	748	0.366	275	0.8	7.889	A
C-A	144			144			
A-B	23			23			
A-C	87			87			

2024 Baseflow + Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		4.94	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2024 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	255	100.000
B		✓	240	100.000
C		✓	278	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	48	207
	B	46	0	194
	C	152	126	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	3	3
	B	3	0	3
	C	3	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
16:45-17:00	A	192	192
	B	181	181
	C	209	209
17:00-17:15	A	229	229
	B	216	216
	C	250	250
17:15-17:30	A	281	281
	B	264	264
	C	306	306
17:30-17:45	A	281	281
	B	264	264
	C	306	306
17:45-18:00	A	229	229
	B	216	216
	C	250	250
18:00-18:15	A	192	192
	B	181	181
	C	209	209

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.36	9.62	0.6	A
B-A	0.17	15.50	0.2	C
C-AB	0.28	7.68	0.5	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	146	635	0.230	145	0.3	7.547	A
B-A	35	332	0.104	34	0.1	12.457	B
C-AB	115	652	0.176	114	0.3	6.882	A
C-A	94			94			
A-B	36			36			
A-C	156			156			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	174	620	0.281	174	0.4	8.300	A
B-A	41	315	0.131	41	0.2	13.533	B
C-AB	143	659	0.217	143	0.3	7.186	A
C-A	107			107			
A-B	43			43			
A-C	186			186			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	214	599	0.357	213	0.6	9.585	A
B-A	51	290	0.175	50	0.2	15.458	C
C-AB	185	669	0.277	185	0.5	7.660	A
C-A	121			121			
A-B	53			53			
A-C	228			228			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	214	599	0.357	214	0.6	9.623	A
B-A	51	290	0.175	51	0.2	15.501	C
C-AB	186	669	0.277	186	0.5	7.681	A
C-A	121			121			
A-B	53			53			
A-C	228			228			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	174	620	0.281	175	0.4	8.347	A
B-A	41	315	0.131	42	0.2	13.583	B
C-AB	143	659	0.217	144	0.4	7.210	A
C-A	107			107			
A-B	43			43			
A-C	186			186			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	146	634	0.230	146	0.3	7.609	A
B-A	35	332	0.104	35	0.1	12.501	B
C-AB	115	652	0.177	116	0.3	6.920	A
C-A	94			94			
A-B	36			36			
A-C	156			156			

2039 Baseflow , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		8.34	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2039 Baseflow	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	157	100.000
B		✓	180	100.000
C		✓	601	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	29	128
	B	75	0	105
	C	336	265	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	3	3
	B	3	0	3
	C	3	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
07:45-08:00	A	118	118
	B	136	136
	C	452	452
08:00-08:15	A	141	141
	B	162	162
	C	540	540
08:15-08:30	A	173	173
	B	198	198
	C	662	662
08:30-08:45	A	173	173
	B	198	198
	C	662	662
08:45-09:00	A	141	141
	B	162	162
	C	540	540
09:00-09:15	A	118	118
	B	136	136
	C	452	452

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.22	8.87	0.3	A
B-A	0.29	18.18	0.4	C
C-AB	0.64	12.49	2.5	B
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	79	575	0.137	78	0.2	7.454	A
B-A	56	345	0.163	56	0.2	12.766	B
C-AB	299	762	0.392	295	0.9	7.921	A
C-A	154			154			
A-B	22			22			
A-C	96			96			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	94	560	0.169	94	0.2	7.961	A
B-A	67	321	0.210	67	0.3	14.587	B
C-AB	387	791	0.490	385	1.3	9.165	A
C-A	153			153			
A-B	26			26			
A-C	115			115			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	116	534	0.216	115	0.3	8.841	A
B-A	83	287	0.287	82	0.4	18.011	C
C-AB	529	831	0.637	525	2.4	12.139	B
C-A	132			132			
A-B	32			32			
A-C	141			141			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	116	533	0.217	116	0.3	8.874	A
B-A	83	286	0.288	83	0.4	18.176	C
C-AB	531	833	0.638	531	2.5	12.490	B
C-A	130			130			
A-B	32			32			
A-C	141			141			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	94	559	0.169	95	0.2	7.997	A
B-A	67	320	0.211	68	0.3	14.747	B
C-AB	389	793	0.491	394	1.4	9.453	A
C-A	151			151			
A-B	26			26			
A-C	115			115			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	79	574	0.138	79	0.2	7.501	A
B-A	56	344	0.164	57	0.2	12.903	B
C-AB	301	763	0.394	302	0.9	8.112	A
C-A	152			152			
A-B	22			22			
A-C	96			96			

Generated on 08/12/2021 11:37:56 using Junctions 9 (9.5.1.7462)

2039 Baseflow , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		5.06	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2039 Baseflow	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	283	100.000
B		✓	274	100.000
C		✓	290	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	49	234
	B	51	0	223
	C	185	105	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	3	3
	B	3	0	3
	C	3	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
16:45-17:00	A	213	213
	B	206	206
	C	218	218
17:00-17:15	A	254	254
	B	246	246
	C	261	261
17:15-17:30	A	312	312
	B	302	302
	C	319	319
17:30-17:45	A	312	312
	B	302	302
	C	319	319
17:45-18:00	A	254	254
	B	246	246
	C	261	261
18:00-18:15	A	213	213
	B	206	206
	C	218	218

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.42	10.87	0.7	B
B-A	0.20	16.72	0.3	C
C-AB	0.24	7.10	0.4	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	168	628	0.267	166	0.4	8.000	A
B-A	38	326	0.118	38	0.1	12.843	B
C-AB	100	664	0.151	99	0.2	6.554	A
C-A	118			118			
A-B	37			37			
A-C	176			176			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	200	612	0.328	200	0.5	8.996	A
B-A	46	307	0.149	46	0.2	14.167	B
C-AB	126	674	0.186	125	0.3	6.761	A
C-A	135			135			
A-B	44			44			
A-C	210			210			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	246	587	0.418	245	0.7	10.804	B
B-A	56	278	0.202	56	0.3	16.655	C
C-AB	165	688	0.240	164	0.4	7.090	A
C-A	155			155			
A-B	54			54			
A-C	258			258			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	246	586	0.419	245	0.7	10.873	B
B-A	56	278	0.202	56	0.3	16.720	C
C-AB	165	688	0.240	165	0.4	7.103	A
C-A	154			154			
A-B	54			54			
A-C	258			258			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	200	611	0.328	201	0.5	9.068	A
B-A	46	307	0.149	46	0.2	14.233	B
C-AB	126	674	0.187	126	0.3	6.779	A
C-A	135			135			
A-B	44			44			
A-C	210			210			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	168	628	0.267	168	0.4	8.084	A
B-A	38	326	0.118	39	0.1	12.918	B
C-AB	100	665	0.151	101	0.2	6.582	A
C-A	118			118			
A-B	37			37			
A-C	176			176			

2039 Baseflow + Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		12.02	B

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2039 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	174	100.000
B		✓	244	100.000
C		✓	659	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	36	138
	B	102	0	142
	C	362	297	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	3	3
	B	3	0	3
	C	3	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
07:45-08:00	A	131	131
	B	184	184
	C	496	496
08:00-08:15	A	156	156
	B	219	219
	C	592	592
08:15-08:30	A	192	192
	B	269	269
	C	726	726
08:30-08:45	A	192	192
	B	269	269
	C	726	726
08:45-09:00	A	156	156
	B	219	219
	C	592	592
09:00-09:15	A	131	131
	B	184	184
	C	496	496

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.32	11.34	0.5	B
B-A	0.43	24.83	0.8	C
C-AB	0.74	17.00	3.9	C
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	107	558	0.192	106	0.2	8.186	A
B-A	77	332	0.231	76	0.3	14.408	B
C-AB	346	772	0.448	341	1.1	8.561	A
C-A	151			151			
A-B	27			27			
A-C	104			104			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	128	533	0.239	127	0.3	9.123	A
B-A	92	303	0.302	91	0.4	17.430	C
C-AB	451	804	0.561	449	1.7	10.459	B
C-A	141			141			
A-B	32			32			
A-C	124			124			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	156	486	0.321	156	0.5	11.187	B
B-A	112	263	0.427	111	0.7	24.219	C
C-AB	623	848	0.735	615	3.7	15.928	C
C-A	103			103			
A-B	40			40			
A-C	152			152			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	156	483	0.323	156	0.5	11.336	B
B-A	112	261	0.430	112	0.8	24.833	C
C-AB	627	850	0.737	626	3.9	17.001	C
C-A	99			99			
A-B	40			40			
A-C	152			152			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	128	530	0.241	128	0.3	9.236	A
B-A	92	301	0.304	93	0.5	17.890	C
C-AB	455	808	0.564	463	1.9	11.126	B
C-A	137			137			
A-B	32			32			
A-C	124			124			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	107	556	0.192	107	0.2	8.275	A
B-A	77	330	0.232	77	0.3	14.689	B
C-AB	348	774	0.450	351	1.1	8.870	A
C-A	148			148			
A-B	27			27			
A-C	104			104			

2039 Baseflow + Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		4.57	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2039 Baseflow + Dev	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	305	100.000
B		✓	228	100.000
C		✓	288	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	72	233
	B	42	0	186
	C	160	128	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	3	3
	B	3	0	3
	C	3	3	0

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
16:45-17:00	A	230	230
	B	172	172
	C	217	217
17:00-17:15	A	274	274
	B	205	205
	C	259	259
17:15-17:30	A	336	336
	B	251	251
	C	317	317
17:30-17:45	A	336	336
	B	251	251
	C	317	317
17:45-18:00	A	274	274
	B	205	205
	C	259	259
18:00-18:15	A	230	230
	B	172	172
	C	217	217

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.35	9.55	0.5	A
B-A	0.16	15.79	0.2	C
C-AB	0.29	7.89	0.5	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	140	631	0.222	139	0.3	7.513	A
B-A	32	325	0.097	31	0.1	12.616	B
C-AB	118	648	0.183	117	0.3	6.981	A
C-A	98			98			
A-B	54			54			
A-C	175			175			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	167	616	0.272	167	0.4	8.252	A
B-A	38	307	0.123	38	0.1	13.752	B
C-AB	148	654	0.226	147	0.4	7.319	A
C-A	111			111			
A-B	65			65			
A-C	209			209			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	205	593	0.345	204	0.5	9.513	A
B-A	46	281	0.164	46	0.2	15.747	C
C-AB	192	663	0.290	192	0.5	7.869	A
C-A	125			125			
A-B	79			79			
A-C	257			257			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	205	593	0.345	205	0.5	9.550	A
B-A	46	281	0.165	46	0.2	15.789	C
C-AB	193	663	0.290	192	0.5	7.888	A
C-A	125			125			
A-B	79			79			
A-C	257			257			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	167	615	0.272	168	0.4	8.295	A
B-A	38	307	0.123	38	0.1	13.801	B
C-AB	148	654	0.226	149	0.4	7.347	A
C-A	111			111			
A-B	65			65			
A-C	209			209			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	140	631	0.222	140	0.3	7.570	A
B-A	32	324	0.097	32	0.1	12.678	B
C-AB	119	648	0.183	119	0.3	7.019	A
C-A	98			98			
A-B	54			54			
A-C	175			175			

Junctions 9

PICADY 9 - Priority Intersection Module

Version: 9.5.1.7462

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Filename: 11269 Junction 4 - PICADY.j9
Path: J:\Projects\11269 – Glenveagh Residential - Ennis\05-Design\01-Calculations\Traffic
Report generation date: 08/12/2021 11:39:37

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
2021 Baseflow										
Stream B-ACD	D1	0.0	0.00	0.00	A	D2	0.0	11.77	0.02	B
Stream A-BCD		0.5	11.15	0.31	B		1.1	15.95	0.50	C
Stream D-ABC		1.4	15.69	0.57	C		0.5	10.82	0.35	B
Stream C-ABD		0.0	7.36	0.01	A		0.0	8.29	0.01	A
2024 Baseflow										
Stream B-ACD	D3	0.0	0.00	0.00	A	D4	0.0	12.30	0.02	B
Stream A-BCD		0.5	11.57	0.32	B		1.3	17.13	0.53	C
Stream D-ABC		1.6	17.29	0.61	C		0.6	11.45	0.37	B
Stream C-ABD		0.0	7.45	0.01	A		0.0	8.46	0.01	A
2024 Baseflow + Dev										
Stream B-ACD	D5	0.0	0.00	0.00	A	D6	0.0	13.06	0.02	B
Stream A-BCD		0.7	12.70	0.38	B		2.0	21.37	0.64	C
Stream D-ABC		2.7	24.85	0.73	C		0.8	12.69	0.43	B
Stream C-ABD		0.0	7.61	0.01	A		0.0	8.81	0.01	A
2039 Baseflow										
Stream B-ACD	D7	0.0	0.00	0.00	A	D8	0.0	14.87	0.03	B
Stream A-BCD		0.7	12.98	0.38	B		1.9	21.31	0.63	C
Stream D-ABC		2.5	24.25	0.71	C		0.8	13.53	0.44	B
Stream C-ABD		0.0	7.76	0.01	A		0.0	9.01	0.01	A
2039 Baseflow + Dev										
Stream B-ACD	D9	0.0	0.00	0.00	A	D10	0.0	16.12	0.03	C
Stream A-BCD		0.9	14.39	0.44	B		3.2	27.50	0.74	D
Stream D-ABC		4.8	41.03	0.84	E		1.0	15.66	0.51	C
Stream C-ABD		0.0	7.93	0.01	A		0.0	9.42	0.01	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

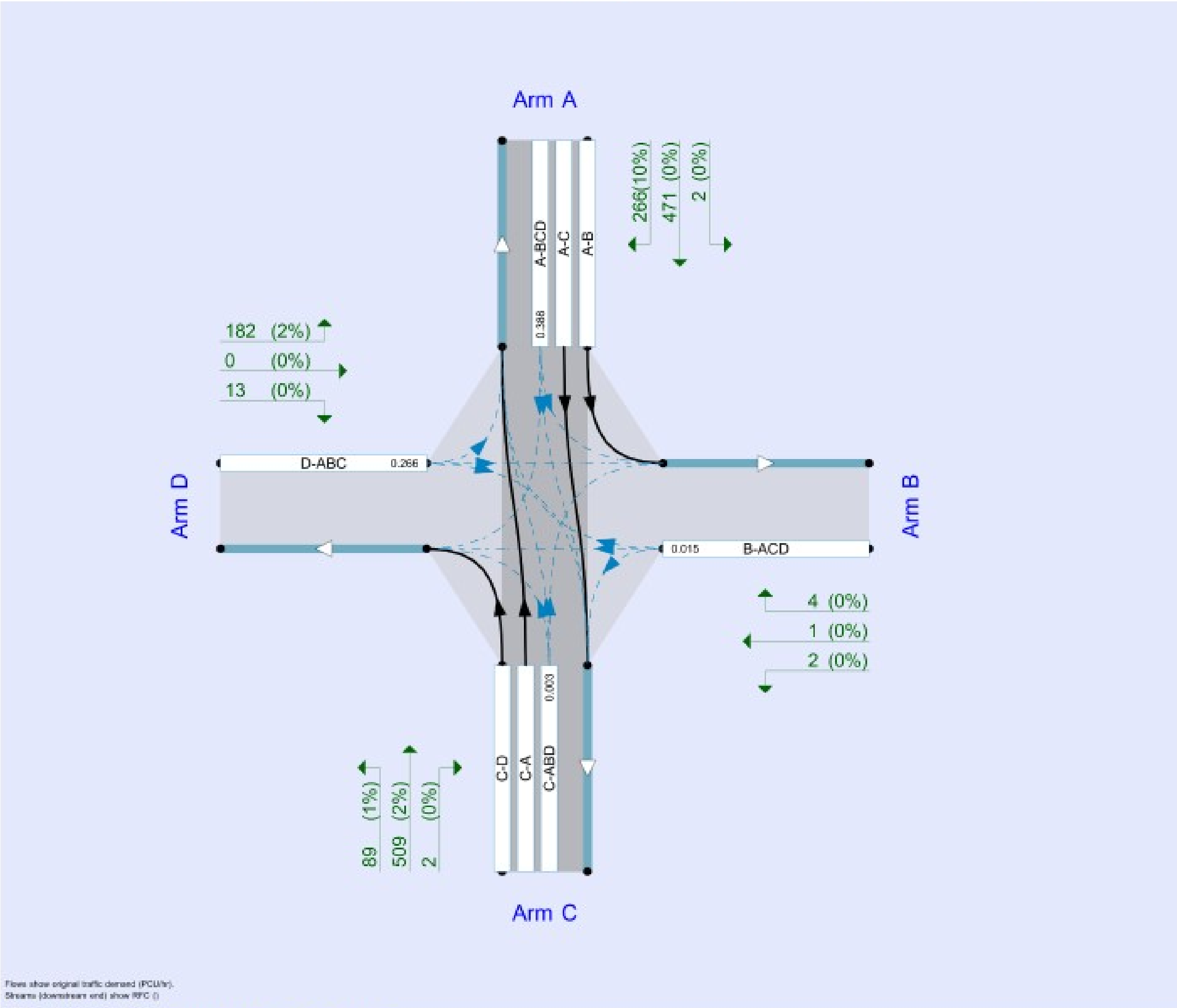
File summary

File Description

Title	
Location	
Site number	
Date	08/12/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	TOBIN\James.Quinn
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin



The junction diagram reflects the last run of Junctions.

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021 Baseflow	AM	ONE HOUR	07:45	09:15	15
D2	2021 Baseflow	PM	ONE HOUR	07:45	09:15	15
D3	2024 Baseflow	AM	ONE HOUR	07:45	09:15	15
D4	2024 Baseflow	PM	ONE HOUR	07:45	09:15	15
D5	2024 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15
D6	2024 Baseflow + Dev	PM	ONE HOUR	07:45	09:15	15
D7	2039 Baseflow	AM	ONE HOUR	07:45	09:15	15
D8	2039 Baseflow	PM	ONE HOUR	07:45	09:15	15
D9	2039 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15
D10	2039 Baseflow + Dev	PM	ONE HOUR	07:45	09:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2021 Baseflow, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		5.34	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	untitled		Major
B	untitled		Minor
C	untitled		Major
D	untitled		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A	7.00		✓	2.50	45.0	✓	7.00
C	7.00		✓	2.50	45.0	✓	3.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Lane width (m)	Visibility to left (m)	Visibility to right (m)
B	One lane	3.00	45	45
D	One lane	3.50	45	45

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	620	-	-	-	-	-	-	0.230	0.328	0.230	-	-	-
B-A	514	0.090	0.227	0.227	-	-	-	0.142	0.324	-	0.227	0.227	0.113
B-C	652	0.096	0.242	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	514	0.090	0.227	0.227	-	-	-	0.142	0.324	0.142	-	-	-
B-D, offside lane	514	0.090	0.227	0.227	-	-	-	0.142	0.324	0.142	-	-	-
C-B	620	0.230	0.230	0.328	-	-	-	-	-	-	-	-	-
D-A	685	-	-	-	-	-	-	0.254	-	0.100	-	-	-
D-B, nearside lane	540	0.150	0.150	0.340	-	-	-	0.238	0.238	0.094	-	-	-
D-B, offside lane	540	0.150	0.150	0.340	-	-	-	0.238	0.238	0.094	-	-	-
D-C	540	-	0.150	0.340	0.119	0.238	0.238	0.238	0.238	0.094	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021 Baseflow	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	436	100.000
B		✓	2	100.000
C		✓	427	100.000
D		✓	290	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	6	288	142
	B	0	0	2	0
	C	399	4	0	24
	D	279	0	11	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	0	10	5	10
	B	10	0	0	0
	C	3	0	0	4
	D	3	10	5	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-ACD	0.00	0.00	0.0	A
A-BCD	0.31	11.15	0.5	B
A-B				
A-C				
D-ABC	0.57	15.69	1.4	C
C-ABD	0.01	7.36	0.0	A
C-D				
C-A				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	416	0.000	0	0.0	0.000	A
A-BCD	107	546	0.196	106	0.3	8.986	A
A-B	5			5			
A-C	217			217			
D-ABC	218	595	0.367	216	0.6	9.731	A
C-ABD	3	534	0.006	3	0.0	6.782	A
C-D	18			18			
C-A	300			300			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	390	0.000	0	0.0	0.000	A
A-BCD	128	531	0.240	127	0.3	9.798	A
A-B	5			5			
A-C	259			259			
D-ABC	261	579	0.451	260	0.8	11.604	B
C-ABD	4	517	0.007	4	0.0	7.015	A
C-D	22			22			
C-A	359			359			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	353	0.000	0	0.0	0.000	A
A-BCD	156	511	0.306	156	0.5	11.121	B
A-B	7			7			
A-C	317			317			
D-ABC	319	555	0.575	317	1.3	15.436	C
C-ABD	4	494	0.009	4	0.0	7.358	A
C-D	26			26			
C-A	439			439			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	352	0.000	0	0.0	0.000	A
A-BCD	156	511	0.306	156	0.5	11.154	B
A-B	7			7			
A-C	317			317			
D-ABC	319	555	0.575	319	1.4	15.686	C
C-ABD	4	493	0.009	4	0.0	7.361	A
C-D	26			26			
C-A	439			439			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	389	0.000	0	0.0	0.000	A
A-BCD	128	531	0.240	128	0.4	9.839	A
A-B	5			5			
A-C	259			259			
D-ABC	261	578	0.451	263	0.9	11.826	B
C-ABD	4	516	0.007	4	0.0	7.019	A
C-D	22			22			
C-A	359			359			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	416	0.000	0	0.0	0.000	A
A-BCD	107	545	0.196	107	0.3	9.043	A
A-B	5			5			
A-C	217			217			
D-ABC	218	595	0.367	219	0.6	9.908	A
C-ABD	3	533	0.006	3	0.0	6.788	A
C-D	18			18			
C-A	300			300			

2021 Baseflow, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		4.20	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2021 Baseflow	PM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	622	100.000
B		✓	6	100.000
C		✓	505	100.000
D		✓	164	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	2	396	224
	B	3	0	2	1
	C	428	2	0	75
	D	153	0	11	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	0	0	0	10
	B	0	0	0	0
	C	2	0	0	1
	D	2	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-ACD	0.02	11.77	0.0	B
A-BCD	0.50	15.95	1.1	C
A-B				
A-C				
D-ABC	0.35	10.82	0.5	B
C-ABD	0.01	8.29	0.0	A
C-D				
C-A				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	394	0.011	4	0.0	9.238	A
A-BCD	169	532	0.317	167	0.5	10.773	B
A-B	2			2			
A-C	298			298			
D-ABC	123	571	0.216	122	0.3	8.149	A
C-ABD	2	495	0.003	1	0.0	7.286	A
C-D	56			56			
C-A	322			322			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	360	0.015	5	0.0	10.140	B
A-BCD	202	516	0.391	201	0.7	12.532	B
A-B	2			2			
A-C	356			356			
D-ABC	147	550	0.268	147	0.4	9.089	A
C-ABD	2	471	0.004	2	0.0	7.675	A
C-D	67			67			
C-A	385			385			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	7	313	0.021	7	0.0	11.756	B
A-BCD	249	497	0.501	248	1.1	15.766	C
A-B	2			2			
A-C	433			433			
D-ABC	181	520	0.348	180	0.5	10.773	B
C-ABD	2	437	0.005	2	0.0	8.275	A
C-D	83			83			
C-A	471			471			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	7	312	0.021	7	0.0	11.773	B
A-BCD	249	497	0.502	249	1.1	15.952	C
A-B	2			2			
A-C	433			433			
D-ABC	181	519	0.348	181	0.5	10.818	B
C-ABD	2	437	0.005	2	0.0	8.285	A
C-D	83			83			
C-A	471			471			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	360	0.015	5	0.0	10.160	B
A-BCD	202	516	0.391	203	0.7	12.715	B
A-B	2			2			
A-C	356			356			
D-ABC	147	550	0.268	148	0.4	9.140	A
C-ABD	2	470	0.004	2	0.0	7.691	A
C-D	67			67			
C-A	385			385			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	393	0.011	5	0.0	9.262	A
A-BCD	169	532	0.317	170	0.5	10.939	B
A-B	2			2			
A-C	298			298			
D-ABC	123	571	0.216	124	0.3	8.206	A
C-ABD	2	495	0.003	2	0.0	7.300	A
C-D	56			56			
C-A	322			322			

2024 Baseflow, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		5.80	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2024 Baseflow	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	457	100.000
B		✓	2	100.000
C		✓	447	100.000
D		✓	304	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	6	302	149
	B	0	0	2	0
	C	418	4	0	25
	D	292	0	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	0	10	5	10
	B	10	0	0	0
	C	3	0	0	4
	D	3	10	5	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-ACD	0.00	0.00	0.0	A
A-BCD	0.32	11.57	0.5	B
A-B				
A-C				
D-ABC	0.61	17.29	1.6	C
C-ABD	0.01	7.45	0.0	A
C-D				
C-A				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	410	0.000	0	0.0	0.000	A
A-BCD	112	542	0.207	111	0.3	9.164	A
A-B	5			5			
A-C	227			227			
D-ABC	229	590	0.388	226	0.6	10.121	B
C-ABD	3	530	0.006	3	0.0	6.836	A
C-D	19			19			
C-A	315			315			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	382	0.000	0	0.0	0.000	A
A-BCD	134	527	0.254	134	0.4	10.056	B
A-B	5			5			
A-C	271			271			
D-ABC	273	573	0.477	272	0.9	12.283	B
C-ABD	4	512	0.007	4	0.0	7.083	A
C-D	22			22			
C-A	376			376			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	343	0.000	0	0.0	0.000	A
A-BCD	164	506	0.324	164	0.5	11.527	B
A-B	7			7			
A-C	332			332			
D-ABC	335	549	0.610	332	1.5	16.929	C
C-ABD	4	487	0.009	4	0.0	7.451	A
C-D	28			28			
C-A	460			460			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	342	0.000	0	0.0	0.000	A
A-BCD	164	506	0.324	164	0.5	11.566	B
A-B	7			7			
A-C	332			332			
D-ABC	335	549	0.610	335	1.6	17.290	C
C-ABD	4	487	0.009	4	0.0	7.454	A
C-D	28			28			
C-A	460			460			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	381	0.000	0	0.0	0.000	A
A-BCD	134	527	0.254	135	0.4	10.103	B
A-B	5			5			
A-C	271			271			
D-ABC	273	573	0.477	276	1.0	12.578	B
C-ABD	4	511	0.007	4	0.0	7.091	A
C-D	22			22			
C-A	376			376			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	409	0.000	0	0.0	0.000	A
A-BCD	112	542	0.207	113	0.3	9.229	A
A-B	5			5			
A-C	227			227			
D-ABC	229	590	0.388	230	0.7	10.333	B
C-ABD	3	529	0.006	3	0.0	6.842	A
C-D	19			19			
C-A	315			315			

2024 Baseflow, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		4.50	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2024 Baseflow	PM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	652	100.000
B		✓	6	100.000
C		✓	530	100.000
D		✓	172	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	2	415	235
	B	3	0	2	1
	C	449	2	0	79
	D	160	0	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	0	0	0	10
	B	0	0	0	0
	C	2	0	0	1
	D	2	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-ACD	0.02	12.30	0.0	B
A-BCD	0.53	17.13	1.3	C
A-B				
A-C				
D-ABC	0.37	11.45	0.6	B
C-ABD	0.01	8.46	0.0	A
C-D				
C-A				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	386	0.012	4	0.0	9.436	A
A-BCD	177	528	0.335	175	0.5	11.142	B
A-B	2			2			
A-C	312			312			
D-ABC	129	565	0.229	128	0.3	8.374	A
C-ABD	2	489	0.003	1	0.0	7.376	A
C-D	59			59			
C-A	338			338			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	350	0.015	5	0.0	10.435	B
A-BCD	212	511	0.414	211	0.8	13.137	B
A-B	2			2			
A-C	373			373			
D-ABC	155	542	0.285	154	0.4	9.436	A
C-ABD	2	464	0.004	2	0.0	7.796	A
C-D	71			71			
C-A	404			404			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	7	300	0.022	7	0.0	12.273	B
A-BCD	263	494	0.533	261	1.2	16.879	C
A-B	2			2			
A-C	452			452			
D-ABC	189	510	0.372	189	0.6	11.397	B
C-ABD	2	428	0.005	2	0.0	8.448	A
C-D	87			87			
C-A	494			494			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	7	299	0.022	7	0.0	12.296	B
A-BCD	263	494	0.533	263	1.3	17.130	C
A-B	2			2			
A-C	452			452			
D-ABC	189	509	0.372	189	0.6	11.455	B
C-ABD	2	428	0.005	2	0.0	8.460	A
C-D	87			87			
C-A	494			494			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	350	0.015	5	0.0	10.461	B
A-BCD	212	511	0.415	214	0.8	13.378	B
A-B	2			2			
A-C	373			373			
D-ABC	155	542	0.285	155	0.4	9.496	A
C-ABD	2	463	0.004	2	0.0	7.813	A
C-D	71			71			
C-A	404			404			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	385	0.012	5	0.0	9.461	A
A-BCD	177	528	0.335	178	0.6	11.340	B
A-B	2			2			
A-C	312			312			
D-ABC	129	565	0.229	130	0.3	8.441	A
C-ABD	2	488	0.003	2	0.0	7.392	A
C-D	59			59			
C-A	338			338			

2024 Baseflow + Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		8.69	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2024 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	484	100.000
B		✓	2	100.000
C		✓	452	100.000
D		✓	363	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	6	302	176
	B	0	0	2	0
	C	418	4	0	30
	D	349	0	14	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	0	10	5	10
	B	10	0	0	0
	C	3	0	0	4
	D	3	10	5	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-ACD	0.00	0.00	0.0	A
A-BCD	0.38	12.70	0.7	B
A-B				
A-C				
D-ABC	0.73	24.85	2.7	C
C-ABD	0.01	7.61	0.0	A
C-D				
C-A				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	402	0.000	0	0.0	0.000	A
A-BCD	133	541	0.245	131	0.4	9.624	A
A-B	5			5			
A-C	227			227			
D-ABC	273	590	0.463	270	0.9	11.479	B
C-ABD	3	523	0.006	3	0.0	6.923	A
C-D	23			23			
C-A	315			315			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	372	0.000	0	0.0	0.000	A
A-BCD	158	526	0.301	158	0.5	10.738	B
A-B	5			5			
A-C	271			271			
D-ABC	326	572	0.570	325	1.3	14.869	B
C-ABD	4	504	0.007	4	0.0	7.198	A
C-D	27			27			
C-A	376			376			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	329	0.000	0	0.0	0.000	A
A-BCD	194	506	0.384	193	0.7	12.640	B
A-B	7			7			
A-C	332			332			
D-ABC	400	547	0.730	395	2.6	23.542	C
C-ABD	4	478	0.009	4	0.0	7.607	A
C-D	33			33			
C-A	460			460			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	328	0.000	0	0.0	0.000	A
A-BCD	194	506	0.384	194	0.7	12.705	B
A-B	7			7			
A-C	332			332			
D-ABC	400	547	0.730	399	2.7	24.850	C
C-ABD	4	477	0.009	4	0.0	7.611	A
C-D	33			33			
C-A	460			460			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	371	0.000	0	0.0	0.000	A
A-BCD	158	526	0.301	159	0.5	10.812	B
A-B	5			5			
A-C	271			271			
D-ABC	326	572	0.570	331	1.4	15.708	C
C-ABD	4	503	0.007	4	0.0	7.204	A
C-D	27			27			
C-A	376			376			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	401	0.000	0	0.0	0.000	A
A-BCD	133	541	0.245	133	0.4	9.712	A
A-B	5			5			
A-C	227			227			
D-ABC	273	590	0.463	275	0.9	11.878	B
C-ABD	3	522	0.006	3	0.0	6.934	A
C-D	23			23			
C-A	315			315			

2024 Baseflow + Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		6.03	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2024 Baseflow + Dev	PM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	696	100.000
B		✓	6	100.000
C		✓	544	100.000
D		✓	196	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	2	415	279
	B	3	0	2	1
	C	449	2	0	93
	D	183	0	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	0	0	0	10
	B	0	0	0	0
	C	2	0	0	1
	D	2	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-ACD	0.02	13.06	0.0	B
A-BCD	0.64	21.37	2.0	C
A-B				
A-C				
D-ABC	0.43	12.69	0.8	B
C-ABD	0.01	8.81	0.0	A
C-D				
C-A				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	376	0.012	4	0.0	9.689	A
A-BCD	210	526	0.400	208	0.7	12.313	B
A-B	2			2			
A-C	312			312			
D-ABC	148	563	0.262	146	0.4	8.764	A
C-ABD	2	479	0.003	1	0.0	7.544	A
C-D	70			70			
C-A	338			338			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	338	0.016	5	0.0	10.832	B
A-BCD	253	512	0.494	252	1.1	15.151	C
A-B	2			2			
A-C	371			371			
D-ABC	176	540	0.326	176	0.5	10.060	B
C-ABD	2	450	0.004	2	0.0	8.026	A
C-D	84			84			
C-A	404			404			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	7	283	0.023	7	0.0	13.007	B
A-BCD	324	509	0.636	320	1.9	20.692	C
A-B	2			2			
A-C	440			440			
D-ABC	216	505	0.427	215	0.7	12.588	B
C-ABD	2	412	0.005	2	0.0	8.783	A
C-D	102			102			
C-A	494			494			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	7	282	0.023	7	0.0	13.056	B
A-BCD	324	508	0.638	324	2.0	21.369	C
A-B	2			2			
A-C	440			440			
D-ABC	216	505	0.428	216	0.8	12.687	B
C-ABD	2	411	0.005	2	0.0	8.806	A
C-D	102			102			
C-A	494			494			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	336	0.016	5	0.0	10.879	B
A-BCD	253	510	0.496	256	1.1	15.716	C
A-B	2			2			
A-C	371			371			
D-ABC	176	539	0.327	177	0.5	10.156	B
C-ABD	2	449	0.004	2	0.0	8.054	A
C-D	84			84			
C-A	404			404			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	375	0.012	5	0.0	9.725	A
A-BCD	210	526	0.400	212	0.8	12.653	B
A-B	2			2			
A-C	312			312			
D-ABC	148	563	0.262	148	0.4	8.853	A
C-ABD	2	477	0.003	2	0.0	7.570	A
C-D	70			70			
C-A	338			338			

2039 Baseflow, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		7.73	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2039 Baseflow	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	518	100.000
B		✓	2	100.000
C		✓	508	100.000
D		✓	345	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	7	342	169
	B	0	0	2	0
	C	474	5	0	29
	D	332	0	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	0	10	5	10
	B	10	0	0	0
	C	3	0	0	4
	D	3	10	5	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-ACD	0.00	0.00	0.0	A
A-BCD	0.38	12.98	0.7	B
A-B				
A-C				
D-ABC	0.71	24.25	2.5	C
C-ABD	0.01	7.76	0.0	A
C-D				
C-A				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	391	0.000	0	0.0	0.000	A
A-BCD	127	531	0.239	126	0.3	9.733	A
A-B	5			5			
A-C	257			257			
D-ABC	260	579	0.449	256	0.8	11.391	B
C-ABD	4	518	0.007	4	0.0	7.006	A
C-D	22			22			
C-A	357			357			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	359	0.000	0	0.0	0.000	A
A-BCD	152	514	0.295	152	0.5	10.896	B
A-B	6			6			
A-C	307			307			
D-ABC	310	559	0.555	308	1.2	14.687	B
C-ABD	4	497	0.009	4	0.0	7.304	A
C-D	26			26			
C-A	426			426			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	313	0.000	0	0.0	0.000	A
A-BCD	186	491	0.379	186	0.7	12.911	B
A-B	8			8			
A-C	376			376			
D-ABC	380	532	0.715	375	2.4	23.079	C
C-ABD	6	470	0.012	5	0.0	7.754	A
C-D	32			32			
C-A	522			522			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	312	0.000	0	0.0	0.000	A
A-BCD	186	491	0.379	186	0.7	12.977	B
A-B	8			8			
A-C	376			376			
D-ABC	380	531	0.715	379	2.5	24.251	C
C-ABD	6	469	0.012	6	0.0	7.758	A
C-D	32			32			
C-A	522			522			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	358	0.000	0	0.0	0.000	A
A-BCD	152	514	0.295	153	0.5	10.972	B
A-B	6			6			
A-C	307			307			
D-ABC	310	559	0.555	315	1.3	15.442	C
C-ABD	4	497	0.009	5	0.0	7.311	A
C-D	26			26			
C-A	426			426			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	390	0.000	0	0.0	0.000	A
A-BCD	127	531	0.239	128	0.4	9.821	A
A-B	5			5			
A-C	257			257			
D-ABC	260	579	0.449	262	0.9	11.758	B
C-ABD	4	517	0.007	4	0.0	7.014	A
C-D	22			22			
C-A	357			357			

2039 Baseflow, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		5.56	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2039 Baseflow	PM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	739	100.000
B		✓	7	100.000
C		✓	600	100.000
D		✓	195	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	2	471	266
	B	4	0	2	1
	C	509	2	0	89
	D	182	0	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	0	0	0	10
	B	0	0	0	0
	C	2	0	0	1
	D	2	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-ACD	0.03	14.87	0.0	B
A-BCD	0.63	21.31	1.9	C
A-B				
A-C				
D-ABC	0.44	13.53	0.8	B
C-ABD	0.01	9.01	0.0	A
C-D				
C-A				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	352	0.015	5	0.0	10.383	B
A-BCD	201	517	0.388	198	0.7	12.320	B
A-B	2			2			
A-C	354			354			
D-ABC	147	551	0.266	145	0.4	9.007	A
C-ABD	2	472	0.003	1	0.0	7.648	A
C-D	67			67			
C-A	383			383			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	6	310	0.020	6	0.0	11.848	B
A-BCD	241	500	0.482	240	1.0	15.151	C
A-B	2			2			
A-C	421			421			
D-ABC	175	525	0.334	175	0.5	10.458	B
C-ABD	2	443	0.004	2	0.0	8.166	A
C-D	80			80			
C-A	458			458			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	8	251	0.031	8	0.0	14.804	B
A-BCD	309	495	0.625	306	1.8	20.658	C
A-B	2			2			
A-C	502			502			
D-ABC	215	486	0.442	214	0.8	13.412	B
C-ABD	2	403	0.005	2	0.0	8.989	A
C-D	98			98			
C-A	560			560			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	8	250	0.031	8	0.0	14.868	B
A-BCD	309	494	0.626	309	1.9	21.305	C
A-B	2			2			
A-C	502			502			
D-ABC	215	485	0.442	215	0.8	13.535	B
C-ABD	2	402	0.005	2	0.0	9.012	A
C-D	98			98			
C-A	560			560			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	6	309	0.020	6	0.0	11.908	B
A-BCD	241	498	0.484	244	1.1	15.691	C
A-B	2			2			
A-C	421			421			
D-ABC	175	524	0.334	176	0.5	10.571	B
C-ABD	2	441	0.004	2	0.0	8.196	A
C-D	80			80			
C-A	458			458			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	351	0.015	5	0.0	10.425	B
A-BCD	201	516	0.388	202	0.7	12.644	B
A-B	2			2			
A-C	354			354			
D-ABC	147	551	0.267	147	0.4	9.106	A
C-ABD	2	471	0.003	2	0.0	7.670	A
C-D	67			67			
C-A	383			383			

2039 Baseflow + Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		13.31	B

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2039 Baseflow + Dev	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	545	100.000
B		✓	2	100.000
C		✓	512	100.000
D		✓	404	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	7	342	196
	B	0	0	2	0
	C	474	5	0	33
	D	389	0	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	0	10	5	10
	B	10	0	0	0
	C	3	0	0	4
	D	3	10	5	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-ACD	0.00	0.00	0.0	A
A-BCD	0.44	14.39	0.9	B
A-B				
A-C				
D-ABC	0.84	41.03	4.8	E
C-ABD	0.01	7.93	0.0	A
C-D				
C-A				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	382	0.000	0	0.0	0.000	A
A-BCD	148	531	0.278	146	0.4	10.245	B
A-B	5			5			
A-C	257			257			
D-ABC	304	578	0.526	300	1.1	13.116	B
C-ABD	4	511	0.007	4	0.0	7.098	A
C-D	25			25			
C-A	357			357			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	348	0.000	0	0.0	0.000	A
A-BCD	176	514	0.343	176	0.6	11.691	B
A-B	6			6			
A-C	307			307			
D-ABC	363	558	0.651	360	1.8	18.469	C
C-ABD	4	489	0.009	4	0.0	7.425	A
C-D	30			30			
C-A	426			426			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	298	0.000	0	0.0	0.000	A
A-BCD	217	492	0.441	216	0.8	14.278	B
A-B	8			8			
A-C	376			376			
D-ABC	445	530	0.839	435	4.4	35.572	E
C-ABD	6	460	0.012	5	0.0	7.923	A
C-D	36			36			
C-A	522			522			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	296	0.000	0	0.0	0.000	A
A-BCD	217	492	0.441	217	0.9	14.391	B
A-B	8			8			
A-C	376			376			
D-ABC	445	530	0.839	443	4.8	41.034	E
C-ABD	6	459	0.012	6	0.0	7.929	A
C-D	36			36			
C-A	522			522			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	346	0.000	0	0.0	0.000	A
A-BCD	176	514	0.343	177	0.6	11.811	B
A-B	6			6			
A-C	307			307			
D-ABC	363	558	0.651	374	2.0	21.198	C
C-ABD	4	489	0.009	5	0.0	7.437	A
C-D	30			30			
C-A	426			426			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	0	381	0.000	0	0.0	0.000	A
A-BCD	148	531	0.278	148	0.4	10.367	B
A-B	5			5			
A-C	257			257			
D-ABC	304	578	0.526	308	1.2	13.872	B
C-ABD	4	510	0.007	4	0.0	7.111	A
C-D	25			25			
C-A	357			357			

2039 Baseflow + Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		7.83	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2039 Baseflow + Dev	PM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	783	100.000
B		✓	7	100.000
C		✓	615	100.000
D		✓	220	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	2	471	310
	B	4	0	2	1
	C	509	2	0	104
	D	205	0	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	0	0	0	10
	B	0	0	0	0
	C	2	0	0	1
	D	2	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-ACD	0.03	16.12	0.0	C
A-BCD	0.74	27.50	3.2	D
A-B				
A-C				
D-ABC	0.51	15.66	1.0	C
C-ABD	0.01	9.42	0.0	A
C-D				
C-A				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	341	0.015	5	0.0	10.712	B
A-BCD	234	516	0.455	231	0.9	13.744	B
A-B	2			2			
A-C	354			354			
D-ABC	166	547	0.303	164	0.4	9.533	A
C-ABD	2	461	0.003	1	0.0	7.829	A
C-D	78			78			
C-A	383			383			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	6	297	0.021	6	0.0	12.400	B
A-BCD	285	504	0.565	283	1.4	17.746	C
A-B	2			2			
A-C	417			417			
D-ABC	198	519	0.381	197	0.6	11.359	B
C-ABD	2	429	0.004	2	0.0	8.419	A
C-D	93			93			
C-A	458			458			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	8	233	0.033	8	0.0	15.977	C
A-BCD	396	540	0.732	389	3.0	25.548	D
A-B	2			2			
A-C	464			464			
D-ABC	242	477	0.508	241	1.0	15.418	C
C-ABD	2	386	0.006	2	0.0	9.373	A
C-D	115			115			
C-A	560			560			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	8	231	0.033	8	0.0	16.122	C
A-BCD	396	538	0.736	395	3.2	27.502	D
A-B	2			2			
A-C	464			464			
D-ABC	242	476	0.509	242	1.0	15.664	C
C-ABD	2	384	0.006	2	0.0	9.422	A
C-D	115			115			
C-A	560			560			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	6	294	0.021	6	0.0	12.520	B
A-BCD	285	500	0.570	292	1.5	19.253	C
A-B	2			2			
A-C	417			417			
D-ABC	198	518	0.382	199	0.6	11.553	B
C-ABD	2	426	0.004	2	0.0	8.477	A
C-D	93			93			
C-A	458			458			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	5	339	0.016	5	0.0	10.775	B
A-BCD	234	515	0.455	237	0.9	14.323	B
A-B	2			2			
A-C	354			354			
D-ABC	166	546	0.303	166	0.4	9.669	A
C-ABD	2	459	0.003	2	0.0	7.863	A
C-D	78			78			
C-A	383			383			

Junctions 9

PICADY 9 - Priority Intersection Module

Filename: 11269 Junction 5 - PICADY.j9
Path: J:\Projects\11269 – Glenveagh Residential - Ennis\05-Design\01-Calculations\Traffic
Report generation date: 25/04/2022 09:49:24

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2024 Baseflow + Dev									
Stream B-AC	D1	0.4	12.04	0.27	B	D2	0.1	9.26	0.11	A
Stream C-AB		0.1	6.72	0.09	A		0.2	5.84	0.11	A
	2039 Baseflow + Dev									
Stream B-AC	D3	0.4	12.69	0.28	B	D4	0.1	9.51	0.12	A
Stream C-AB		0.2	6.73	0.09	A		0.2	5.76	0.12	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

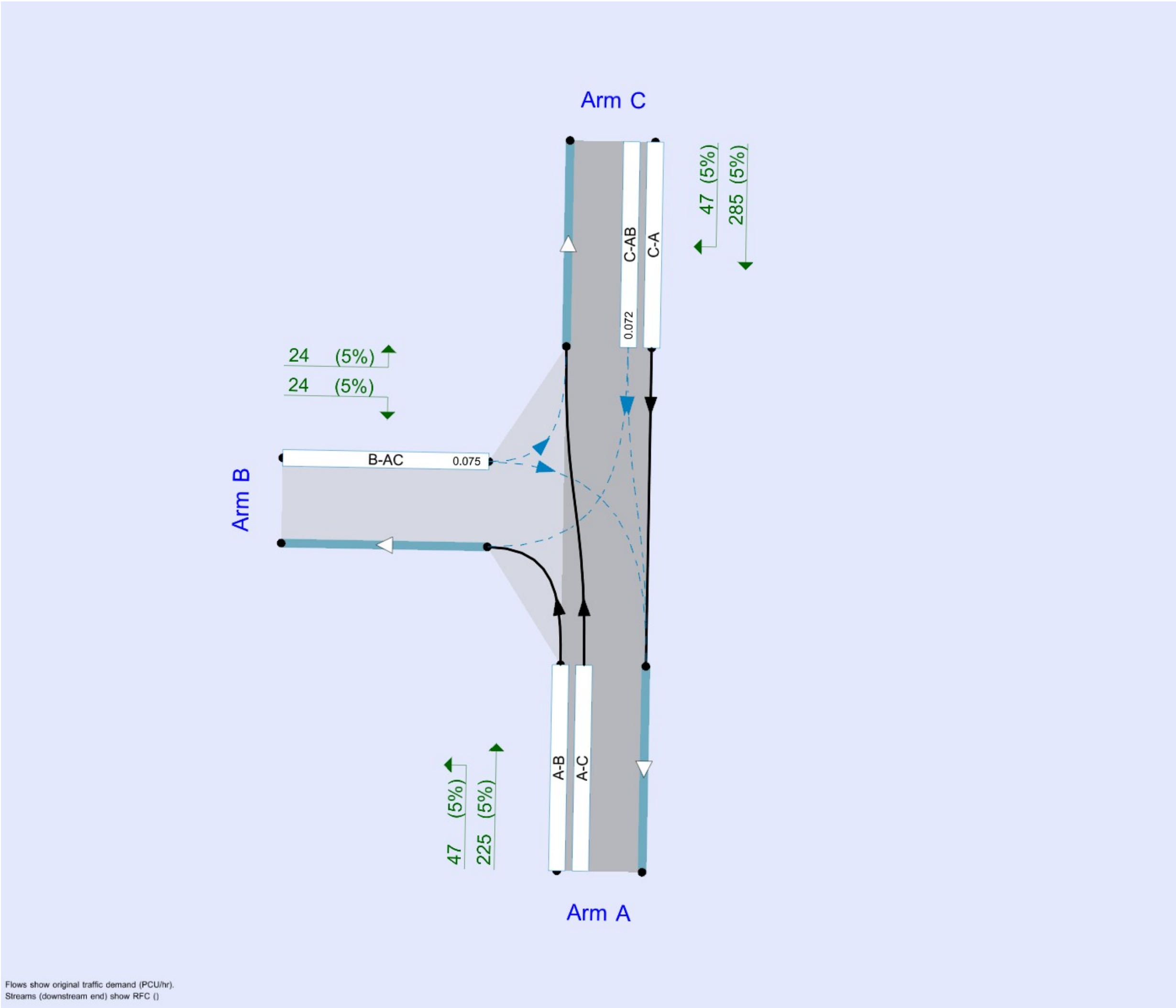
File summary

File Description

Title	
Location	
Site number	
Date	25/04/2022
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	TOBIN\James.Quinn
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin



The junction diagram reflects the last run of Junctions.

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2024 Baseflow + Dev	AM	ONE HOUR	08:00	09:30	15
D2	2024 Baseflow + Dev	PM	ONE HOUR	17:00	18:30	15
D3	2039 Baseflow + Dev	AM	ONE HOUR	08:00	09:30	15
D4	2039 Baseflow + Dev	PM	ONE HOUR	17:00	18:30	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2024 Baseflow + Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		2.29	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	untitled		Major
B	untitled		Minor
C	untitled		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	6.00			59.0	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Lane width (m)	Visibility to left (m)	Visibility to right (m)
B	One lane	2.50	59	59

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	500	0.091	0.230	0.145	0.329
B-C	628	0.096	0.243	-	-
C-B	608	0.236	0.236	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2024 Baseflow + Dev	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	408	100.000
B		✓	106	100.000
C		✓	182	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	37	371
	B	53	0	53
	C	145	37	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.27	12.04	0.4	B
C-AB	0.09	6.72	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	80	471	0.169	79	0.2	9.620	A
C-AB	34	612	0.055	34	0.1	6.527	A
C-A	103			103			
A-B	28			28			
A-C	279			279			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	95	454	0.210	95	0.3	10.517	B
C-AB	42	614	0.069	42	0.1	6.610	A
C-A	121			121			
A-B	33			33			
A-C	334			334			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	117	431	0.271	116	0.4	12.002	B
C-AB	55	617	0.089	55	0.1	6.720	A
C-A	145			145			
A-B	41			41			
A-C	408			408			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	117	431	0.271	117	0.4	12.036	B
C-AB	55	617	0.089	55	0.1	6.724	A
C-A	145			145			

A-B	41			41			
A-C	408			408			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	95	454	0.210	96	0.3	10.557	B
C-AB	42	614	0.069	42	0.1	6.615	A
C-A	121			121			
A-B	33			33			
A-C	334			334			

09:15 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	80	471	0.169	80	0.2	9.677	A
C-AB	34	612	0.055	34	0.1	6.539	A
C-A	103			103			
A-B	28			28			
A-C	279			279			

2024 Baseflow + Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		1.44	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2024 Baseflow + Dev	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	245	100.000
B		✓	48	100.000
C		✓	302	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	47	198
	B	24	0	24
	C	255	47	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.11	9.26	0.1	A
C-AB	0.11	5.84	0.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	36	492	0.073	36	0.1	8.280	A
C-AB	49	696	0.070	48	0.1	5.831	A
C-A	179			179			
A-B	35			35			
A-C	149			149			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	43	479	0.090	43	0.1	8.671	A
C-AB	62	715	0.087	62	0.2	5.797	A
C-A	209			209			
A-B	42			42			
A-C	178			178			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	53	461	0.115	53	0.1	9.255	A
C-AB	84	741	0.113	83	0.2	5.757	A
C-A	249			249			
A-B	52			52			
A-C	218			218			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	53	461	0.115	53	0.1	9.261	A
C-AB	84	741	0.113	84	0.2	5.759	A
C-A	249			249			
A-B	52			52			
A-C	218			218			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	43	479	0.090	43	0.1	8.678	A
C-AB	62	715	0.087	63	0.2	5.803	A
C-A	209			209			
A-B	42			42			
A-C	178			178			

18:15 - 18:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	36	492	0.073	36	0.1	8.299	A
C-AB	49	697	0.070	49	0.1	5.842	A
C-A	178			178			
A-B	35			35			
A-C	149			149			

2039 Baseflow + Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		2.19	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2039 Baseflow + Dev	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	461	100.000
B		✓	106	100.000
C		✓	200	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	37	424
	B	53	0	53
	C	163	37	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.28	12.69	0.4	B
C-AB	0.09	6.73	0.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	80	460	0.173	79	0.2	9.892	A
C-AB	35	613	0.057	34	0.1	6.529	A
C-A	116			116			
A-B	28			28			
A-C	319			319			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	95	441	0.216	95	0.3	10.913	B
C-AB	44	616	0.071	44	0.1	6.610	A
C-A	136			136			
A-B	33			33			
A-C	381			381			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	117	415	0.281	116	0.4	12.647	B
C-AB	58	619	0.093	57	0.2	6.727	A
C-A	163			163			
A-B	41			41			
A-C	467			467			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	117	415	0.282	117	0.4	12.686	B
C-AB	58	619	0.093	58	0.2	6.731	A
C-A	163			163			
A-B	41			41			
A-C	467			467			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	95	441	0.216	96	0.3	10.962	B
C-AB	44	616	0.071	44	0.1	6.619	A
C-A	136			136			
A-B	33			33			
A-C	381			381			

09:15 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	80	460	0.173	80	0.2	9.956	A
C-AB	35	613	0.057	35	0.1	6.542	A
C-A	116			116			
A-B	28			28			
A-C	319			319			

2039 Baseflow + Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way		1.36	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2039 Baseflow + Dev	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	272	100.000
B		✓	48	100.000
C		✓	332	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	47	225
	B	24	0	24
	C	285	47	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.12	9.51	0.1	A
C-AB	0.12	5.76	0.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	36	485	0.075	36	0.1	8.412	A
C-AB	51	708	0.072	50	0.1	5.748	A
C-A	199			199			
A-B	35			35			
A-C	169			169			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	43	470	0.092	43	0.1	8.841	A
C-AB	65	728	0.090	65	0.2	5.703	A
C-A	233			233			
A-B	42			42			
A-C	202			202			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	53	450	0.117	53	0.1	9.503	A
C-AB	89	758	0.117	88	0.2	5.650	A
C-A	277			277			
A-B	52			52			
A-C	248			248			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	53	450	0.117	53	0.1	9.510	A
C-AB	89	758	0.117	89	0.2	5.656	A
C-A	277			277			
A-B	52			52			
A-C	248			248			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	43	470	0.092	43	0.1	8.854	A
C-AB	65	729	0.090	66	0.2	5.710	A
C-A	233			233			
A-B	42			42			
A-C	202			202			

18:15 - 18:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	36	485	0.075	36	0.1	8.429	A
C-AB	51	708	0.072	51	0.1	5.759	A
C-A	199			199			
A-B	35			35			
A-C	169			169			

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Proposed Strategic Housing Development at Ballymacaula, Drumbiggle, Keelty, Circular Road, Ennis, Co. Clare

CHAPTER 6 **Material Assets: Services, Infrastructure and Utilities**

Appendix 6.1	**Site Investigation**
Appendix 6.2	**Bespoke Confirmation of Feasibility**

Volume III

List of Appendices

August 2022

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CHARTERED PLANNING CONSULTANTS

Appendix 6.1 Site Investigation

August 2022

Glenveagh
Home of the new.

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CHARTERED PLANNING CONSULTANTS

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Ground Investigations Ireland

Site Investigation Ennis

Glenveagh

Ground Investigation Report

September 2021

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APPENDICES

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1.0 Preamble

On the instructions of AKM Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between July and September 2021 at the site of the proposed Development in Ennis Co Clare.

2.0 Overview

2.1. Background

It is proposed to construct a new residential development associated services, access roads and car parking at the proposed site. The site is currently greenfield and is situated to the west of Ennis Town. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 16 No. Trial Pits to a maximum depth of 3.20m BGL
- Carry out 3 No. Soakaways to determine a soil infiltration value to BRE digest 365
- Carry out 63 No. Dynamic Probes to determine soil strength/density characteristics
- Carry out 4 No. Cable Percussion boreholes to a maximum depth of 1.0m BGL
- Carry out 4 No. Rotary Core Boreholes to a maximum depth of 6.90m BGL
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

The trial pits were excavated using a 13T tracked excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Soakaway Testing

The soakaway testing was carried out in selected trial pits at the locations shown in the exploratory hole location plan in Appendix 1. These pits were carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pits were allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pits were logged prior to completing the soakaway test and were backfilled with arising's upon completion. The soakaway test results are provided in Appendix 5 of this Report.

3.4. Dynamic Probing

The dynamic probe tests (DPH) were carried out at the locations shown in the location plan in Appendix 1 in accordance with B.S. 1377: Part 9 1990. The test consists of mechanically driving a cone with a 50kg weight in 100mm intervals and monitoring the number of blows required. An equivalent Standard Penetration Test (SPT) 'N' value may be calculated by dividing the total number of blows over a 300mm drive length by 1.5. The dynamic probe logs are provided in Appendix 3 of this Report.

3.5. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.
The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular material may not be noticed. Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.

Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60º cone. The Standard Penetration Test number referred to as the 'N' value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The cable percussion borehole logs are provided in Appendix 6 of this Report.

3.6. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the "overshoot" recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit, and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 7 of this Report.

3.7. Surveying

The exploratory hole locations have been recorded using a Trimble R10 GNSS System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.8. Insitu Plate Bearing Test

The plate bearing tests were carried out using a 457mm diameter plate at the locations shown on the site plan in Appendix 1. The plate was loaded in increments using a hydraulic jack and an excavator to provide a reaction and the displacement was monitored in accordance with BS1377 Part 9 using independently mounted digital strain gauges. The constrained modulus and equivalent CBR are calculated in accordance with HD29/75 and are provided on the test reports in Appendix 4 of this Report.

3.9. Laboratory Testing

Samples were selected from the exploratory holes for a range of environmental testing to assist in the classification of soils and to provide information for the proposed design.
Environmental & Chemical testing as required by the specification, including the Rilta Suite testing was carried out by Element Materials Technology Laboratory in the UK. The Rilta suite testing includes both Solid Waste and Leachate Waste Acceptance Criteria.
The results of the laboratory testing are included in Appendix 8 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and generally comprised;

- Topsoil
- Cohesive Deposits
- Weathered Bedrock
- Bedrock

TOPSOIL: Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.3m BGL.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the topsoil and were described typically as *brown sandy gravelly SILT or CLAY with occasional cobbles and boulders*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. The strength of the cohesive deposits was generally Firm below the topsoil but occasionally was soft to firm. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

WEATHERED BEDROCK: In some of the exploratory holes weathered rock was encountered which was digable with the large excavator to a depth of up to 1.0m below the top of the stratum in one of the pits. The trial pits were terminated upon encountering the more competent bedrock, in which further excavation became more difficult. This material was recovered typically as angular gravel and cobbles of however there was some variability in the fracture spacing and the ease at which the excavator could progress. Some clay and sand were also present with the rock mass either from weathering or as infilling to fractures which were opened upon excavation.

BEDROCK: The rotary core boreholes recovered Strong massive grey fine to medium grained. This is typical of the Allwee Member, which is noted on the geological underlying the proposed site.
The depth to rock varies from 1.06m BGL in RC04 to a maximum of 2.6m BGL in RC03. The total core recovery is good, typically 100% The SCR and RQD both mostly ok across the site due to rock type massive.

4.2. Insitu Strength Testing

The correlated DPH blow counts indicate that the overburden deposits are Firm to depth of 1.0m and become firm or firm to stiff with depth. DP24, DP25, DP39, DP45, DP47, DP49 and DP53, , had low blow counts in the soft to firm cohesive deposits to a depth of 1.5m, 1.10m, 1.80m, 1.90m, 1.20m, 1.70m, 1.0m BGL consecutively.

4.3. Groundwater

No groundwater was noted during the investigation however we would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the time of year, rainfall, nearby construction and other factors.

4.4. Laboratory Testing

4.4.1. Environmental Laboratory Testing

A number of samples were analysed for a suite of parameters which allows for the assessment of the sampled material in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous*. The suite also allows for the assessment of the sampled material in terms of suitability for placement at licenced landfills (inert, stable non-reactive, hazardous etc.). The parameter list for the suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.
The suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are total

organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.

As part of the suite a leachate is generated from the solid sample which is analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS).

While the laboratory report provides a comparison with the waste acceptance criteria limits it does not provide a waste classification of the material sampled nor does it comment on any potentially hazardous properties of the materials tested. The possibility for contamination, not revealed by the testing undertaken should be borne in mind particularly where Made Ground deposits are present or the previous site use or location indicate a risk of environmental variation. A waste classification report is recommended to be carried out to provide an interpretation of the laboratory data should any material be required to be disposed of off site.

The results from the completed laboratory testing is included in Appendix 8 of this report.

5.0 Recommendations & Conclusions

5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Foundations

An allowable bearing capacity of 200 kN/m^2 is recommended for conventional strip or pad foundations on the weathered rock or rock at a depth of between 0.45- 1.9m BGL across most of the site. Where the soft to firm cohesive deposits are deeper, such as at the location of TP7 and TP10, lean mix trench fill to a depth of 3.2m and 2.4m consecutively is recommended to achieve the recommended allowable bearing capacity at the location. It should be noted that TP12 did not encounter the weathered rock within the Trial Pit however the surrounding Dynamic Probes DP54, 57, 58, 59 and 60 all reached refusal mostly between 1.3-1.8m with DP58 the exception which reached refusal at 3.3m BGL.

The possibility for variation in the depth of the soft ground and the depth of rock in the vicinity of these foundations should be considered and foundation inspections should be carried out. Any soft spots encountered at the proposed foundation depths should be excavated and replaced with lean mix concrete.

A ground bearing floor slab is recommended to be based on the firm to stiff cohesive deposits with an appropriate depth of compacted hardcore specified by the consulting engineer and in accordance with the limits and guidelines in SR21:2014 +A1:2016 and/or NRA SRW CL808 Type E granular stone fill. Where the depth of Soft deposits exceeds 0.9m then suspended floor slabs should be considered.

5.3. External Pavements

The proposed pavements are recommended to be designed in accordance with the CBR test results included in the Appendices of this Report. The low CBR test results indicate that a capping layer or a sufficient depth of crushed stone fill may be required. Plate bearing tests are recommended at the time of construction to verify the design assumptions for the proposed pavement make up and to verify adequate compaction has been achieved.

The use of a geogrid and separation membrane may improve the performance of the proposed pavement and enable a more economical pavement design to be achieved, a specialist supplier is recommended to advise of the required strength, depth and type of geotextile for the proposed design.

5.4. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.

Excavations in the soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits.

Any excavations which penetrate the granular deposits will require to be appropriately battered or the sides supported.

The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations.

Excavations in the weathered rock deposits are expected to be excavatable with conventional excavation equipment, with zones of more intact bedrock below this depth requiring rock breaking techniques The 13T excavator was generally able to excavate to depths of 0.45m to 1.05m below the top of the weathered rock, and became difficult to excavate within the confines of the trial pit on encountering the more competent rock.

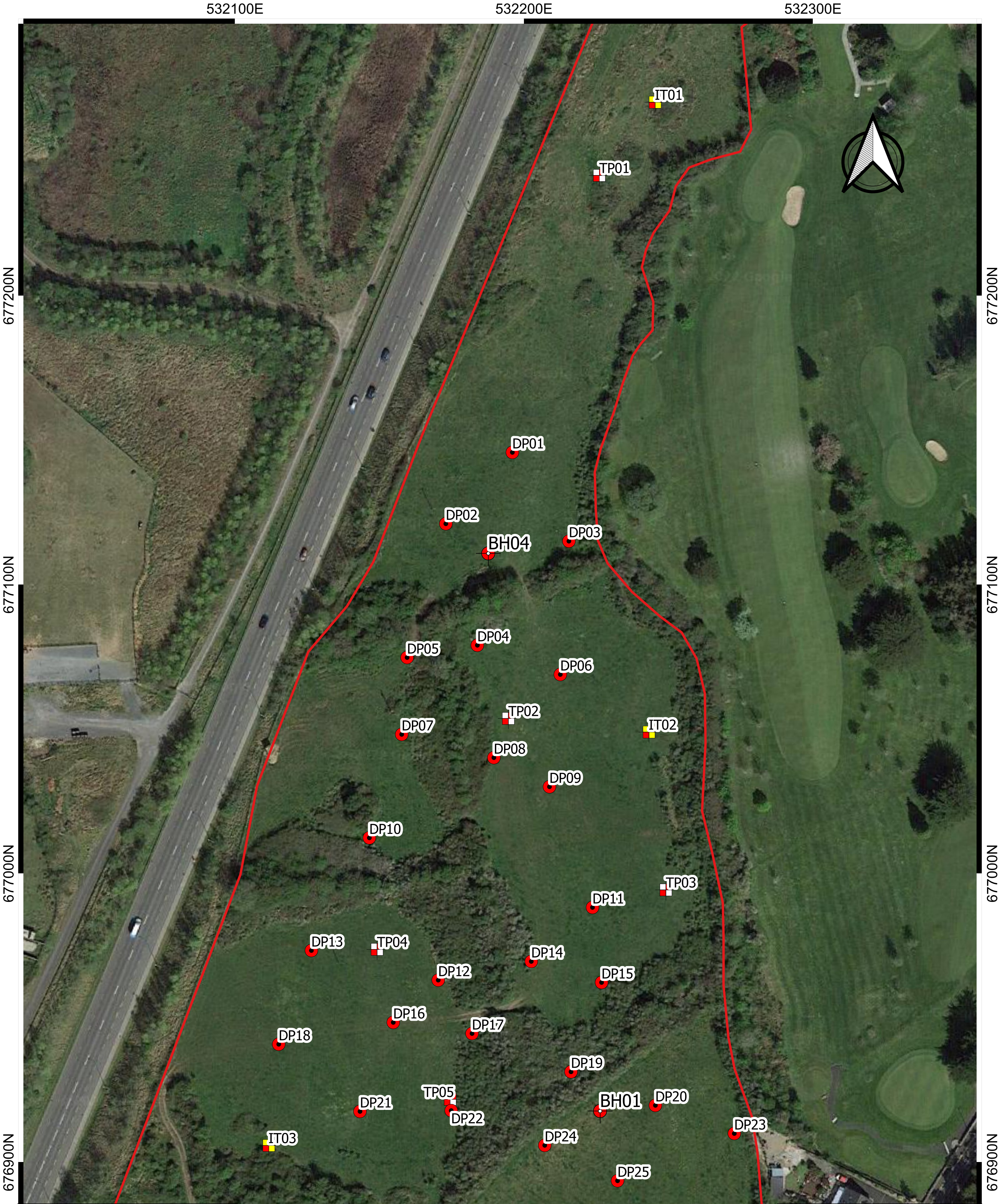
Any waste material to be removed off site should be disposed of to a suitably licenced landfill.

5.5. Soakaway Design

Infiltration rates of f=3.82 x 10^{-5} m/s, 3.91x 10^{-5} m/s and 2.16 x 10^{-5} m/s respectively were calculated for the soakaway locations IT01, IT02 and IT03.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan



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Client:

AKM

0 10 20 30 40 50 m

Project Title:
Site Investigation Ennis

Drawing Title:
Figure 1 Site Location

GII Project Reference:
10809-06-21

Drawn By:
CB

Date:
27/07/2021

- Probes
- Trial Pit
- Boreholes
- Soakaway
- Site Boundary

532000E 532100E 532200E 532300E

676900N 676800N 676700N 676600N

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Client:

AKM

0 10 20 30 40 50 m

Project Title:
Site Investigation Ennis

Drawing Title:
Figure 1 Site Location

GII Project Reference:
10809-06-21

Drawn By:
CB

Date:
27/07/2021

Probes
Trial Pit
Boreholes
Soakaway
Site Boundary

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Trial Pit Number: IT01
Machine : 13T Digger Method : Trial Pit	Dimensions: 1.90 x 0.90 x 1.30	Ground Level (mOD): 10.26	Client: AKM Design	Job Number: 10809-06-21
	Location: 532245.3 E 677266.6 N	Dates: 15/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				10.06	0.20			
					(0.20)	Firm light brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles.		
				9.86	0.40			
					(0.90)	Firm greyish brown slightly sandy slightly gravelly clayey SILT with occasional boulders,		
				8.96	1.30			
						Refusal at 1.30m		

Plan

Remarks

No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Soakaway test IT01 undertaken in pit.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.IT01

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Trial Pit Number: IT02
Machine : 13T Digger Method : Trial Pit	Dimensions: 2.30 x 0.90 x 1.30	Ground Level (mOD): 15.10	Client: AKM Design	Job Number: 10809-06-21
	Location: 532243.2 E 677048.6 N	Dates: 15/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				14.90	(0.20) 0.20	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				13.80	(1.10) 1.30	Firm light brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles and boulders.		
						Refusal at 1.30m		

Plan

Remarks

No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Soakaway test IT02 undertaken in pit.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.IT02

Ground Investigations Ireland Ltd www.gii.ie	Site Site Investigation Ennis	Trial Pit Number **IT03**

Machine : 13T Digger Method : Trial Pit	Dimensions 1.90 x 0.90 x 1.50	Ground Level (mOD) 21.19	Client AKM Design	Job Number 10809-06-21
	Location 532111.6 E 676905.4 N	Dates 15/07/2021	Engineer	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				20.99	0.20	Firm light brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles and boulders.		
					(1.30)			
				19.69	1.50	Complete at 1.50m		

Plan

Remarks

No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Soakaway test IT03 undertaken in pit.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.IT03

Ground Investigations Ireland Ltd
www.gii.ie

Machine : 13T Digger **Method :** Trial Pit	**Dimensions** 2.30 x 0.90 x 1.90	**Ground Level (mOD)** 12.50	**Site** Site Investigation Ennis **Client** AKM Design	**Trial Pit Number** TP01 **Job Number** 10809-06-21
	Location 532226.1 E 677241.3 N	**Dates** 15/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				12.40	(0.10) 0.10	Dark brown slightly sandy slightly organic TOPSOIL with rootlets.		
				12.15	(0.25) 0.35	Firm light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
0.50	B					Firm greyish brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles and boulders.		
1.50	B			10.60	(1.55) 1.90	Refusal: possible rock or boulder.		
						Refusal at 1.90m		

Plan

Remarks

No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP01

Ground Investigations Ireland Ltd www.gii.ie	Site: Site Investigation Ennis	Trial Pit Number: TP02

Machine : 13T Digger Method : Trial Pit	Dimensions: 2.90 x 0.90 x 0.95	Ground Level (mOD): 16.10	Client: AKM Design	Job Number: 10809-06-21
	Location: 532194.6 E 677053.3 N	Dates: 15/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				16.00	(0.10) 0.10	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
					(0.85)	Firm greyish brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
				15.15	0.95	Refusal: possible rock or boulder.		
						Refusal at 0.95m		

Plan

Remarks

No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP02

Ground Investigations Ireland Ltd www.gii.ie		Site: Site Investigation Ennis	Trial Pit Number: TP03
Machine : 13T Digger Method : Trial Pit	Dimensions: 2.20 x 0.70 x 0.85	Ground Level (mOD): 18.83	Client: AKM Design	Job Number: 10809-06-21
	Location: 532249.1 E 676993.9 N	Dates: 15/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				18.73	(0.10) 0.10	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
					(0.75)	Firm greyish brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles.		
0.50 0.50	B B							
				17.98	0.85	Refusal: possible rock or boulder.		
						Refusal at 0.85m		

Plan

Remarks

No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP03

Ground Investigations Ireland Ltd www.gii.ie	Site: Site Investigation Ennis	Trial Pit Number: TP04
Machine : 13T Digger; Method : Trial Pit	Dimensions: 2.10 x 0.90 x 1.25	Ground Level (mOD): 19.57
Client: AKM Design	Job Number: 10809-06-21	
Location: 532149.2 E 676973.3 N	Dates: 15/07/2021	Engineer:
Sheet: 1/1		

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				19.27	0.30	WEATHERED ROCK: Brown/grey slightly sandy clayey coarse angular GRAVEL with some angular cobbles and boulders.		
					(0.95)			
1.00	B							
				18.32	1.25	Refusal: rock.		
						Refusal at 1.25m		

Plan

Remarks

No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP04

Ground Investigations Ireland Ltd www.gii.ie	Site Site Investigation Ennis	Trial Pit Number **TP05**

Machine : 13T Digger Method : Trial Pit	Dimensions 2.10 x 0.70 x 0.60	Ground Level (mOD) 20.75	Client AKM Design	Job Number 10809-06-21
	Location 532174.4 E 676921.4 N	Dates 15/07/2021	Engineer	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				20.60	0.15	WEATHERED ROCK: Brown/grey slightly sandy clayey coarse angular GRAVEL with occasional angular cobbles and boulders.		
					(0.45)			
				20.15	0.60	Refusal: rock.		
						Refusal at 0.60m		

Plan

Remarks

Two attempts made at digging to depth. Refusal at 0.55m BGL and 0.60m BGL.
No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP05

Ground Investigations Ireland Ltd www.gii.ie	Site Site Investigation Ennis	Trial Pit Number **TP06**

Machine : 13T Digger Method : Trial Pit	Dimensions 2.50 x 0.60 x 0.45	Ground Level (mOD) 25.01	Client AKM Design	Job Number 10809-06-21
	Location 532162.4 E 676829.3 N	Dates 14/07/2021	Engineer	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				24.91	(0.10) 0.10	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				24.56	(0.35) 0.45	Firm light brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles. Refusal: possible rock or boulder.		
						Refusal at 0.45m		

Plan

Remarks

Two attempts made at digging to depth. Refusal at 0.35m BGL and 0.45m BGL.
No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP06

Ground Investigations Ireland Ltd www.gii.ie		Site Site Investigation Ennis	Trial Pit Number **TP07**
Machine : 13T Digger **Method :** Trial Pit	**Dimensions** 3.90 x 0.60 x 3.20	**Ground Level (mOD)** 26.15	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532207.9 E 676840.3 N	**Dates** 14/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				25.85	0.30	Firm light brown slightly sandy slightly gravelly silty CLAY.		
					(0.30)			
0.50	B							
				25.55	0.60	Firm greyish brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles and boulders.		
1.50	B							
					(2.60)			
2.50	B							
				22.95	3.20	Refusal: possible rock or boulder.		
						Refusal at 3.20m		

Plan

Remarks

No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP07

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Machine : 13T Digger **Method :** Trial Pit	**Dimensions** 3.70 x 0.60 x 0.80	**Ground Level (mOD)** 24.59	**Site** Site Investigation Ennis **Client** AKM Design	**Trial Pit Number** TP08 **Job Number** 10809-06-21
	Location 532089.8 E 676824.1 N	**Dates** 14/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				24.44	(0.15) 0.15	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
0.50	B			23.79	(0.65) 0.80	Soft to firm light brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles. Refusal: possible rock or boulder.		
						Refusal at 0.80m		

Plan

Remarks

Two attempts made at digging to depth. Refusal at 0.60m BGL and 0.80m BGL.
No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP08

Ground Investigations Ireland Ltd
www.gii.ie

Site	Trial Pit Number
Site Investigation Ennis	**TP09**

Machine	Method	Dimensions	Ground Level (mOD)	Client	Job Number
13T Digger	Trial Pit	2.20 x 0.70 x 1.40	27.09	AKM Design	10809-06-21

Location	Dates	Engineer	Sheet
532157.1 E 676781.6 N	14/07/2021		1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				26.89	0.20	Firm greyish brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles and boulders.		
0.50	B							
0.50	B							
					(1.20)			
				25.69	1.40	Refusal: possible rock or boulder.		
						Refusal at 1.40m		

Plan

Remarks

No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP09

Ground Investigations Ireland Ltd www.gii.ie	Site: Site Investigation Ennis	Trial Pit Number: TP10

Machine : 13T Digger Method : Trial Pit	Dimensions: 3.40 x 0.70 x 2.40	Ground Level (mOD): 29.65	Client: AKM Design	Job Number: 10809-06-21
	Location: 532073.8 E 676772.3 N	Dates: 14/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				29.45	0.20			
					(0.40)	Firm light brown slightly sandy slightly gravelly silty CLAY with occasional subangular to subrounded cobbles and boulders.		
0.50	B							
				29.05	0.60			
1.50	B				(1.80)	Firm greyish brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles and boulders.		
				27.25	2.40			
						Refusal at 2.40m		

Plan

Remarks

No groundwater encountered during excavation.
Trial pit sidewall collapsing.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP10

Ground Investigations Ireland Ltd www.gii.ie		Site: Site Investigation Ennis	Trial Pit Number: TP11
Machine: 13T Digger Method: Trial Pit	Dimensions: 2.60 x 0.60 x 1.40	Ground Level (mOD): 26.84	Client: AKM Design	Job Number: 10809-06-21
	Location: 532218.4 E 676711 N	Dates: 14/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				26.64	0.20 (0.15)	Firm light brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles.		
				26.49	0.35	Firm greyish brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles.		
0.50	B							
					(1.05)			
				25.44	1.40	Refusal: possible rock or boulder.		
						Refusal at 1.40m		

Plan

Remarks

No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP11

Ground Investigations Ireland Ltd www.gii.ie			Site Site Investigation Ennis	Trial Pit Number **TP12**
Machine : 13T Digger **Method :** Trial Pit	**Dimensions** 3.20 x 0.60 x 3.00	**Ground Level (mOD)** 28.54	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532125.9 E 676658.4 N	**Dates** 14/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				28.34	(0.20) 0.20	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
0.50 0.50	B B							
				27.34	(1.00) 1.20	Firm light brown slightly sandy slightly gravelly silty CLAY with occasional subangular to subrounded cobbles and boulders.		
1.50 1.50	B B							
2.50 2.50	B B							
				25.54	(1.80) 3.00	Soft to firm greyish brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles and boulders.		
						Abandoned at 3.00m		

Plan

Remarks

No groundwater encountered during excavation.
Trial pit sidewall collapsing.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP12

Ground Investigations Ireland Ltd www.gii.ie			Site Site Investigation Ennis	Trial Pit Number **TP13**
Machine : 13T Digger **Method :** Trial Pit	**Dimensions** 2.20 x 0.60 x 0.60	**Ground Level (mOD)** 26.72	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532152.6 E 676628 N	**Dates** 14/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				26.57	(0.15) 0.15	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
				26.12	(0.45) 0.60	Firm light brown slightly sandy slightly gravelly clayey SILT with occasional subangular to subrounded cobbles.		
						Refusal: possible rock or boulder.		
						Refusal at 0.60m		

Plan

Remarks

Two attempts made at digging to depth. Refusal at 0.60m BGL and 0.55m BGL.
No groundwater encountered during excavation.
Slight spalling of trial pit wall.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	C. Byrne	10809-06-21.TP13

Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP01






Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP02






Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP03






Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP04






Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP05






Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP06






Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP07






Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP08






Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP09

Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP10






Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP11

Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP12






Trial Pit Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

TP13






Soakaway Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

IT01






Soakaway Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

IT02






Soakaway Photographs – Site Investigation Ennis
AKM Design – 10809-06-21

IT03






APPENDIX 3 – Dynamic Probe Records

www.gii.ie

Ground Investigations Ireland Ltd
www.gii.ie

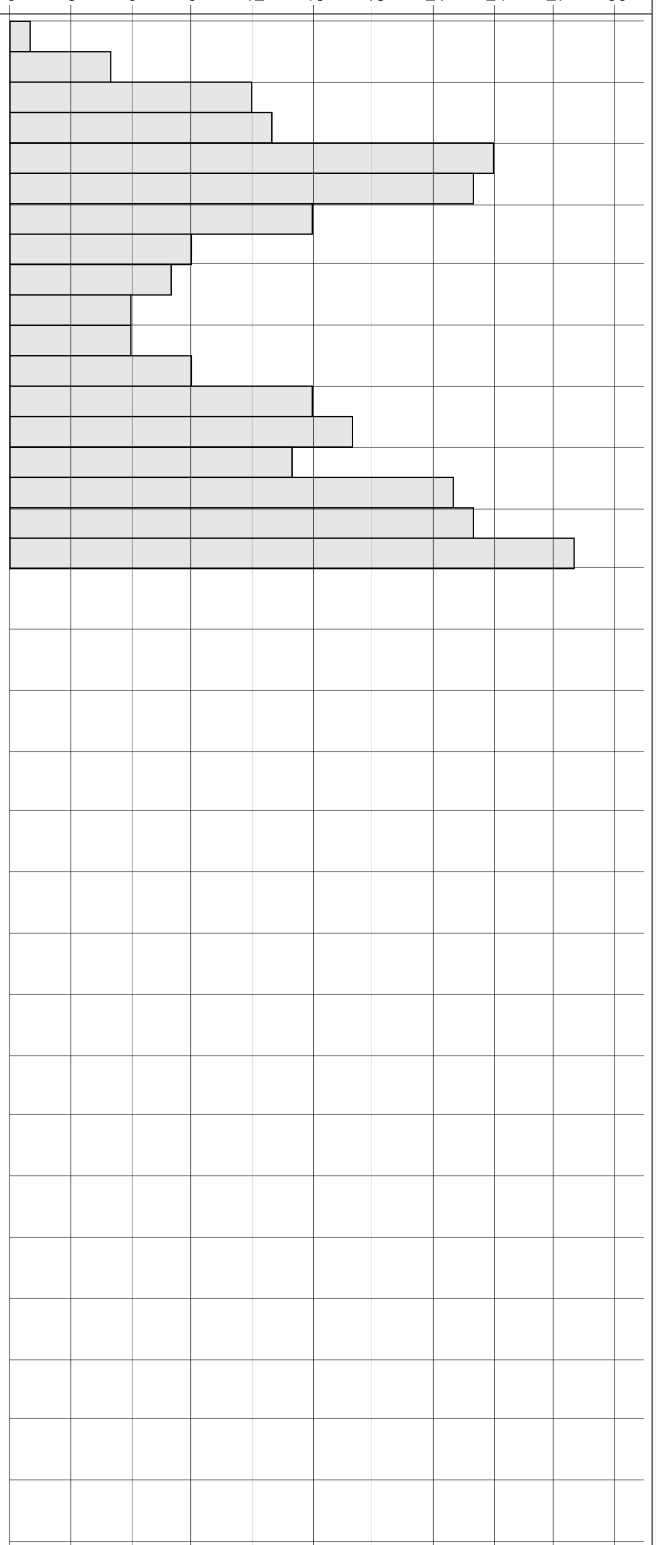
Site	Probe Number
Site Investigation Ennis	DPH01

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	15.94	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532196 E 677145.9 N	21/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	1	
0.10-0.20	5	
0.20-0.30	12	
0.30-0.40	13	
0.40-0.50	24	
0.50-0.60	23	
0.60-0.70	15	
0.70-0.80	9	
0.80-0.90	8	
0.90-1.00	6	
1.00-1.10	6	
1.10-1.20	9	
1.20-1.30	15	
1.30-1.40	17	
1.40-1.50	14	
1.50-1.60	22	
1.60-1.70	23	
1.70-1.80	28	

Level (mOD)	Depth (m)
15.94	0.00
15.44	0.50
14.94	1.00
14.44	1.50
13.94	2.00
13.44	2.50
12.94	3.00
12.44	3.50
11.94	4.00
11.44	4.50
10.94	5.00

Blows for Depth Increment



Remarks
Refusal at 1.80m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH01

Ground Investigations Ireland Ltd
www.gii.ie

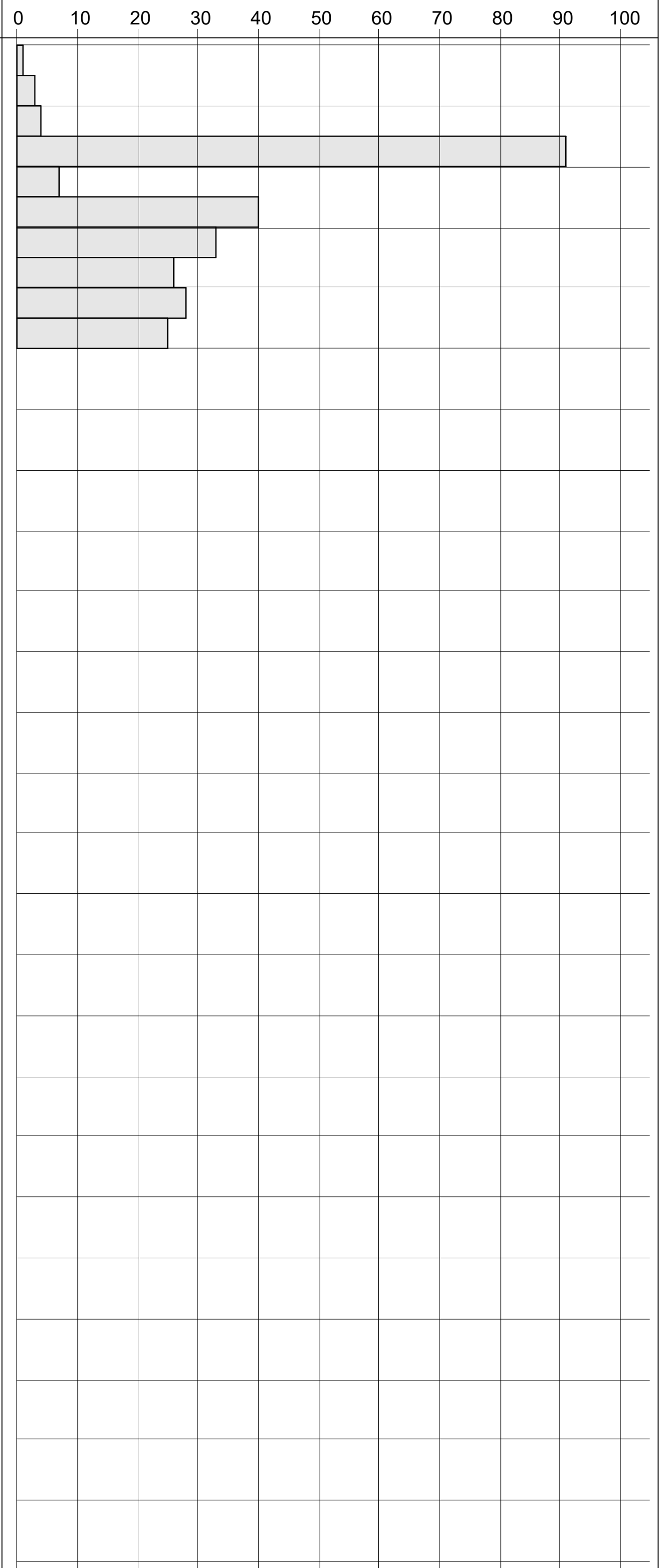
Site	Probe Number
Site Investigation Ennis	DPH02

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	16.13	AKM Design	10809-06-21

Location	Dates	Engineer	Sheet
532173 E 677121.2 N	21/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	1		16.13	0.00
0.10-0.20	3			
0.20-0.30	4			
0.30-0.40	91			
0.40-0.50	7			
0.50-0.60	40		15.63	0.50
0.60-0.70	33			
0.70-0.80	26			
0.80-0.90	28			
0.90-1.00	25			
			15.13	1.00
			14.63	1.50
			14.13	2.00
			13.63	2.50
			13.13	3.00
			12.63	3.50
			12.13	4.00
			11.63	4.50
			11.13	5.00

Blows for Depth Increment



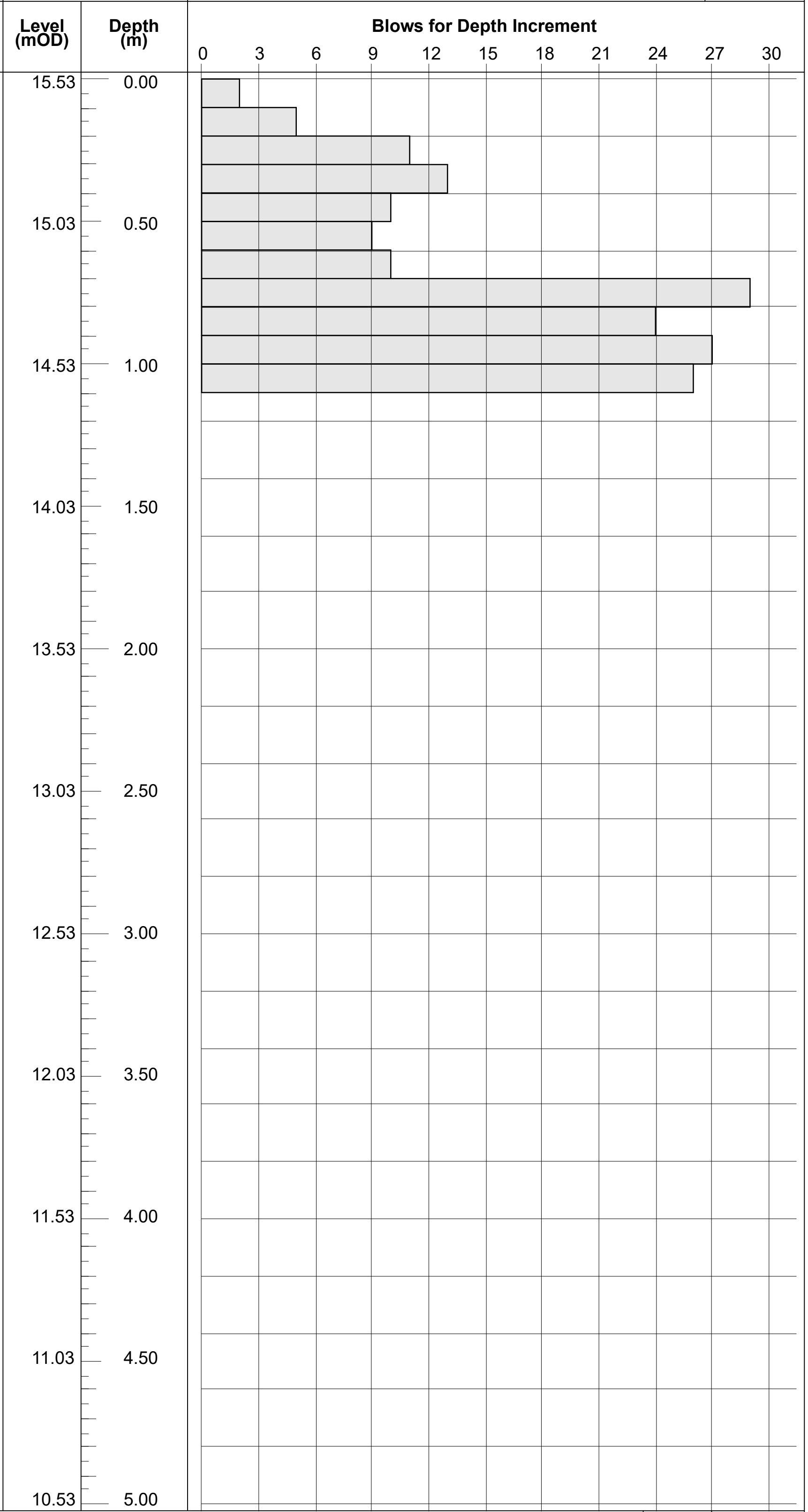
Remarks
Refusal at 1.00m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH02

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH03
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 15.53	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532215.6 E 677115.2 N	**Dates** 21/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	5	
0.20-0.30	11	
0.30-0.40	13	
0.40-0.50	10	
0.50-0.60	9	
0.60-0.70	10	
0.70-0.80	29	
0.80-0.90	24	
0.90-1.00	27	
1.00-1.10	26	



Remarks
Refusal at 1.10m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

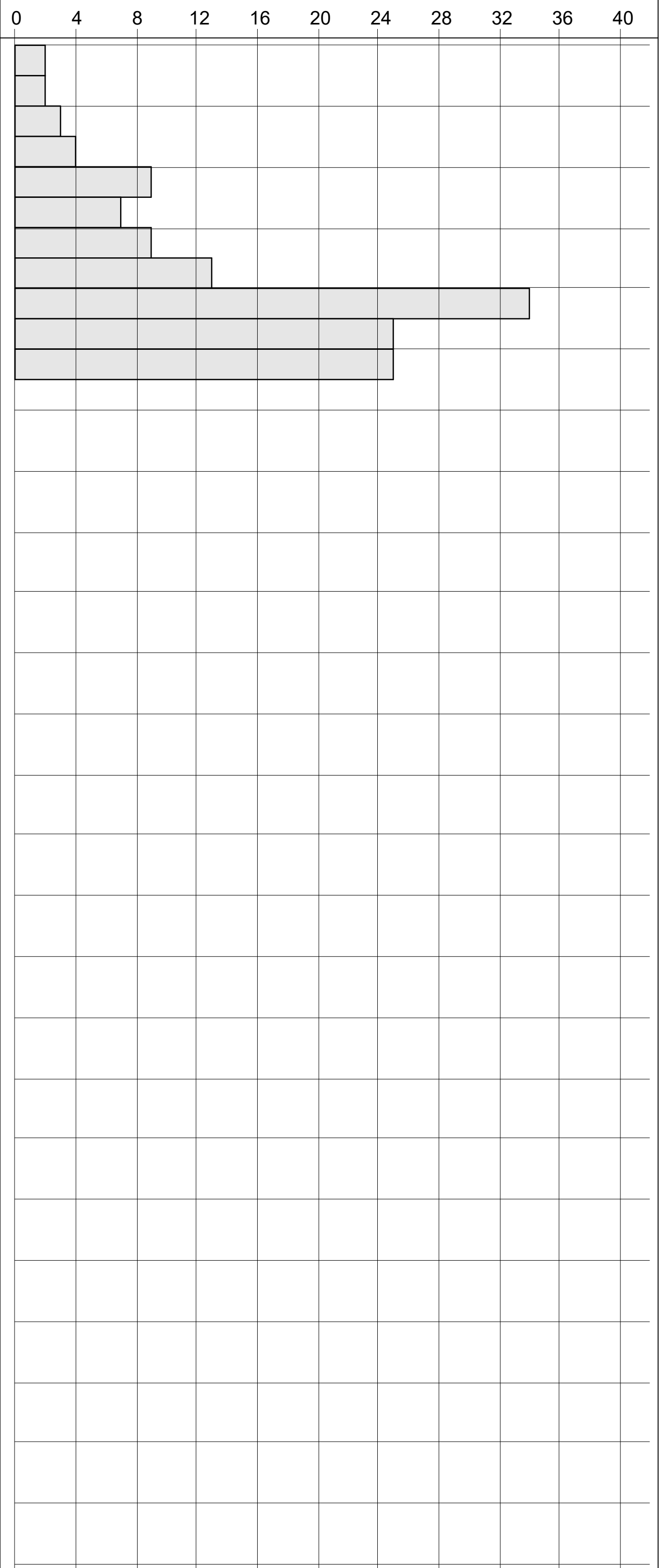
Figure No. 10809-06-21.DPH03

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: **DPH04**
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 16.64	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532183.9 E 677079.1 N	**Dates** 21/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	2	
0.20-0.30	3	
0.30-0.40	4	
0.40-0.50	9	
0.50-0.60	7	
0.60-0.70	9	
0.70-0.80	13	
0.80-0.90	34	
0.90-1.00	25	
1.00-1.10	25	

Level (mOD)	Depth (m)
16.64	0.00
16.14	0.50
15.64	1.00
15.14	1.50
14.64	2.00
14.14	2.50
13.64	3.00
13.14	3.50
12.64	4.00
12.14	4.50
11.64	5.00

Blows for Depth Increment



Remarks
Refusal at 1.10m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

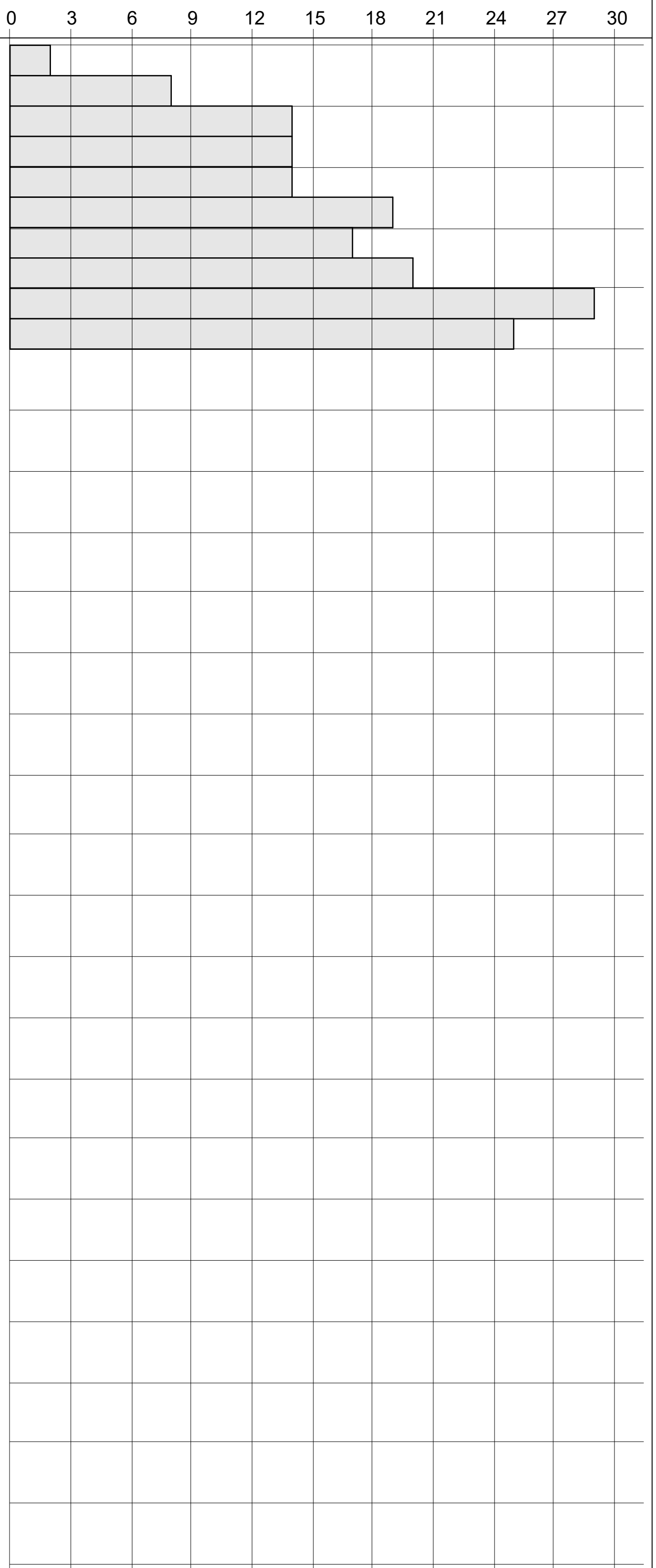
Figure No. 10809-06-21.DPH04

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: **DPH05**
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions**: Diameter 43.7mm, Angle 0°	**Ground Level (mOD)**: 16.63	**Client**: AKM Design	**Job Number**: 10809-06-21
	Location: 532159.6 E 677074.9 N	**Dates**: 21/07/2021	**Engineer**:	**Sheet**: 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	8	
0.20-0.30	14	
0.30-0.40	14	
0.40-0.50	14	
0.50-0.60	19	
0.60-0.70	17	
0.70-0.80	20	
0.80-0.90	29	
0.90-1.00	25	

Level (mOD)	Depth (m)
16.63	0.00
16.13	0.50
15.63	1.00
15.13	1.50
14.63	2.00
14.13	2.50
13.63	3.00
13.13	3.50
12.63	4.00
12.13	4.50
11.63	5.00

Blows for Depth Increment



Remarks
Refusal at 1.00m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

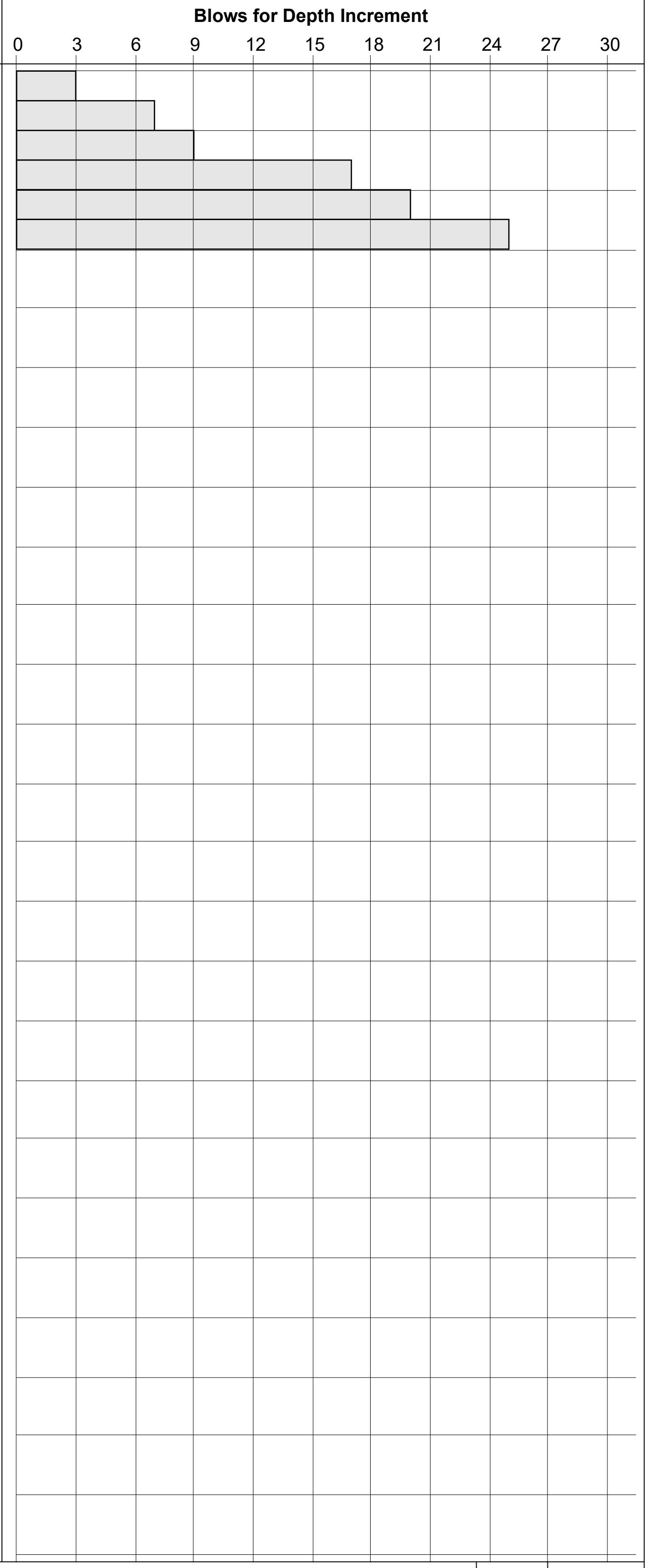
Figure No. 10809-06-21.DPH05

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Site Investigation Ennis	DPH06

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	16.16	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532212.6 E 677069.1 N	21/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	3		16.16	0.00
0.10-0.20	7			
0.20-0.30	9			
0.30-0.40	17			
0.40-0.50	20			
0.50-0.60	25		15.66	0.50
			15.16	1.00
			14.66	1.50
			14.16	2.00
			13.66	2.50
			13.16	3.00
			12.66	3.50
			12.16	4.00
			11.66	4.50
			11.16	5.00



Remarks
Refusal at 1.60m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

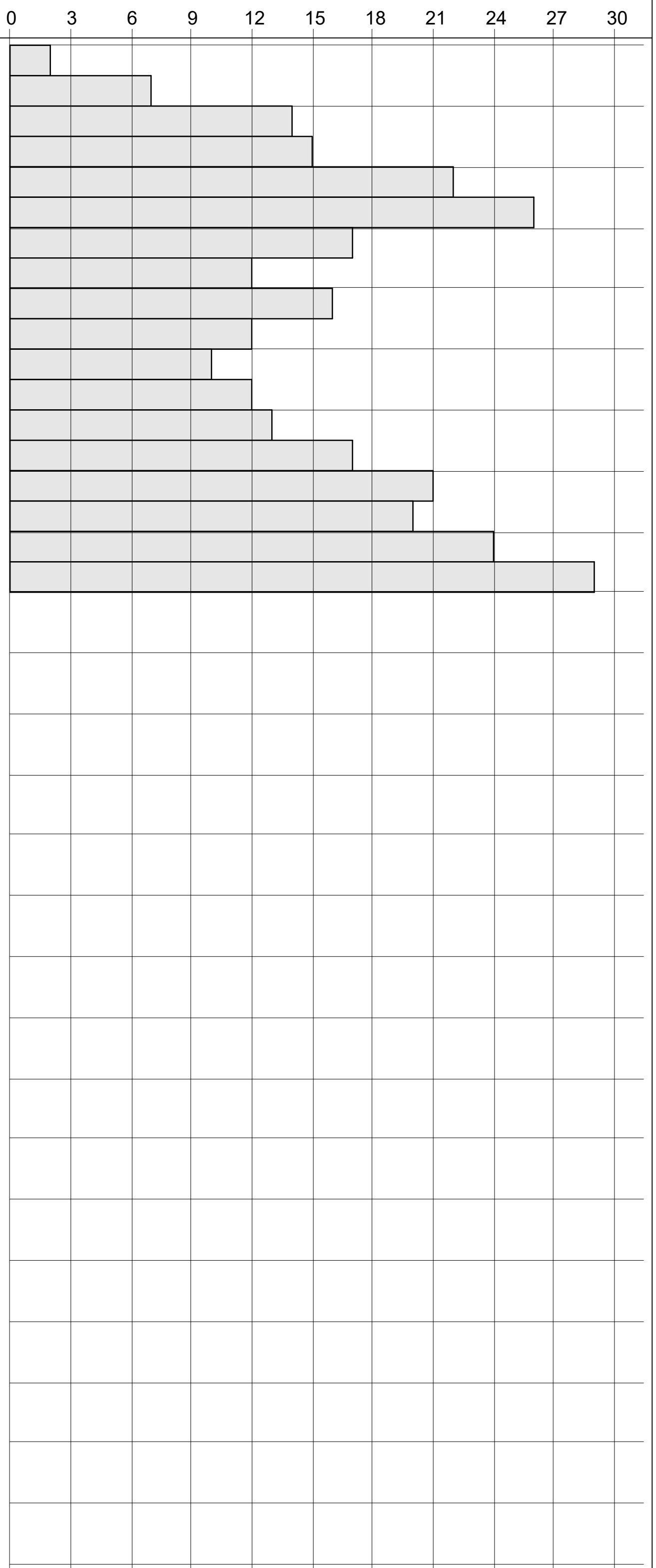
Figure No.
10809-06-21.DPH06

Ground Investigations Ireland Ltd www.gii.ie		Site: Site Investigation Ennis	Probe Number: **DPH07**
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0° / **Ground Level (mOD)** 17.44	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532157.7 E 677048.3 N / **Dates** 21/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	7	
0.20-0.30	14	
0.30-0.40	15	
0.40-0.50	22	
0.50-0.60	26	
0.60-0.70	17	
0.70-0.80	12	
0.80-0.90	16	
0.90-1.00	12	
1.00-1.10	10	
1.10-1.20	12	
1.20-1.30	13	
1.30-1.40	17	
1.40-1.50	21	
1.50-1.60	20	
1.60-1.70	24	
1.70-1.80	29	

Level (mOD)	Depth (m)
17.44	0.00
16.94	0.50
16.44	1.00
15.94	1.50
15.44	2.00
14.94	2.50
14.44	3.00
13.94	3.50
13.44	4.00
12.94	4.50
12.44	5.00

Blows for Depth Increment



Remarks
Refusal at 1.80m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No. 10809-06-21.DPH07

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Site Investigation Ennis	DPH08

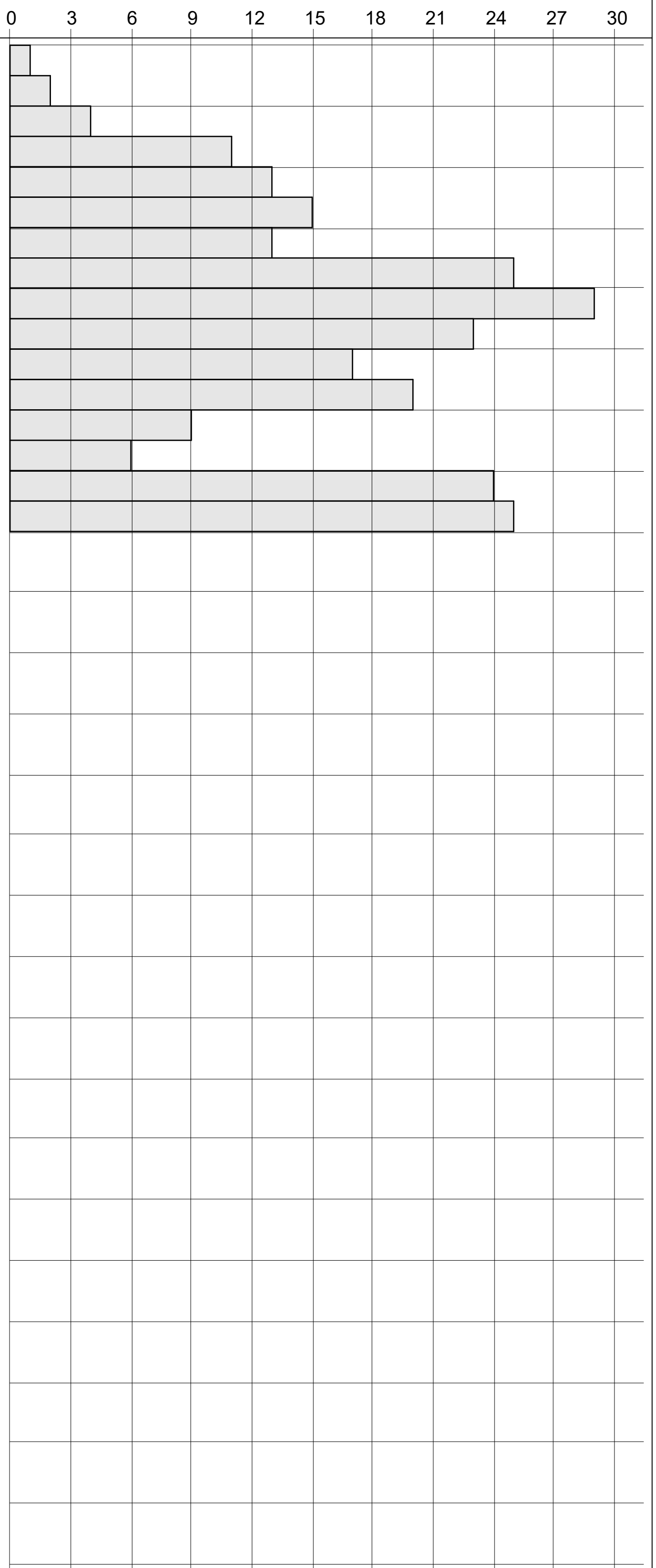
Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	15.82	AKM Design	10809-06-21

Location	Dates	Engineer	Sheet
532189.6 E 677040.3 N	21/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	1	
0.10-0.20	2	
0.20-0.30	4	
0.30-0.40	11	
0.40-0.50	13	
0.50-0.60	15	
0.60-0.70	13	
0.70-0.80	25	
0.80-0.90	29	
0.90-1.00	23	
1.00-1.10	17	
1.10-1.20	20	
1.20-1.30	9	
1.30-1.40	6	
1.40-1.50	24	
1.50-1.60	25	

Level (mOD)	Depth (m)
15.82	0.00
15.32	0.50
14.82	1.00
14.32	1.50
13.82	2.00
13.32	2.50
12.82	3.00
12.32	3.50
11.82	4.00
11.32	4.50
10.82	5.00

Blows for Depth Increment



Remarks
Refusal at 1.60m BGL.

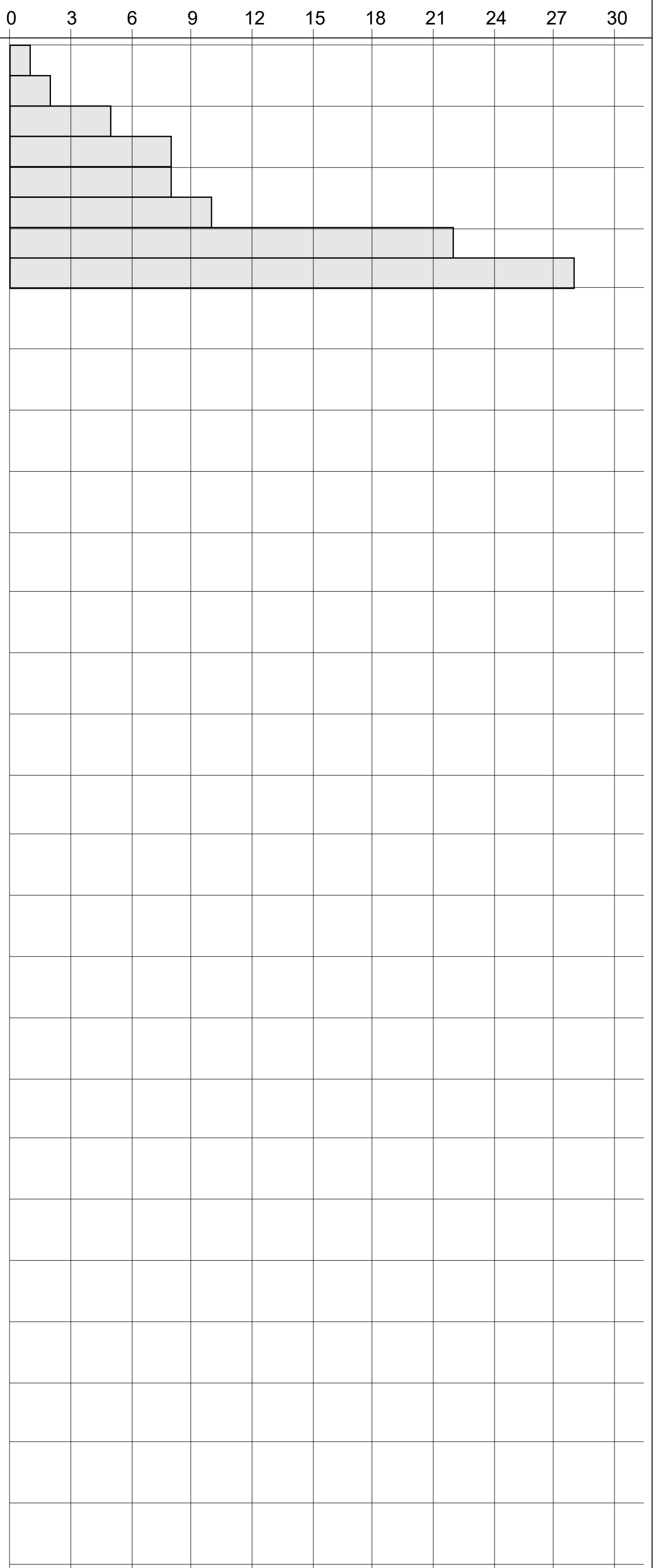
Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH08

Ground Investigations Ireland Ltd www.gii.ie			Site Site Investigation Ennis	Probe Number DPH09
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions Diameter 43.7mm, Angle 0°	Ground Level (mOD) 15.91	Client AKM Design	Job Number 10809-06-21
	Location 532208.9 E 677030.1 N	Dates 21/07/2021	Engineer	Sheet 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	1		15.91	0.00
0.10-0.20	2			
0.20-0.30	5			
0.30-0.40	8			
0.40-0.50	8			
0.50-0.60	10		15.41	0.50
0.60-0.70	22			
0.70-0.80	28			
			14.91	1.00
			14.41	1.50
			13.91	2.00
			13.41	2.50
			12.91	3.00
			12.41	3.50
			11.91	4.00
			11.41	4.50
			10.91	5.00

Blows for Depth Increment



Remarks
Refusal at 0.80m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

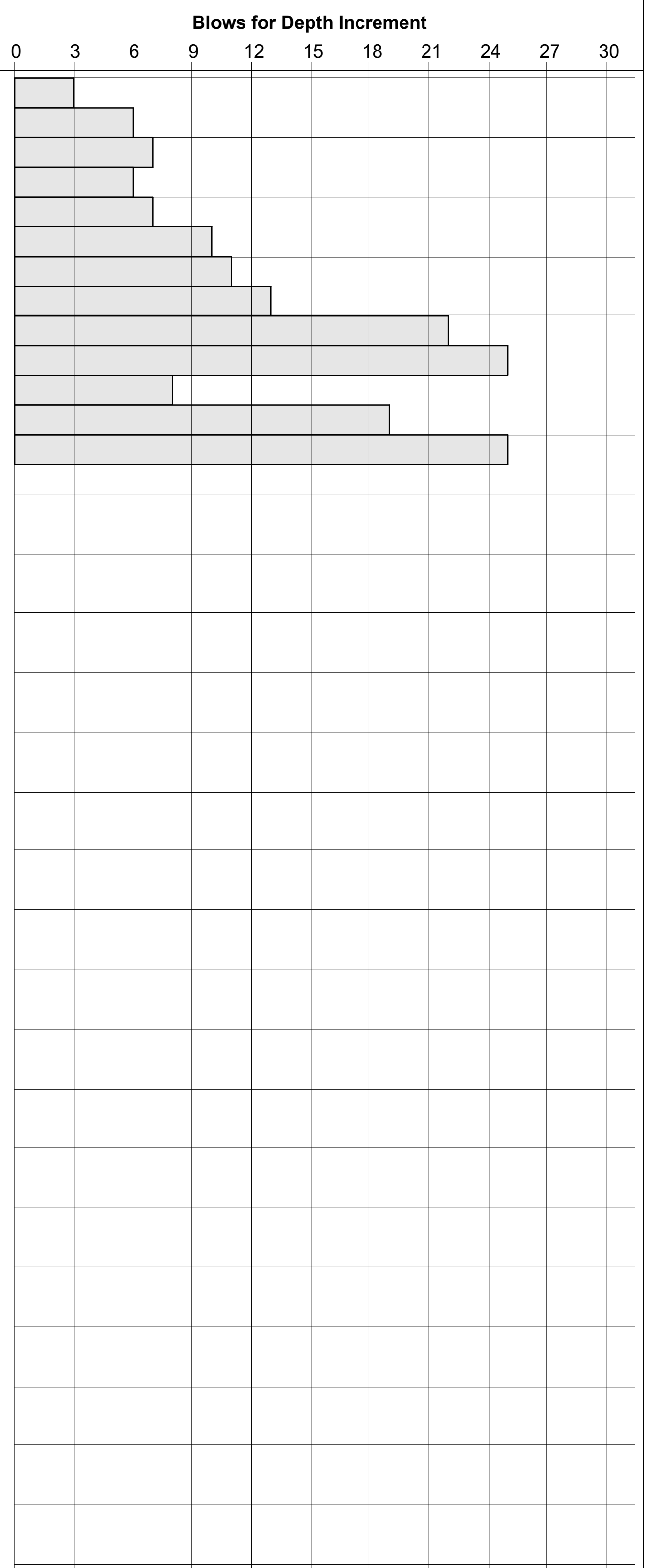
Figure No.
10809-06-21.DPH09

Ground Investigations Ireland Ltd www.gii.ie	Site Site Investigation Ennis	Probe Number **DPH10**

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	14.70	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532146.5 E 677012.4 N	21/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	3	
0.10-0.20	6	
0.20-0.30	7	
0.30-0.40	6	
0.40-0.50	7	
0.50-0.60	10	
0.60-0.70	11	
0.70-0.80	13	
0.80-0.90	22	
0.90-1.00	25	
1.00-1.10	8	
1.10-1.20	19	
1.20-1.30	25	

Level (mOD)	Depth (m)
14.70	0.00
14.20	0.50
13.70	1.00
13.20	1.50
12.70	2.00
12.20	2.50
11.70	3.00
11.20	3.50
10.70	4.00
10.20	4.50
9.70	5.00



Remarks
Refusal at 1.30m BGL.

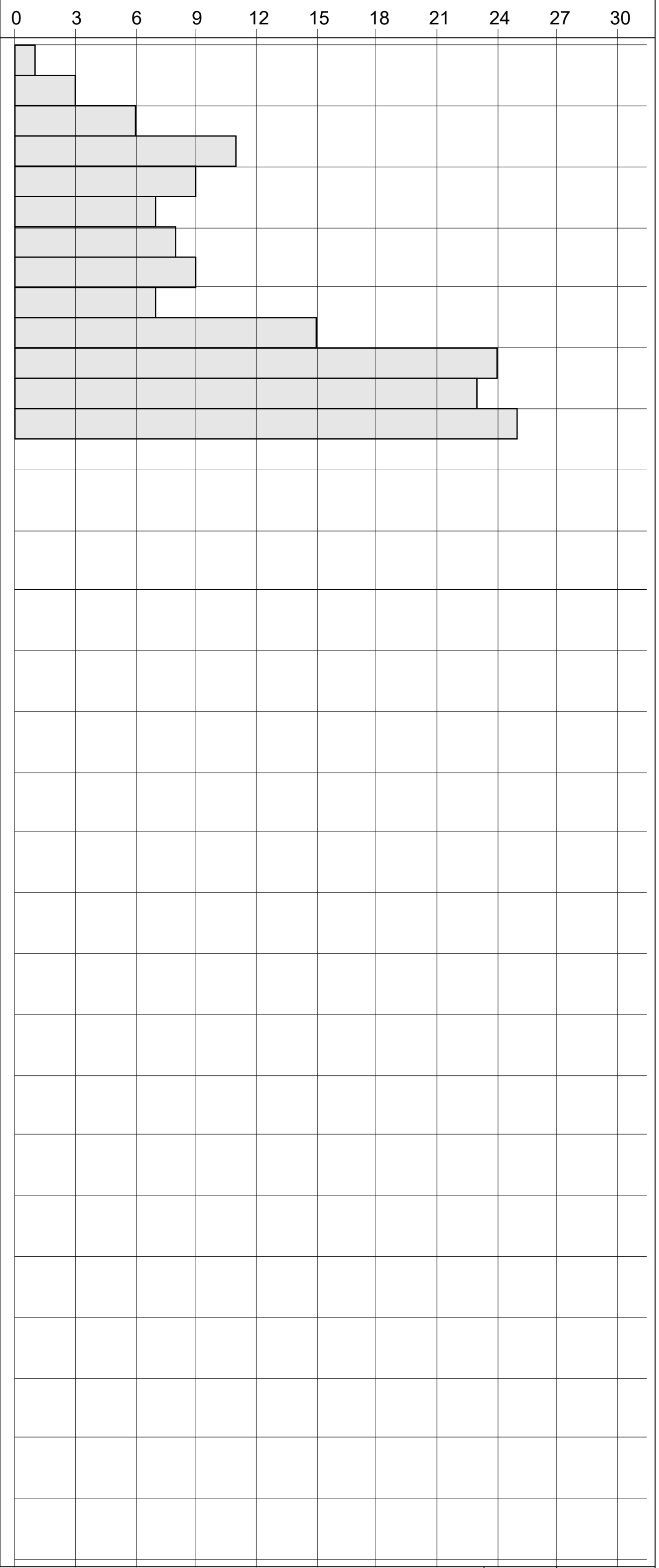
Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH10

Ground Investigations Ireland Ltd www.gii.ie		Site Site Investigation Ennis	Probe Number DPH11
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions Diameter 43.7mm, Angle 0°	Ground Level (mOD) 18.30	Client AKM Design	Job Number 10809-06-21
	Location 532223.8 E 676988.4 N	Dates 21/07/2021	Engineer	Sheet 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	1		18.30	0.00
0.10-0.20	3			
0.20-0.30	6			
0.30-0.40	11			
0.40-0.50	9			
0.50-0.60	7		17.80	0.50
0.60-0.70	8			
0.70-0.80	9			
0.80-0.90	7			
0.90-1.00	15			
1.00-1.10	24		17.30	1.00
1.10-1.20	23			
1.20-1.30	25			
			16.80	1.50
			16.30	2.00
			15.80	2.50
			15.30	3.00
			14.80	3.50
			14.30	4.00
			13.80	4.50
			13.30	5.00

Blows for Depth Increment



Remarks
Refusal at 1.30m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH11

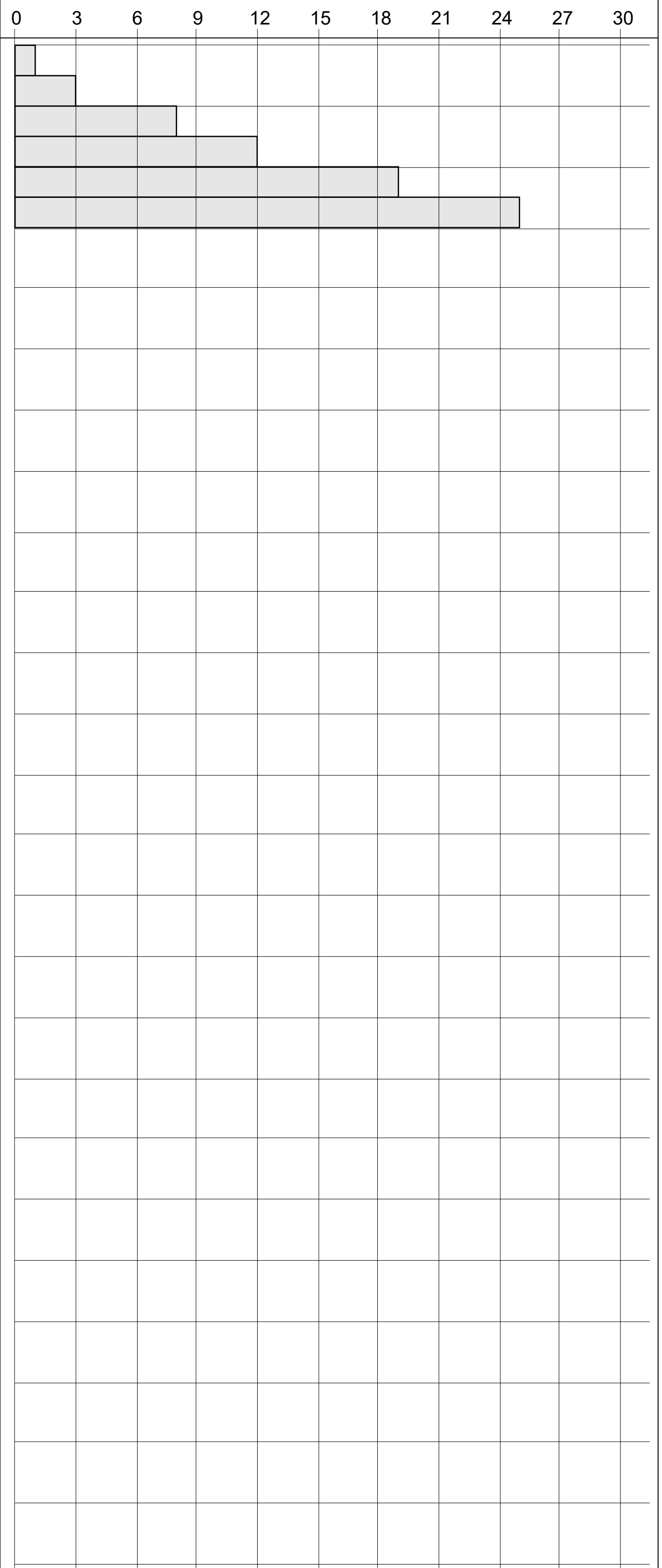
Ground Investigations Ireland Ltd www.gii.ie	Site: Site Investigation Ennis	Probe Number: DPH12

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	19.52	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532170.4 E 676963.2 N	21/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	1	
0.10-0.20	3	
0.20-0.30	8	
0.30-0.40	12	
0.40-0.50	19	
0.50-0.60	25	

Level (mOD)	Depth (m)
19.52	0.00
19.02	0.50
18.52	1.00
18.02	1.50
17.52	2.00
17.02	2.50
16.52	3.00
16.02	3.50
15.52	4.00
15.02	4.50
14.52	5.00

Blows for Depth Increment



Remarks
Refusal at 0.60m BGL.

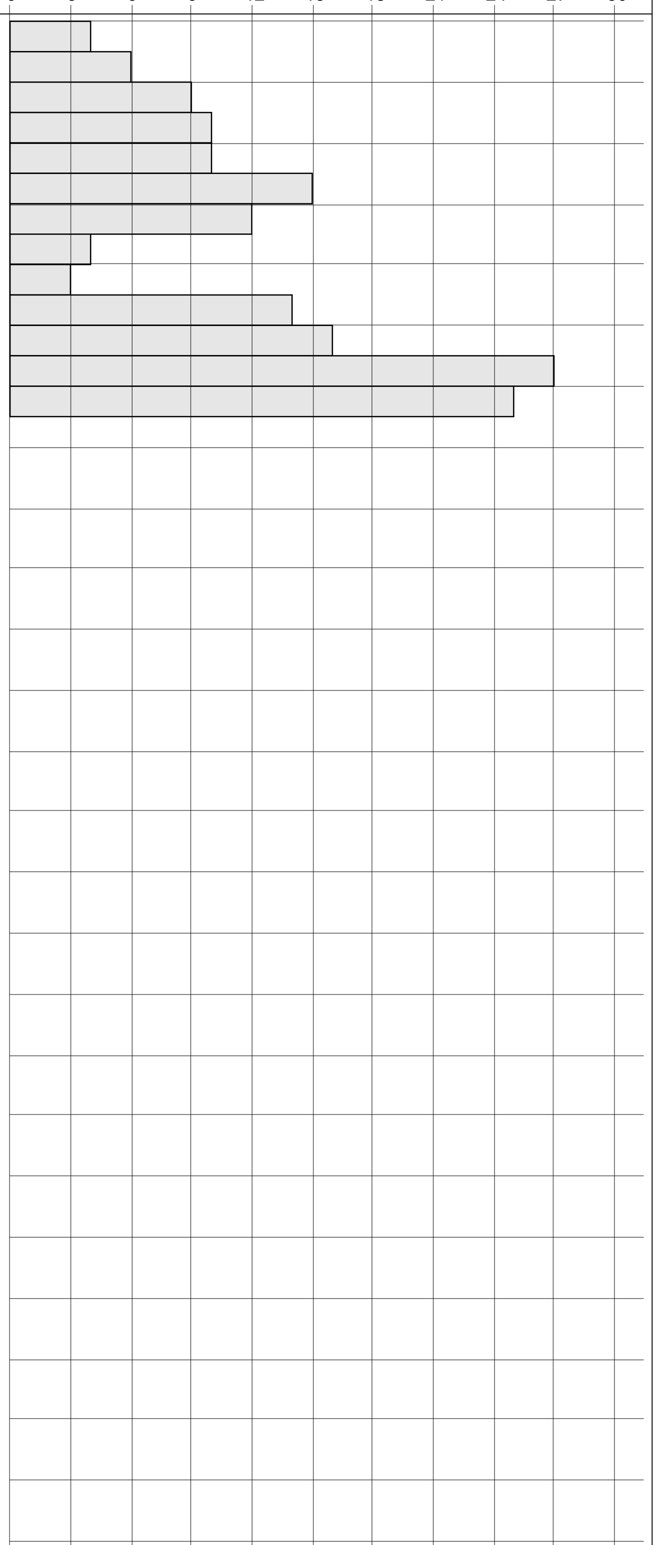
Scale (approx)	Logged By
1:25	C. Byrne

Figure No. 10809-06-21.DPH12

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH13
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 20.29	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532126.4 E 676973.4 N	**Dates** 21/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	4		20.29	0.00
0.10-0.20	6			
0.20-0.30	9			
0.30-0.40	10			
0.40-0.50	10			
0.50-0.60	15		19.79	0.50
0.60-0.70	12			
0.70-0.80	4			
0.80-0.90	3			
0.90-1.00	14			
1.00-1.10	16		19.29	1.00
1.10-1.20	27			
1.20-1.30	25			
			18.79	1.50
			18.29	2.00
			17.79	2.50
			17.29	3.00
			16.79	3.50
			16.29	4.00
			15.79	4.50
			15.29	5.00

Blows for Depth Increment



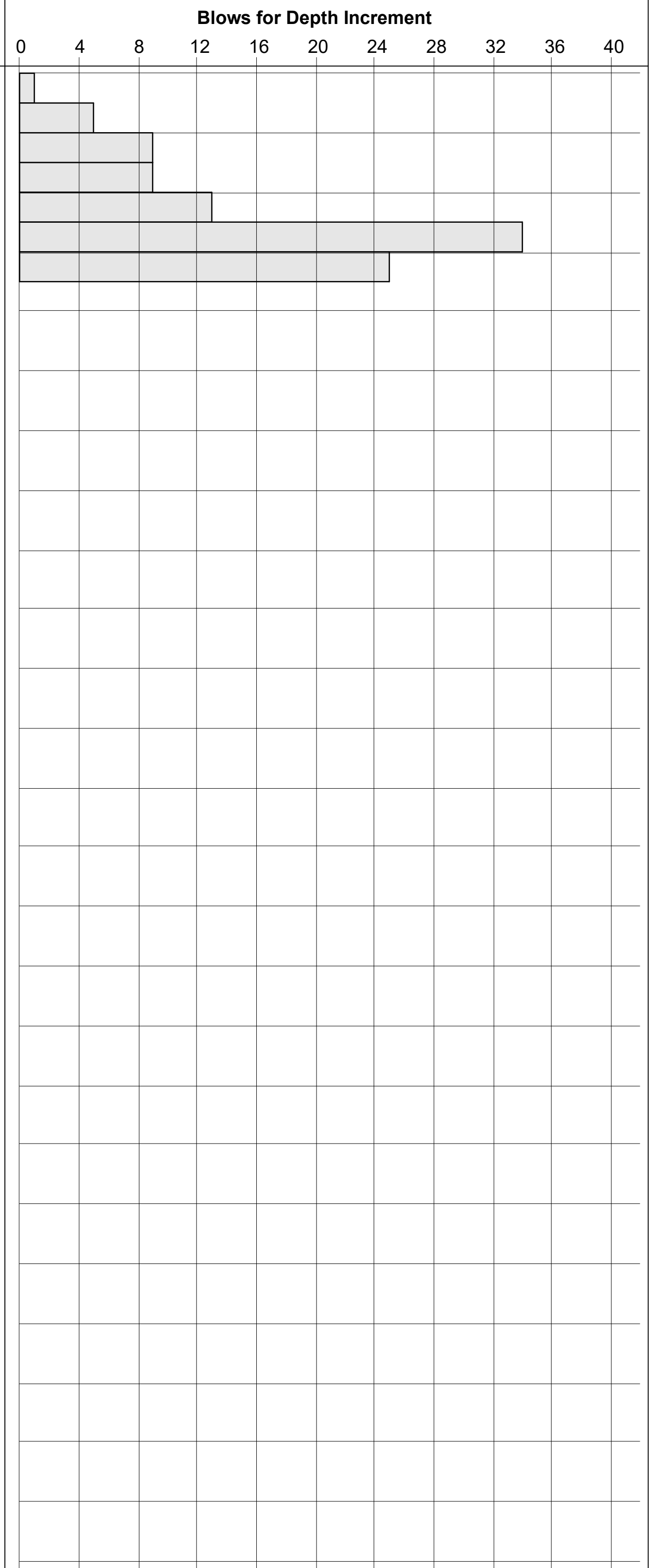
Remarks
Refusal at 1.30m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No. 10809-06-21.DPH13

Ground Investigations Ireland Ltd www.gii.ie		Site: Site Investigation Ennis	Probe Number: DPH14
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions: Diameter 43.7mm, Angle 0°	Ground Level (mOD): 18.90	Client: AKM Design	Job Number: 10809-06-21
	Location: 532202.6 E 676969.7 N	Dates: 21/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	1		18.90	0.00
0.10-0.20	5			
0.20-0.30	9			
0.30-0.40	9			
0.40-0.50	13			
0.50-0.60	34		18.40	0.50
0.60-0.70	25			
			17.90	1.00
			17.40	1.50
			16.90	2.00
			16.40	2.50
			15.90	3.00
			15.40	3.50
			14.90	4.00
			14.40	4.50
			13.90	5.00



Remarks
Refusal at 0.70m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No. 10809-06-21.DPH14

Ground Investigations Ireland Ltd
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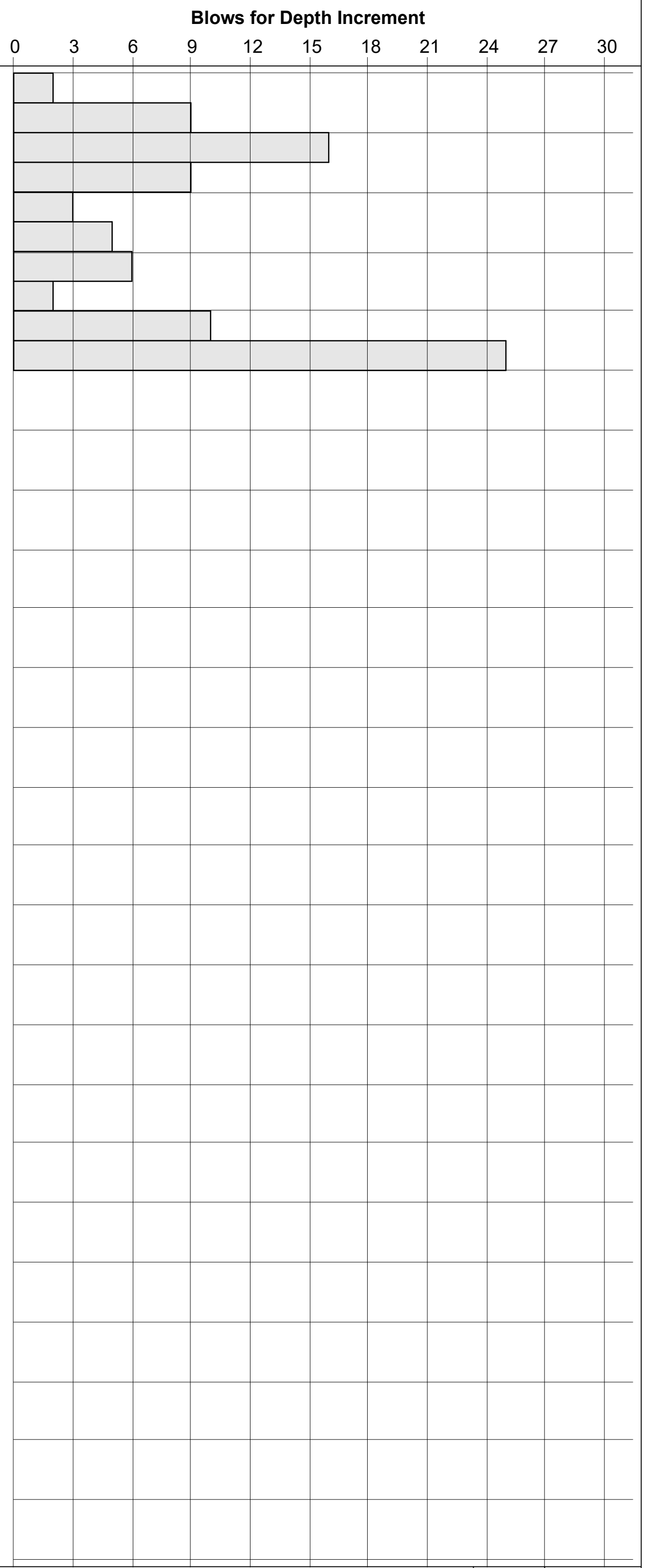
Site	Probe Number
Site Investigation Ennis	DPH15

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	18.86	AKM Design	10809-06-21

Location	Dates	Engineer	Sheet
532226.9 E 676962.4 N	21/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	9	
0.20-0.30	16	
0.30-0.40	9	
0.40-0.50	3	
0.50-0.60	5	
0.60-0.70	6	
0.70-0.80	2	
0.80-0.90	10	
0.90-1.00	25	

Level (mOD)	Depth (m)
18.86	0.00
18.36	0.50
17.86	1.00
17.36	1.50
16.86	2.00
16.36	2.50
15.86	3.00
15.36	3.50
14.86	4.00
14.36	4.50
13.86	5.00



Remarks
Refusal at 1.00m BGL.

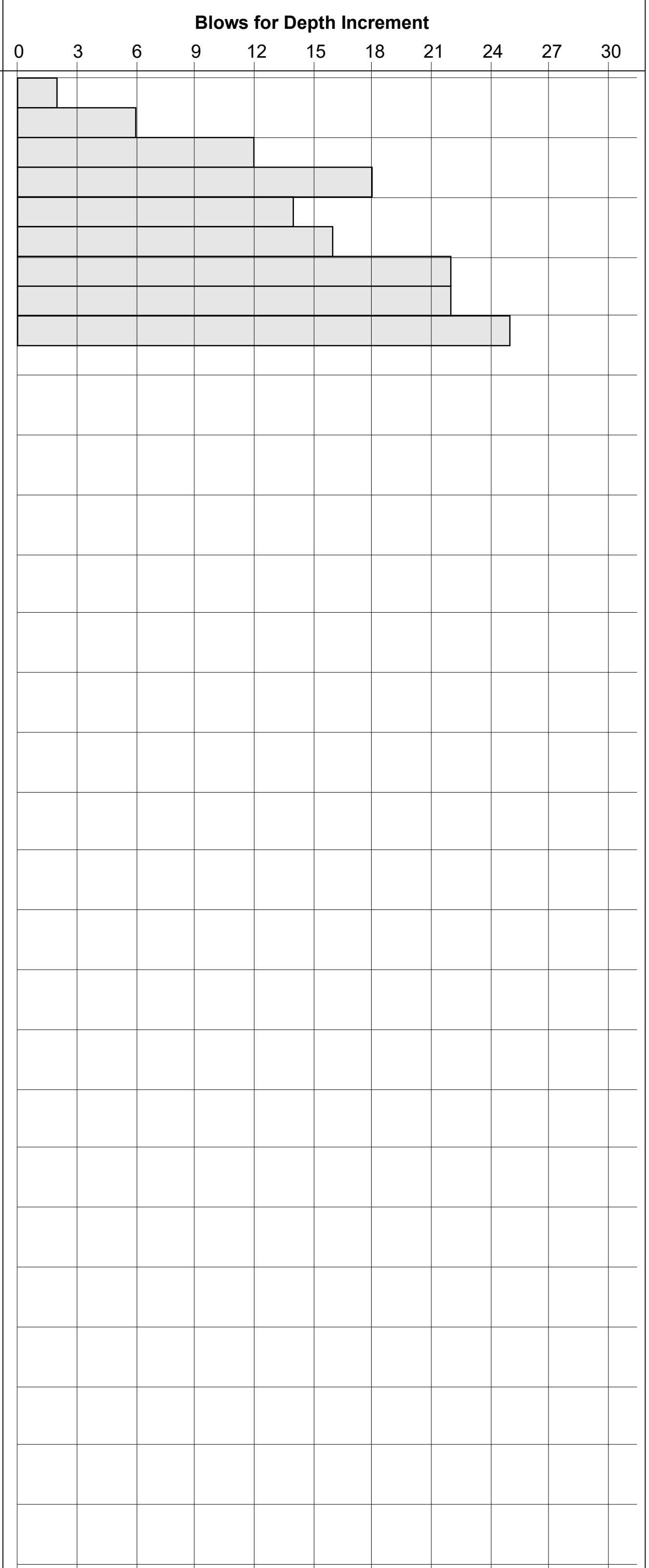
Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH15

Ground Investigations Ireland Ltd
www.gii.ie

Site	Site Investigation Ennis			**Probe Number** DPH16
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 20.93	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532154.8 E 676948.6 N	**Dates** 21/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		20.93	0.00
0.10-0.20	6			
0.20-0.30	12			
0.30-0.40	18			
0.40-0.50	14			
0.50-0.60	16		20.43	0.50
0.60-0.70	22			
0.70-0.80	22			
0.80-0.90	25			
			19.93	1.00
			19.43	1.50
			18.93	2.00
			18.43	2.50
			17.93	3.00
			17.43	3.50
			16.93	4.00
			16.43	4.50
			15.93	5.00



Remarks
Refusal at 0.90m BGL.

Scale (approx)	**Logged By**
1:25	C. Byrne

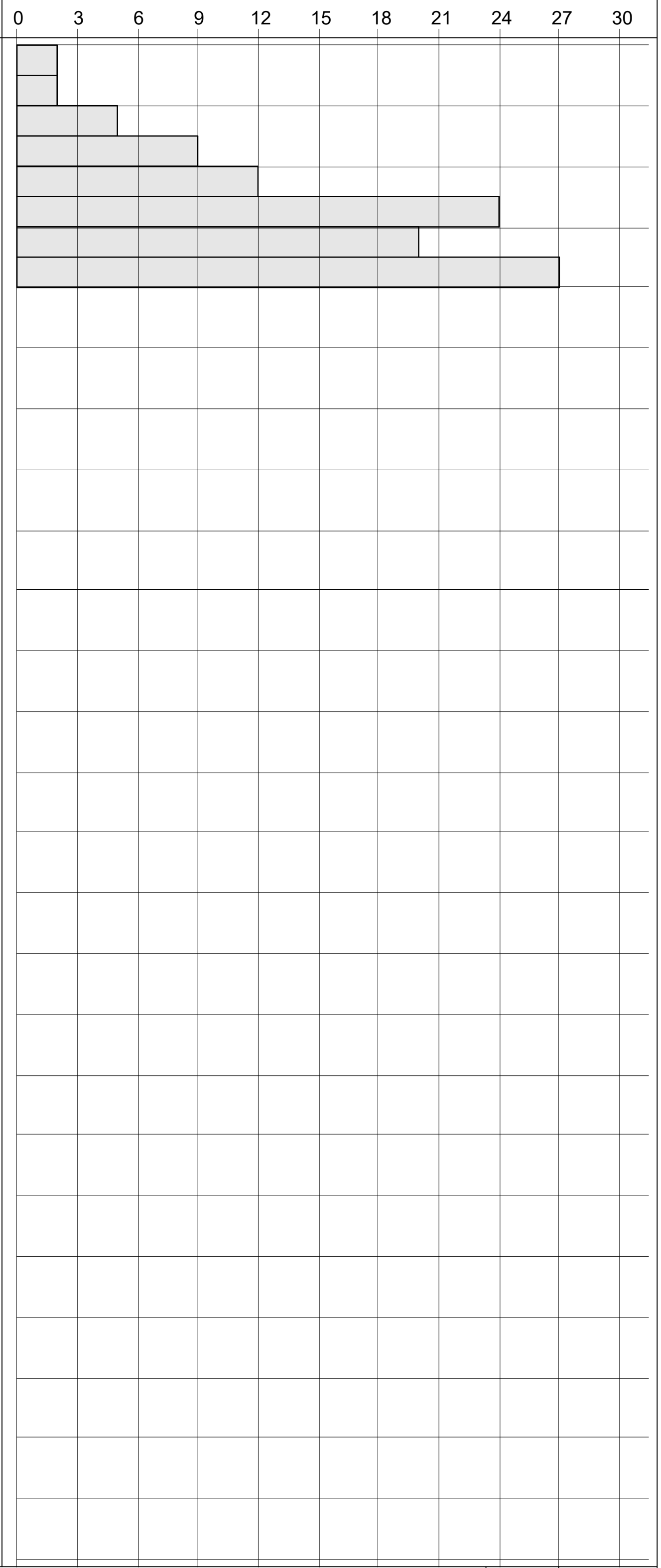
Figure No.
10809-06-21.DPH16

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH17
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions: Diameter 43.7mm, Angle 0°	Ground Level (mOD): 20.03	Client: AKM Design	Job Number: 10809-06-21
	Location: 532182.1 E 676944.7 N	Dates: 21/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	2	
0.20-0.30	5	
0.30-0.40	9	
0.40-0.50	12	
0.50-0.60	24	
0.60-0.70	20	
0.70-0.80	27	

Level (mOD)	Depth (m)
20.03	0.00
19.53	0.50
19.03	1.00
18.53	1.50
18.03	2.00
17.53	2.50
17.03	3.00
16.53	3.50
16.03	4.00
15.53	4.50
15.03	5.00

Blows for Depth Increment



Remarks
Refusal at 0.80m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

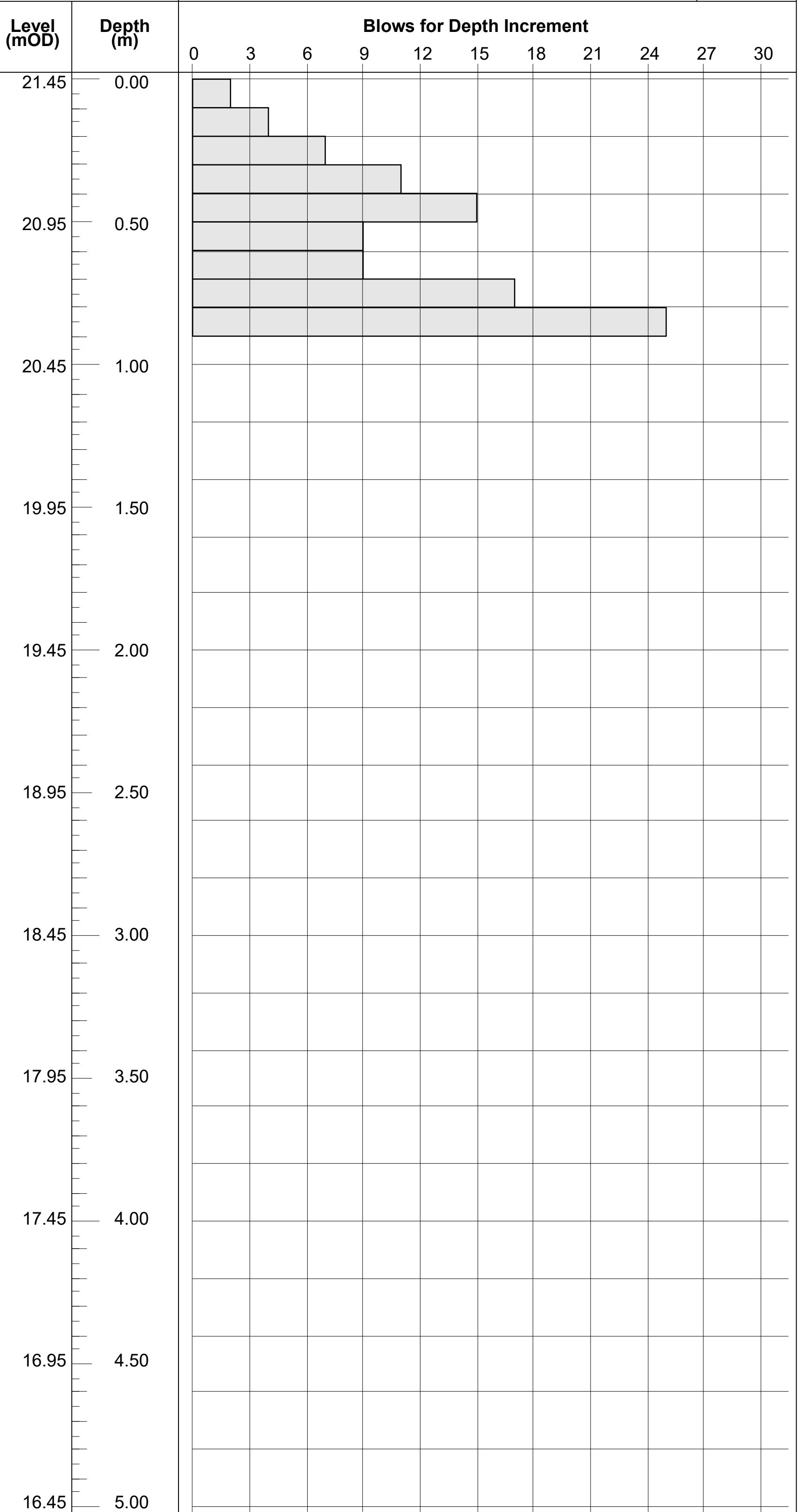
Figure No. 10809-06-21.DPH17

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Site Investigation Ennis	DPH18

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	21.45	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532115.1 E 676941 N	22/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	4	
0.20-0.30	7	
0.30-0.40	11	
0.40-0.50	15	
0.50-0.60	9	
0.60-0.70	9	
0.70-0.80	17	
0.80-0.90	25	



Remarks
Refusal at 0.90m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

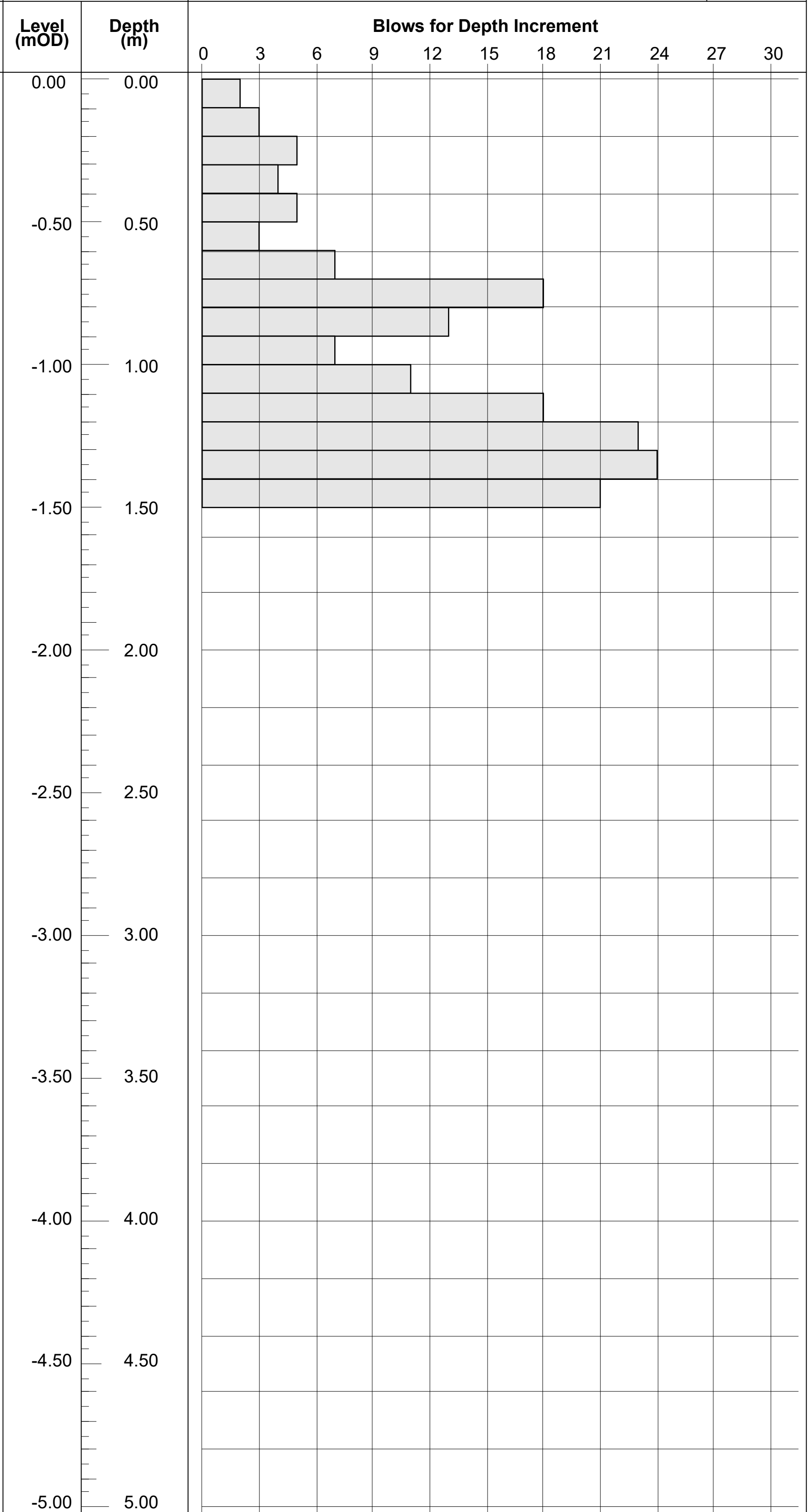
Figure No.
10809-06-21.DPH18

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Site Investigation Ennis	DPH19

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	0.00	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532216.3 E 676931.4 N	21/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	3	
0.20-0.30	5	
0.30-0.40	4	
0.40-0.50	5	
0.50-0.60	3	
0.60-0.70	7	
0.70-0.80	18	
0.80-0.90	13	
0.90-1.00	7	
1.00-1.10	11	
1.10-1.20	18	
1.20-1.30	23	
1.30-1.40	24	
1.40-1.50	21	



Remarks
Refusal at 1.50m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

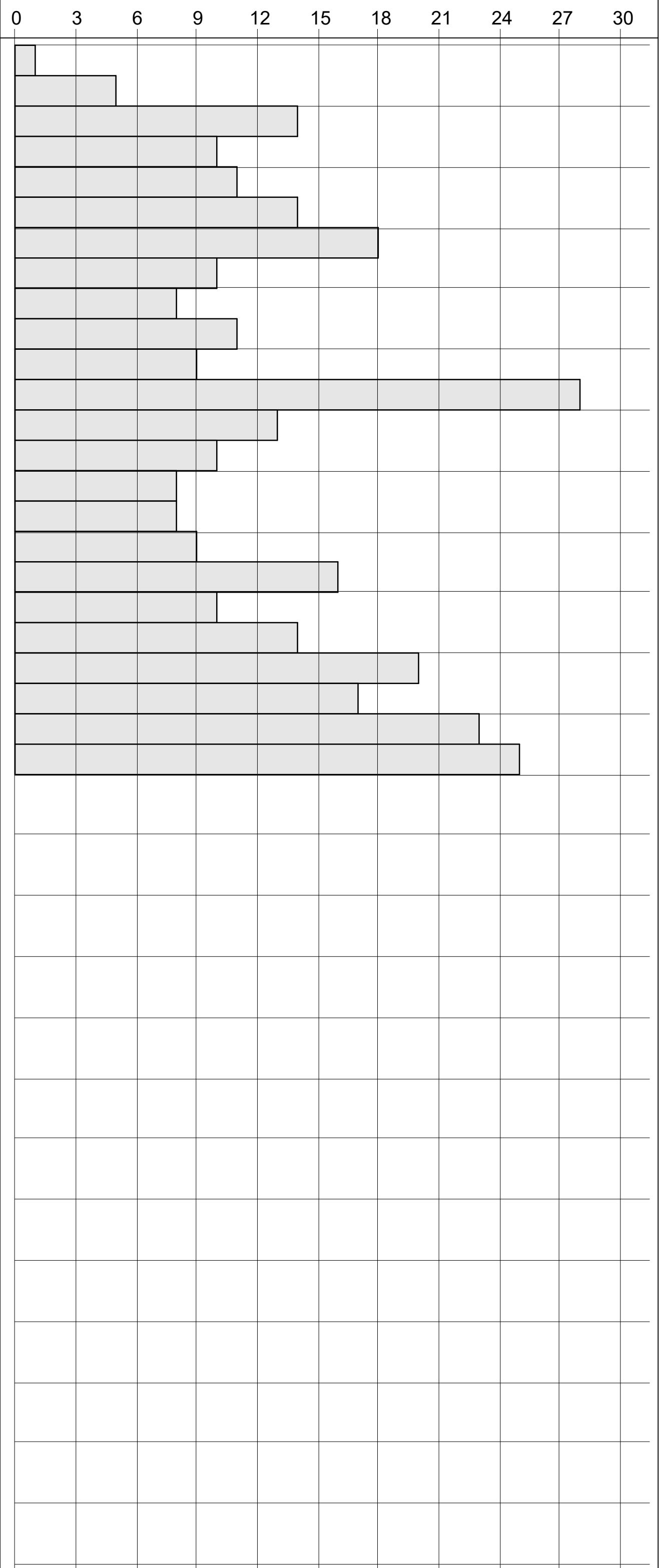
Figure No.
10809-06-21.DPH19

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH20
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions: Diameter 43.7mm, Angle 0°	Ground Level (mOD): 23.05	Client: AKM Design	Job Number: 10809-06-21
	Location: 532245.5 E 676919.8 N	Dates: 21/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	1	
0.10-0.20	5	
0.20-0.30	14	
0.30-0.40	10	
0.40-0.50	11	
0.50-0.60	14	
0.60-0.70	18	
0.70-0.80	10	
0.80-0.90	8	
0.90-1.00	11	
1.00-1.10	9	
1.10-1.20	28	
1.20-1.30	13	
1.30-1.40	10	
1.40-1.50	8	
1.50-1.60	8	
1.60-1.70	9	
1.70-1.80	16	
1.80-1.90	10	
1.90-2.00	14	
2.00-2.10	20	
2.10-2.20	17	
2.20-2.30	23	
2.30-2.40	25	

Level (mOD)	Depth (m)
23.05	0.00
22.55	0.50
22.05	1.00
21.55	1.50
21.05	2.00
20.55	2.50
20.05	3.00
19.55	3.50
19.05	4.00
18.55	4.50
18.05	5.00

Blows for Depth Increment



Remarks
Refusal at 2.40m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

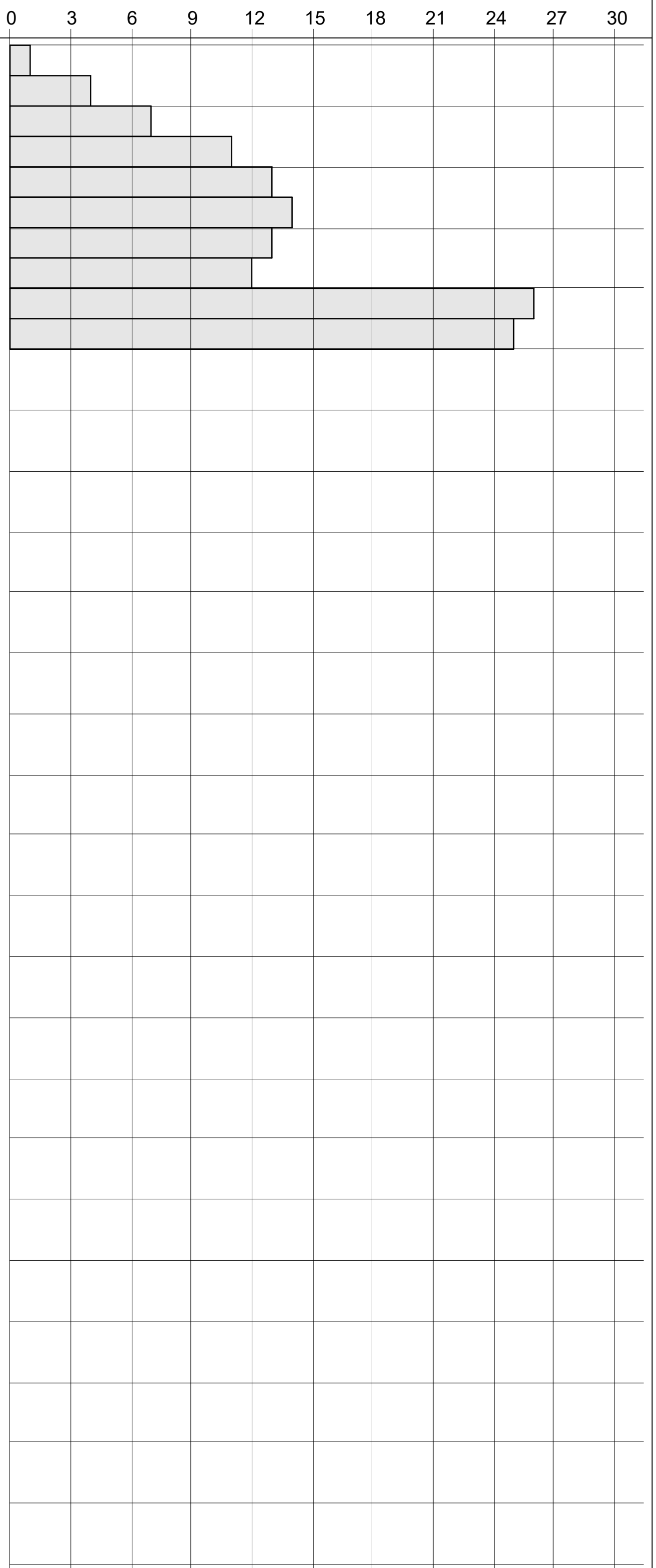
Figure No.
10809-06-21.DPH20

Ground Investigations Ireland Ltd www.gii.ie			Site Site Investigation Ennis	Probe Number DPH21
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions Diameter 43.7mm, Angle 0°	Ground Level (mOD) 22.14	Client AKM Design	Job Number 10809-06-21
	Location 532143.3 E 676917.8 N	Dates 21/07/2021	Engineer	Sheet 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	1	
0.10-0.20	4	
0.20-0.30	7	
0.30-0.40	11	
0.40-0.50	13	
0.50-0.60	14	
0.60-0.70	13	
0.70-0.80	12	
0.80-0.90	26	
0.90-1.00	25	

Level (mOD)	Depth (m)
22.14	0.00
21.64	0.50
21.14	1.00
20.64	1.50
20.14	2.00
19.64	2.50
19.14	3.00
18.64	3.50
18.14	4.00
17.64	4.50
17.14	5.00

Blows for Depth Increment



Remarks
Refusal at 1.00m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

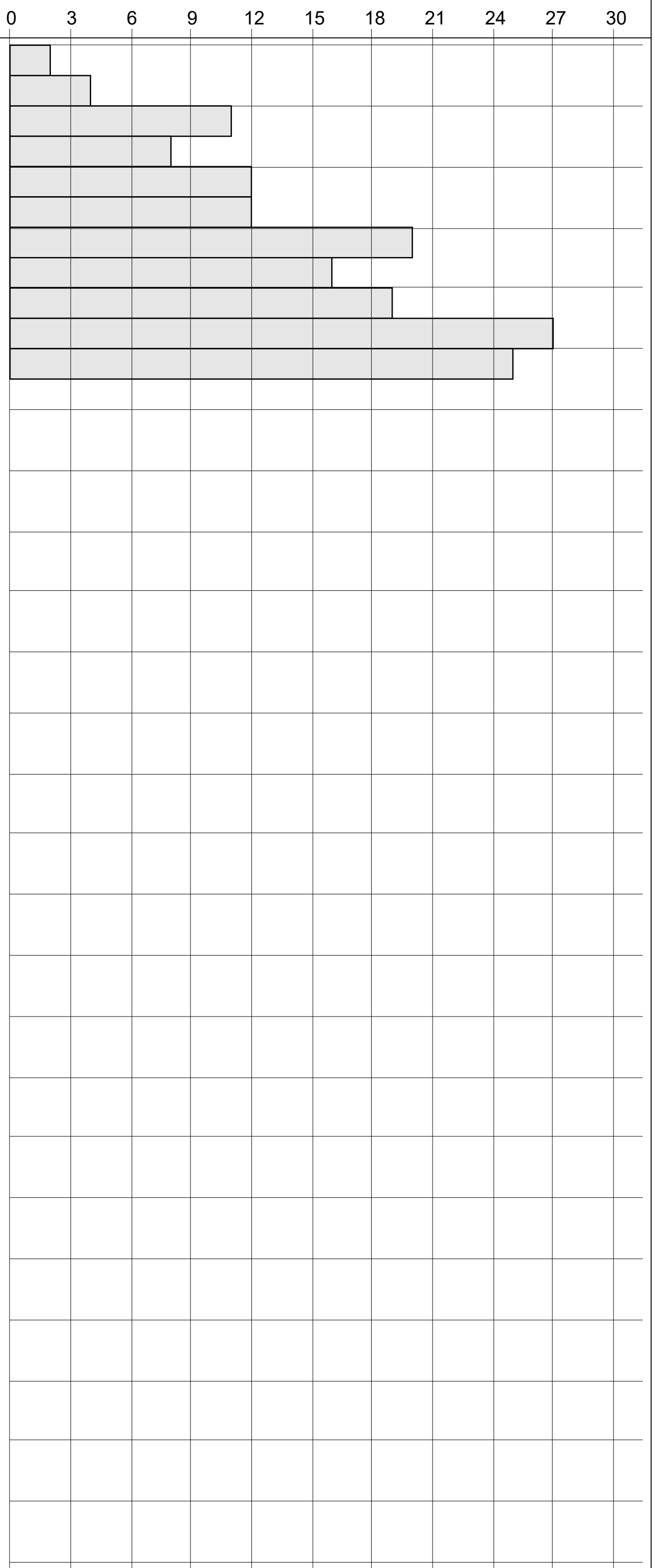
Figure No.
10809-06-21.DPH21

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH22
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions: Diameter 43.7mm, Angle 0°	Ground Level (mOD): 0.00	Client: AKM Design	Job Number: 10809-06-21
	Location: 532174.9 E 676918 N	Dates: 21/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	4	
0.20-0.30	11	
0.30-0.40	8	
0.40-0.50	12	
0.50-0.60	12	
0.60-0.70	20	
0.70-0.80	16	
0.80-0.90	19	
0.90-1.00	27	
1.00-1.10	25	

Level (mOD)	Depth (m)
0.00	0.00
-0.50	0.50
-1.00	1.00
-1.50	1.50
-2.00	2.00
-2.50	2.50
-3.00	3.00
-3.50	3.50
-4.00	4.00
-4.50	4.50
-5.00	5.00

Blows for Depth Increment



Remarks
Refusal at 0.80m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

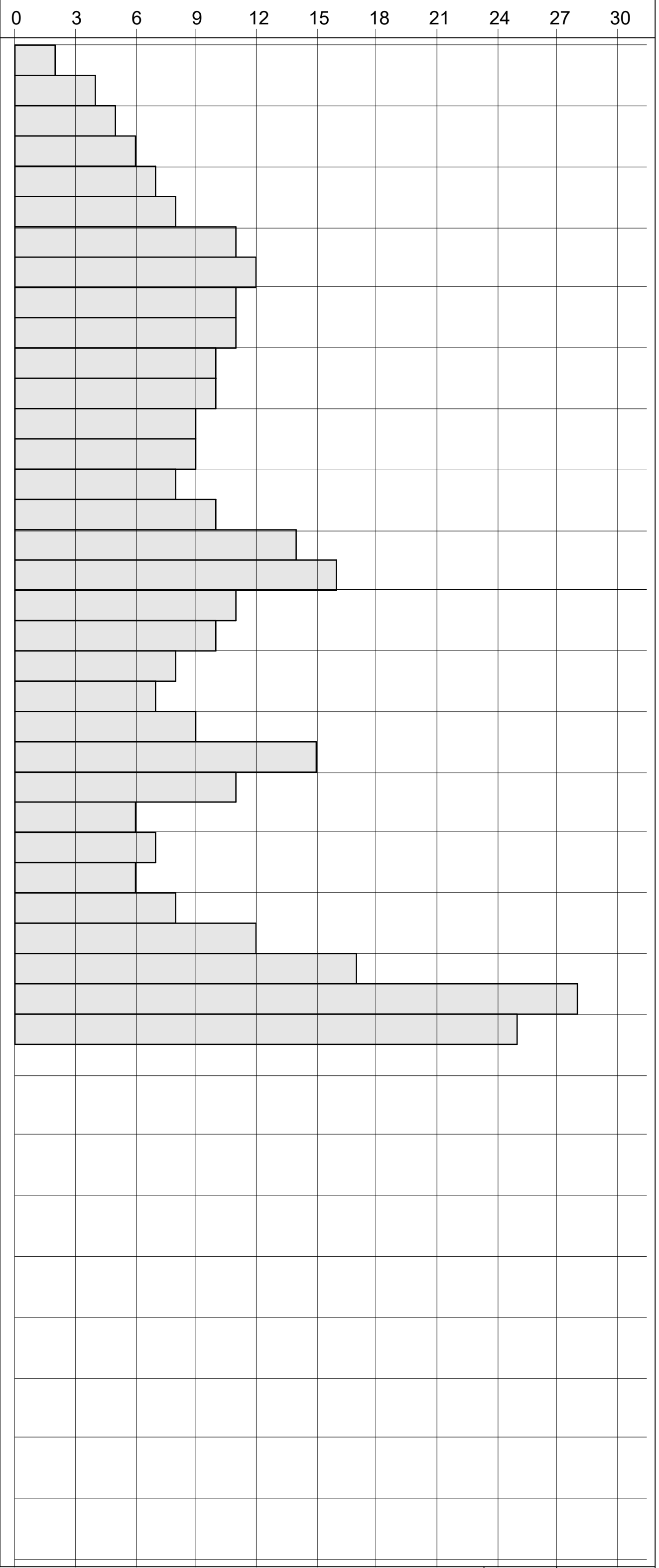
Figure No. 10809-06-21.DPH22

Ground Investigations Ireland Ltd www.gii.ie		Site: Site Investigation Ennis	Probe Number: DPH23
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions**: Diameter 43.7mm, Angle 0° — **Ground Level (mOD)**: 25.46	**Client**: AKM Design	**Job Number**: 10809-06-21
	Location: 532272.8 E 676910.1 N — **Dates**: 22/07/2021	**Engineer**:	**Sheet**: 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	4	
0.20-0.30	5	
0.30-0.40	6	
0.40-0.50	7	
0.50-0.60	8	
0.60-0.70	11	
0.70-0.80	12	
0.80-0.90	11	
0.90-1.00	11	
1.00-1.10	10	
1.10-1.20	10	
1.20-1.30	9	
1.30-1.40	9	
1.40-1.50	8	
1.50-1.60	10	
1.60-1.70	14	
1.70-1.80	16	
1.80-1.90	11	
1.90-2.00	10	
2.00-2.10	8	
2.10-2.20	7	
2.20-2.30	9	
2.30-2.40	15	
2.40-2.50	11	
2.50-2.60	6	
2.60-2.70	7	
2.70-2.80	6	
2.80-2.90	8	
2.90-3.00	12	
3.00-3.10	17	
3.10-3.20	28	
3.20-3.30	25	

Level (mOD)	Depth (m)
25.46	0.00
24.96	0.50
24.46	1.00
23.96	1.50
23.46	2.00
22.96	2.50
22.46	3.00
21.96	3.50
21.46	4.00
20.96	4.50
20.46	5.00

Blows for Depth Increment



Remarks
Refusal at 3.30m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No. 10809-06-21.DPH23

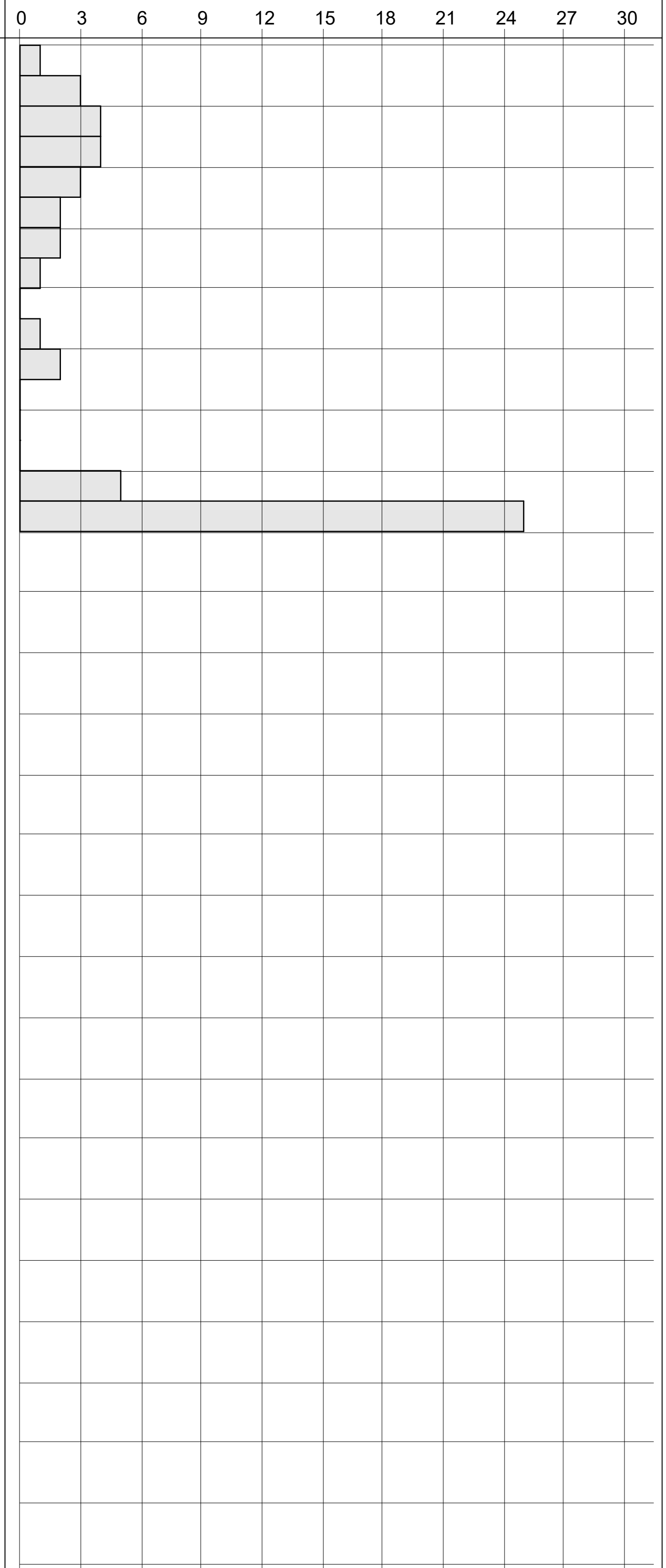
Ground Investigations Ireland Ltd www.gii.ie	Site Site Investigation Ennis	Probe Number **DPH24**

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	21.22	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532207.2 E 676906 N	21/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	1	
0.10-0.20	3	
0.20-0.30	4	
0.30-0.40	4	
0.40-0.50	3	
0.50-0.60	2	
0.60-0.70	2	
0.70-0.80	1	
0.80-0.90	0	
0.90-1.00	1	
1.00-1.10	2	
1.10-1.20	0	
1.20-1.30	0	
1.30-1.40	0	
1.40-1.50	5	
1.50-1.60	25	

Level (mOD)	Depth (m)
21.22	0.00
20.72	0.50
20.22	1.00
19.72	1.50
19.22	2.00
18.72	2.50
18.22	3.00
17.72	3.50
17.22	4.00
16.72	4.50
16.22	5.00

Blows for Depth Increment



Remarks
Refusal at 1.60m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

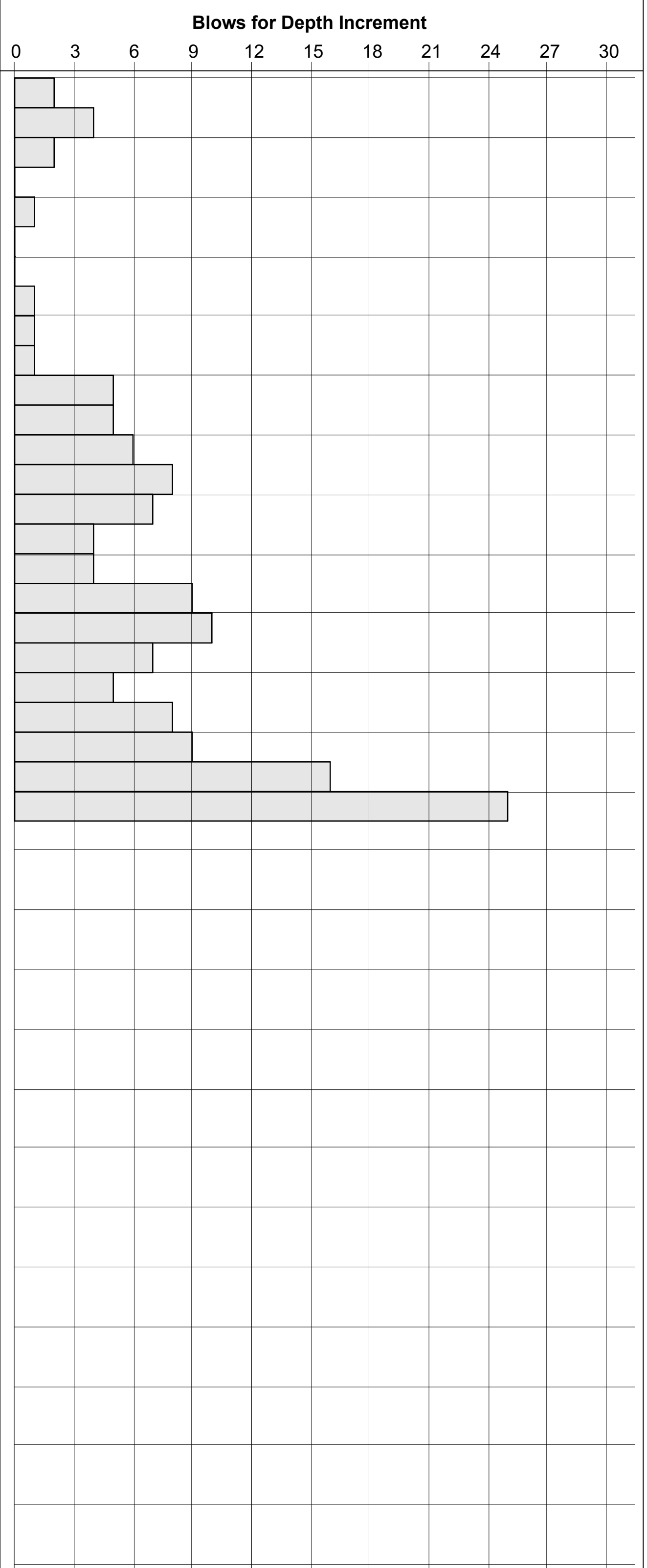
Figure No.
10809-06-21.DPH24

Ground Investigations Ireland Ltd www.gii.ie	Site: Site Investigation Ennis	Probe Number: DPH25

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	24.56	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532232.4 E 676893.8 N	22/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	4	
0.20-0.30	2	
0.30-0.40	0	
0.40-0.50	1	
0.50-0.60	0	
0.60-0.70	0	
0.70-0.80	1	
0.80-0.90	1	
0.90-1.00	1	
1.00-1.10	5	
1.10-1.20	5	
1.20-1.30	6	
1.30-1.40	8	
1.40-1.50	7	
1.50-1.60	4	
1.60-1.70	4	
1.70-1.80	9	
1.80-1.90	10	
1.90-2.00	7	
2.00-2.10	5	
2.10-2.20	8	
2.20-2.30	9	
2.30-2.40	16	
2.40-2.50	25	

Level (mOD)	Depth (m)
24.56	0.00
24.06	0.50
23.56	1.00
23.06	1.50
22.56	2.00
22.06	2.50
21.56	3.00
21.06	3.50
20.56	4.00
20.06	4.50
19.56	5.00

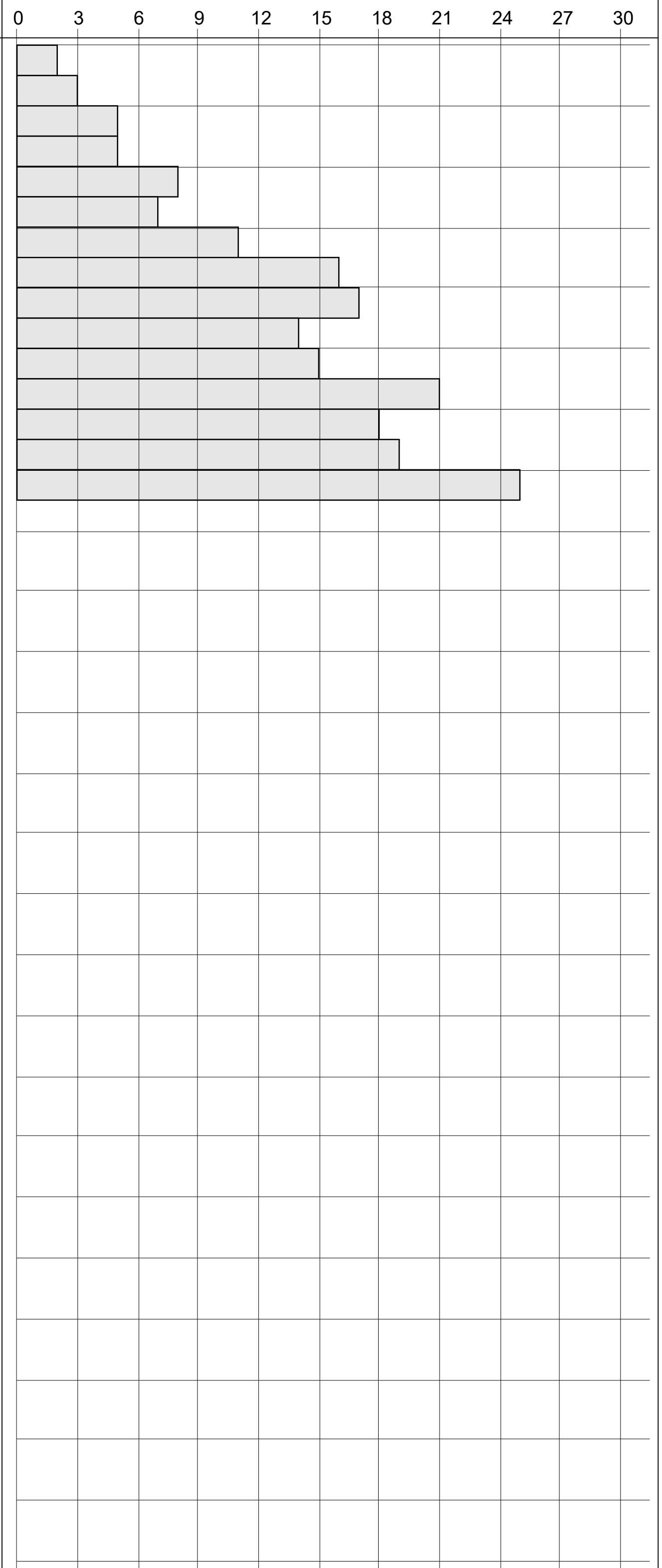


Remarks	Scale (approx)	Logged By
Refusal at 2.50m BGL.	1:25	C. Byrne
	Figure No. 10809-06-21.DPH25	

Ground Investigations Ireland Ltd www.gii.ie			Site Site Investigation Ennis	Probe Number **DPH26**
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 26.41	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532262.3 E 676874.7 N	**Dates** 22/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		26.41	0.00
0.10-0.20	3			
0.20-0.30	5			
0.30-0.40	5			
0.40-0.50	8			
0.50-0.60	7		25.91	0.50
0.60-0.70	11			
0.70-0.80	16			
0.80-0.90	17			
0.90-1.00	14			
1.00-1.10	15		25.41	1.00
1.10-1.20	21			
1.20-1.30	18			
1.30-1.40	19			
1.40-1.50	25			
			24.91	1.50
			24.41	2.00
			23.91	2.50
			23.41	3.00
			22.91	3.50
			22.41	4.00
			21.91	4.50
			21.41	5.00

Blows for Depth Increment



Remarks
Refusal at 1.50m BGL.

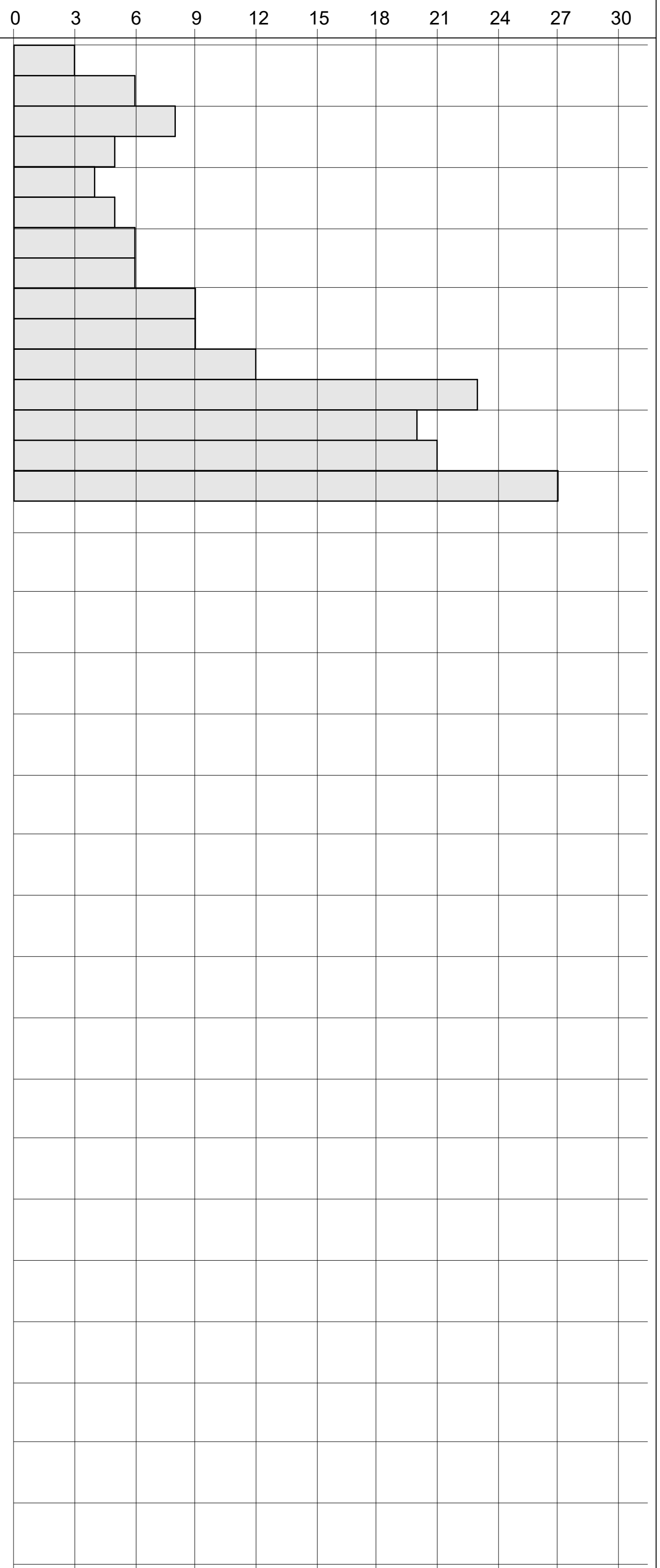
Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH26

Ground Investigations Ireland Ltd www.gii.ie		**Site** Site Investigation Ennis	**Probe Number** **DPH27**
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 24.69	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532199.9 E 676867.7 N	**Dates** 21/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	3		24.69	0.00
0.10-0.20	6			
0.20-0.30	8			
0.30-0.40	5			
0.40-0.50	4			
0.50-0.60	5		24.19	0.50
0.60-0.70	6			
0.70-0.80	6			
0.80-0.90	9			
0.90-1.00	9			
1.00-1.10	12		23.69	1.00
1.10-1.20	23			
1.20-1.30	20			
1.30-1.40	21			
1.40-1.50	27			
			23.19	1.50
			22.69	2.00
			22.19	2.50
			21.69	3.00
			21.19	3.50
			20.69	4.00
			20.19	4.50
			19.69	5.00

Blows for Depth Increment



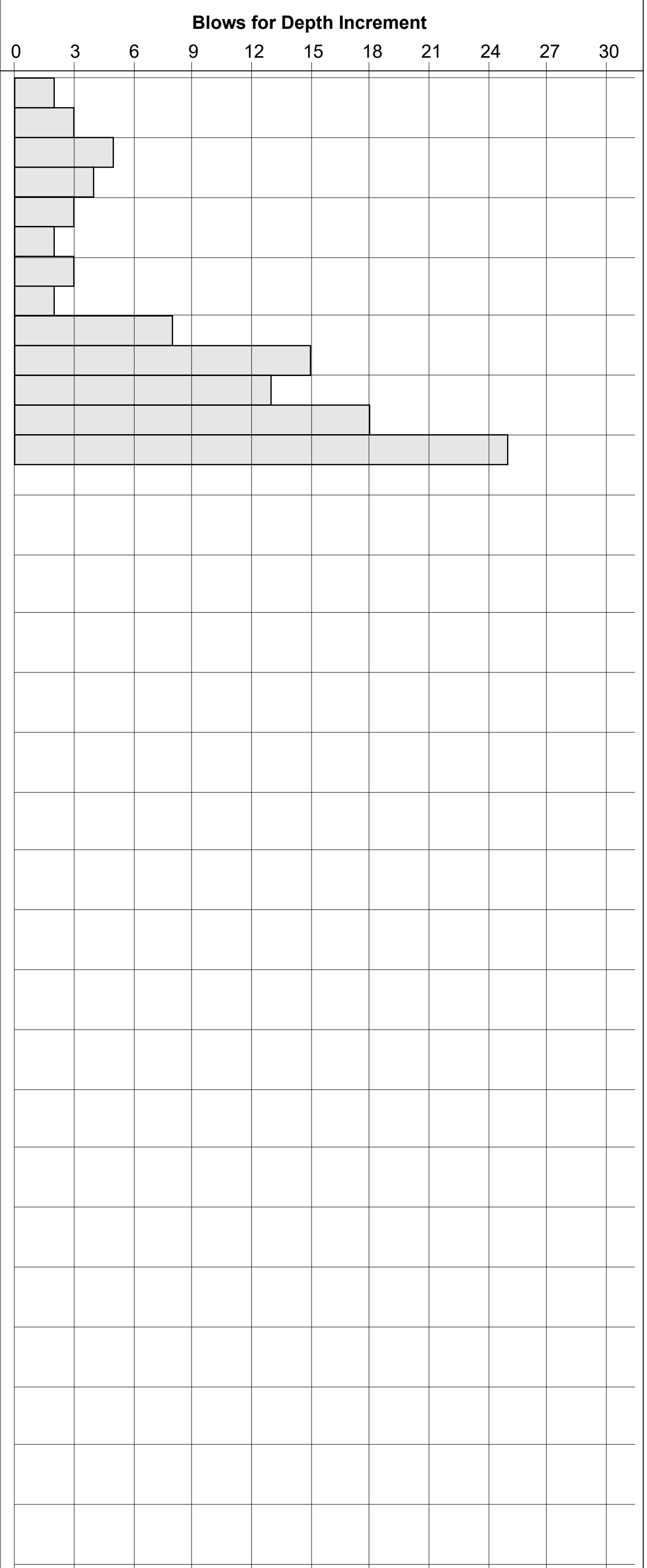
Remarks
Refusal at 1.50m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH27

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH28
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions**: Diameter 43.7mm, Angle 0°	**Ground Level (mOD)**: 26.13	**Client**: AKM Design	**Job Number**: 10809-06-21
	Location: 532227.9 E 676856.9 N	**Dates**: 22/07/2021	**Engineer**:	**Sheet**: 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		26.13	0.00
0.10-0.20	3			
0.20-0.30	5			
0.30-0.40	4			
0.40-0.50	3			
0.50-0.60	2		25.63	0.50
0.60-0.70	3			
0.70-0.80	2			
0.80-0.90	8			
0.90-1.00	15			
1.00-1.10	13		25.13	1.00
1.10-1.20	18			
1.20-1.30	25			
			24.63	1.50
			24.13	2.00
			23.63	2.50
			23.13	3.00
			22.63	3.50
			22.13	4.00
			21.63	4.50
			21.13	5.00



Remarks
Refusal at 1.30m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

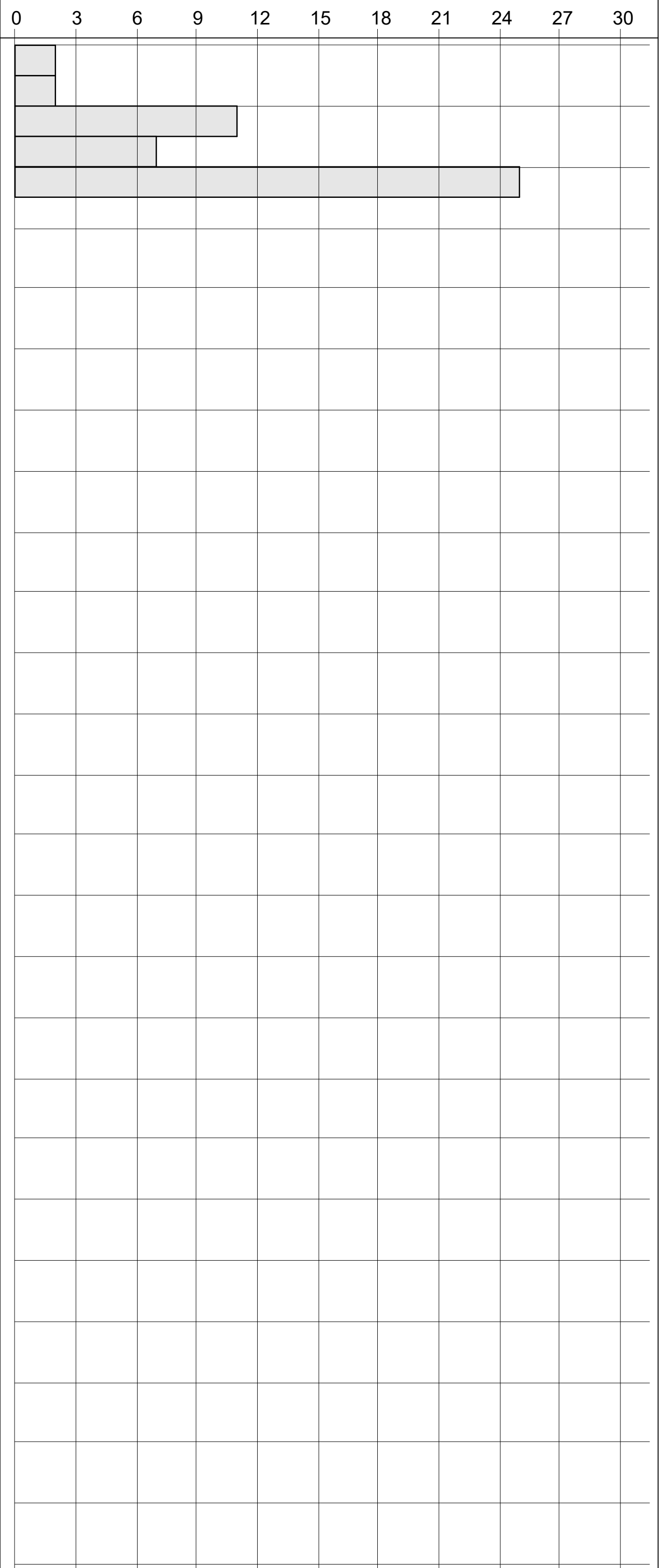
Figure No. 10809-06-21.DPH28

Ground Investigations Ireland Ltd
www.gii.ie

Site	Site Investigation Ennis		**Probe Number**	**DPH29**
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 23.52	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532083.6 E 676845.1 N	**Dates** 20/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		23.52	0.00
0.10-0.20	2			
0.20-0.30	11			
0.30-0.40	7			
0.40-0.50	25			
			23.02	0.50
			22.52	1.00
			22.02	1.50
			21.52	2.00
			21.02	2.50
			20.52	3.00
			20.02	3.50
			19.52	4.00
			19.02	4.50
			18.52	5.00

Blows for Depth Increment



Remarks
Refusal at 0.50m BGL.

Scale (approx)	**Logged By**
1:25	C. Byrne

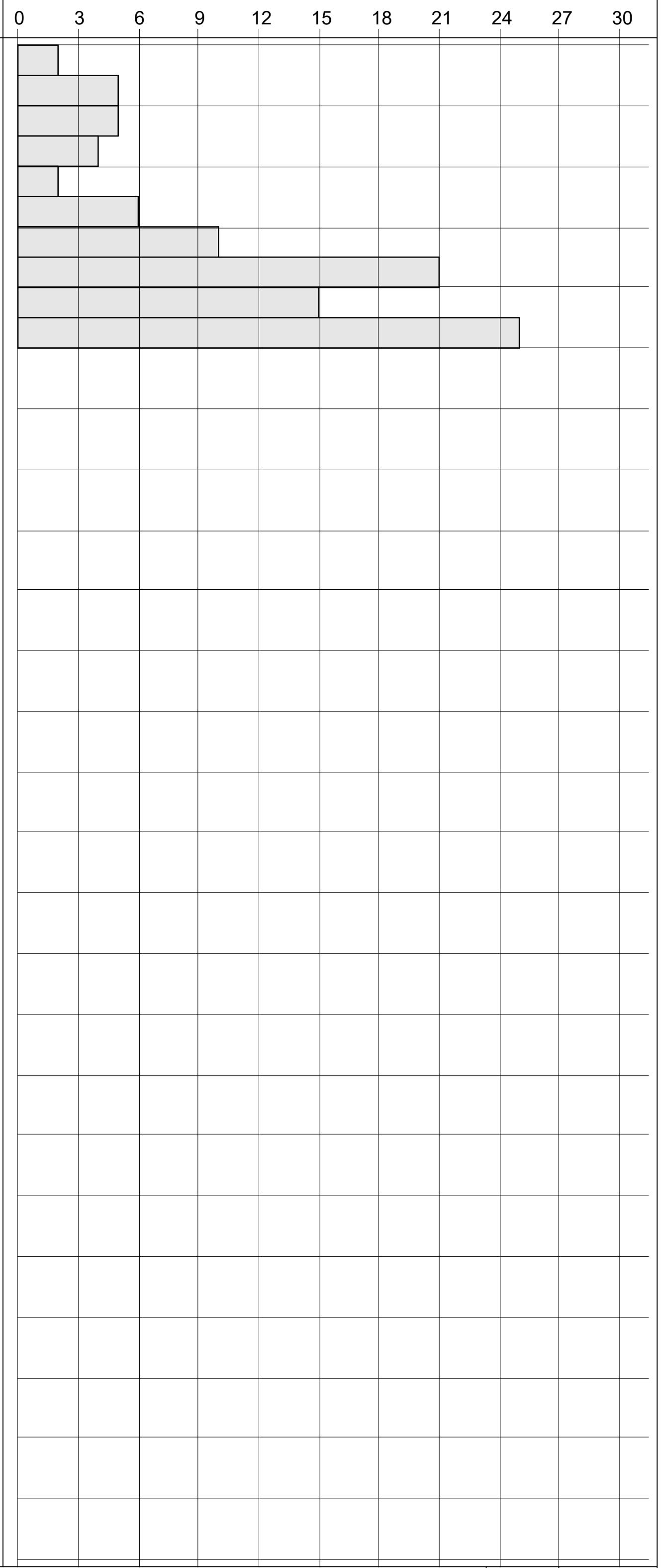
Figure No.
10809-06-21.DPH29

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH30
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 23.42	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532113.9 E 676842.9 N	**Dates** 20/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	5	
0.20-0.30	5	
0.30-0.40	4	
0.40-0.50	2	
0.50-0.60	6	
0.60-0.70	10	
0.70-0.80	21	
0.80-0.90	15	
0.90-1.00	25	

Level (mOD)	Depth (m)
23.42	0.00
22.92	0.50
22.42	1.00
21.92	1.50
21.42	2.00
20.92	2.50
20.42	3.00
19.92	3.50
19.42	4.00
18.92	4.50
18.42	5.00

Blows for Depth Increment



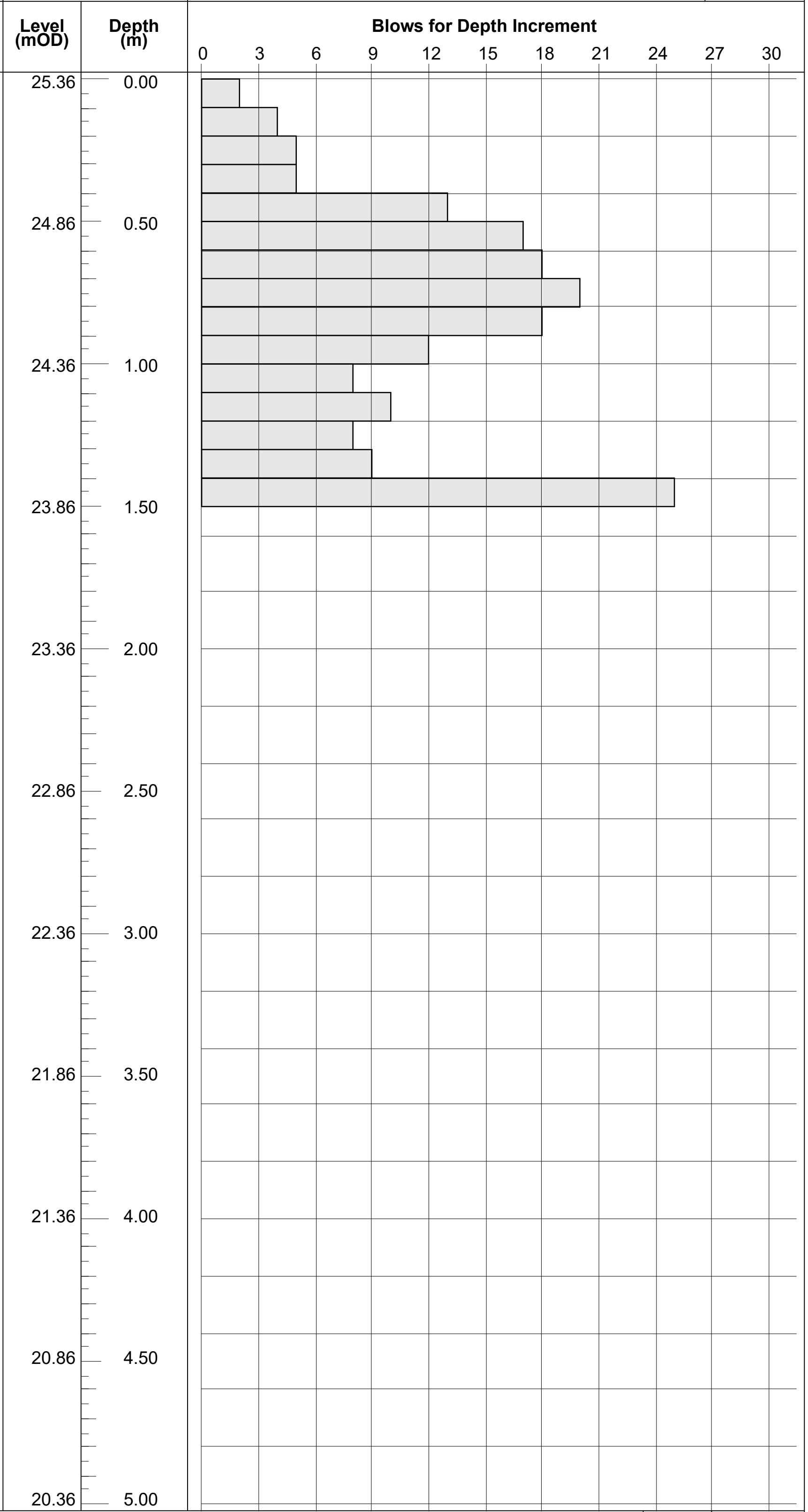
Remarks
Refusal at 1.00m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No. 10809-06-21.DPH30

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH31
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions: Diameter 43.7mm, Angle 0°	Ground Level (mOD): 25.36	Client: AKM Design	Job Number: 10809-06-21
	Location: 532187.1 E 676839.8 N	Dates: 21/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	4	
0.20-0.30	5	
0.30-0.40	5	
0.40-0.50	13	
0.50-0.60	17	
0.60-0.70	18	
0.70-0.80	20	
0.80-0.90	18	
0.90-1.00	12	
1.00-1.10	8	
1.10-1.20	10	
1.20-1.30	8	
1.30-1.40	9	
1.40-1.50	25	



Remarks
Refusal at 1.50m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

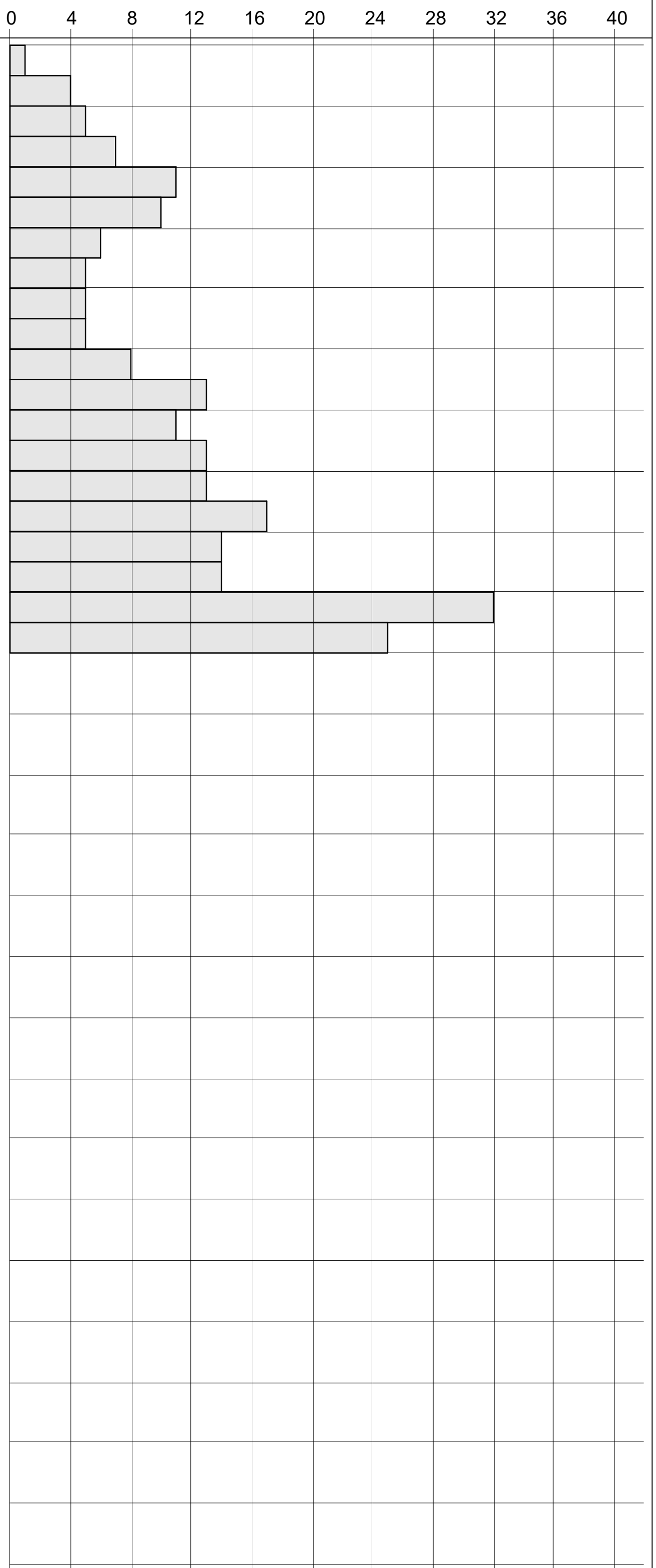
Figure No.
10809-06-21.DPH31

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH32
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions**: Diameter 43.7mm, Angle 0°	**Ground Level (mOD)**: 27.21	**Client**: AKM Design	**Job Number**: 10809-06-21
	Location: 532259.2 E 676831.7 N	**Dates**: 22/07/2021	**Engineer**:	**Sheet**: 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	1	
0.10-0.20	4	
0.20-0.30	5	
0.30-0.40	7	
0.40-0.50	11	
0.50-0.60	10	
0.60-0.70	6	
0.70-0.80	5	
0.80-0.90	5	
0.90-1.00	5	
1.00-1.10	8	
1.10-1.20	13	
1.20-1.30	11	
1.30-1.40	13	
1.40-1.50	13	
1.50-1.60	17	
1.60-1.70	14	
1.70-1.80	14	
1.80-1.90	32	
1.90-2.00	25	

Level (mOD)	Depth (m)
27.21	0.00
26.71	0.50
26.21	1.00
25.71	1.50
25.21	2.00
24.71	2.50
24.21	3.00
23.71	3.50
23.21	4.00
22.71	4.50
22.21	5.00

Blows for Depth Increment



Remarks
Refusal at 2.00m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

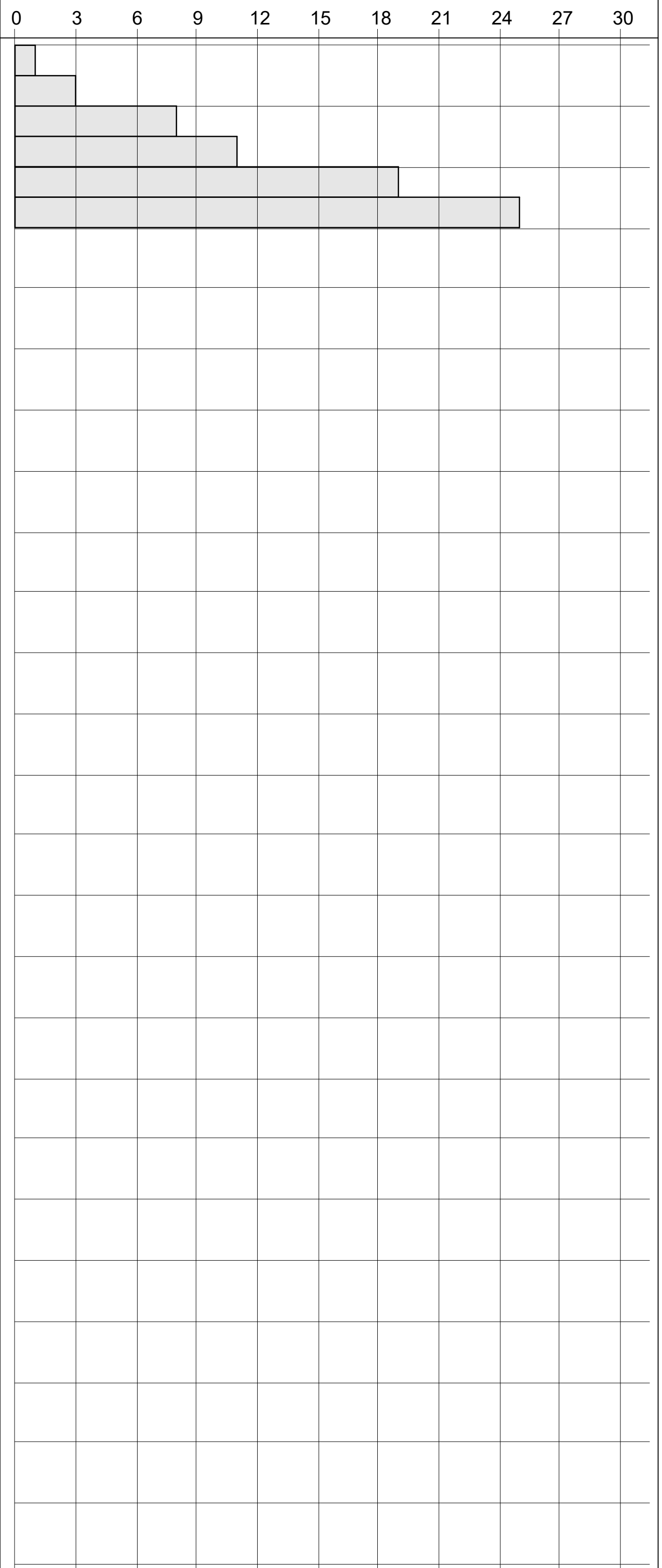
Figure No. 10809-06-21.DPH21

Ground Investigations Ireland Ltd www.gii.ie	Site Site Investigation Ennis	Probe Number **DPH33**

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	26.60	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532071.3 E 676818.3 N	20/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	1		26.60	0.00
0.10-0.20	3			
0.20-0.30	8			
0.30-0.40	11			
0.40-0.50	19			
0.50-0.60	25		26.10	0.50
			25.60	1.00
			25.10	1.50
			24.60	2.00
			24.10	2.50
			23.60	3.00
			23.10	3.50
			22.60	4.00
			22.10	4.50
			21.60	5.00

Blows for Depth Increment



Remarks
Refusal at 0.60m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH33

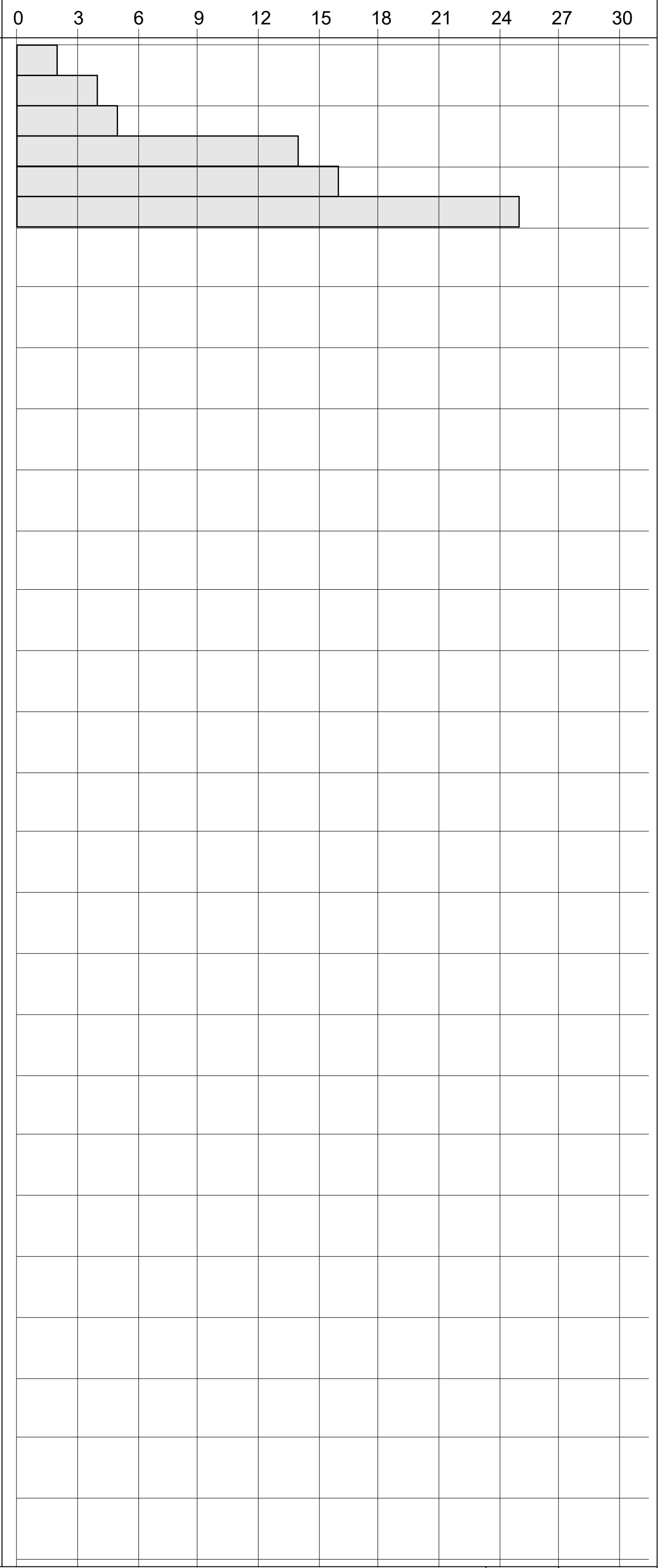
Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Site Investigation Ennis	DPH34

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	25.21	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532109.3 E 676814.4 N	20/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		25.21	0.00
0.10-0.20	4			
0.20-0.30	5			
0.30-0.40	14			
0.40-0.50	16			
0.50-0.60	25		24.71	0.50
			24.21	1.00
			23.71	1.50
			23.21	2.00
			22.71	2.50
			22.21	3.00
			21.71	3.50
			21.21	4.00
			20.71	4.50
			20.21	5.00

Blows for Depth Increment



Remarks
Refusal at 0.60m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

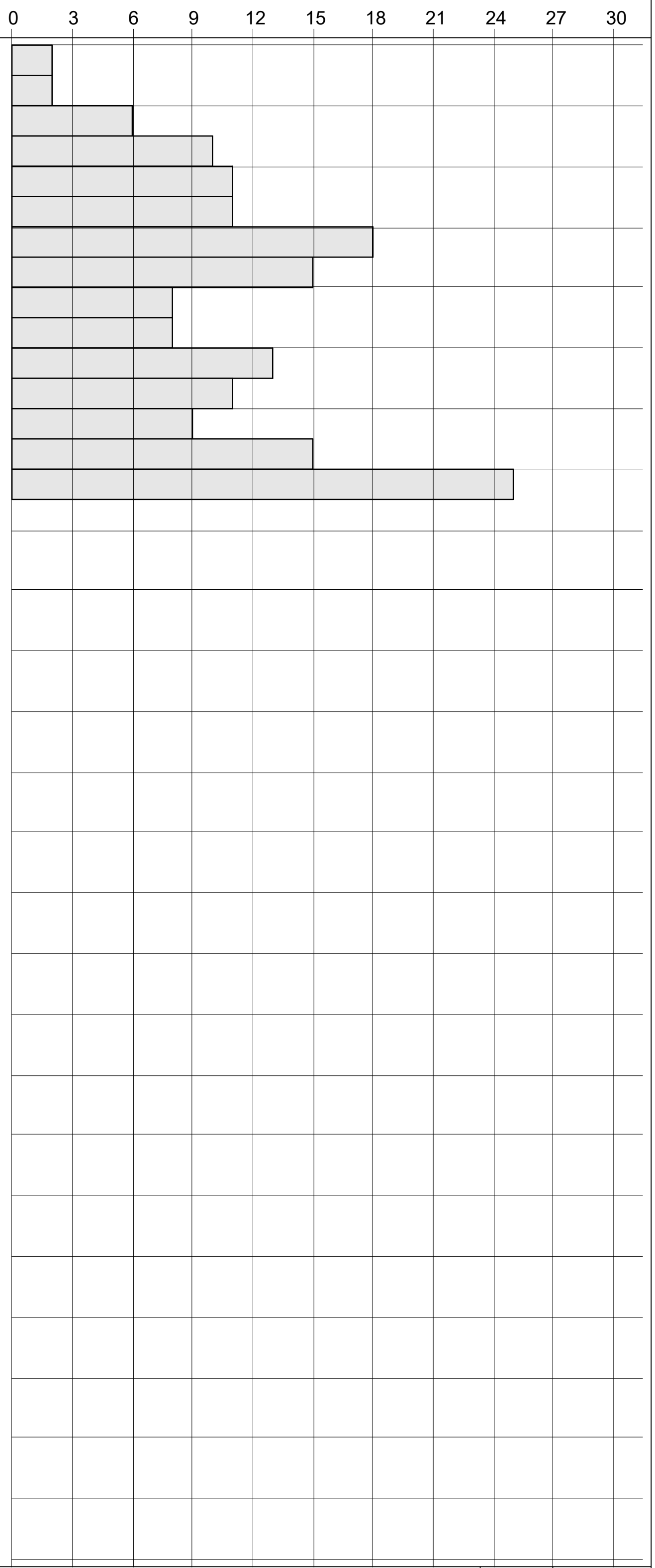
Figure No.
10809-06-21.DPH34

Ground Investigations Ireland Ltd
www.gii.ie

Site	Site Investigation Ennis			**Probe Number** DPH35
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 26.32	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532177.3 E 676816.8 N	**Dates** 21/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		26.32	0.00
0.10-0.20	2			
0.20-0.30	6			
0.30-0.40	10			
0.40-0.50	11			
0.50-0.60	11		25.82	0.50
0.60-0.70	18			
0.70-0.80	15			
0.80-0.90	8			
0.90-1.00	8			
1.00-1.10	13		25.32	1.00
1.10-1.20	11			
1.20-1.30	9			
1.30-1.40	15			
1.40-1.50	25			
			24.82	1.50
			24.32	2.00
			23.82	2.50
			23.32	3.00
			22.82	3.50
			22.32	4.00
			21.82	4.50
			21.32	5.00

Blows for Depth Increment



Remarks
Refusal at 1.50m BGL.

Scale (approx)	**Logged By**
1:25	C. Byrne

Figure No.
10809-06-21.DPH35

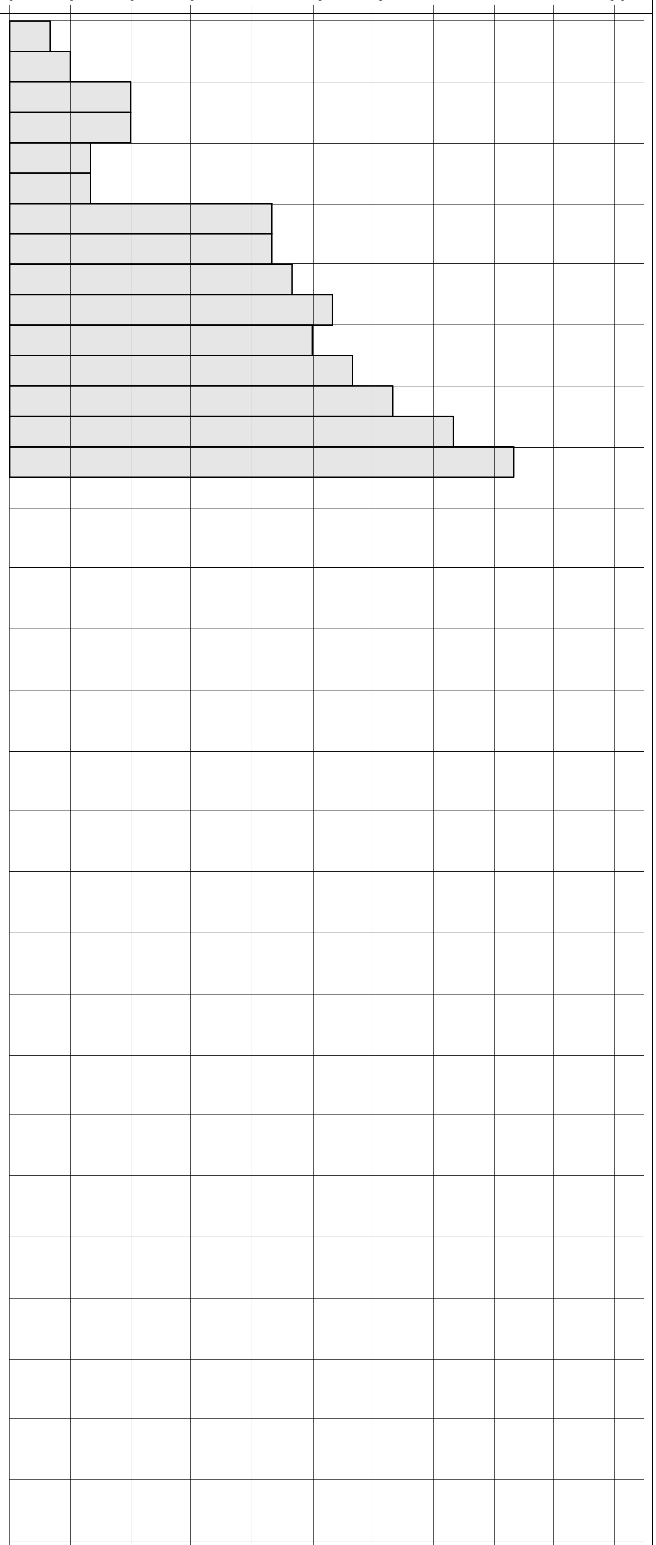
Ground Investigations Ireland Ltd www.gii.ie	Site: Site Investigation Ennis	Probe Number: DPH36

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	27.07	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532216.6 E 676811.8 N	22/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	3	
0.20-0.30	6	
0.30-0.40	6	
0.40-0.50	4	
0.50-0.60	4	
0.60-0.70	13	
0.70-0.80	13	
0.80-0.90	14	
0.90-1.00	16	
1.00-1.10	15	
1.10-1.20	17	
1.20-1.30	19	
1.30-1.40	22	
1.40-1.50	25	

Level (mOD)	Depth (m)
27.07	0.00
26.57	0.50
26.07	1.00
25.57	1.50
25.07	2.00
24.57	2.50
24.07	3.00
23.57	3.50
23.07	4.00
22.57	4.50
22.07	5.00

Blows for Depth Increment



Remarks
Refusal at 1.50m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

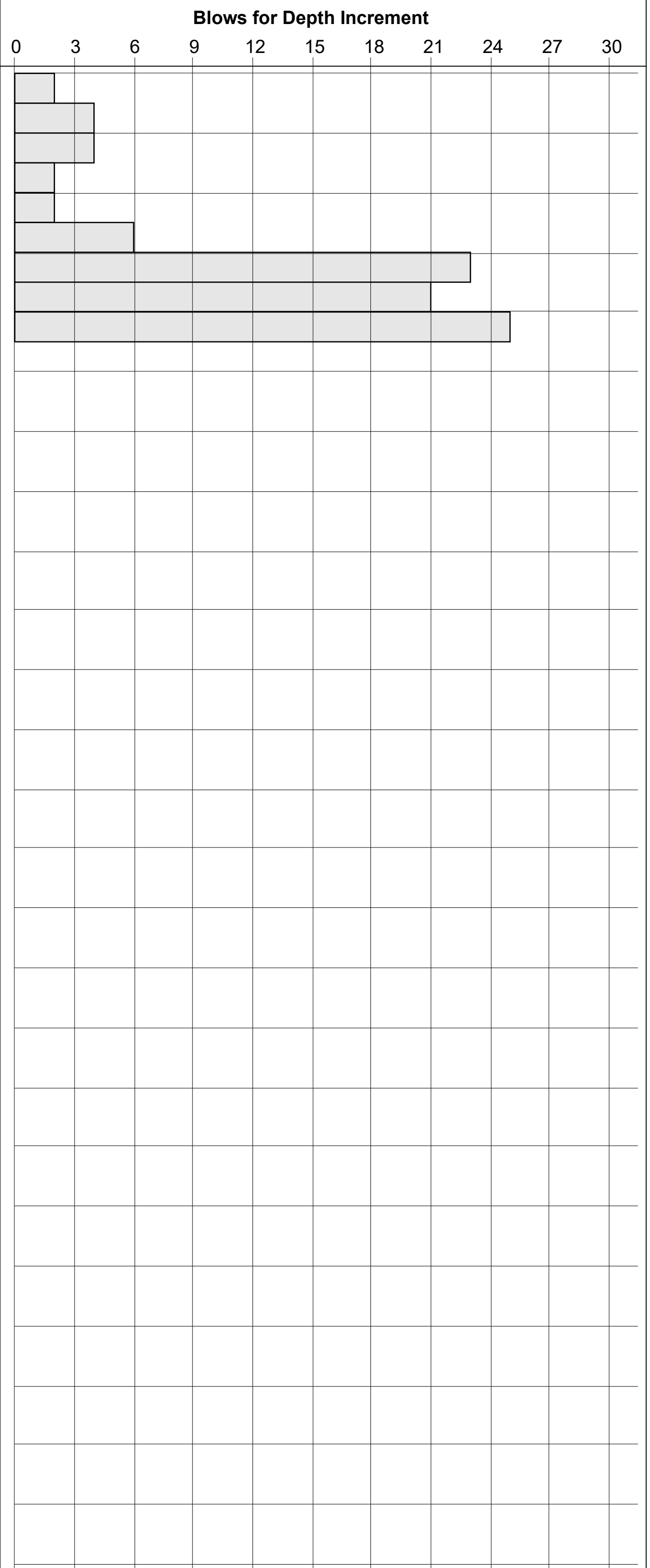
Figure No. 10809-06-21.DPH36

Ground Investigations Ireland Ltd www.gii.ie	Site Site Investigation Ennis	Probe Number **DPH37**

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	25.60	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532144.2 E 676801.4 N	20/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	4	
0.20-0.30	4	
0.30-0.40	2	
0.40-0.50	2	
0.50-0.60	6	
0.60-0.70	23	
0.70-0.80	21	
0.80-0.90	25	

Level (mOD)	Depth (m)
25.60	0.00
25.10	0.50
24.60	1.00
24.10	1.50
23.60	2.00
23.10	2.50
22.60	3.00
22.10	3.50
21.60	4.00
21.10	4.50
20.60	5.00



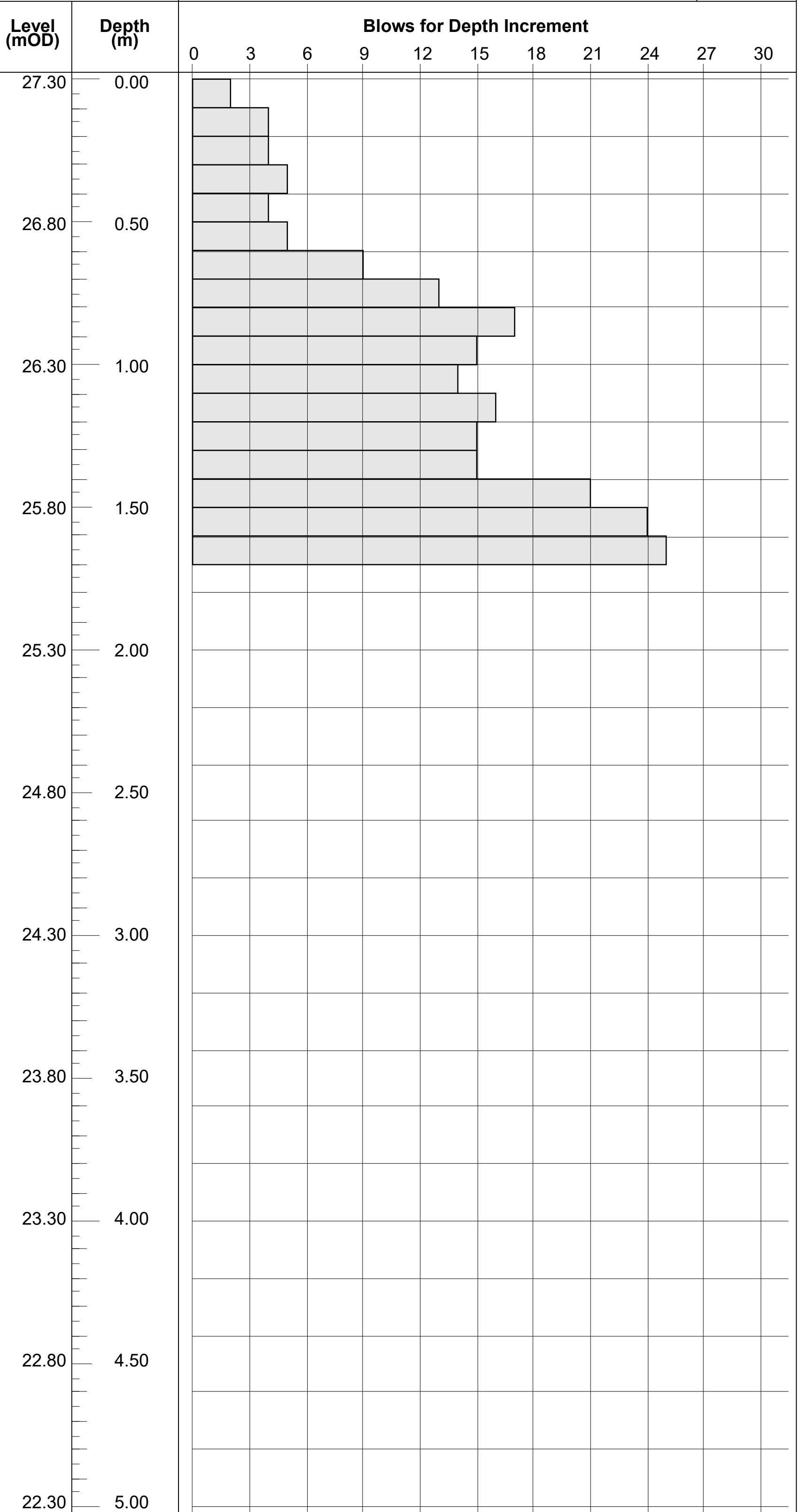
Remarks
Refusal at 0.90m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH37

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH38
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 27.30	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532246.7 E 676796.4 N	**Dates** 22/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	4	
0.20-0.30	4	
0.30-0.40	5	
0.40-0.50	4	
0.50-0.60	5	
0.60-0.70	9	
0.70-0.80	13	
0.80-0.90	17	
0.90-1.00	15	
1.00-1.10	14	
1.10-1.20	16	
1.20-1.30	15	
1.30-1.40	15	
1.40-1.50	21	
1.50-1.60	24	
1.60-1.70	25	



Remarks
Refusal at 1.70m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No. 10809-06-21.DPH38

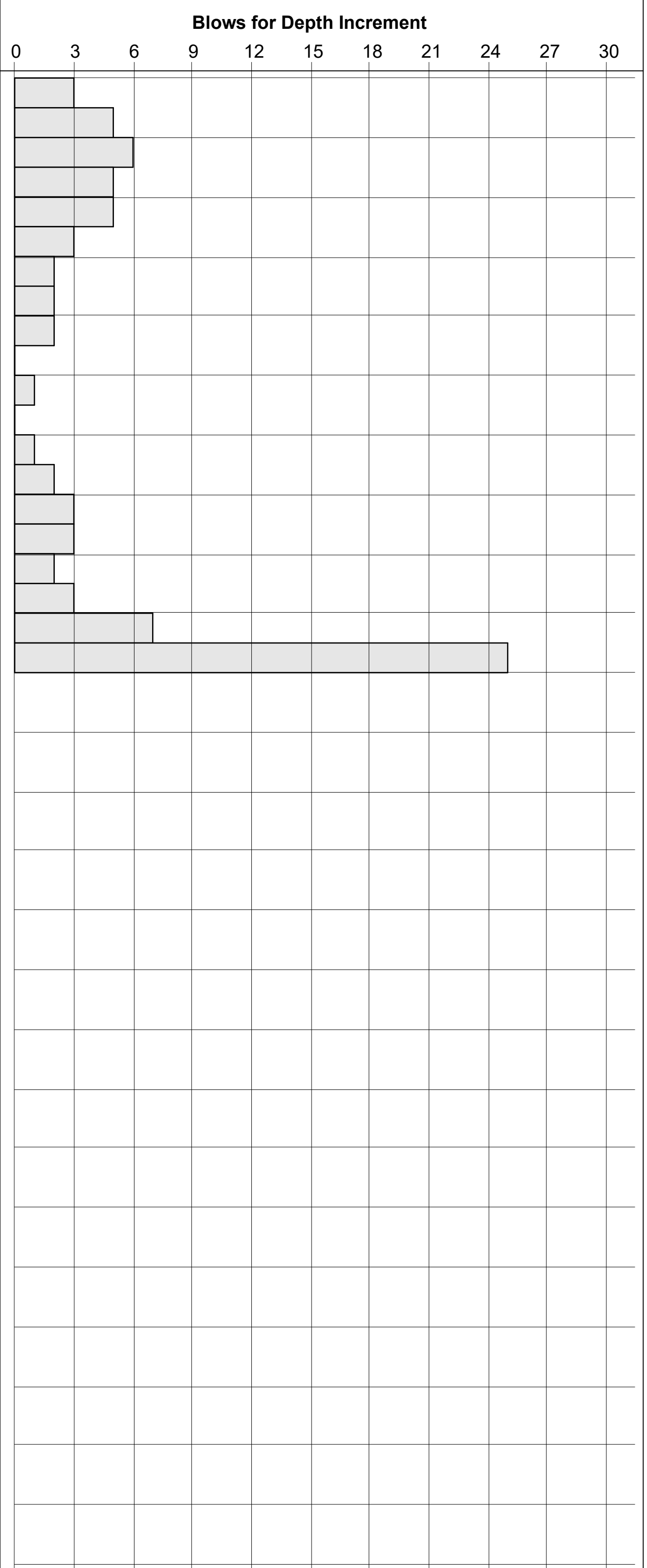
Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Site Investigation Ennis	DPH39

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	29.06	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532064.3 E 676791.9 N	20/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	3	
0.10-0.20	5	
0.20-0.30	6	
0.30-0.40	5	
0.40-0.50	5	
0.50-0.60	3	
0.60-0.70	2	
0.70-0.80	2	
0.80-0.90	2	
0.90-1.00	0	
1.00-1.10	1	
1.10-1.20	0	
1.20-1.30	1	
1.30-1.40	2	
1.40-1.50	3	
1.50-1.60	3	
1.60-1.70	2	
1.70-1.80	3	
1.80-1.90	7	
1.90-2.00	25	

Level (mOD)	Depth (m)
29.06	0.00
28.56	0.50
28.06	1.00
27.56	1.50
27.06	2.00
26.56	2.50
26.06	3.00
25.56	3.50
25.06	4.00
24.56	4.50
24.06	5.00



Remarks
Refusal at 2.00m BGL.

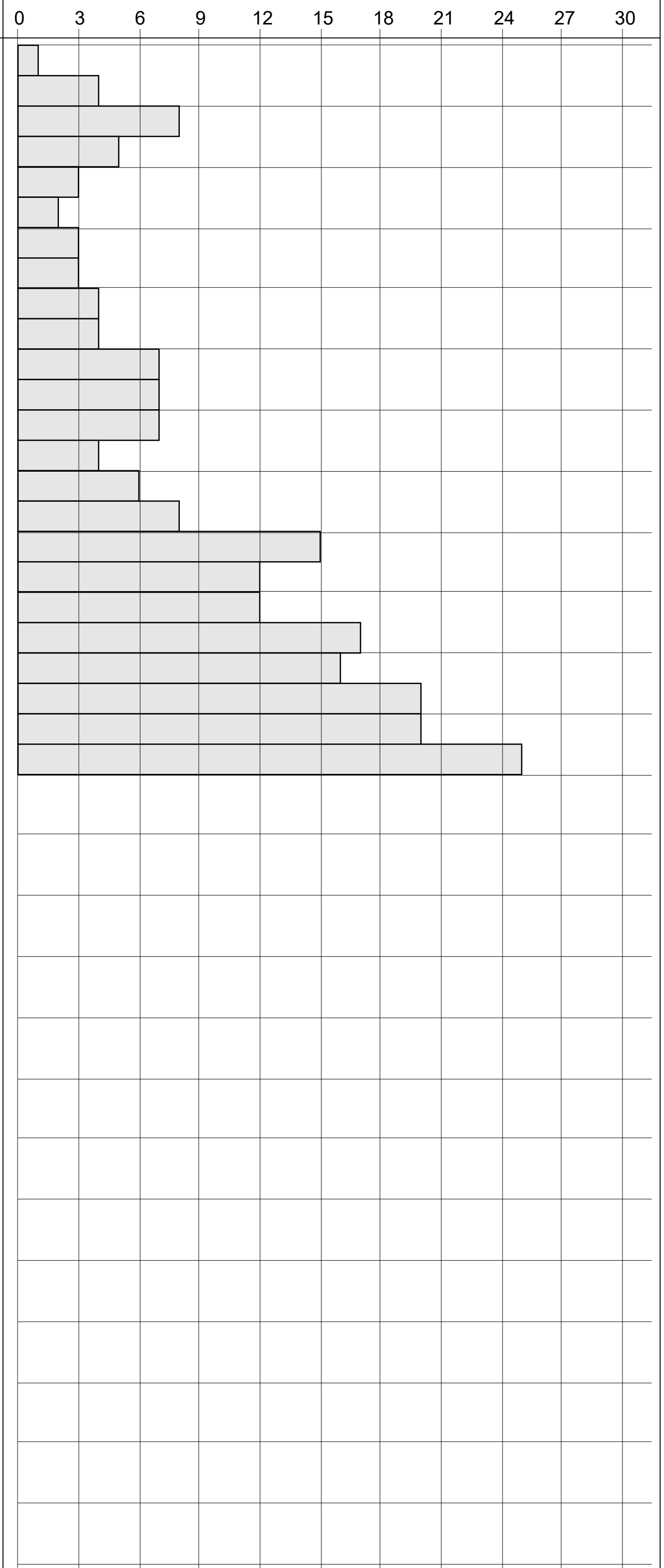
Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH39

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: **DPH40**
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 27.61	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532093.3 E 676787.8 N	**Dates** 21/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	1	
0.10-0.20	4	
0.20-0.30	8	
0.30-0.40	5	
0.40-0.50	3	
0.50-0.60	2	
0.60-0.70	3	
0.70-0.80	3	
0.80-0.90	4	
0.90-1.00	4	
1.00-1.10	7	
1.10-1.20	7	
1.20-1.30	7	
1.30-1.40	4	
1.40-1.50	6	
1.50-1.60	8	
1.60-1.70	15	
1.70-1.80	12	
1.80-1.90	12	
1.90-2.00	17	
2.00-2.10	16	
2.10-2.20	20	
2.20-2.30	20	
2.30-2.40	25	

Level (mOD)	Depth (m)
27.61	0.00
27.11	0.50
26.61	1.00
26.11	1.50
25.61	2.00
25.11	2.50
24.61	3.00
24.11	3.50
23.61	4.00
23.11	4.50
22.61	5.00



Remarks
Refusal at 2.40m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

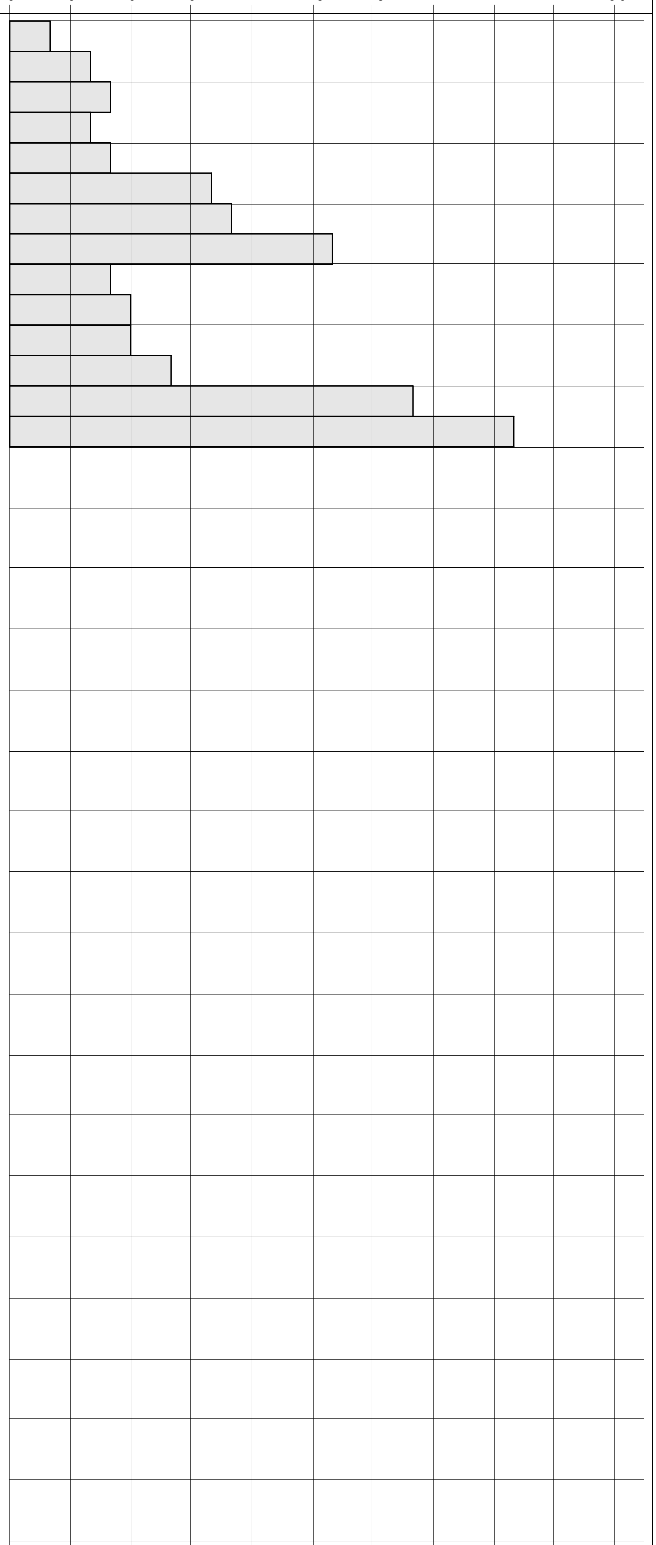
Figure No. 10809-06-21.DPH40

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH41
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions: Diameter 43.7mm, Angle 0°	Ground Level (mOD): 27.52	Client: AKM Design	Job Number: 10809-06-21
	Location: 532203.5 E 676779.9 N	Dates: 22/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	4	
0.20-0.30	5	
0.30-0.40	4	
0.40-0.50	5	
0.50-0.60	10	
0.60-0.70	11	
0.70-0.80	16	
0.80-0.90	5	
0.90-1.00	6	
1.00-1.10	6	
1.10-1.20	8	
1.20-1.30	20	
1.30-1.40	25	

Level (mOD)	Depth (m)
27.52	0.00
27.02	0.50
26.52	1.00
26.02	1.50
25.52	2.00
25.02	2.50
24.52	3.00
24.02	3.50
23.52	4.00
23.02	4.50
22.52	5.00

Blows for Depth Increment



Remarks
Refusal at 1.40m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

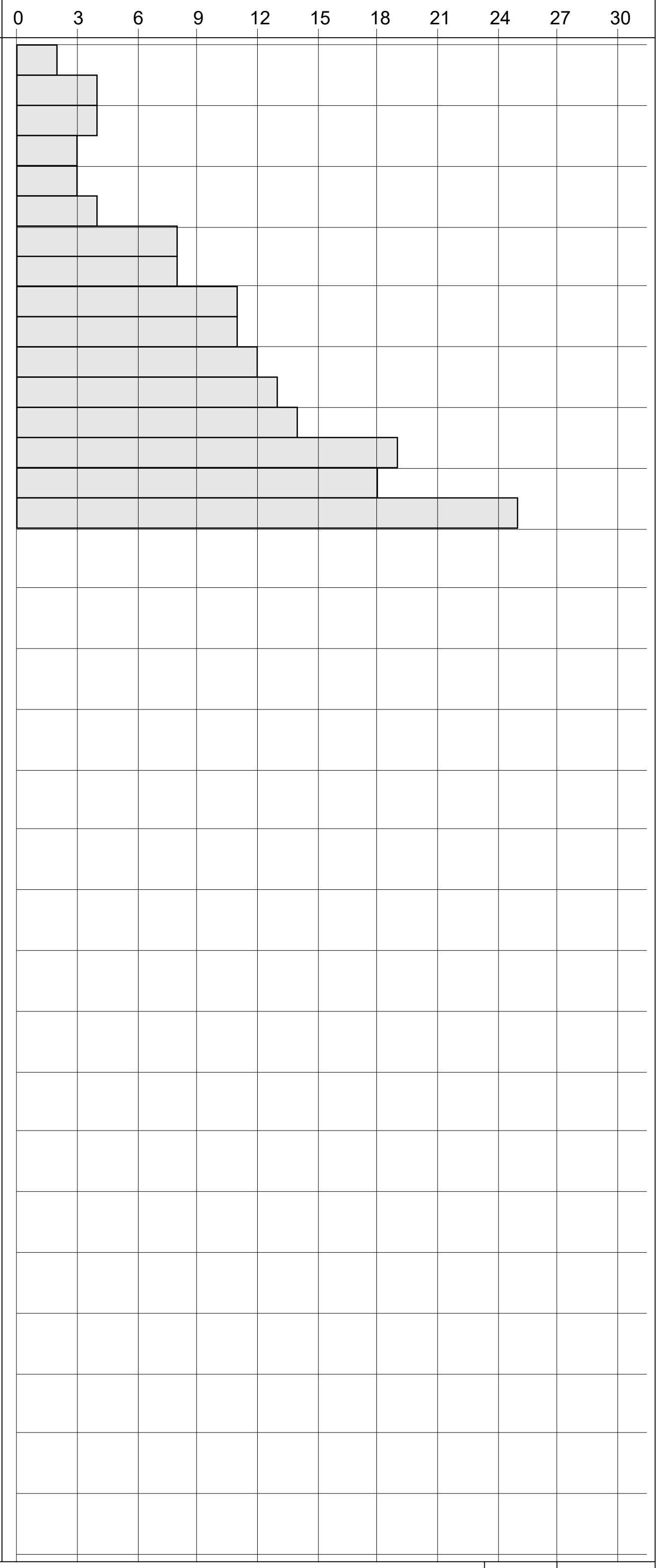
Figure No.
10809-06-21.DPH41

Ground Investigations Ireland Ltd www.gii.ie	Site Site Investigation Ennis	Probe Number DPH42

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	27.44	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532234.8 E 676769.6 N	22/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		27.44	0.00
0.10-0.20	4			
0.20-0.30	4			
0.30-0.40	3			
0.40-0.50	3			
0.50-0.60	4		26.94	0.50
0.60-0.70	8			
0.70-0.80	8			
0.80-0.90	11			
0.90-1.00	11			
1.00-1.10	12		26.44	1.00
1.10-1.20	13			
1.20-1.30	14			
1.30-1.40	19			
1.40-1.50	18			
1.50-1.60	25		25.94	1.50
			25.44	2.00
			24.94	2.50
			24.44	3.00
			23.94	3.50
			23.44	4.00
			22.94	4.50
			22.44	5.00

Blows for Depth Increment



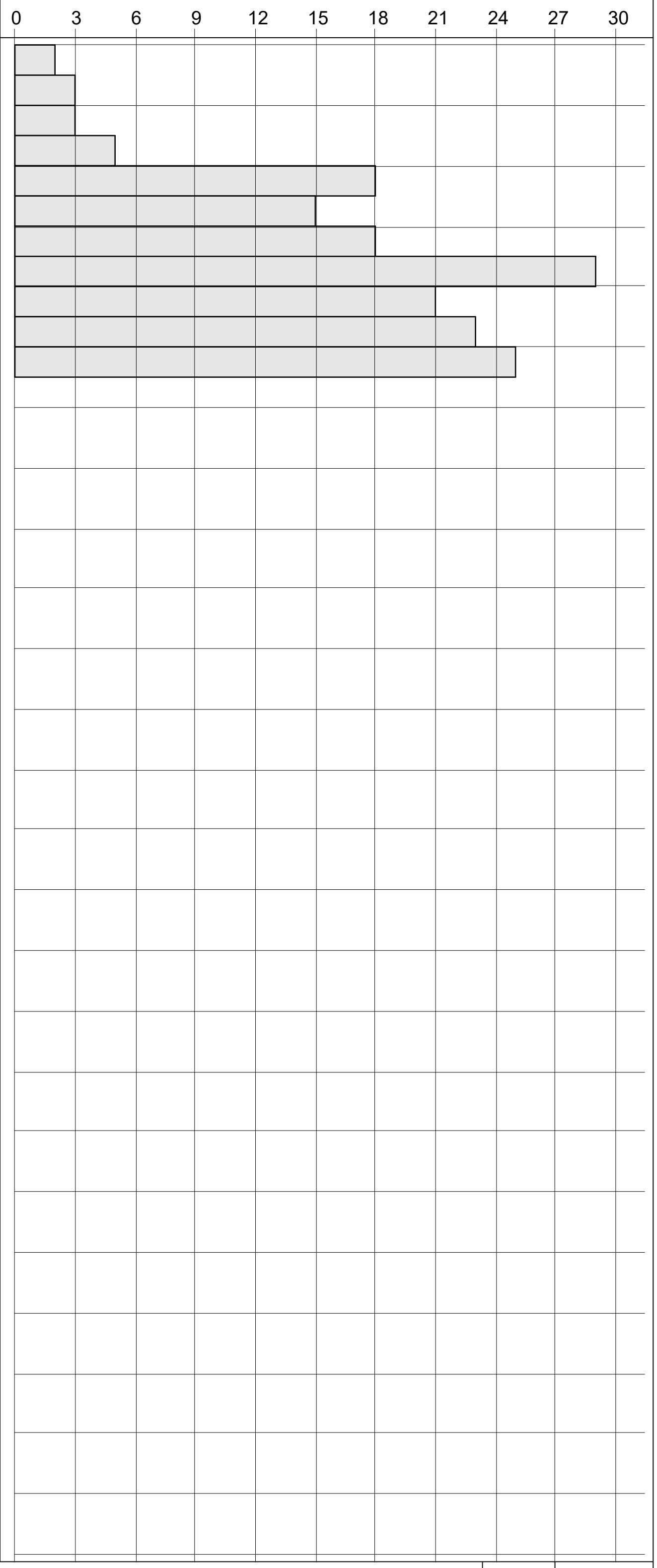
Remarks
Refusal at 1.60m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH42

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH43
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions: Diameter 43.7mm, Angle 0°	Ground Level (mOD): 27.15	Client: AKM Design	Job Number: 10809-06-21
	Location: 532127 E 676770.1 N	Dates: 20/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		27.15	0.00
0.10-0.20	3			
0.20-0.30	3			
0.30-0.40	5			
0.40-0.50	18			
0.50-0.60	15		26.65	0.50
0.60-0.70	18			
0.70-0.80	29			
0.80-0.90	21			
0.90-1.00	23			
1.00-1.10	25		26.15	1.00
			25.65	1.50
			25.15	2.00
			24.65	2.50
			24.15	3.00
			23.65	3.50
			23.15	4.00
			22.65	4.50
			22.15	5.00



Remarks
Refusal at 1.10m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH43

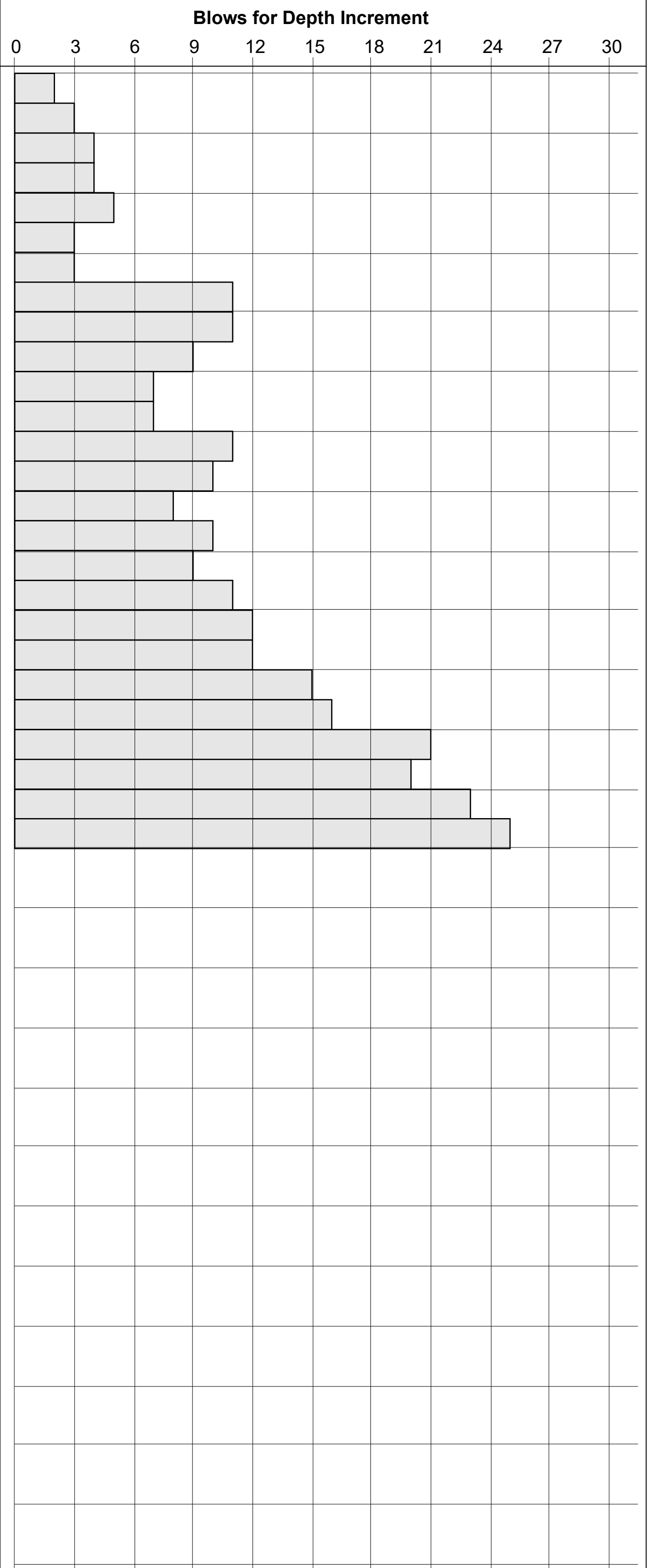
Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Site Investigation Ennis	DPH44

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	30.12	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532053.8 E 676768.1 N	20/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	3	
0.20-0.30	4	
0.30-0.40	4	
0.40-0.50	5	
0.50-0.60	3	
0.60-0.70	3	
0.70-0.80	11	
0.80-0.90	11	
0.90-1.00	9	
1.00-1.10	7	
1.10-1.20	7	
1.20-1.30	11	
1.30-1.40	10	
1.40-1.50	8	
1.50-1.60	10	
1.60-1.70	9	
1.70-1.80	11	
1.80-1.90	12	
1.90-2.00	12	
2.00-2.10	15	
2.10-2.20	16	
2.20-2.30	21	
2.30-2.40	20	
2.40-2.50	23	
2.50-2.60	25	

Level (mOD)	Depth (m)
30.12	0.00
29.62	0.50
29.12	1.00
28.62	1.50
28.12	2.00
27.62	2.50
27.12	3.00
26.62	3.50
26.12	4.00
25.62	4.50
25.12	5.00



Remarks
Refusal at 2.60m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

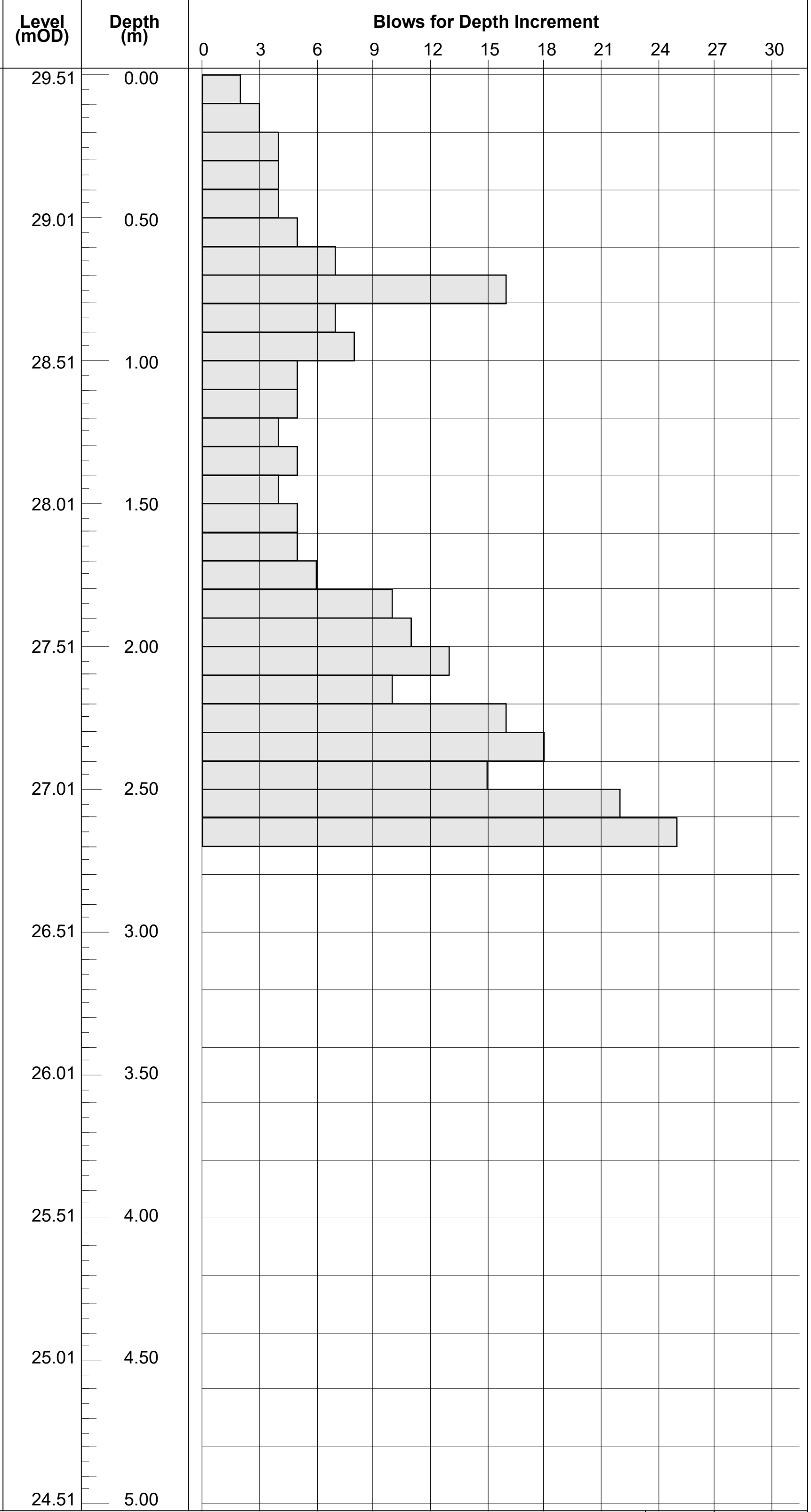
Figure No.
10809-06-21.DPH44

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Site Investigation Ennis	DPH45

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	29.51	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532090.5 E 676764.1 N	21/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	3	
0.20-0.30	4	
0.30-0.40	4	
0.40-0.50	4	
0.50-0.60	5	
0.60-0.70	7	
0.70-0.80	16	
0.80-0.90	7	
0.90-1.00	8	
1.00-1.10	5	
1.10-1.20	5	
1.20-1.30	4	
1.30-1.40	5	
1.40-1.50	4	
1.50-1.60	5	
1.60-1.70	5	
1.70-1.80	6	
1.80-1.90	10	
1.90-2.00	11	
2.00-2.10	13	
2.10-2.20	10	
2.20-2.30	16	
2.30-2.40	18	
2.40-2.50	15	
2.50-2.60	22	
2.60-2.70	25	



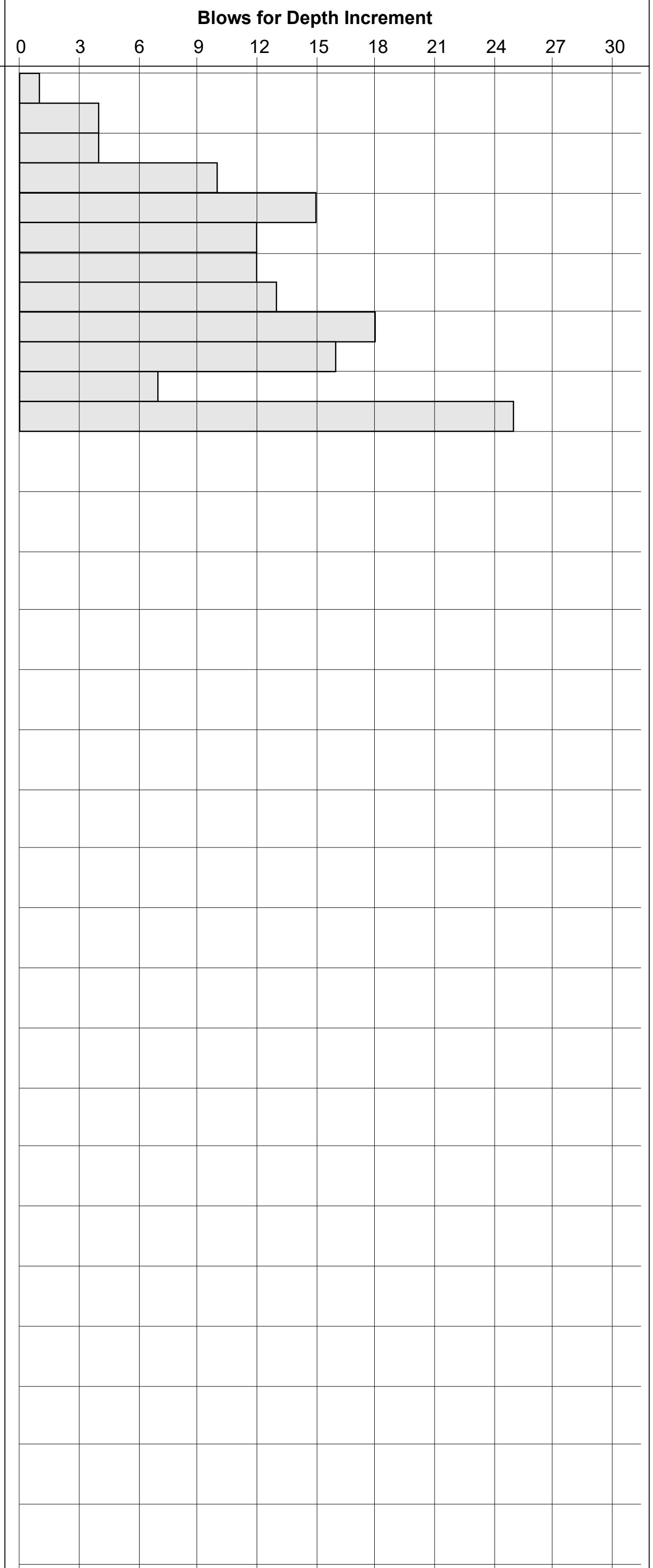
Remarks
Refusal at 2.70m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH45

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH46
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 27.62	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532154.6 E 676751.6 N	**Dates** 20/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	1		27.62	0.00
0.10-0.20	4			
0.20-0.30	4			
0.30-0.40	10			
0.40-0.50	15			
0.50-0.60	12		27.12	0.50
0.60-0.70	12			
0.70-0.80	13			
0.80-0.90	18			
0.90-1.00	16			
1.00-1.10	7		26.62	1.00
1.10-1.20	25			
			26.12	1.50
			25.62	2.00
			25.12	2.50
			24.62	3.00
			24.12	3.50
			23.62	4.00
			23.12	4.50
			22.62	5.00



Remarks
Refusal at 1.20m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

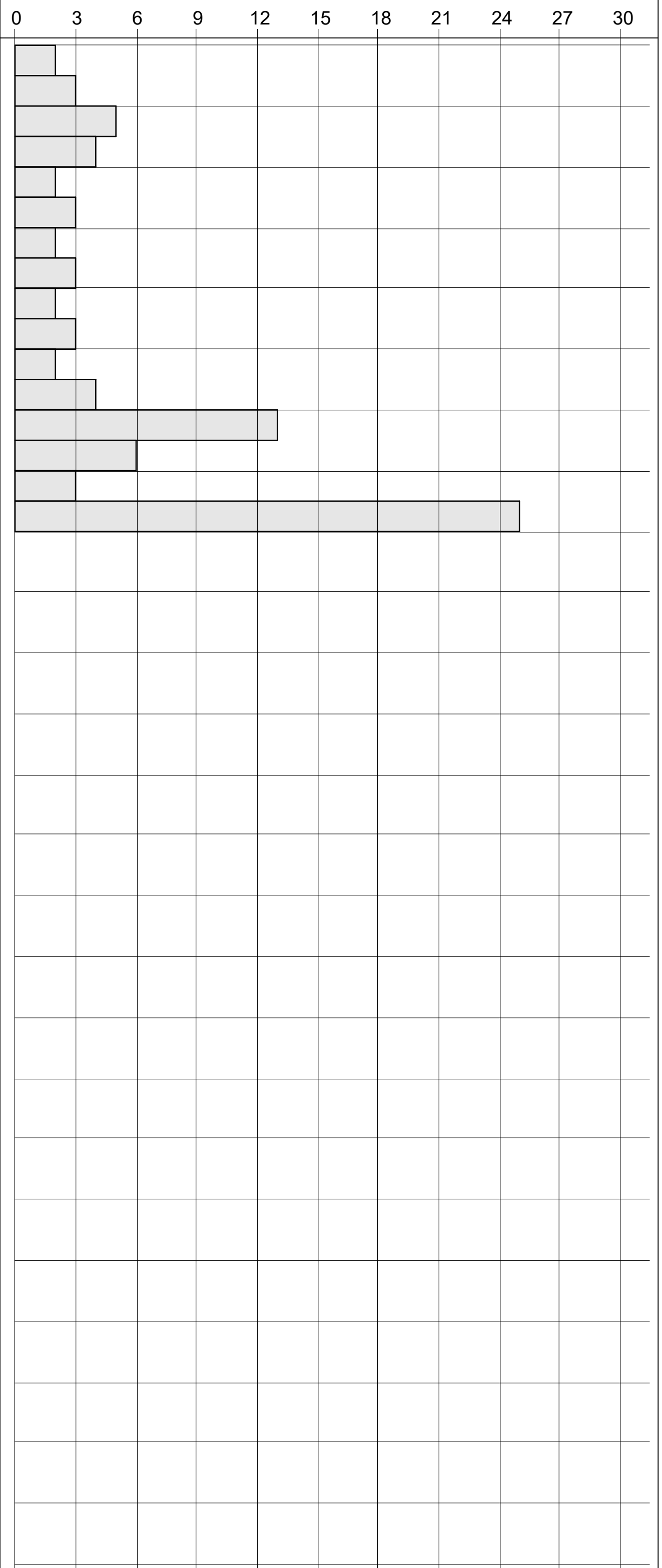
Figure No. 10809-06-21.DPH46

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH47
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions: Diameter 43.7mm, Angle 0°	Ground Level (mOD): 30.36	Client: AKM Design	Job Number: 10809-06-21
	Location: 532078.3 E 676739.7 N	Dates: 20/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	3	
0.20-0.30	5	
0.30-0.40	4	
0.40-0.50	2	
0.50-0.60	3	
0.60-0.70	2	
0.70-0.80	3	
0.80-0.90	2	
0.90-1.00	3	
1.00-1.10	2	
1.10-1.20	4	
1.20-1.30	13	
1.30-1.40	6	
1.40-1.50	3	
1.50-1.60	25	

Level (mOD)	Depth (m)
30.36	0.00
29.86	0.50
29.36	1.00
28.86	1.50
28.36	2.00
27.86	2.50
27.36	3.00
26.86	3.50
26.36	4.00
25.86	4.50
25.36	5.00

Blows for Depth Increment



Remarks
Refusal at 1.60m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

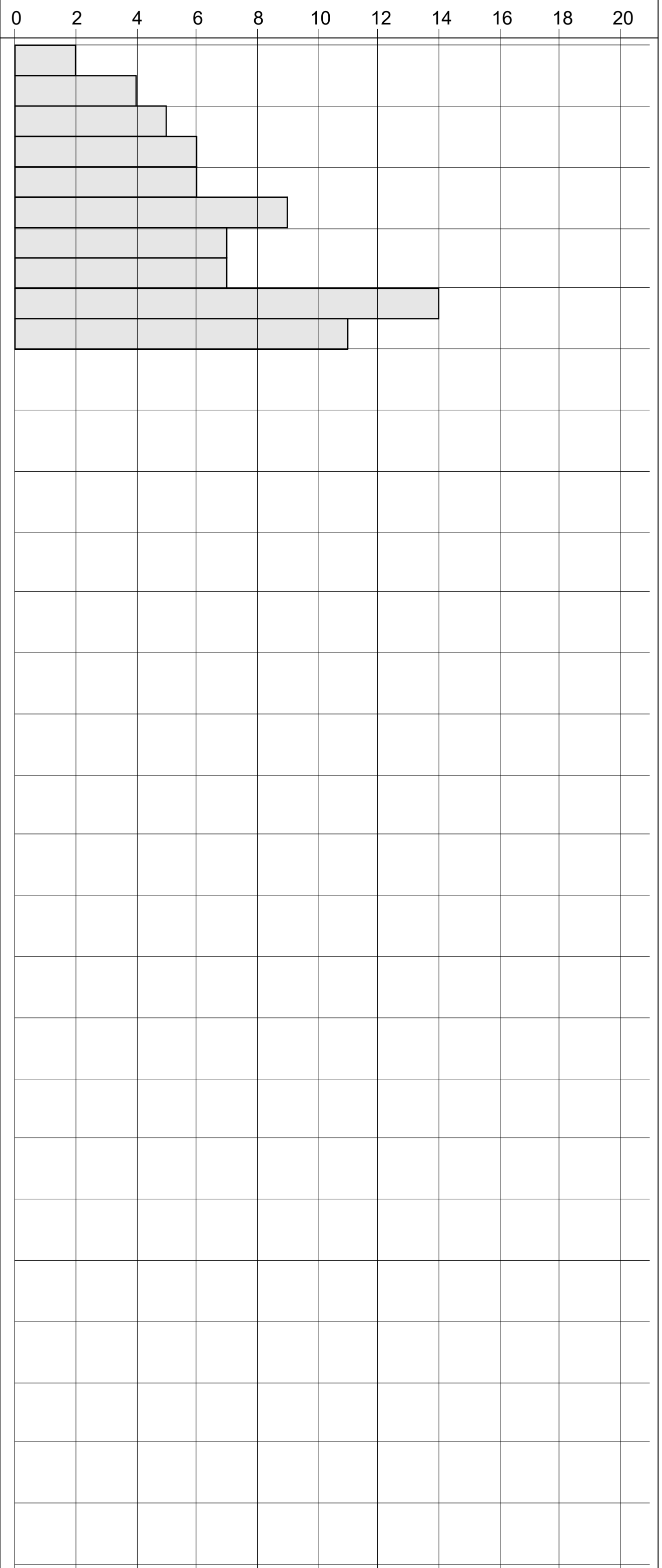
Figure No. 10809-06-21.DPH47

Ground Investigations Ireland Ltd www.gii.ie			Site Site Investigation Ennis	Probe Number **DPH48**
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 28.66	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532115.1 E 676735.9 N	**Dates** 21/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	4	
0.20-0.30	5	
0.30-0.40	6	
0.40-0.50	6	
0.50-0.60	9	
0.60-0.70	7	
0.70-0.80	7	
0.80-0.90	14	
0.90-1.00	11	

Level (mOD)	Depth (m)
28.66	0.00
28.16	0.50
27.66	1.00
27.16	1.50
26.66	2.00
26.16	2.50
25.66	3.00
25.16	3.50
24.66	4.00
24.16	4.50
23.66	5.00

Blows for Depth Increment



Remarks
Refual at 1.00m BGL.

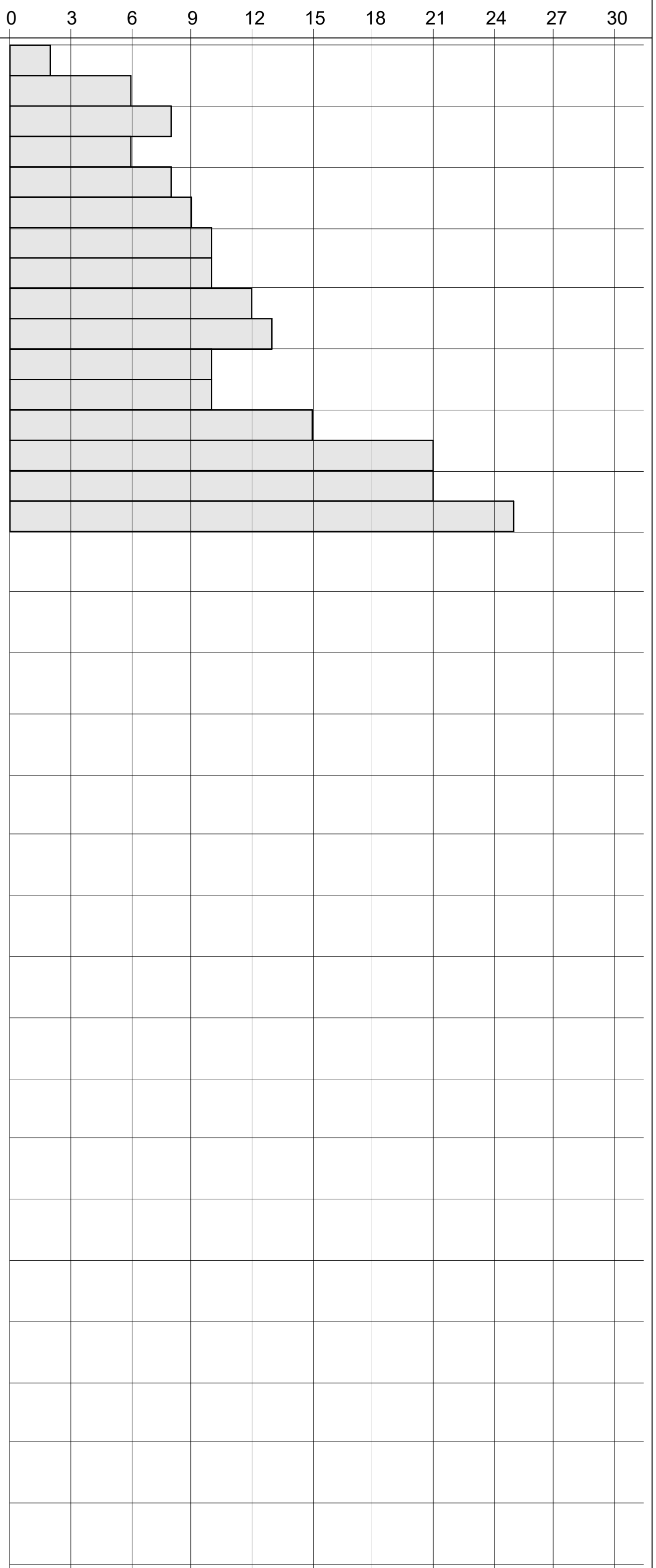
Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH48

Ground Investigations Ireland Ltd www.gii.ie			**Site** Site Investigation Ennis	**Probe Number** **DPH49**
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 27.15	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532225.8 E 676740.9 N	**Dates** 22/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		27.15	0.00
0.10-0.20	6			
0.20-0.30	8			
0.30-0.40	6			
0.40-0.50	8			
0.50-0.60	9		26.65	0.50
0.60-0.70	10			
0.70-0.80	10			
0.80-0.90	12			
0.90-1.00	13			
1.00-1.10	10		26.15	1.00
1.10-1.20	10			
1.20-1.30	15			
1.30-1.40	21			
1.40-1.50	21			
1.50-1.60	25		25.65	1.50
			25.15	2.00
			24.65	2.50
			24.15	3.00
			23.65	3.50
			23.15	4.00
			22.65	4.50
			22.15	5.00

Blows for Depth Increment



Remarks
Refusal at 1.60m BGL.

Scale (approx)	**Logged By**
1:25	C. Byrne

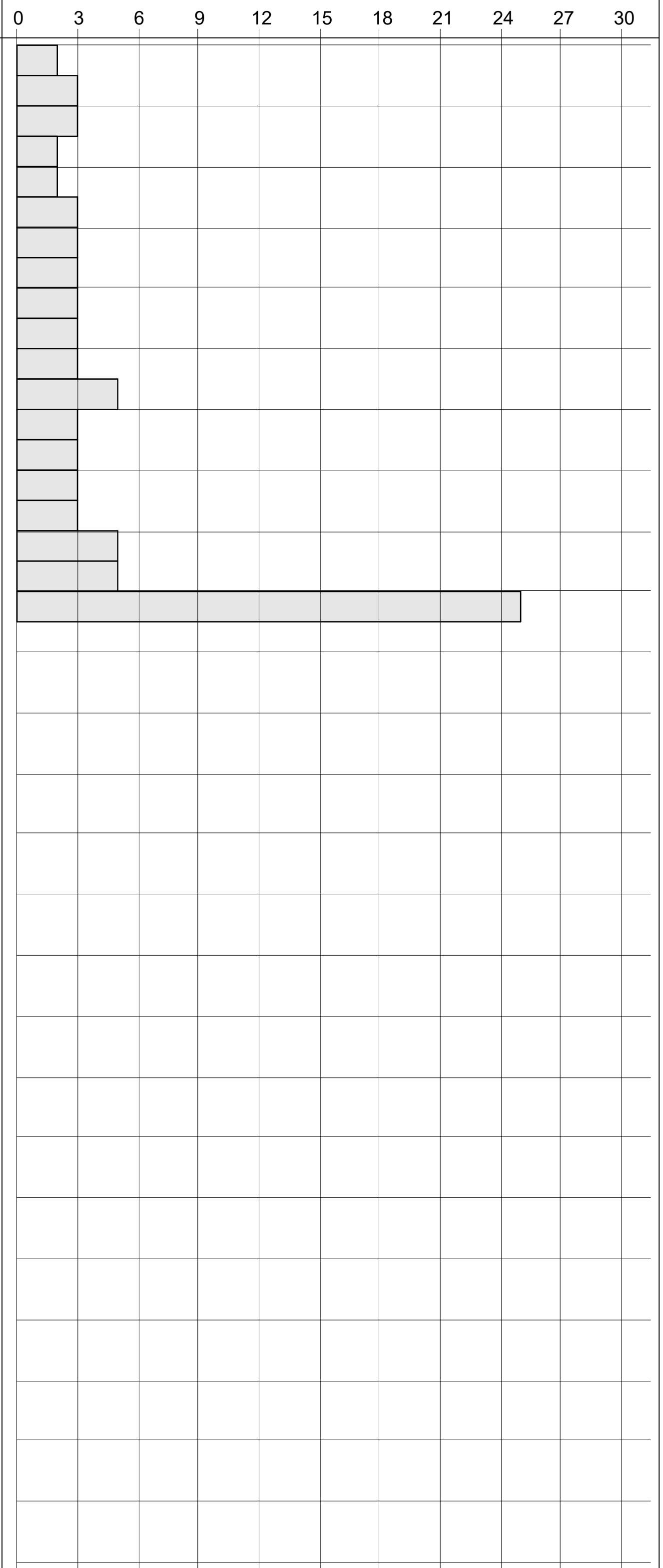
Figure No.
10809-06-21.DPH49

Ground Investigations Ireland Ltd www.gii.ie	Site: Site Investigation Ennis	Probe Number: DPH50

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	30.38	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532026.9 E 676735.3 N	20/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		30.38	0.00
0.10-0.20	3			
0.20-0.30	3			
0.30-0.40	2			
0.40-0.50	2			
0.50-0.60	3		29.88	0.50
0.60-0.70	3			
0.70-0.80	3			
0.80-0.90	3			
0.90-1.00	3			
1.00-1.10	3		29.38	1.00
1.10-1.20	5			
1.20-1.30	3			
1.30-1.40	3			
1.40-1.50	3			
1.50-1.60	3		28.88	1.50
1.60-1.70	5			
1.70-1.80	5			
1.80-1.90	25			
			28.38	2.00
			27.88	2.50
			27.38	3.00
			26.88	3.50
			26.38	4.00
			25.88	4.50
			25.38	5.00

Blows for Depth Increment



Remarks
Refusal at 1.90m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

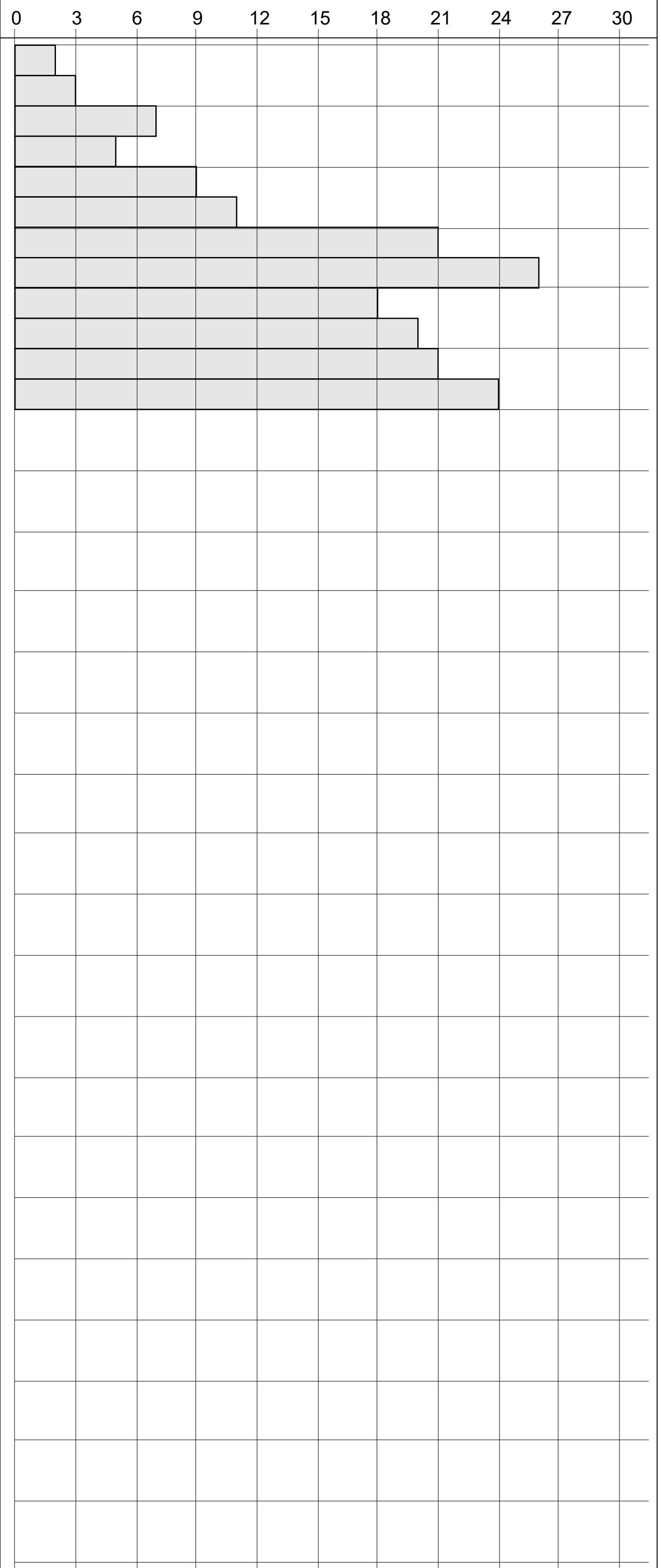
Figure No.
10809-06-21.DPH50

Ground Investigations Ireland Ltd www.gii.ie			Site Site Investigation Ennis	Probe Number **DPH51**
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 30.92	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532044.4 E 676712.8 N	**Dates** 20/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	3	
0.20-0.30	7	
0.30-0.40	5	
0.40-0.50	9	
0.50-0.60	11	
0.60-0.70	21	
0.70-0.80	26	
0.80-0.90	18	
0.90-1.00	20	
1.00-1.10	21	
1.10-1.20	24	

Level (mOD)	Depth (m)
30.92	0.00
30.42	0.50
29.92	1.00
29.42	1.50
28.92	2.00
28.42	2.50
27.92	3.00
27.42	3.50
26.92	4.00
26.42	4.50
25.92	5.00

Blows for Depth Increment



Remarks
Refusal at 1.20m BGL.

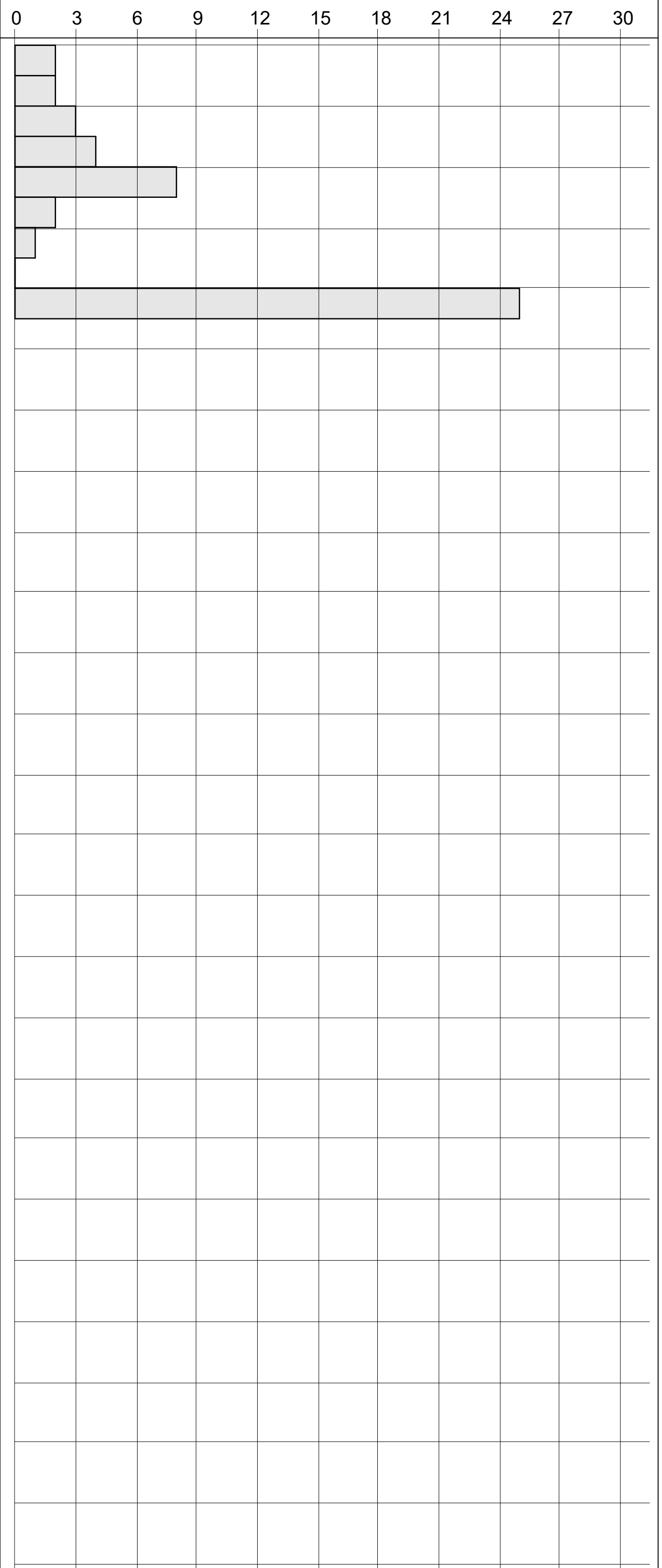
Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH51

Ground Investigations Ireland Ltd www.gii.ie			Site Site Investigation Ennis	Probe Number **DPH52**
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 27.32	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532143.1 E 676721.8 N	**Dates** 20/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		27.32	0.00
0.10-0.20	2			
0.20-0.30	3			
0.30-0.40	4			
0.40-0.50	8			
0.50-0.60	2		26.82	0.50
0.60-0.70	1			
0.70-0.80	0			
0.80-0.90	25			
			26.32	1.00
			25.82	1.50
			25.32	2.00
			24.82	2.50
			24.32	3.00
			23.82	3.50
			23.32	4.00
			22.82	4.50
			22.32	5.00

Blows for Depth Increment



Remarks
Refusal at 0.90m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH52

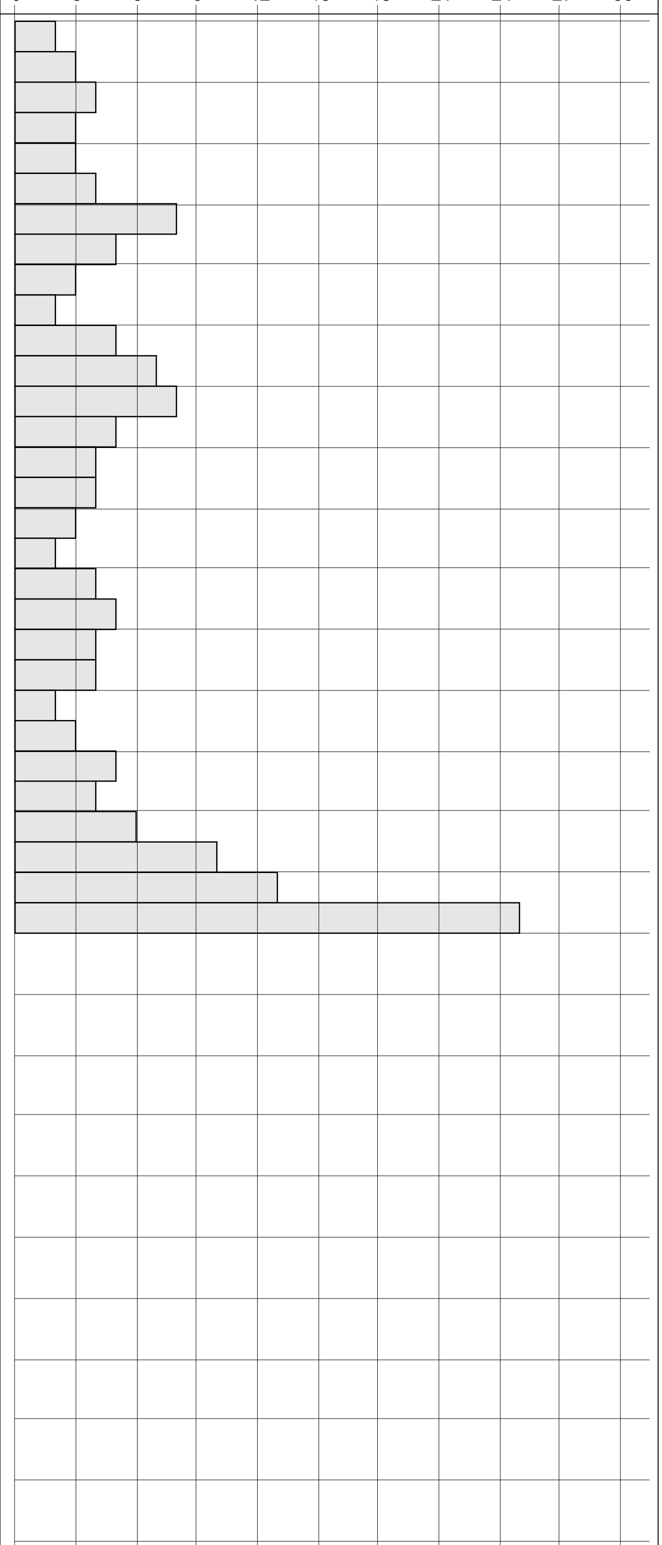
Ground Investigations Ireland Ltd www.gii.ie	Site: Site Investigation Ennis	Probe Number: DPH53

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	29.87	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532103.4 E 676709.9 N	20/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	3	
0.20-0.30	4	
0.30-0.40	3	
0.40-0.50	3	
0.50-0.60	4	
0.60-0.70	8	
0.70-0.80	5	
0.80-0.90	3	
0.90-1.00	2	
1.00-1.10	5	
1.10-1.20	7	
1.20-1.30	8	
1.30-1.40	5	
1.40-1.50	4	
1.50-1.60	4	
1.60-1.70	3	
1.70-1.80	2	
1.80-1.90	4	
1.90-2.00	5	
2.00-2.10	4	
2.10-2.20	4	
2.20-2.30	2	
2.30-2.40	3	
2.40-2.50	5	
2.50-2.60	4	
2.60-2.70	6	
2.70-2.80	10	
2.80-2.90	13	
2.90-3.00	25	

Level (mOD)	Depth (m)
29.87	0.00
29.37	0.50
28.87	1.00
28.37	1.50
27.87	2.00
27.37	2.50
26.87	3.00
26.37	3.50
25.87	4.00
25.37	4.50
24.87	5.00

Blows for Depth Increment



Remarks
Refusal at 3.00m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

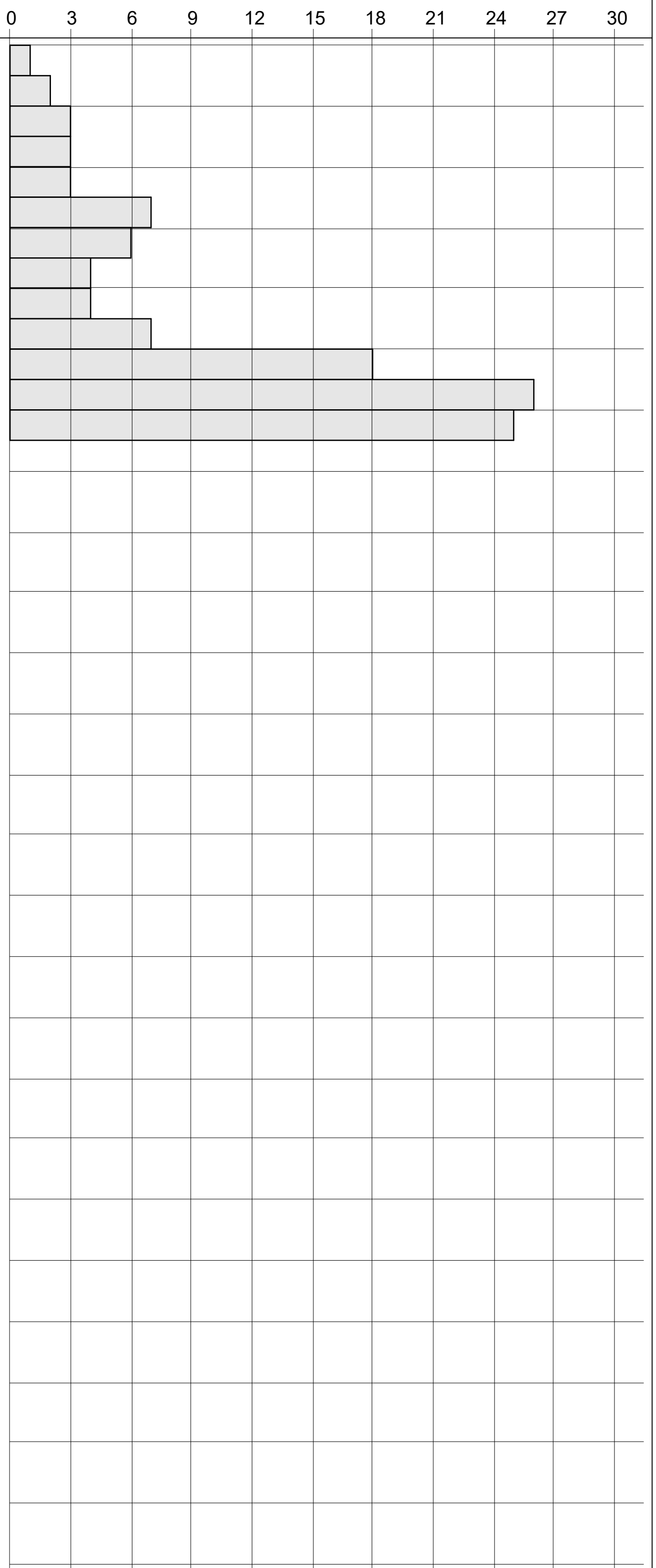
Figure No.
10809-06-21.DPH53

Ground Investigations Ireland Ltd www.gii.ie	**Site** Site Investigation Ennis	**Probe Number** DPH54

Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 28.18	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532131.8 E 676692.6 N	**Dates** 20/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	1		28.18	0.00
0.10-0.20	2			
0.20-0.30	3			
0.30-0.40	3			
0.40-0.50	3			
0.50-0.60	7		27.68	0.50
0.60-0.70	6			
0.70-0.80	4			
0.80-0.90	4			
0.90-1.00	7			
1.00-1.10	18		27.18	1.00
1.10-1.20	26			
1.20-1.30	25			
			26.68	1.50
			26.18	2.00
			25.68	2.50
			25.18	3.00
			24.68	3.50
			24.18	4.00
			23.68	4.50
			23.18	5.00

Blows for Depth Increment



Remarks
Refusal at 1.30m BGL.

Scale (approx)	**Logged By**
1:25	C. Byrne

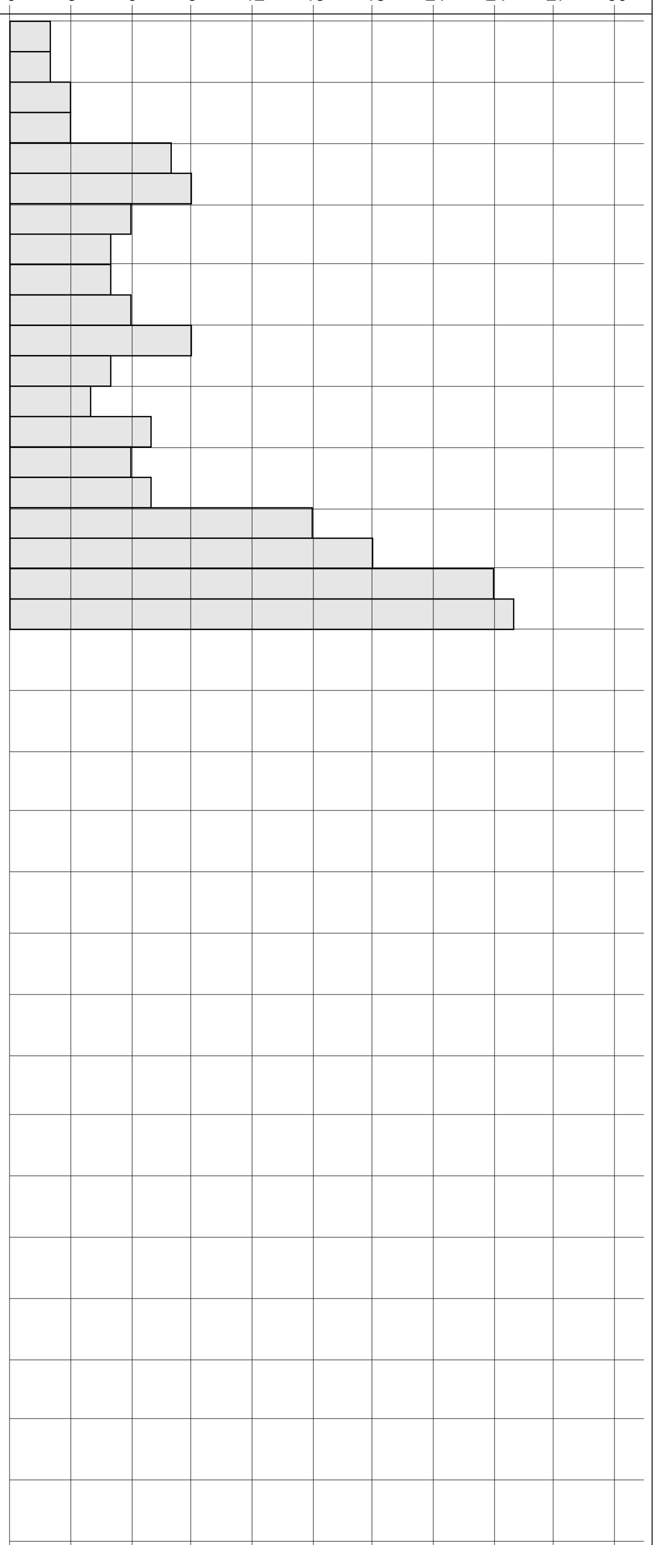
Figure No.
10809-06-21.DPH54

Ground Investigations Ireland Ltd www.gii.ie			Site Site Investigation Ennis	Probe Number DPH55
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions Diameter 43.7mm, Angle 0°	Ground Level (mOD) 27.57	Client AKM Design	Job Number 10809-06-21
	Location 532168.3 E 676694.8 N	Dates 20/07/2021	Engineer	Sheet 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	2	
0.10-0.20	2	
0.20-0.30	3	
0.30-0.40	3	
0.40-0.50	8	
0.50-0.60	9	
0.60-0.70	6	
0.70-0.80	5	
0.80-0.90	5	
0.90-1.00	6	
1.00-1.10	9	
1.10-1.20	5	
1.20-1.30	4	
1.30-1.40	7	
1.40-1.50	6	
1.50-1.60	7	
1.60-1.70	15	
1.70-1.80	18	
1.80-1.90	24	
1.90-2.00	25	

Level (mOD)	Depth (m)
27.57	0.00
27.07	0.50
26.57	1.00
26.07	1.50
25.57	2.00
25.07	2.50
24.57	3.00
24.07	3.50
23.57	4.00
23.07	4.50
22.57	5.00

Blows for Depth Increment



Remarks
Refusal at 2.00m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

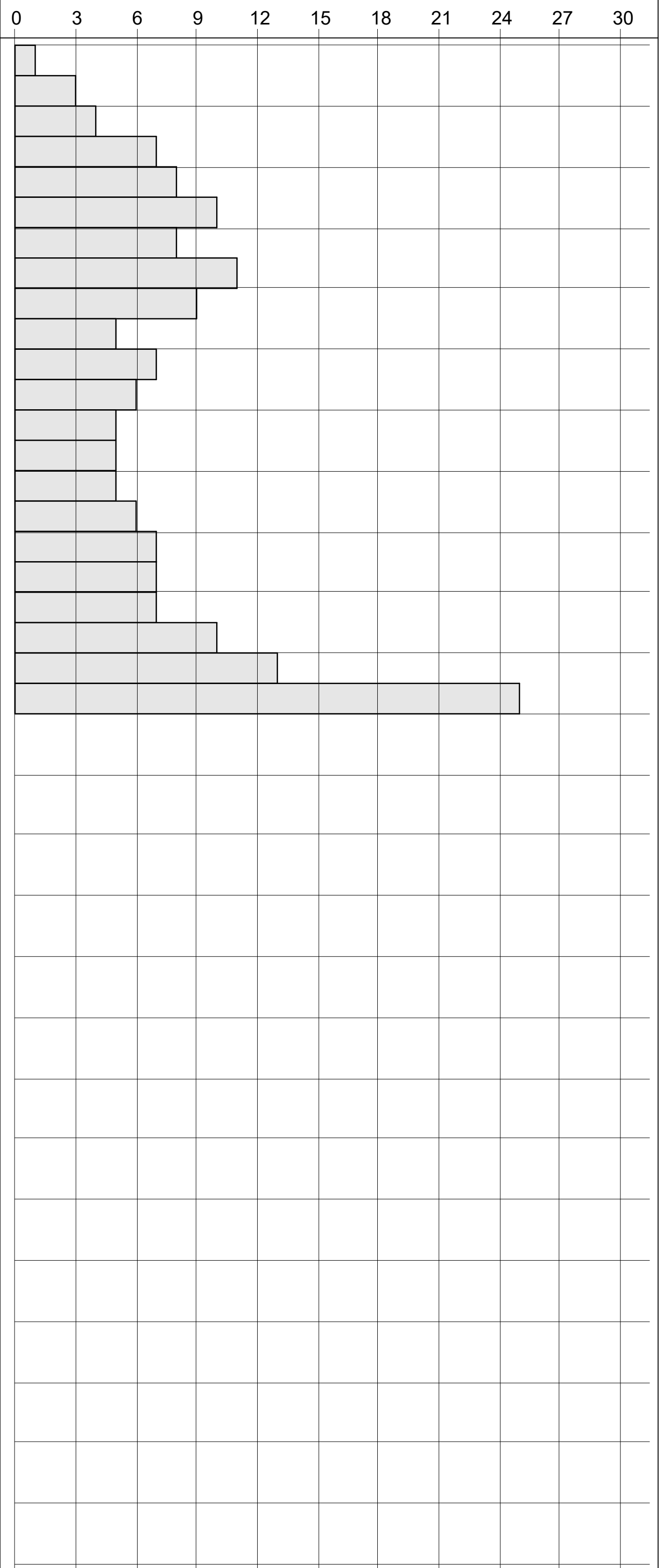
Figure No.
10809-06-21.DPH55

Ground Investigations Ireland Ltd www.gii.ie			Site Site Investigation Ennis	Probe Number **DPH56**
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 30.94	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532062.2 E 676692.1 N	**Dates** 20/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	1	
0.10-0.20	3	
0.20-0.30	4	
0.30-0.40	7	
0.40-0.50	8	
0.50-0.60	10	
0.60-0.70	8	
0.70-0.80	11	
0.80-0.90	9	
0.90-1.00	5	
1.00-1.10	7	
1.10-1.20	6	
1.20-1.30	5	
1.30-1.40	5	
1.40-1.50	5	
1.50-1.60	6	
1.60-1.70	7	
1.70-1.80	7	
1.80-1.90	7	
1.90-2.00	10	
2.00-2.10	13	
2.10-2.20	25	

Level (mOD)	Depth (m)
30.94	0.00
30.44	0.50
29.94	1.00
29.44	1.50
28.94	2.00
28.44	2.50
27.94	3.00
27.44	3.50
26.94	4.00
26.44	4.50
25.94	5.00

Blows for Depth Increment



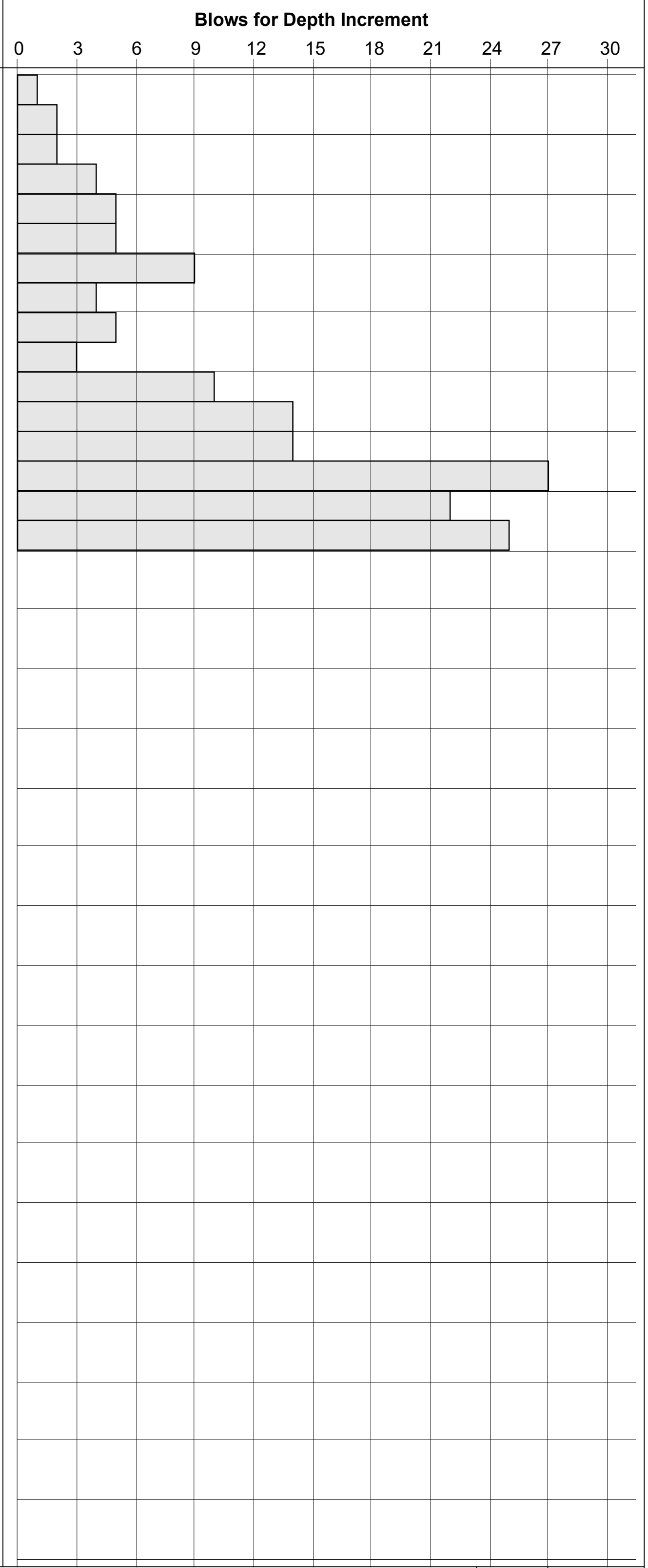
Remarks
Refusal at 2.20m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH56

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH57
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions**: Diameter 43.7mm, Angle 0°	**Ground Level (mOD)**: 30.42	**Client**: AKM Design	**Job Number**: 10809-06-21
	Location: 532082.3 E 676671.4 N	**Dates**: 20/07/2021	**Engineer**:	**Sheet**: 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	1		30.42	0.00
0.10-0.20	2			
0.20-0.30	2			
0.30-0.40	4			
0.40-0.50	5			
0.50-0.60	5		29.92	0.50
0.60-0.70	9			
0.70-0.80	4			
0.80-0.90	5			
0.90-1.00	3			
1.00-1.10	10		29.42	1.00
1.10-1.20	14			
1.20-1.30	14			
1.30-1.40	27			
1.40-1.50	22			
1.50-1.60	25		28.92	1.50
			28.42	2.00
			27.92	2.50
			27.42	3.00
			26.92	3.50
			26.42	4.00
			25.92	4.50
			25.42	5.00



Remarks
Refusal at 1.60m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

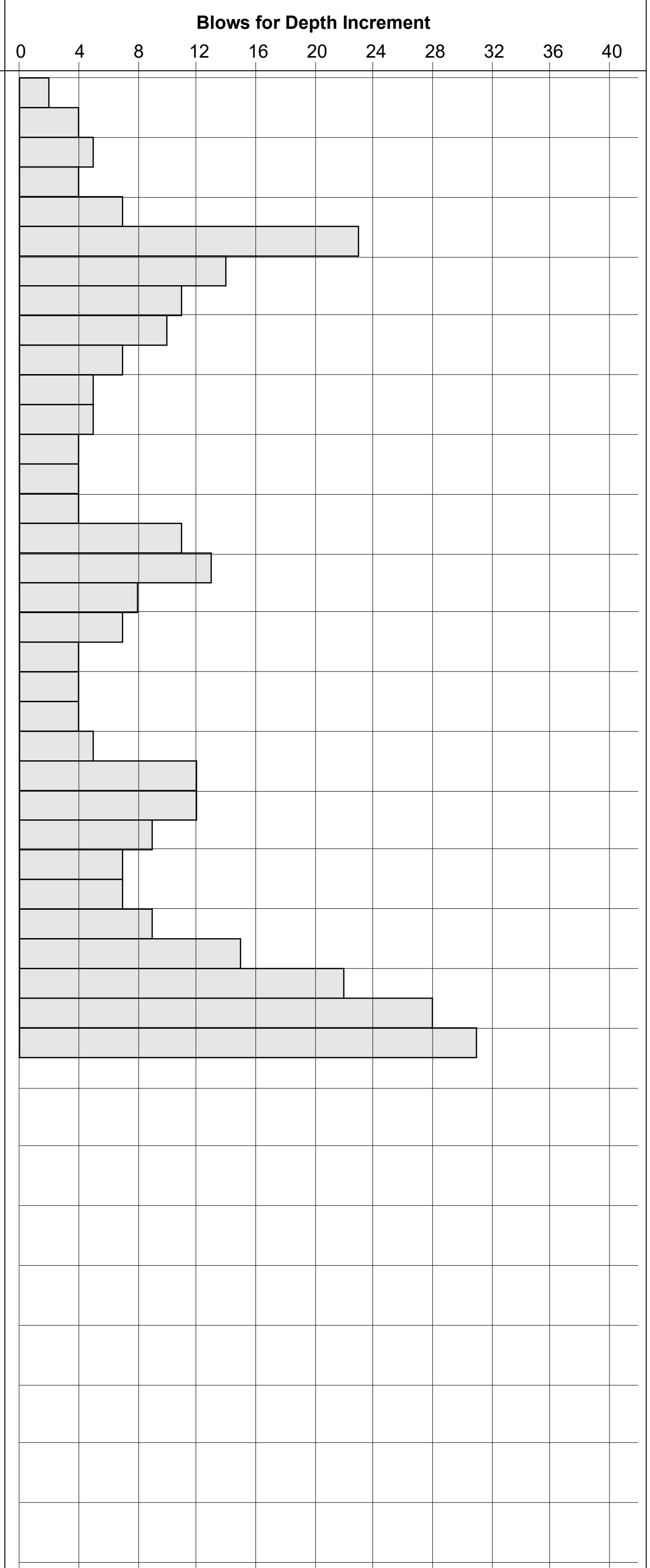
Figure No.
10809-06-21.DPH57

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Site Investigation Ennis	DPH58

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	27.24	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532159.6 E 676669.4 N	20/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		27.24	0.00
0.10-0.20	4			
0.20-0.30	5			
0.30-0.40	4			
0.40-0.50	7			
0.50-0.60	23		26.74	0.50
0.60-0.70	14			
0.70-0.80	11			
0.80-0.90	10			
0.90-1.00	7			
1.00-1.10	5		26.24	1.00
1.10-1.20	5			
1.20-1.30	4			
1.30-1.40	4			
1.40-1.50	4			
1.50-1.60	11		25.74	1.50
1.60-1.70	13			
1.70-1.80	8			
1.80-1.90	7			
1.90-2.00	4			
2.00-2.10	4		25.24	2.00
2.10-2.20	4			
2.20-2.30	5			
2.30-2.40	12			
2.40-2.50	12			
2.50-2.60	9		24.74	2.50
2.60-2.70	7			
2.70-2.80	7			
2.80-2.90	9			
2.90-3.00	15			
3.00-3.10	22		24.24	3.00
3.10-3.20	28			
3.20-3.30	31			
			23.74	3.50
			23.24	4.00
			22.74	4.50
			22.24	5.00



Remarks
Refusal at 3.30m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

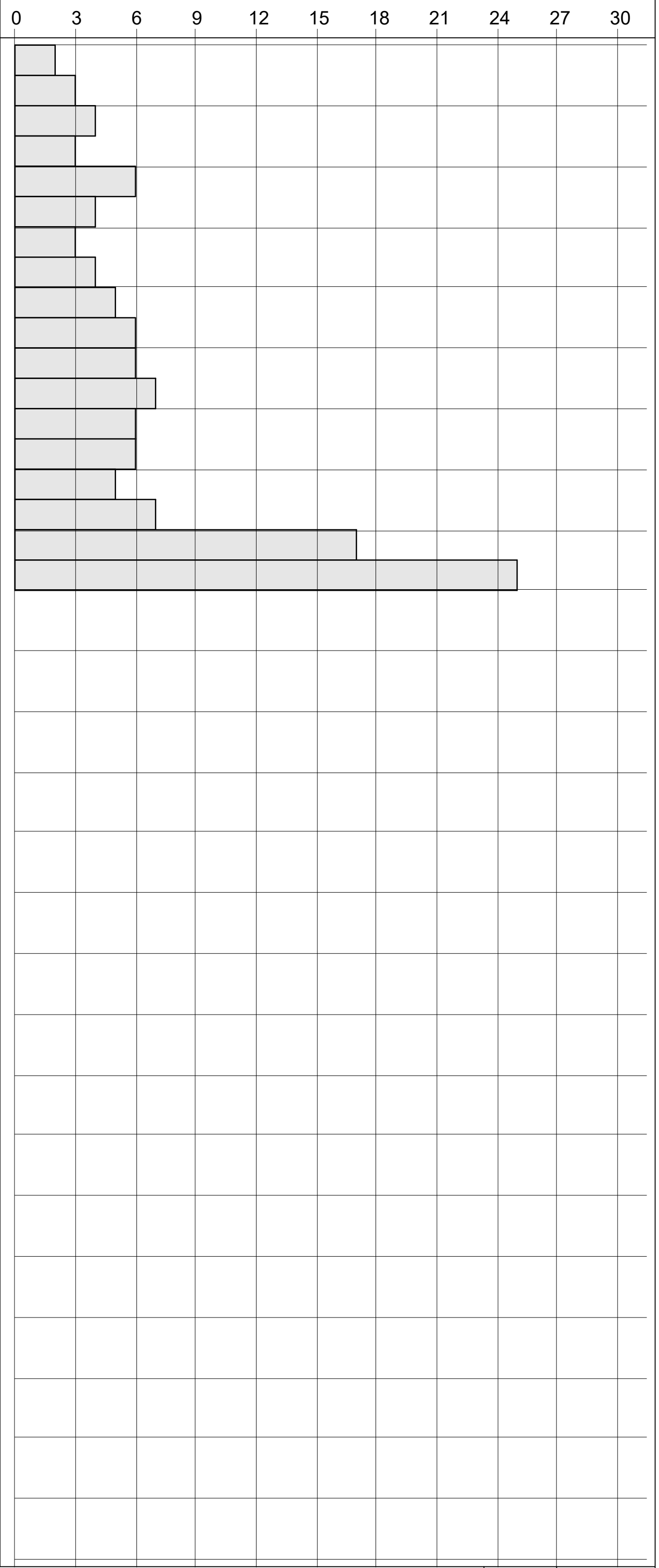
Figure No.
10809-06-21.DPH58

Ground Investigations Ireland Ltd www.gii.ie	Site Site Investigation Ennis	Probe Number DPH59

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	29.18	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532100.8 E 676648.9 N	20/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		29.18	0.00
0.10-0.20	3			
0.20-0.30	4			
0.30-0.40	3			
0.40-0.50	6			
0.50-0.60	4		28.68	0.50
0.60-0.70	3			
0.70-0.80	4			
0.80-0.90	5			
0.90-1.00	6			
1.00-1.10	6		28.18	1.00
1.10-1.20	7			
1.20-1.30	6			
1.30-1.40	6			
1.40-1.50	5			
1.50-1.60	7		27.68	1.50
1.60-1.70	17			
1.70-1.80	25			
			27.18	2.00
			26.68	2.50
			26.18	3.00
			25.68	3.50
			25.18	4.00
			24.68	4.50
			24.18	5.00

Blows for Depth Increment

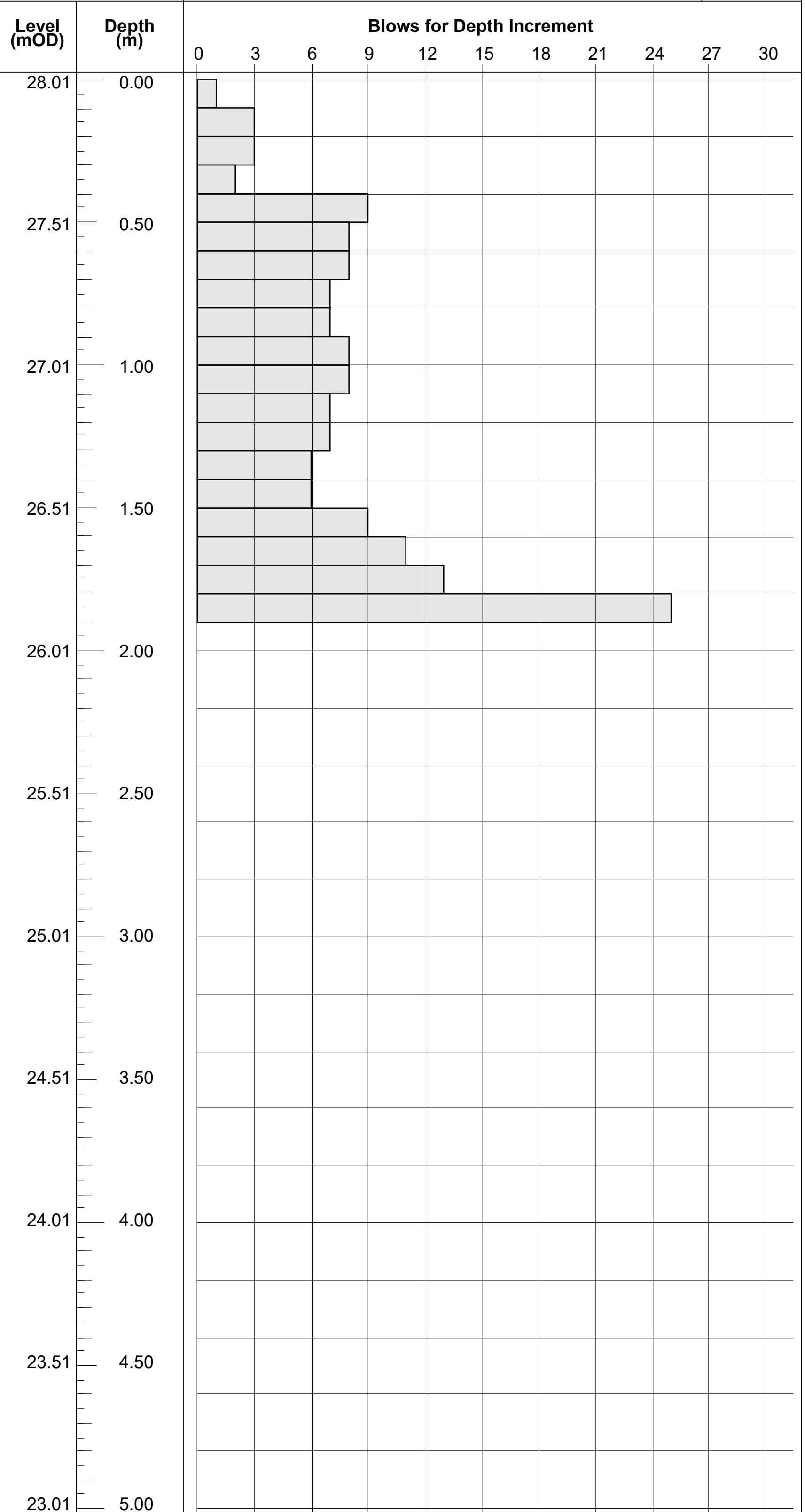


Remarks	Scale (approx)	Logged By
Refusal at 1.80m BGL.	1:25	C. Byrne
	Figure No.	
	10809-06-21.DPH59	

Ground Investigations Ireland Ltd
www.gii.ie

Site	Site Investigation Ennis			**Probe Number** DPH60
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 28.01	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532118.8 E 676629.1 N	**Dates** 20/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	1	
0.10-0.20	3	
0.20-0.30	3	
0.30-0.40	2	
0.40-0.50	9	
0.50-0.60	8	
0.60-0.70	8	
0.70-0.80	7	
0.80-0.90	7	
0.90-1.00	8	
1.00-1.10	8	
1.10-1.20	7	
1.20-1.30	7	
1.30-1.40	6	
1.40-1.50	6	
1.50-1.60	9	
1.60-1.70	11	
1.70-1.80	13	
1.80-1.90	25	



Remarks
Refusal at 1.90m BGL.

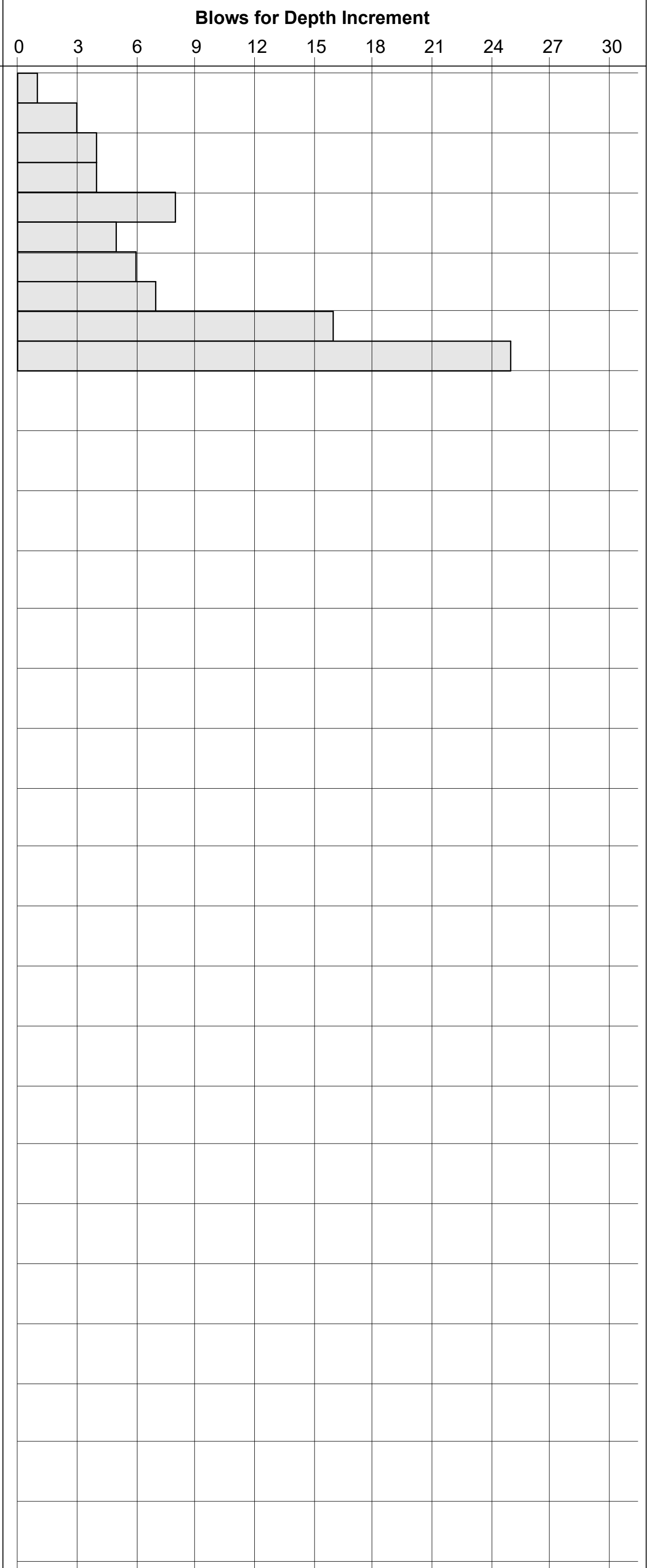
Scale (approx)	**Logged By**
1:25	C. Byrne

Figure No. 10809-06-21.DPH60

Ground Investigations Ireland Ltd www.gii.ie	Site: Site Investigation Ennis	Probe Number: DPH61

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Diameter 43.7mm, Angle 0°	26.18	AKM Design	10809-06-21
	Location	**Dates**	**Engineer**	**Sheet**
	532184.9 E 676622.3 N	20/07/2021		1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	1		26.18	0.00
0.10-0.20	3			
0.20-0.30	4			
0.30-0.40	4			
0.40-0.50	8			
0.50-0.60	5		25.68	0.50
0.60-0.70	6			
0.70-0.80	7			
0.80-0.90	16			
0.90-1.00	25		25.18	1.00
			24.68	1.50
			24.18	2.00
			23.68	2.50
			23.18	3.00
			22.68	3.50
			22.18	4.00
			21.68	4.50
			21.18	5.00



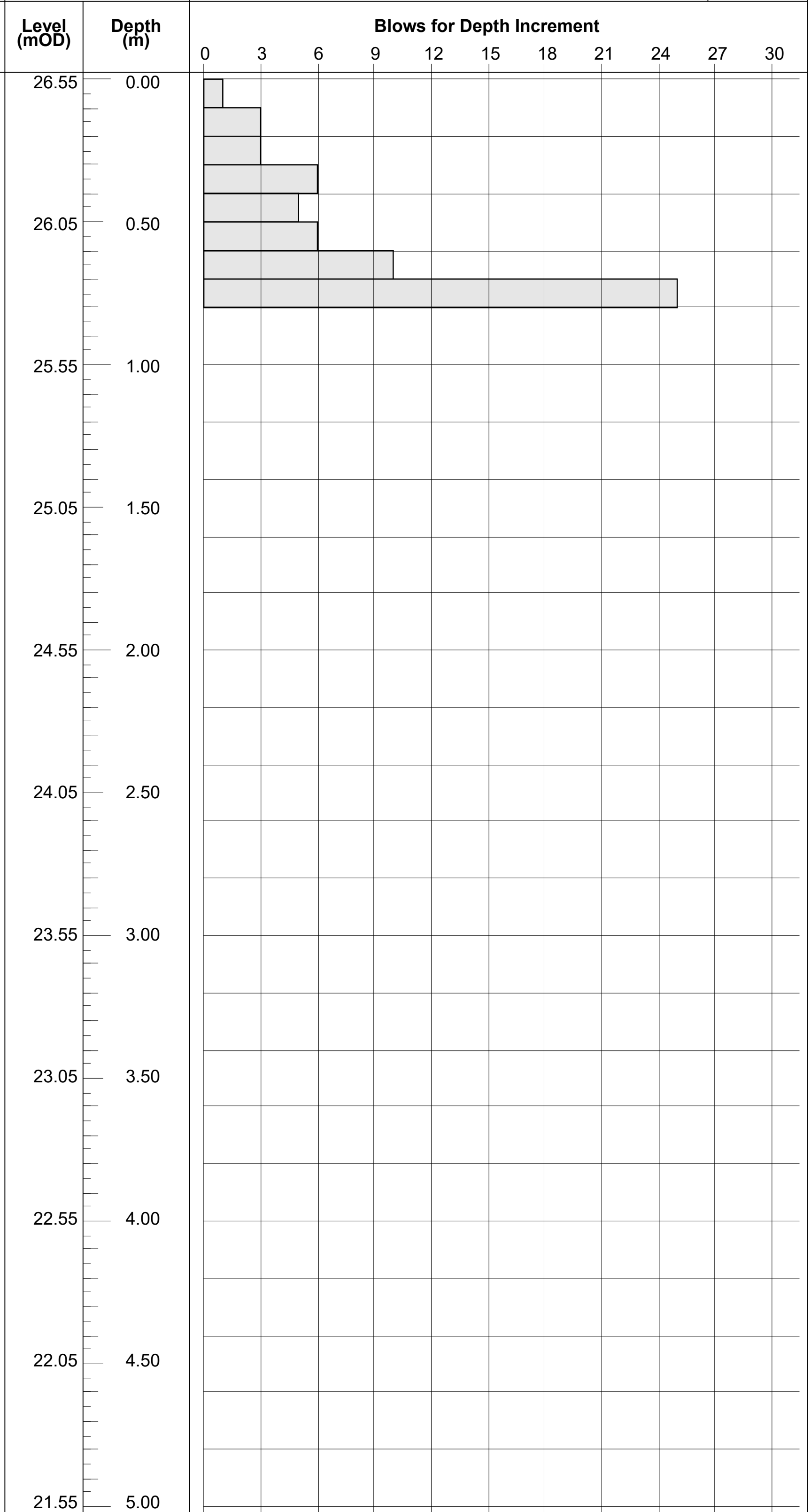
Remarks
Refusal at 1.00m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

Figure No.
10809-06-21.DPH61

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Probe Number: DPH62
Method: Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	Cone Dimensions: Diameter 43.7mm, Angle 0°	Ground Level (mOD): 26.55	Client: AKM Design	Job Number: 10809-06-21
	Location: 532137.8 E 676604.4 N	Dates: 20/07/2021	Engineer:	Sheet: 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	1	
0.10-0.20	3	
0.20-0.30	3	
0.30-0.40	6	
0.40-0.50	5	
0.50-0.60	6	
0.60-0.70	10	
0.70-0.80	25	



Remarks
Refusal at 0.80m BGL.

Scale (approx)	Logged By
1:25	C. Byrne

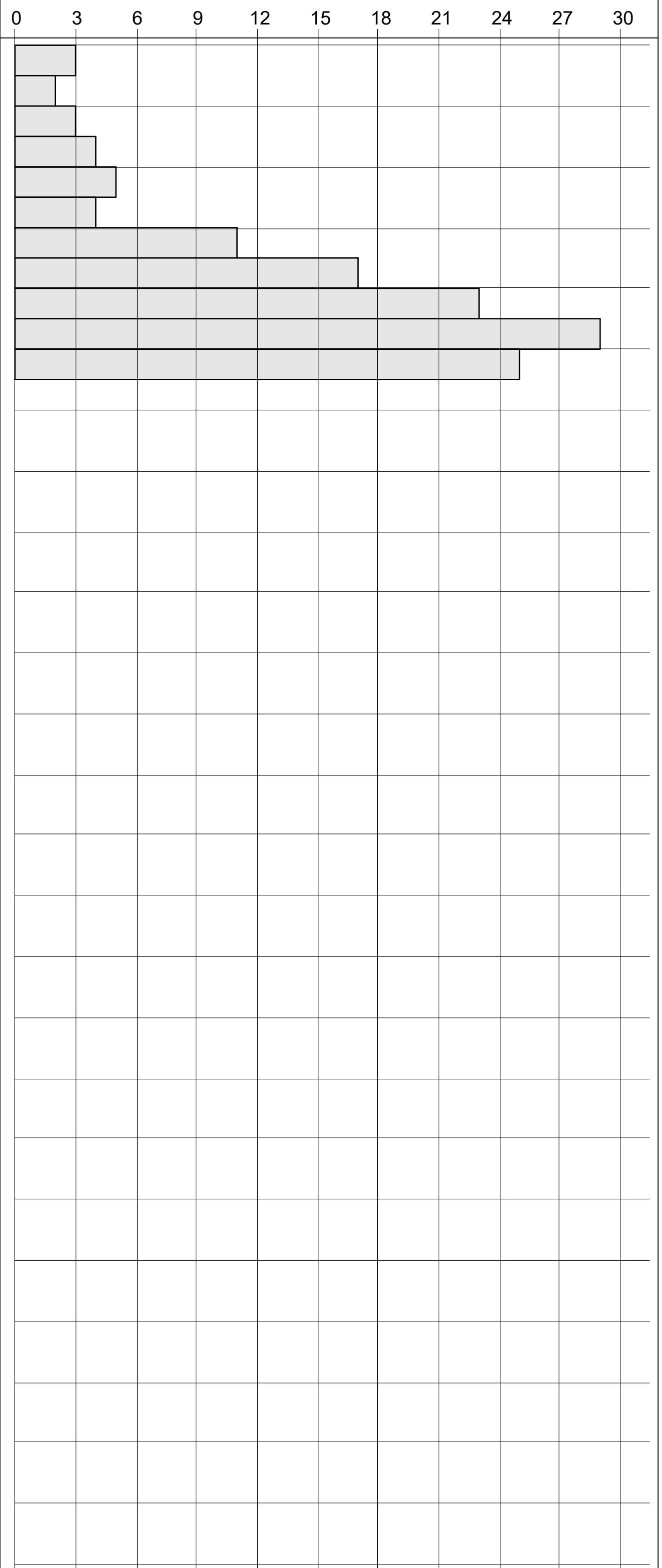
Figure No. 10809-06-21.DPH62

Ground Investigations Ireland Ltd www.gii.ie			**Site** Site Investigation Ennis	**Probe Number** DPH63
Method Dynamic Probe Heavy (DPH), Fall Height 500mm, Hammer Weight 50kg	**Cone Dimensions** Diameter 43.7mm, Angle 0°	**Ground Level (mOD)** 26.33	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532157.8 E 676622.5 N	**Dates** 20/07/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.00-0.10	3	
0.10-0.20	2	
0.20-0.30	3	
0.30-0.40	4	
0.40-0.50	5	
0.50-0.60	4	
0.60-0.70	11	
0.70-0.80	17	
0.80-0.90	23	
0.90-1.00	29	
1.00-1.10	25	

Level (mOD)	Depth (m)
26.33	0.00
25.83	0.50
25.33	1.00
24.83	1.50
24.33	2.00
23.83	2.50
23.33	3.00
22.83	3.50
22.33	4.00
21.83	4.50
21.33	5.00

Blows for Depth Increment



Remarks
Refusal at 1.10m BGL.

Scale (approx)	**Logged By**
1:25	C. Byrne

Figure No. 10809-06-21.DPH63

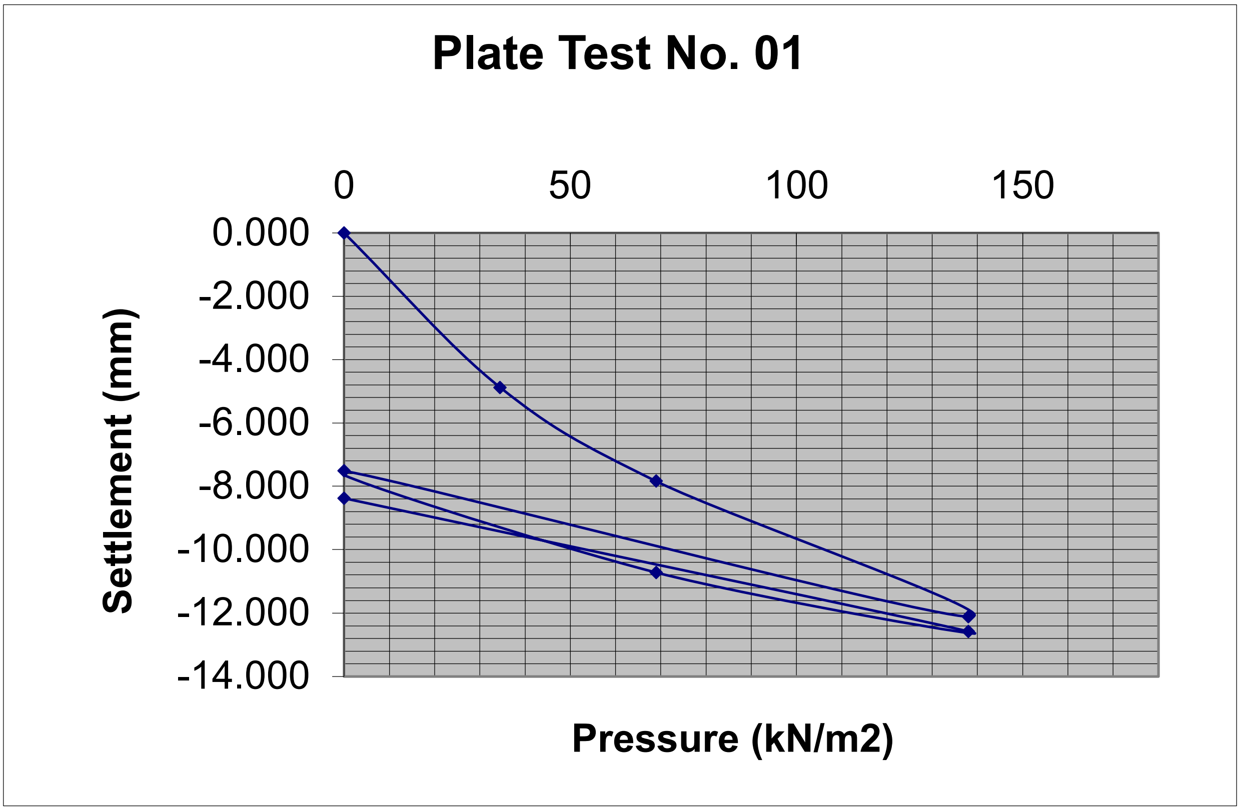
APPENDIX 4 – Plate Test Records

www.gii.ie

Applied Load	Gauge settlement
0	**0.000**
34.5	-4.88
69	-7.835
138	-12.115
0	-7.515
69	-10.72
138	-12.58
0	-8.375

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	15/07/2021		
CLIENT	AKM	**DEPTH**	0.25m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-01	**SAMPLES**	



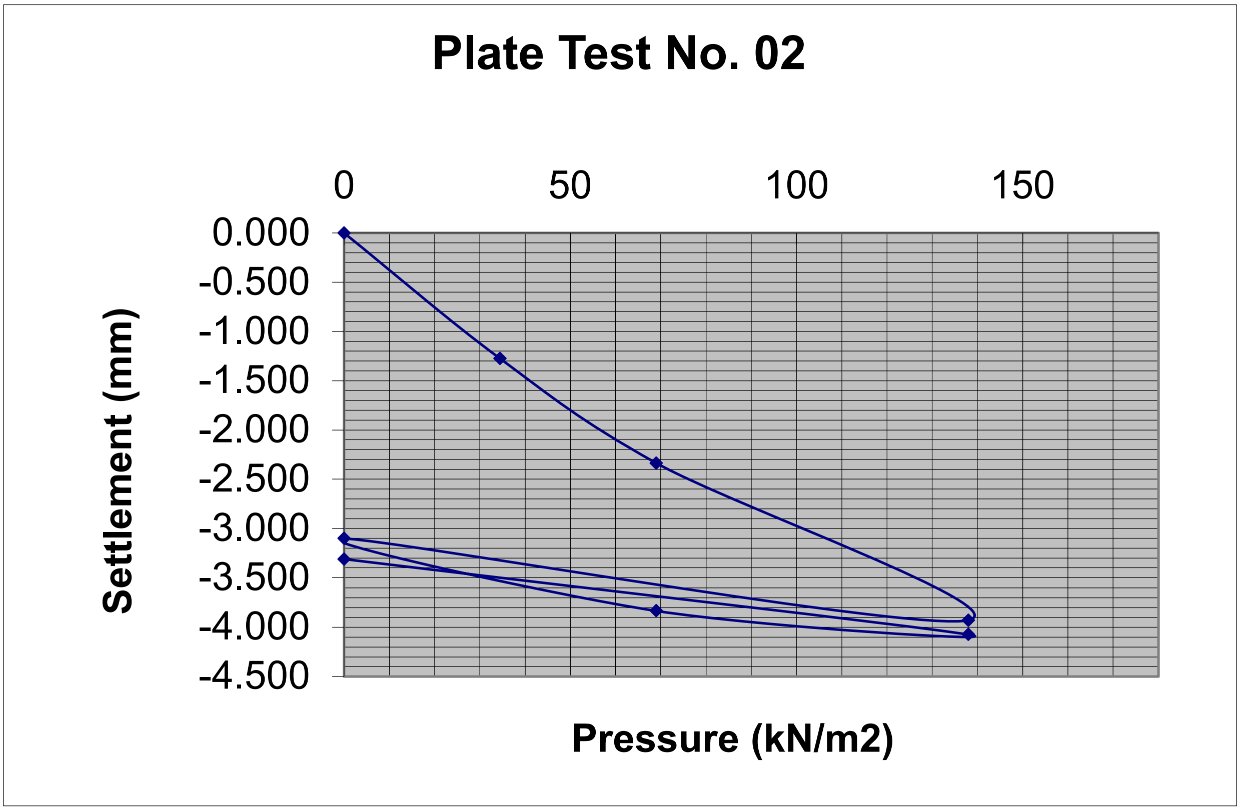
Modulus of subgrade reaction, K (Initial) = **5.95 MN/m2/m**
Modulus of subgrade reaction, K (Reload) = **14.55 MN/m2/m**

Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.21 %**
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **1.00 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-1.275
69	-2.335
138	-3.93
0	-3.1
69	-3.835
138	-4.075
0	-3.31

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	15/07/2021		
CLIENT	AKM	**DEPTH**	0.30m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-02	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **19.97 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **63.43 MN/m2/m**

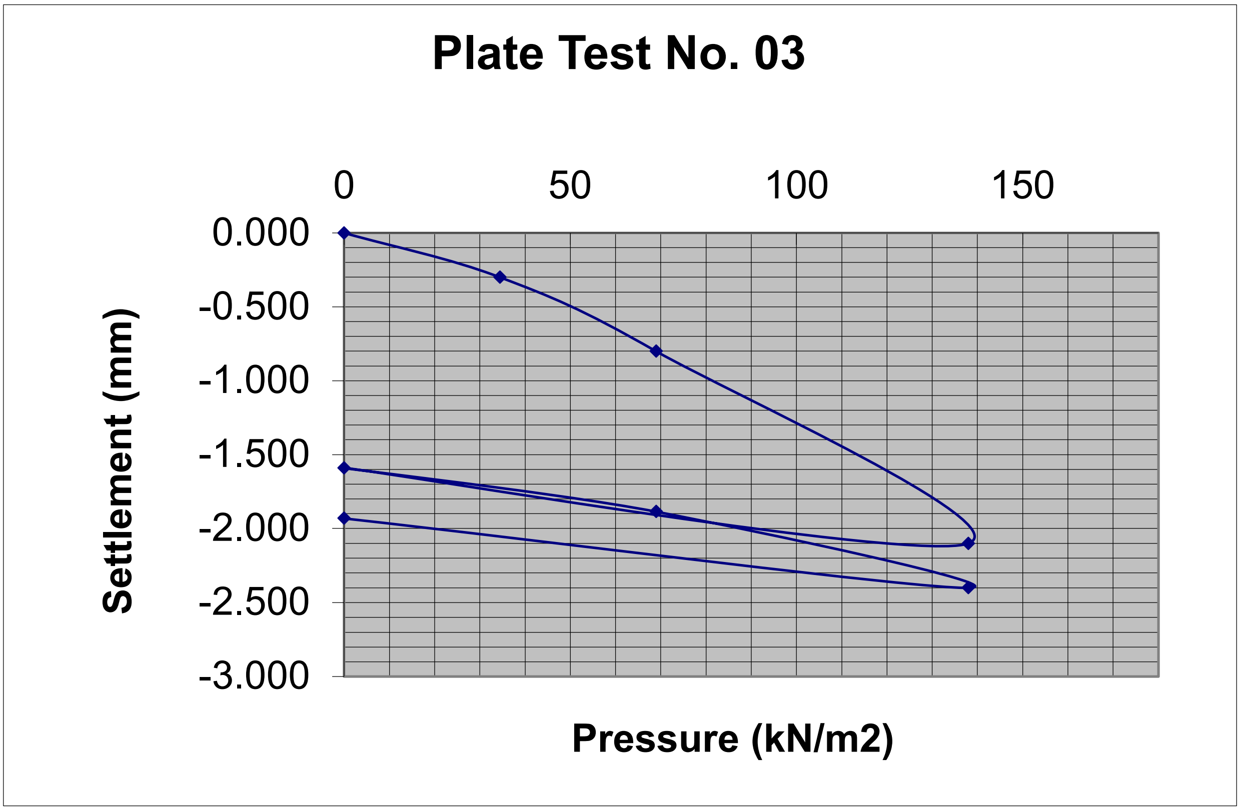
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **1.73 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **12.82 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-0.3
69	-0.8
138	-2.1
0	-1.59
69	-1.885
138	-2.4
0	-1.93

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	15/07/2021		
CLIENT	AKM	**DEPTH**	0.20m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-03	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **58.28 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **158.05 MN/m2/m**

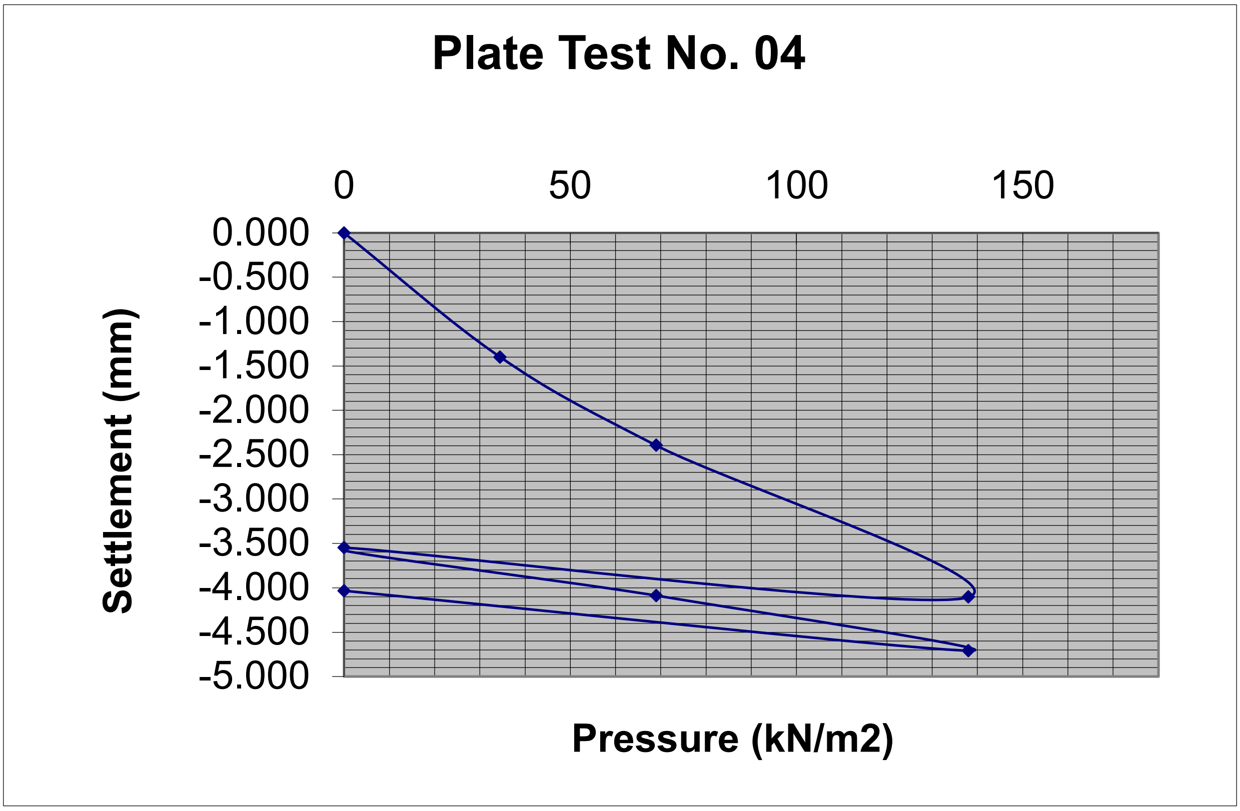
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **11.07 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **62.35 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-1.4
69	-2.395
138	-4.105
0	-3.55
69	-4.09
138	-4.71
0	-4.035

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	15/07/2021		
CLIENT	AKM	**DEPTH**	0.35m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-04	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **19.47 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **86.34 MN/m2/m**

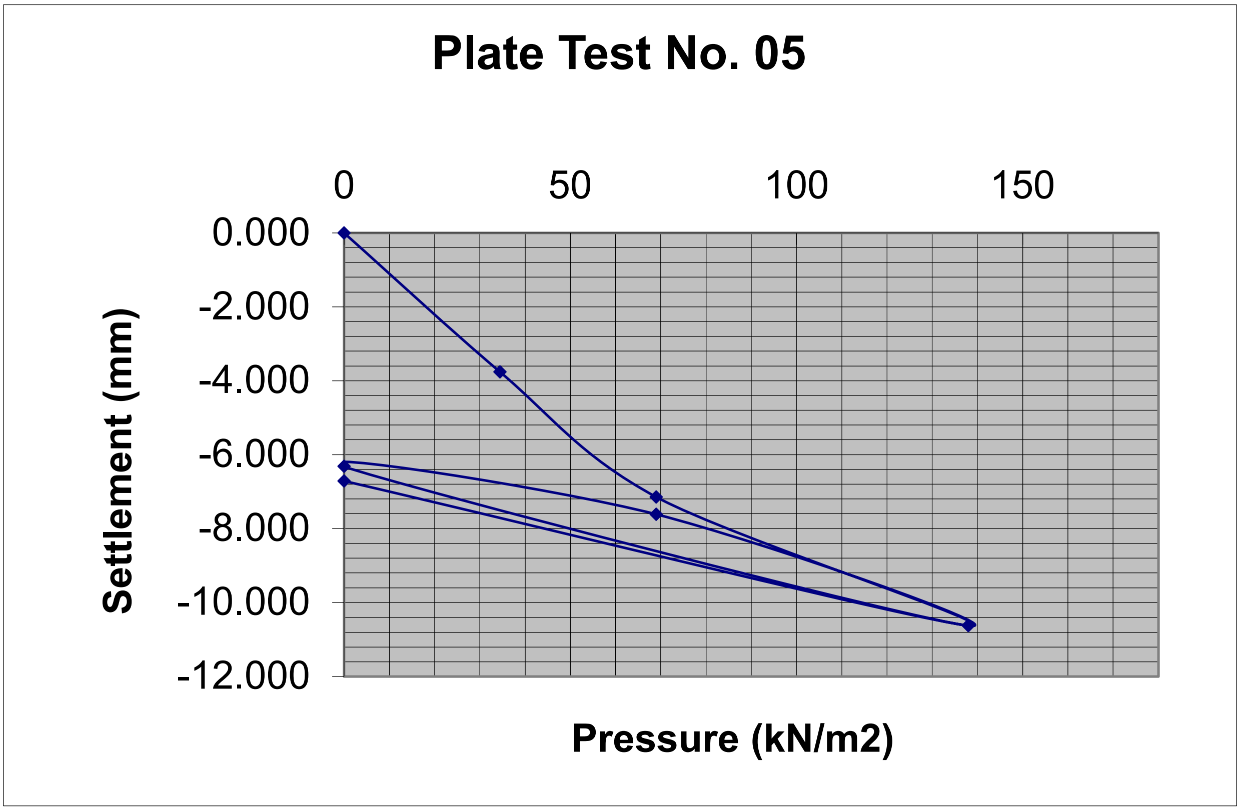
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **1.65 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **21.87 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-3.765
69	-7.145
138	-10.625
0	-6.32
69	-7.615
138	-10.63
0	-6.715

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	15/07/2021		
CLIENT	AKM	**DEPTH**	0.35m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-05	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **6.53 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **36.00 MN/m2/m**

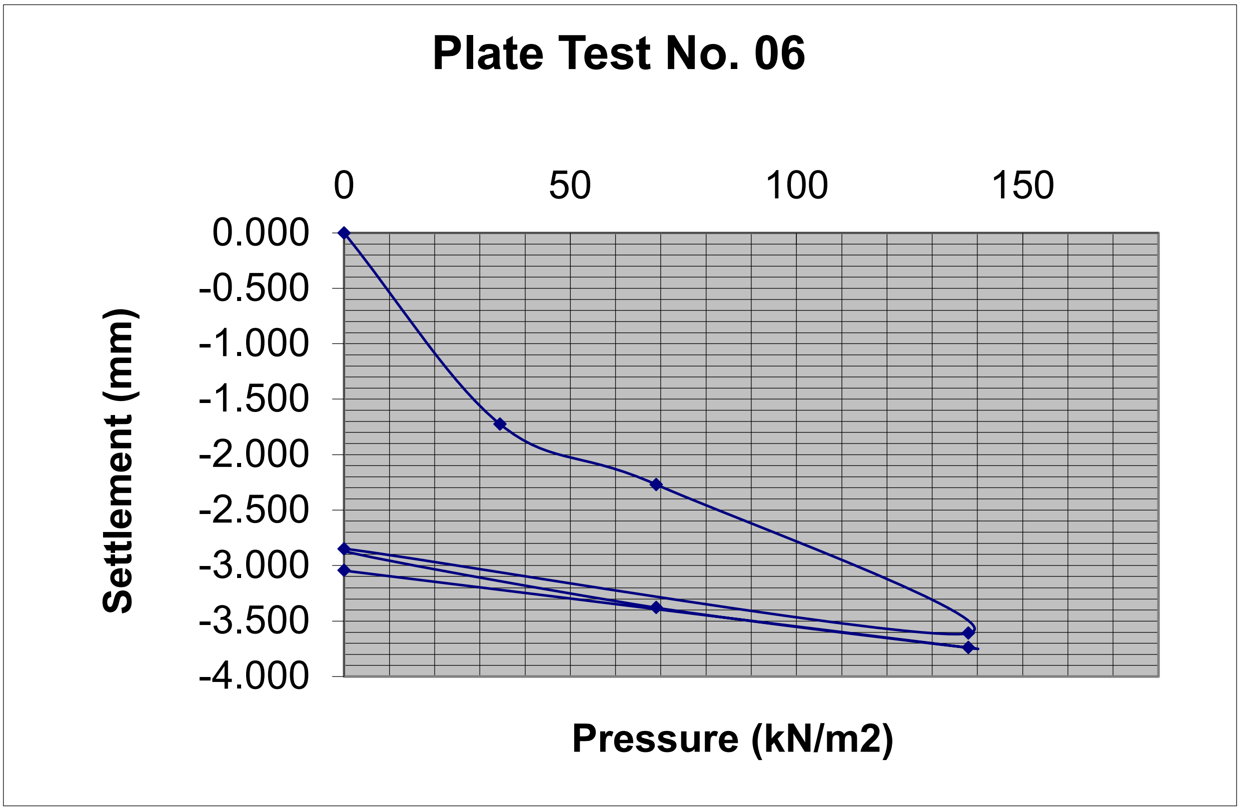
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.25 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **4.80 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-1.725
69	-2.27
138	-3.61
0	-2.85
69	-3.38
138	-3.74
0	-3.045

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	15/07/2021		
CLIENT	AKM	**DEPTH**	0.35m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-06	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **20.54 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **87.97 MN/m2/m**

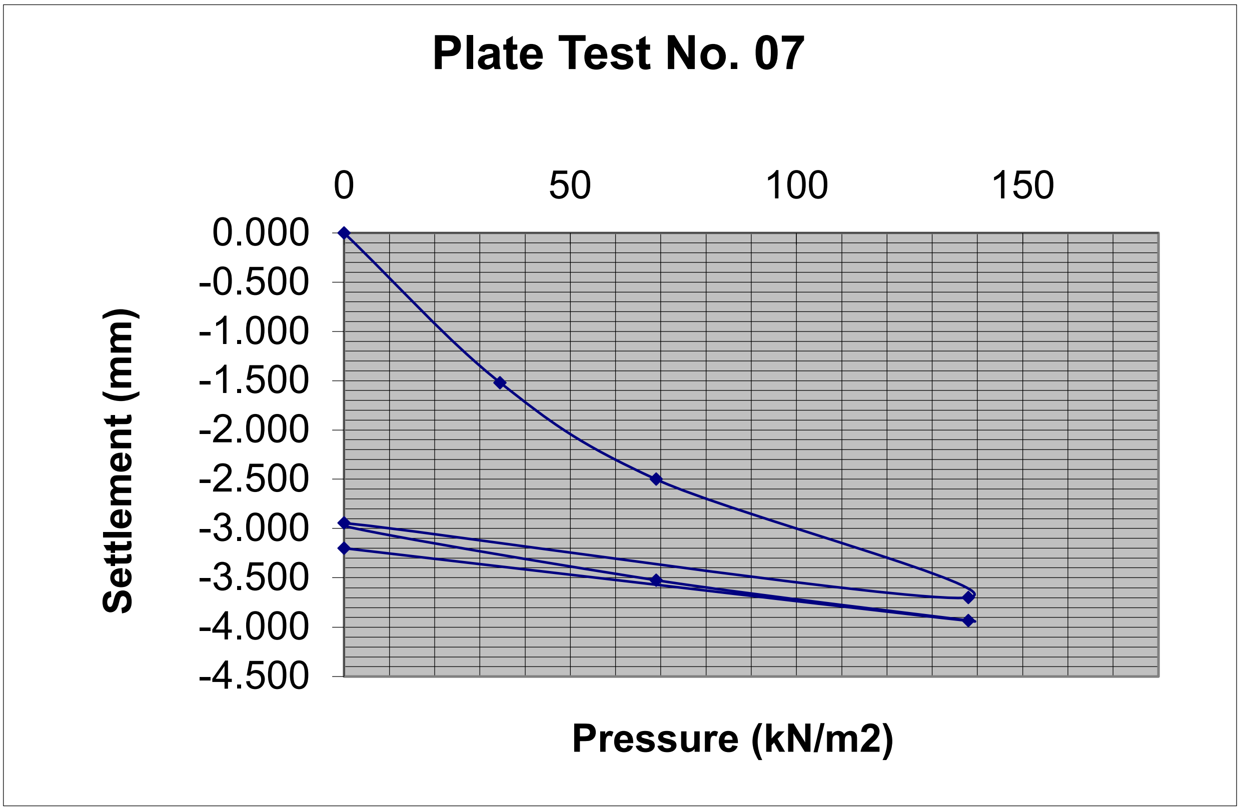
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **1.82 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **22.59 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-1.52
69	-2.5
138	-3.7
0	-2.945
69	-3.525
138	-3.935
0	-3.2

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	15/07/2021		
CLIENT	AKM	**DEPTH**	0.35m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-07	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **18.65 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **80.39 MN/m2/m**

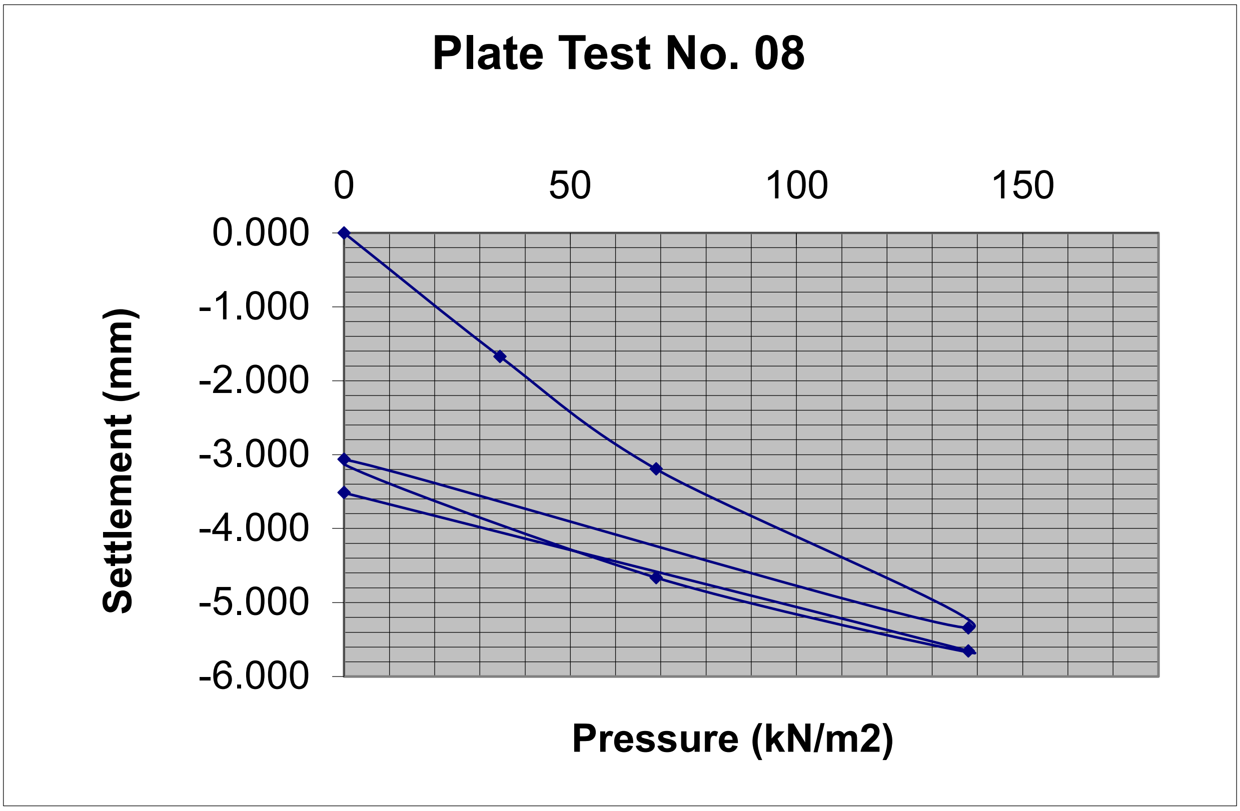
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **1.54 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **19.32 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-1.675
69	-3.195
138	-5.345
0	-3.065
69	-4.665
138	-5.655
0	-3.515

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	15/07/2021		
CLIENT	AKM	**DEPTH**	0.30m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-08	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **14.59 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **29.14 MN/m2/m**

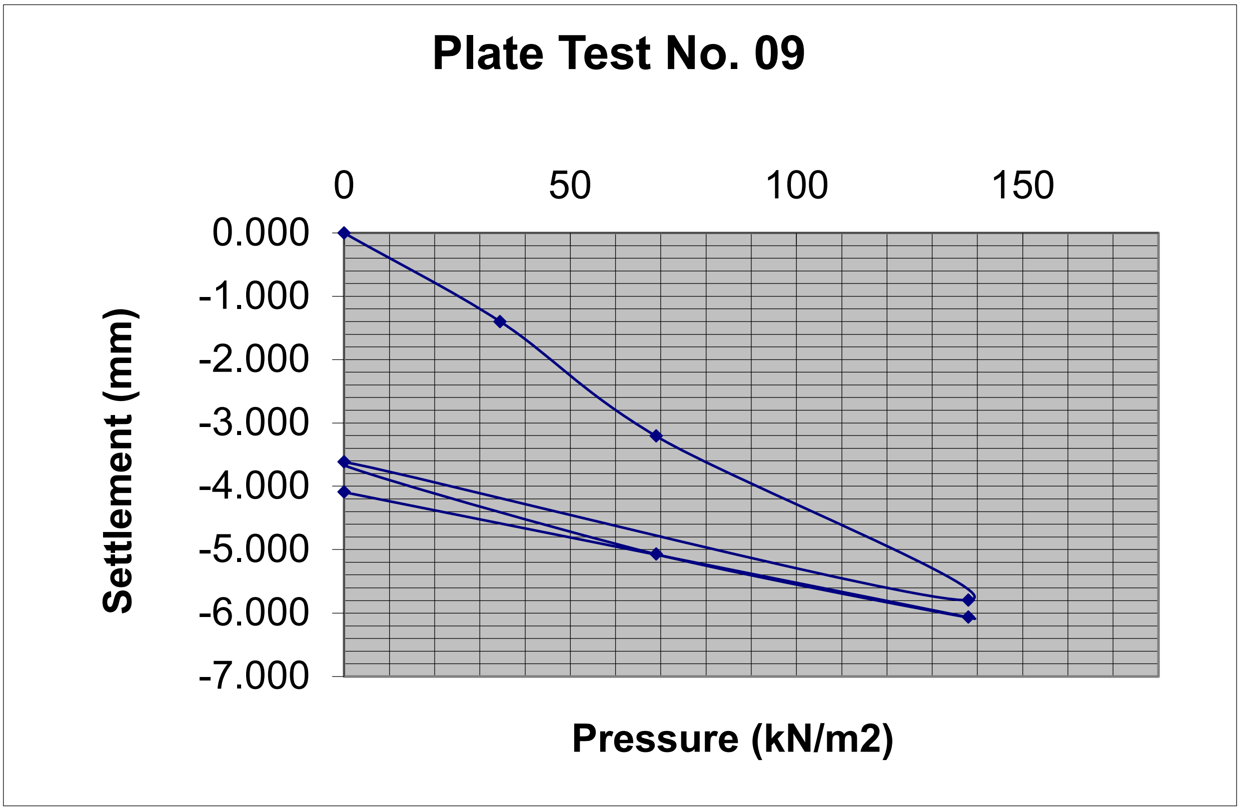
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **1.00 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **3.33 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-1.4
69	-3.205
138	-5.795
0	-3.615
69	-5.07
138	-6.065
0	-4.09

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	14/07/2021		
CLIENT	AKM	**DEPTH**	0.30m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-09	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **14.55 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **32.04 MN/m2/m**

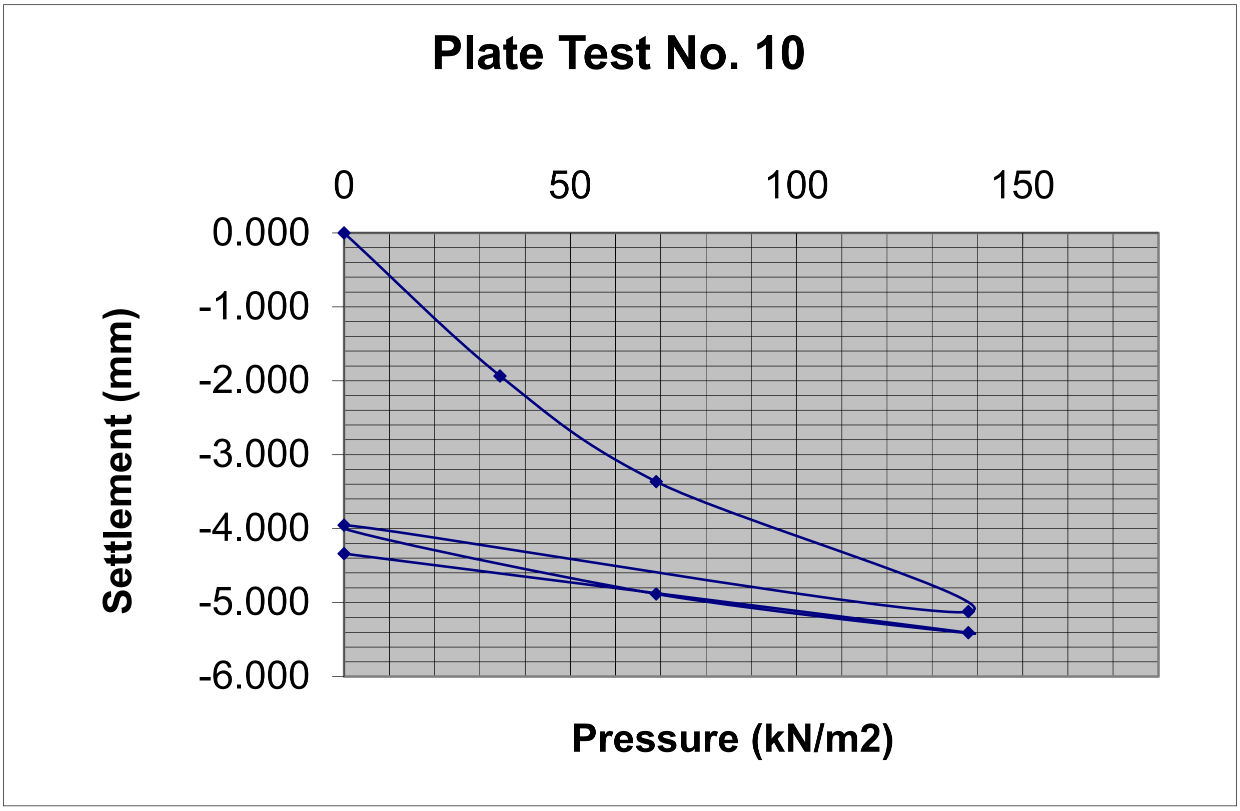
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **1.00 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **3.92 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-1.935
69	-3.365
138	-5.125
0	-3.955
69	-4.885
138	-5.41
0	-4.34

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	15/07/2021		
CLIENT	AKM	**DEPTH**	0.25m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-10	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **13.86 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **50.13 MN/m2/m**

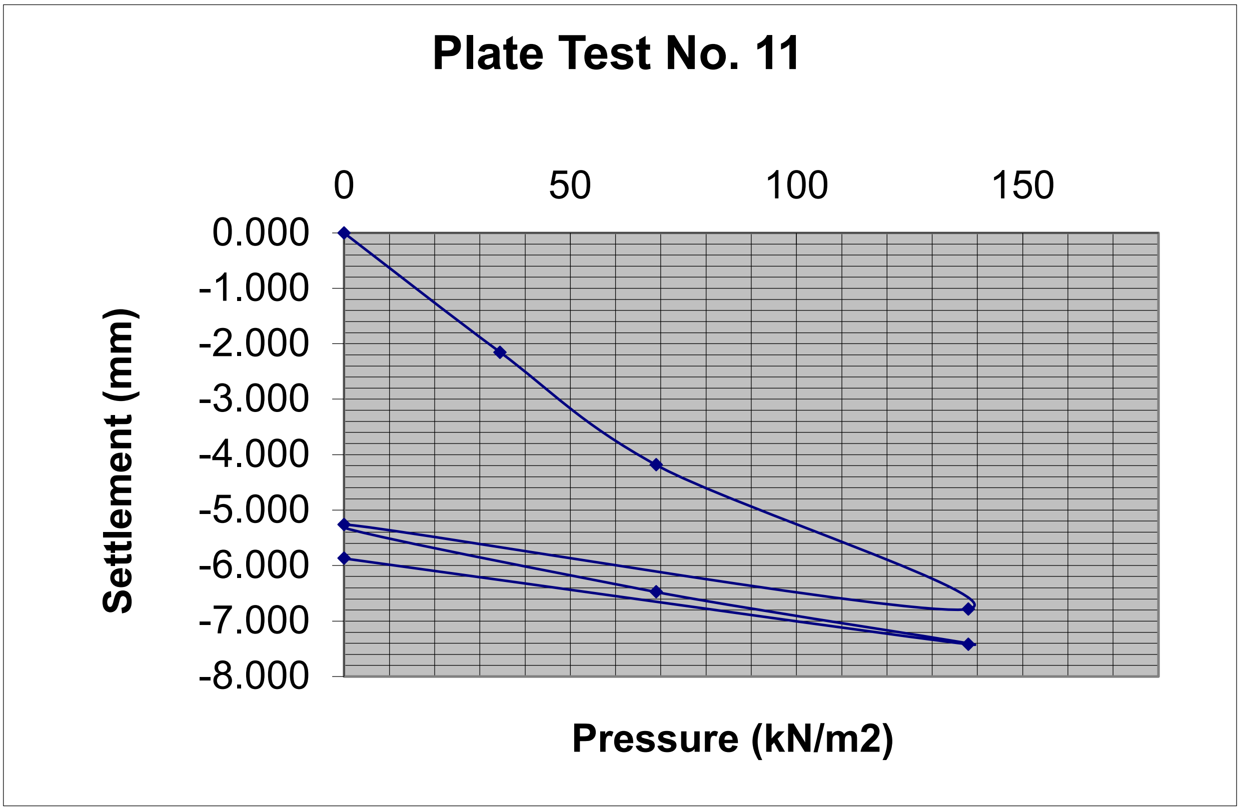
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.92 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **8.52 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-2.155
69	-4.185
138	-6.785
0	-5.26
69	-6.475
138	-7.42
0	-5.87

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	14/07/2021		
CLIENT	AKM	**DEPTH**	0.35m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-11	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **11.14 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **38.37 MN/m2/m**

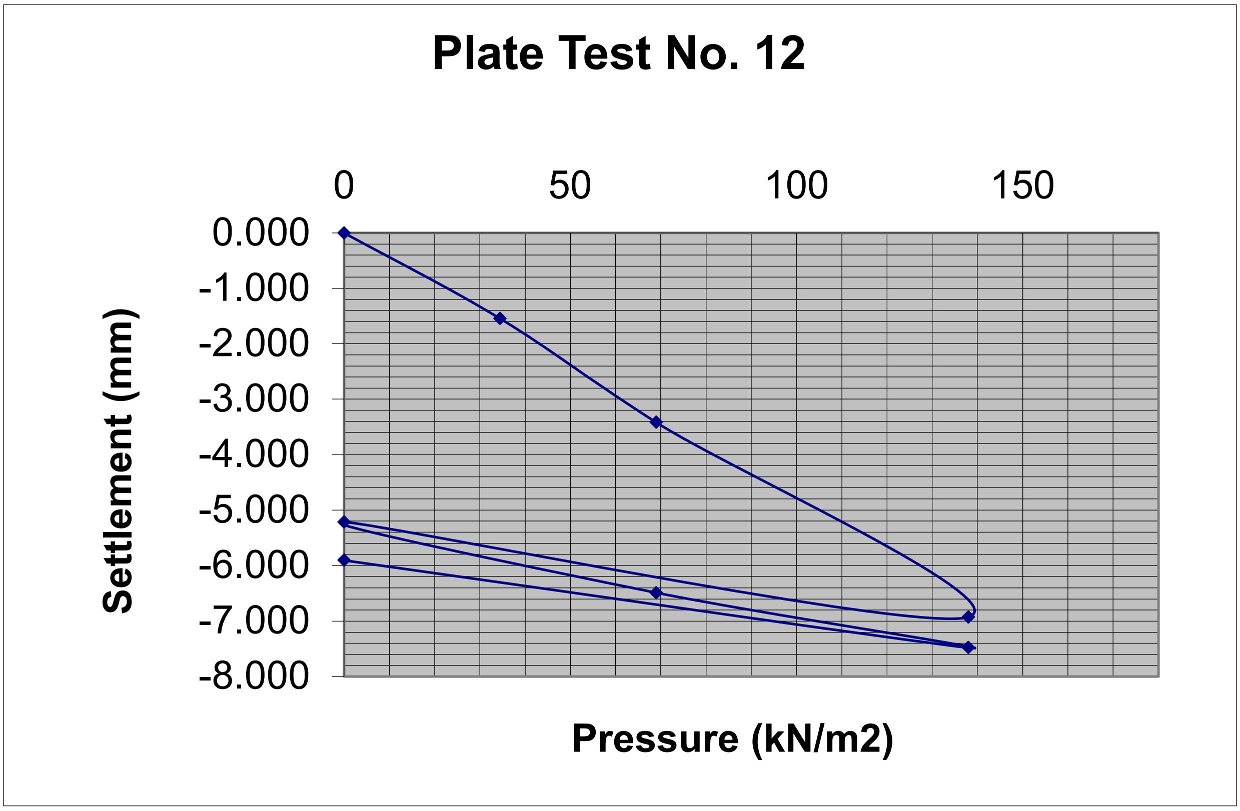
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.63 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **5.36 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-1.545
69	-3.415
138	-6.93
0	-5.215
69	-6.49
138	-7.48
0	-5.905

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	14/07/2021		
CLIENT	AKM	**DEPTH**	0.30m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-12	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **13.65 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **36.57 MN/m2/m**

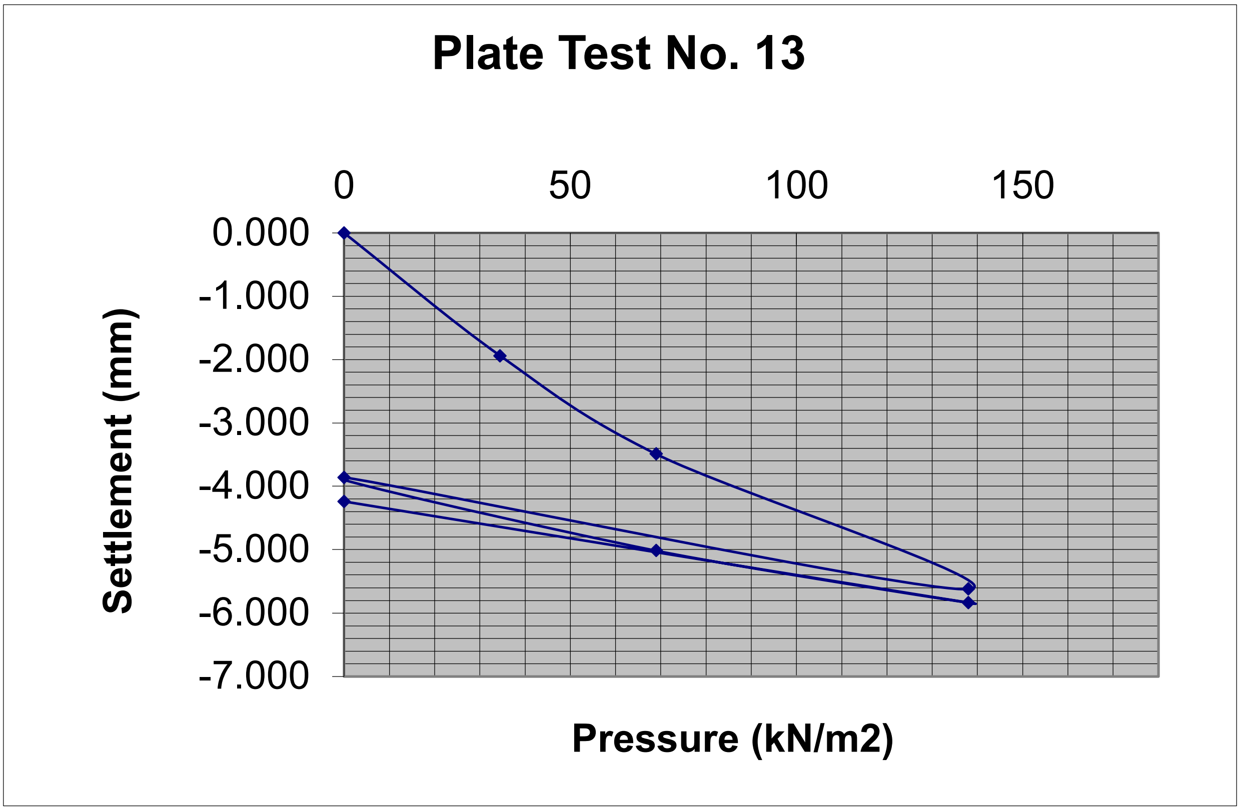
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.89 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **4.93 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-1.94
69	-3.49
138	-5.62
0	-3.86
69	-5.015
138	-5.835
0	-4.24

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	14/07/2021		
CLIENT	AKM	**DEPTH**	0.30m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-13	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **13.36 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **40.37 MN/m2/m**

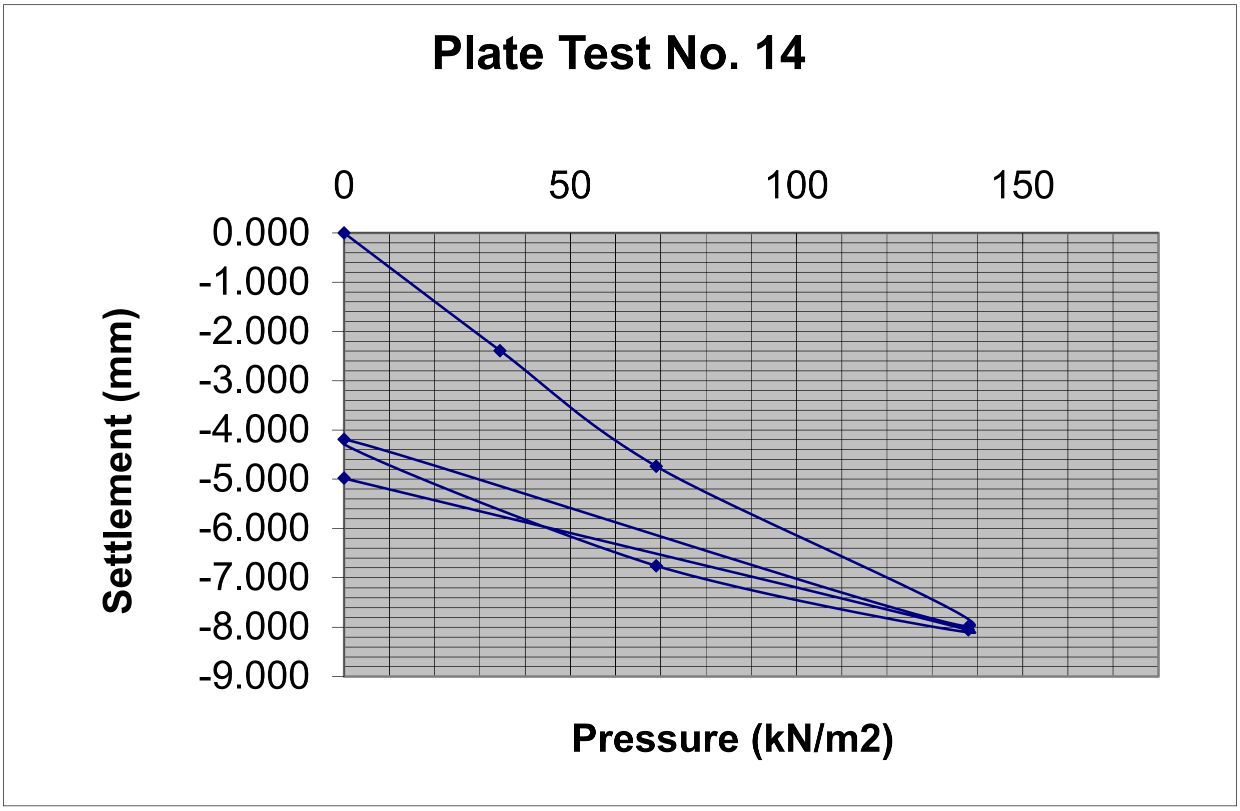
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.86 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **5.86 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-2.39
69	-4.735
138	-7.99
0	-4.19
69	-6.755
138	-8.06
0	-4.98

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	14/07/2021		
CLIENT	AKM	**DEPTH**	0.25m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-14	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **9.85 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **18.18 MN/m2/m**

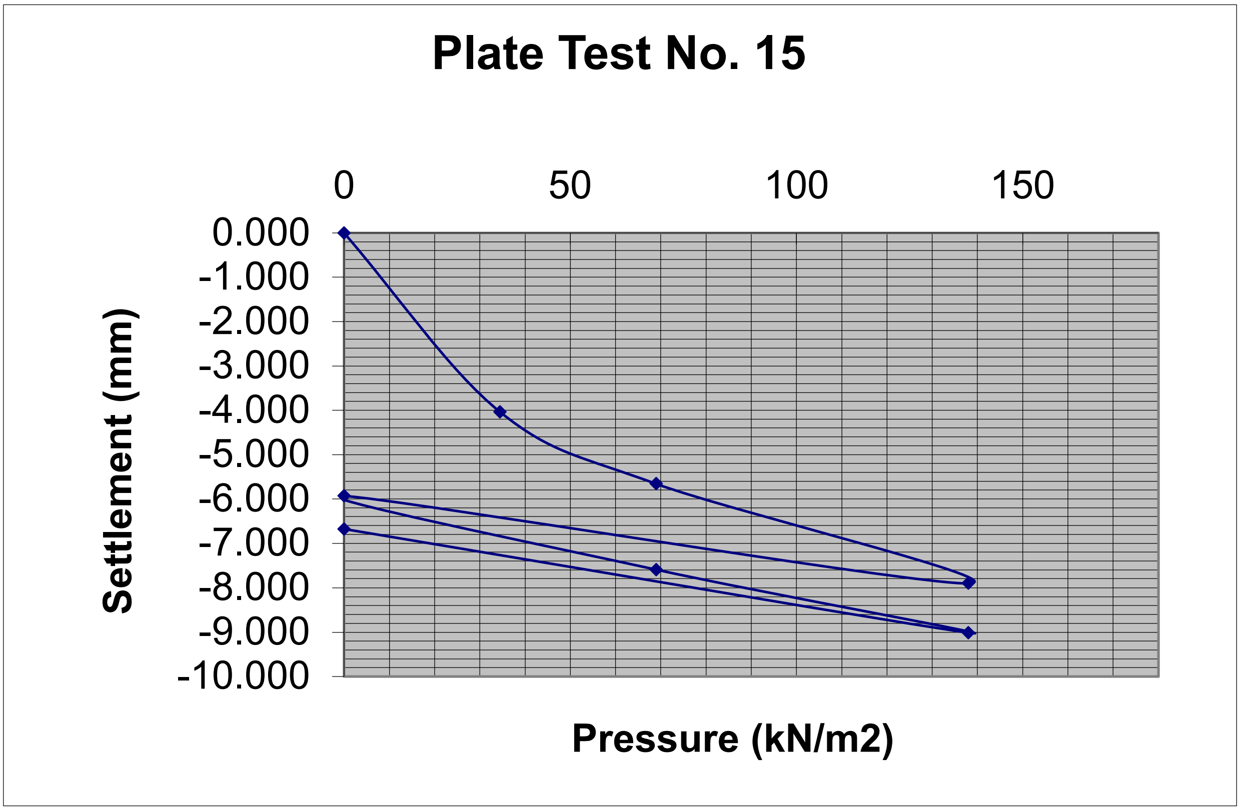
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.51 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **1.47 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-4.04
69	-5.655
138	-7.9
0	-5.93
69	-7.595
138	-9.015
0	-6.675

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	14/07/2021		
CLIENT	AKM	**DEPTH**	0.30m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-15	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **8.24 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **28.00 MN/m2/m**

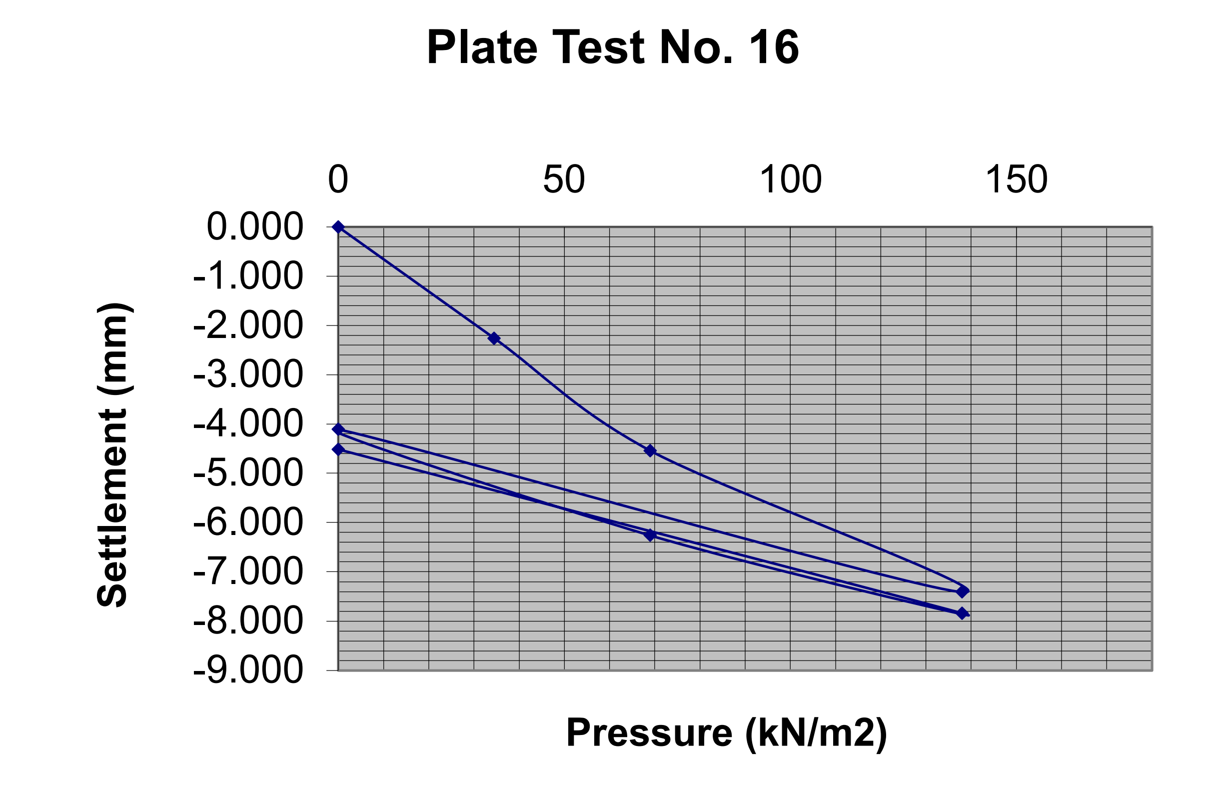
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.37 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **3.11 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-2.26
69	-4.54
138	-7.41
0	-4.11
69	-6.26
138	-7.84
0	-4.515

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	14/07/2021		
CLIENT	AKM	**DEPTH**	0.30m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-16	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **10.27 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **21.69 MN/m2/m**

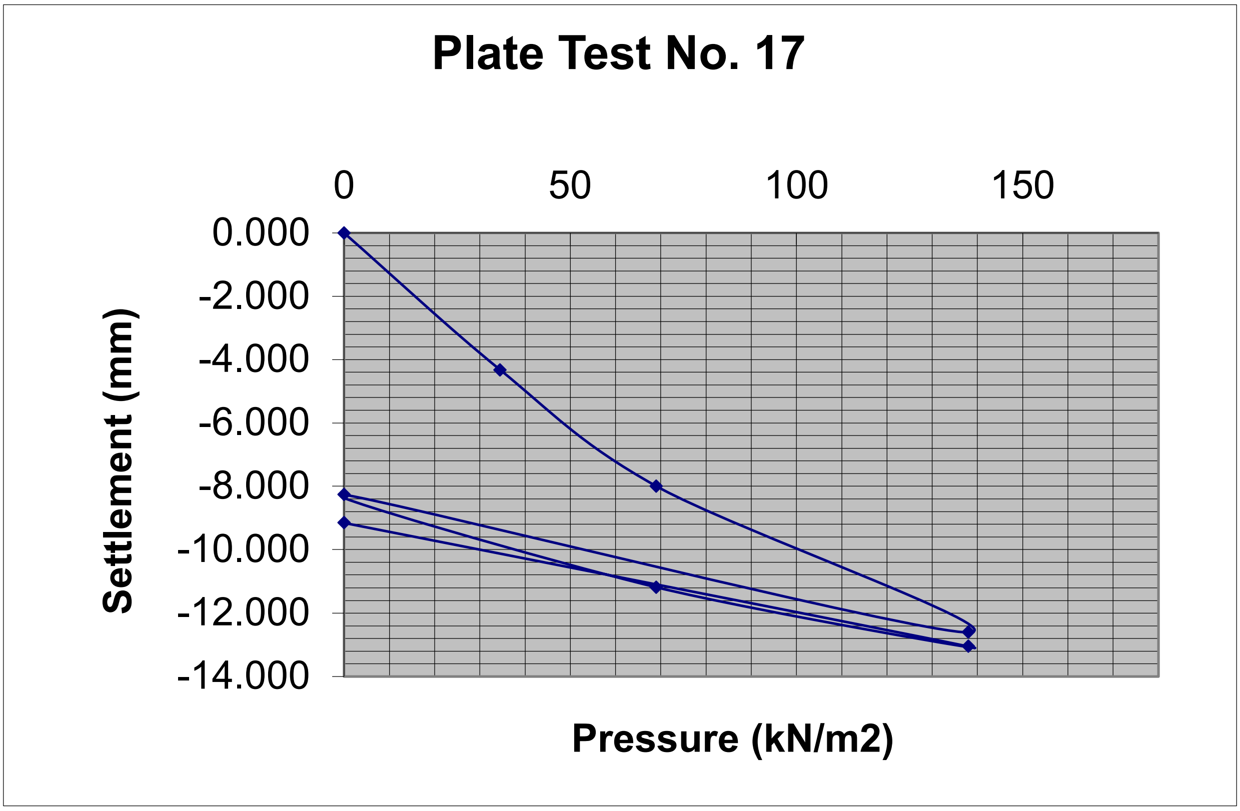
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.55 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **1.99 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-4.325
69	-7.995
138	-12.605
0	-8.26
69	-11.185
138	-13.05
0	-9.15

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	14/07/2021		
CLIENT	AKM	**DEPTH**	0.25m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-17	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **5.83 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **15.94 MN/m2/m**

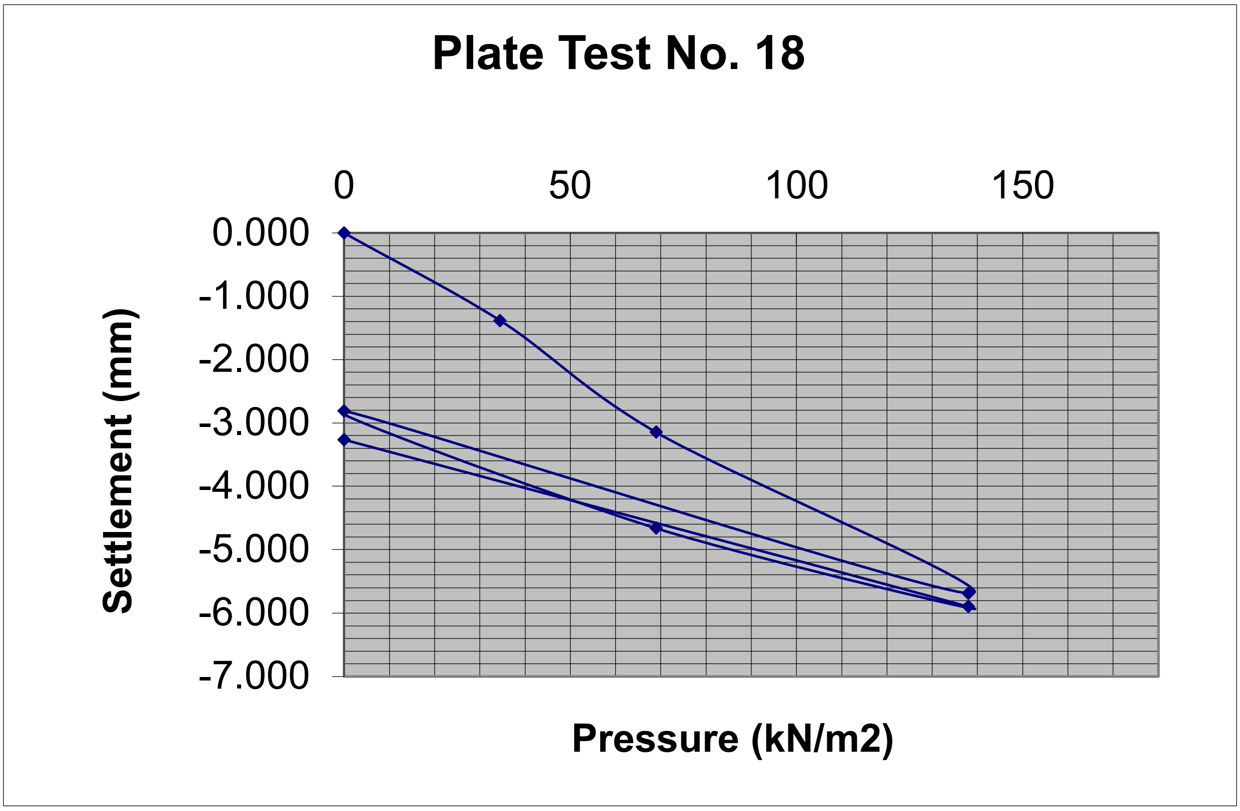
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.20 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **1.17 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-1.385
69	-3.145
138	-5.69
0	-2.81
69	-4.66
138	-5.9
0	-3.265

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	14/07/2021		
CLIENT	AKM	**DEPTH**	0.25m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-18	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **14.82 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **25.20 MN/m2/m**

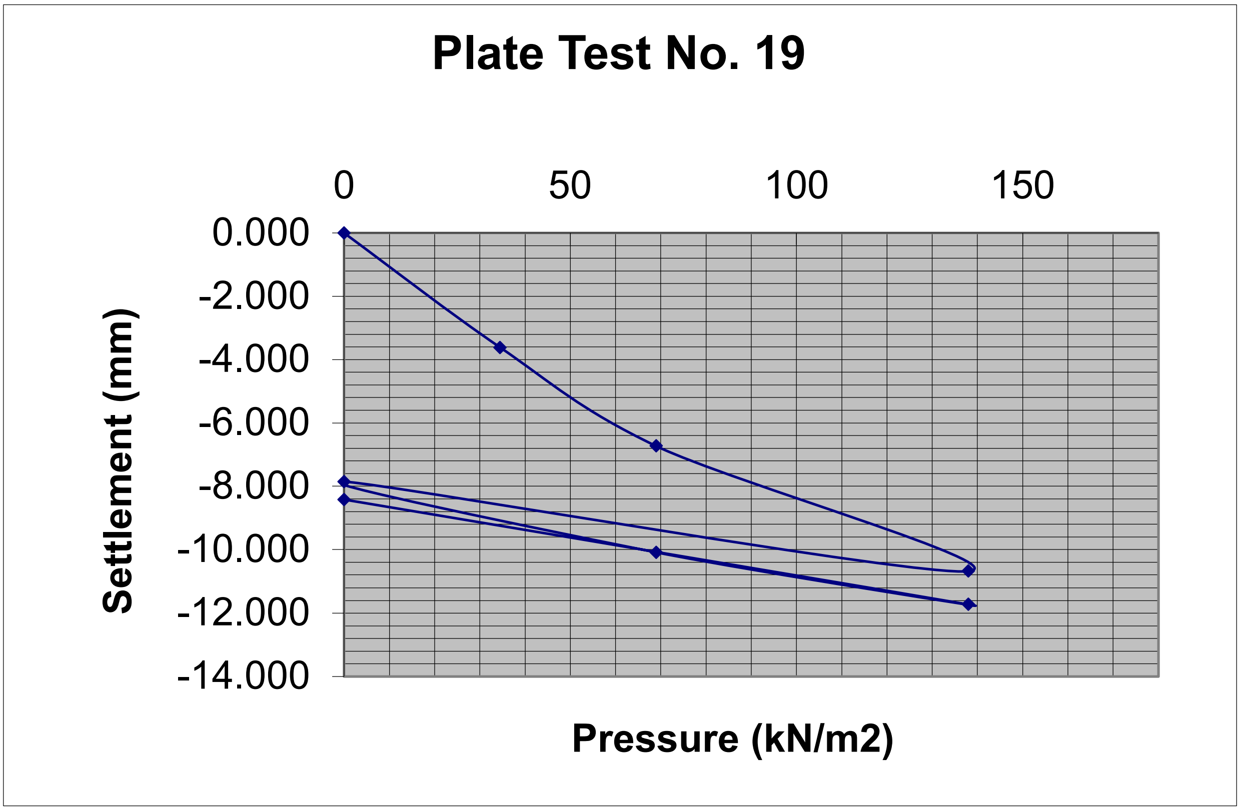
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **1.03 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **2.59 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-3.62
69	-6.725
138	-10.675
0	-7.85
69	-10.085
138	-11.725
0	-8.42

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Site Investigation Ennis	**MATERIAL**	Light brown slightly sandy slightly gravelly CLAY.
CONTRACT NO.	10809-06-21		
DATE	14/07/2021		
CLIENT	AKM	**DEPTH**	0.30m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR-19	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **6.93 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **20.86 MN/m2/m**

Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.28 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **1.87 %**

APPENDIX 5 – Soakaway Results

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

IT01

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 1.90m x 0.90m 1.30m (L x W x D)

Date	Time	Water level (m bgl)
15/07/2021	0	-0.600
15/07/2021	5	-0.680
15/07/2021	25	-0.850
15/07/2021	48	-0.980
15/07/2021	81	-1.100
15/07/2021	105	-1.200
15/07/2021	143	-1.300

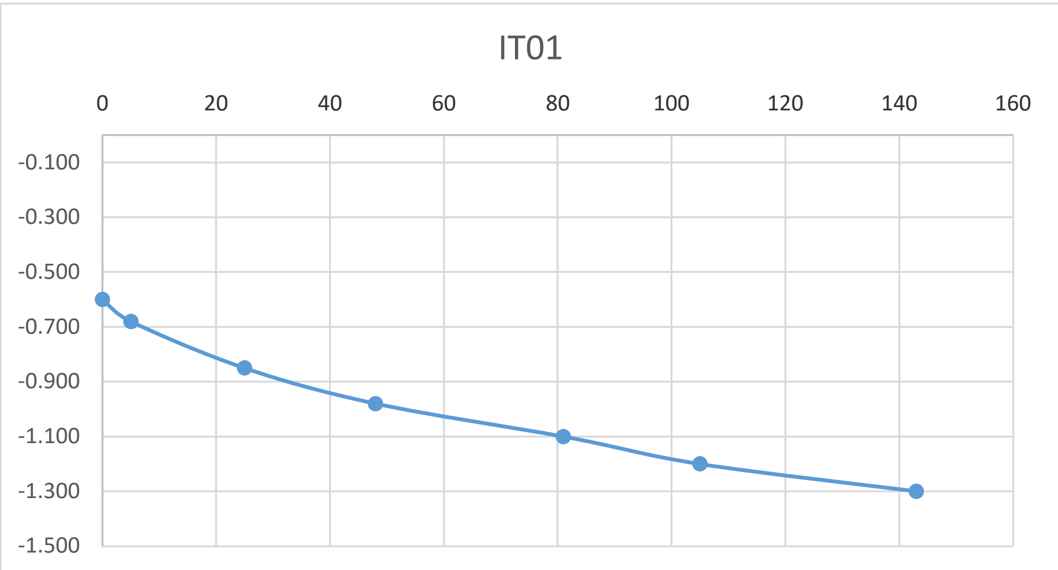
Start depth	Depth of Pit	Diff	75% full	25%full
0.60	1.300	0.700	0.775	1.125

Length of pit (m)	Width of pit (m)	75-25Ht (m)	Vp75-25 (m3)
1.900	0.900	0.350	0.60

Tp75-25 (from graph) (s) **4260**

50% Eff Depth	ap50 (m2)
0.350	3.67

f = 3.828E-05 m/s



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

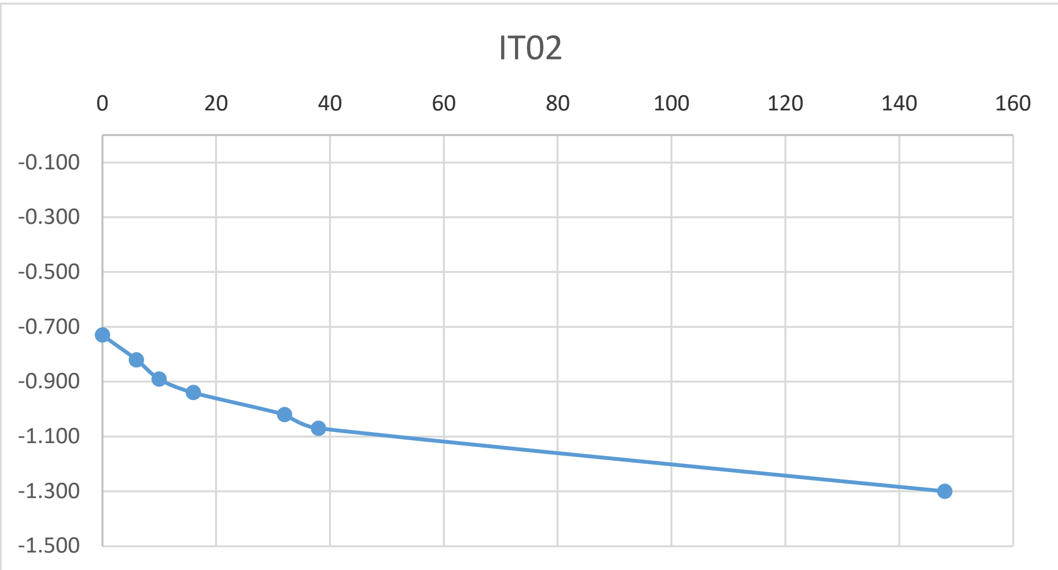
Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

IT02

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.30m x 0.90m 1.30m (L x W x D)

Date	Time	Water level (m bgl)
15/07/2021	0	-0.730
15/07/2021	6	-0.820
15/07/2021	10	-0.890
15/07/2021	16	-0.940
15/07/2021	32	-1.020
15/07/2021	38	-1.070
15/07/2021	148	-1.300

Start depth	Depth of Pit		Diff	75% full	25%full
0.73	**1.300**		**0.570**	**0.8725**	**1.1575**
Length of pit (m)	Width of pit (m)			75-25Ht (m)	Vp75-25 (m3)
2.300	0.900			0.285	0.59
Tp75-25 (from graph) (s)		**3870**		50% Eff Depth	ap50 (m2)
				0.285	3.894
f =	**3.915E-05**	**m/s**			



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

IT03

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 1.90m x 0.90m 1.50m (L x W x D)

Date	Time	Water level (m bgl)
15/07/2021	0	-0.660
15/07/2021	7	-0.690
15/07/2021	17	-0.750
15/07/2021	41	-0.860
15/07/2021	77	-0.990
15/07/2021	107	-1.100
15/07/2021	185	-1.300
15/07/2021	295	-1.500

Start depth	Depth of Pit	Diff	75% full	25%full
0.66	**1.500**	**0.840**	**0.87**	**1.29**

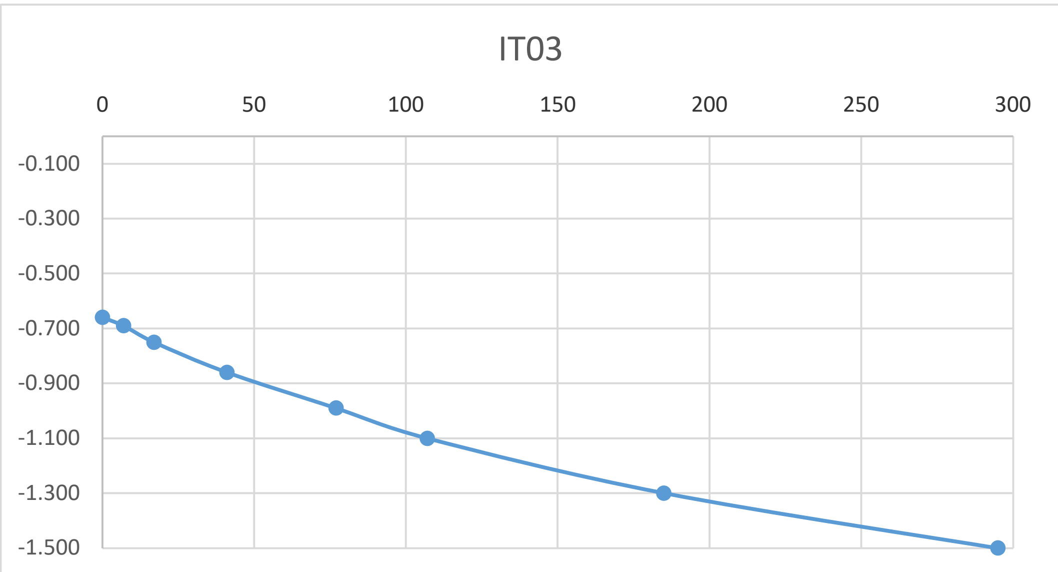
Length of pit (m)	Width of pit (m)	75-25Ht (m)	Vp75-25 (m3)
1.900	0.900	0.420	0.72

Tp75-25 (from graph) (s) **8160**

50% Eff Depth 0.420

ap50 (m2) 4.062

f = 2.167E-05 m/s



APPENDIX 6 – Cable Percussion Records

www.gii.ie

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Borehole Number: BH01
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 0.50m	**Ground Level (mOD)** 21.17	**Client** AKM Design	**Job Number** 10809-06-21
	Location 523226.3 E 676917.6 N	**Dates** 17/08/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					20.87	(0.30) 0.30	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
0.50	B				20.67	(0.20) 0.50	Reddish brown slightly sandy silty CLAY with occasional subangular to subrounded cobbles and boulders. Refusal: Boulder.		
							Refusal at 0.50m		

Remarks
Borehole refusal at 0.50m BGL
No groundwater encountered during drilling.
Chiselling from 0.50m to 0.50m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 10809-06-21.BH01

Ground Investigations Ireland Ltd www.gii.ie	Site: Site Investigation Ennis	Borehole Number: BH02

Machine : Dando 2000 Method : Cable Percussion	Casing Diameter: 200mm cased to 1.00m	Ground Level (mOD): 23.64	Client: AKM Design	Job Number: 10809-06-21
	Location: 532163.8 E 676846.4 N	Dates: 16/08/2021	Engineer:	Sheet: 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
					23.34	0.30	Reddish brown slightly sandy slightly gravelly silty CLAY with occasional subangular to subrounded cobbles and boulders.		
0.50	B					(0.70)			
1.00-1.00	SPT(C) 25*/0 50/0			25/50	22.64	1.00	Refusal: Boulder.		
1.00	B						Refusal at 1.00m		

Remarks
Borehole refusal at 1.00m BGL
No groundwater encountered during drilling.
Chiselling from 0.90m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 10809-06-21.BH02

Ground Investigations Ireland Ltd www.gii.ie		Site: Site Investigation Ennis	Borehole Number: BH03
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 0.30m	**Ground Level (mOD)** 30.42	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532064.1 E 676755.9 N	**Dates** 17/08/2021	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
0.30	B				30.12	0.30	Refusal: Boulder.		
							Refusal at 0.30m		

Remarks
Borehole refusal at 0.30m BGL
No groundwater encountered during drilling.
Chiselling from 0.30m to 0.30m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 10809-06-21.BH03

Ground Investigations Ireland Ltd www.gii.ie		Site: Site Investigation Ennis	Borehole Number: BH04
Machine: Dando 2000 Method: Cable Percussion	Casing Diameter: 200mm cased to 0.30m Ground Level (mOD): 16.62	Client: AKM Design	Job Number: 10809-06-21
	Location: 532187.6 E 677110.7 N Dates: 17/08/2021	Engineer:	Sheet: 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with rootlets.		
0.30	B				16.32	0.30	Refusal: Boulder.		
							Refusal at 0.30m		

Remarks
Borehole refusal at 0.30m BGL
No groundwater encountered during drilling.
Chiselling from 0.30m to 0.30m for 1 hour.

Scale (approx)	Logged By
1:50	C. Byrne

Figure No. 10809-06-21.BH03

APPENDIX 7 – Rotary Borehole Records

Ground Investigations Ireland Ltd www.gii.ie			Site Site Investigation Ennis	Borehole Number **RC01**
Machine : Beretta T44 **Flush :** Water **Core Dia :** 96 mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)** 21.17	**Client** AKM Design	**Job Number** 10809-06-21
	Location 532226.3 E 676917.6 N	**Dates** 01/09/2021	**Engineer** AKM Design	**Sheet** 1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(0.30)	MADE GROUND: Topsoil with rootlets.		
						20.87	0.30	Poor recovery of stiff brown slightly sandy slightly gravelly CLAY. Tiller notes: Clay.		
	58						(1.00)			
1.30						19.87	1.30	Strong massive grey fine to coarse grained LIMESTONE. Slightly weathered. Fossiliferous. 1.3-5.0m BGL: One fracture set. F1: 10-50 degrees, rough, undulating with clay infill. Closely to medium spaced.		
	100	100	58							
2.30										
	100	100	100	5			(4.00)			
3.90										
	100	100	94							
5.30						15.87	5.30	Complete at 5.30m		

Remarks	Scale (approx)	Logged By
	1:50	SK
	Figure No. 10809-06-21.RC01	

Ground Investigations Ireland Ltd www.gii.ie			Site: Site Investigation Ennis	Borehole Number: RC02
Machine : Beretta T44 Flush : Water Core Dia : 96 mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD): 23.64	Client: AKM Design	Job Number: 10809-06-21
	Location: 532163.8 E 676846.4 N	Dates: 01/09/2021	Engineer: AKM Design	Sheet: 1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	32					23.34	(0.30) 0.30	MADE GROUND: Topsoil with rootlets.		
1.10						22.34	(1.00) 1.30	Recovery consists of coarse angular to subrounded GRAVELS and cobbles (Stiff). Driller notes: CLAY		
2.20	100	100	82	4						
3.80	100	100	88							
5.20	100	100	96			18.44	(3.90) 5.20	Strong massive grey fine to coarse grained LIMESTONE. Slightly weathered. Fossiliferous. 1.3-5.0m BGL: One fracture set. F1: 15-45 degrees, rough, undulating with clay infill. Closely to medium spaced.		
								Complete at 5.20m		

Remarks	Scale (approx): 1:50	Logged By: SK
	Figure No.: 10809-06-21.RC01	

Ground Investigations Ireland Ltd
www.gii.ie

Machine : Beretta T44 **Flush :** Water **Core Dia :** 96 mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)** 30.42	**Site** Site Investigation Ennis **Client** AKM Design	**Borehole Number** RC03 **Job Number** 10809-06-21
	Location 532064.1 E 676755.9 N	**Dates** 01/09/2021	**Engineer** AKM Design	**Sheet** 1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						30.22	(0.20) 0.20	MADE GROUND: Topsoil with rootlets.		
	100						(2.40)	Recovery consists of coarse angular to subrounded GRAVELS and cobbles (Stiff). Driller notes: CLAY		
2.60	100	94	100	3		27.82	2.60	Strong massive grey fine to coarse grained LIMESTONE. Slightly weathered. Fossiliferous. 2.6-6.9m BGL: One fracture set. F1: 15-45 degrees, rough, undulating with clay infill. Closely to medium spaced.		
3.70	100	94	94				(4.30)			
5.30	100	100	94							
6.90						23.52	6.90	Complete at 6.90m		

Remarks

Scale (approx)	Logged By
1:50	SK

Figure No. 10809-06-21.RC03

Ground Investigations Ireland Ltd www.gii.ie	Site: Site Investigation Ennis	Borehole Number: RC04

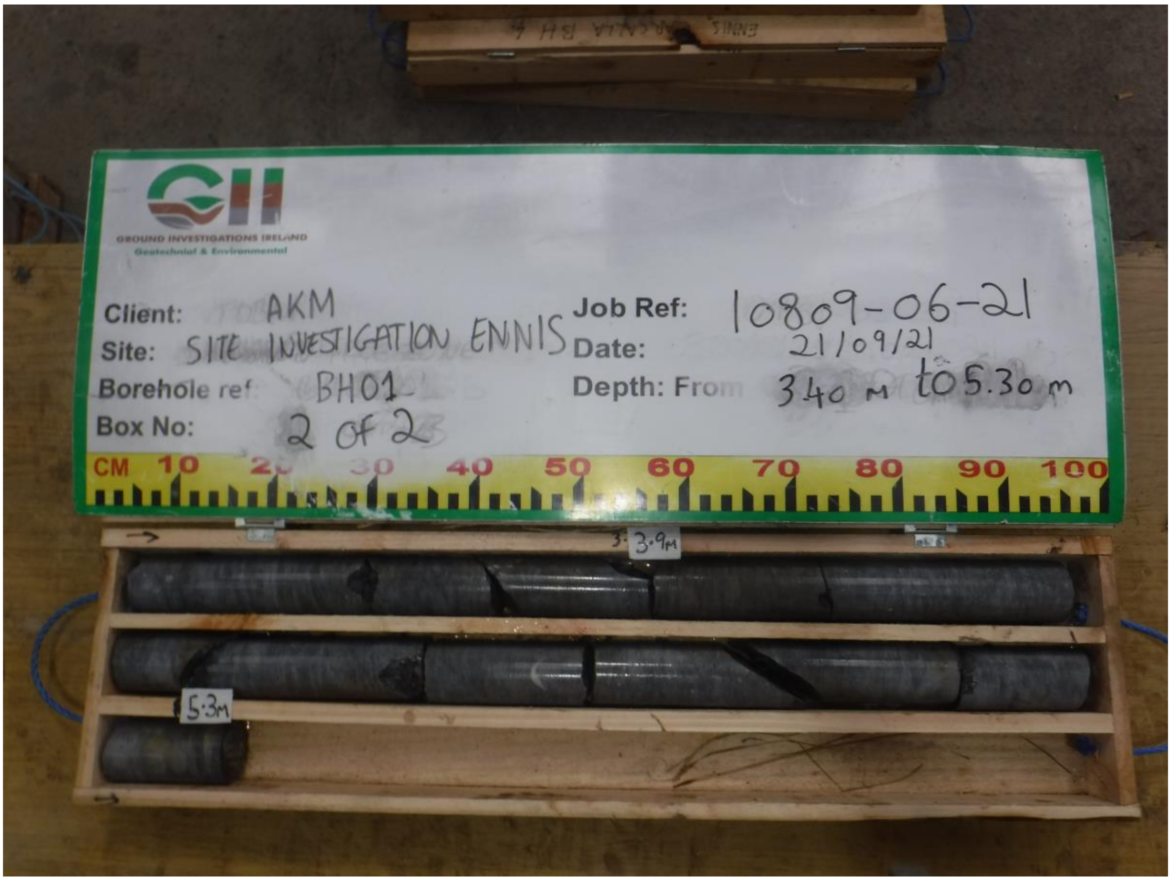
Machine : Beretta T44 Flush : Water Core Dia : 96 mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD): 16.62	Client: AKM Design	Job Number: 10809-06-21
	Location: 532187.6 E 677110.7 N	Dates: 01/09/2021	Engineer: AKM Design	Sheet: 1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						16.56	0.06	MADE GROUND: Topsoil with rootlets.		
	25						(1.00)	Recovery consists of coarse angular to subrounded GRAVELS and cobbles (Stiff). Driller notes: CLAY		
						15.56	1.06	Strong massive grey fine to coarse grained LIMESTONE. Slightly weathered. Fossiliferous. 1.3-5.0m BGL: One fracture set. F1: 15-45 degrees, rough, undulating with clay infill. Closely to medium spaced with occasional clay bands.		
1.60	100	69	69	6						
2.40	92	92	92	4						
3.60							(5.04)			
4.00	100	97	75	1						
5.00				5						
5.20	100	100	74							
6.10						10.52	6.10	Complete at 6.10m		

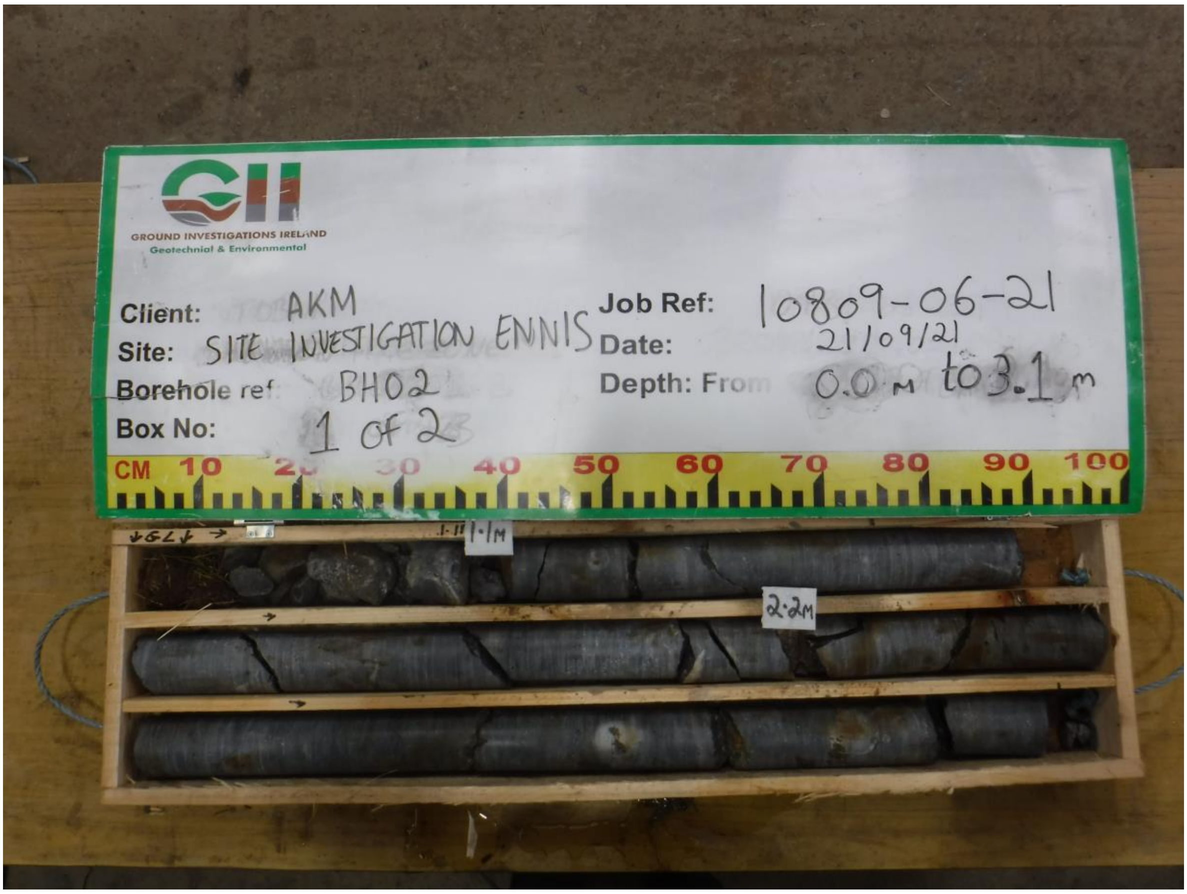
Remarks	Scale (approx): 1:50	Logged By: SK
	Figure No.: 10809-06-21.RC04	

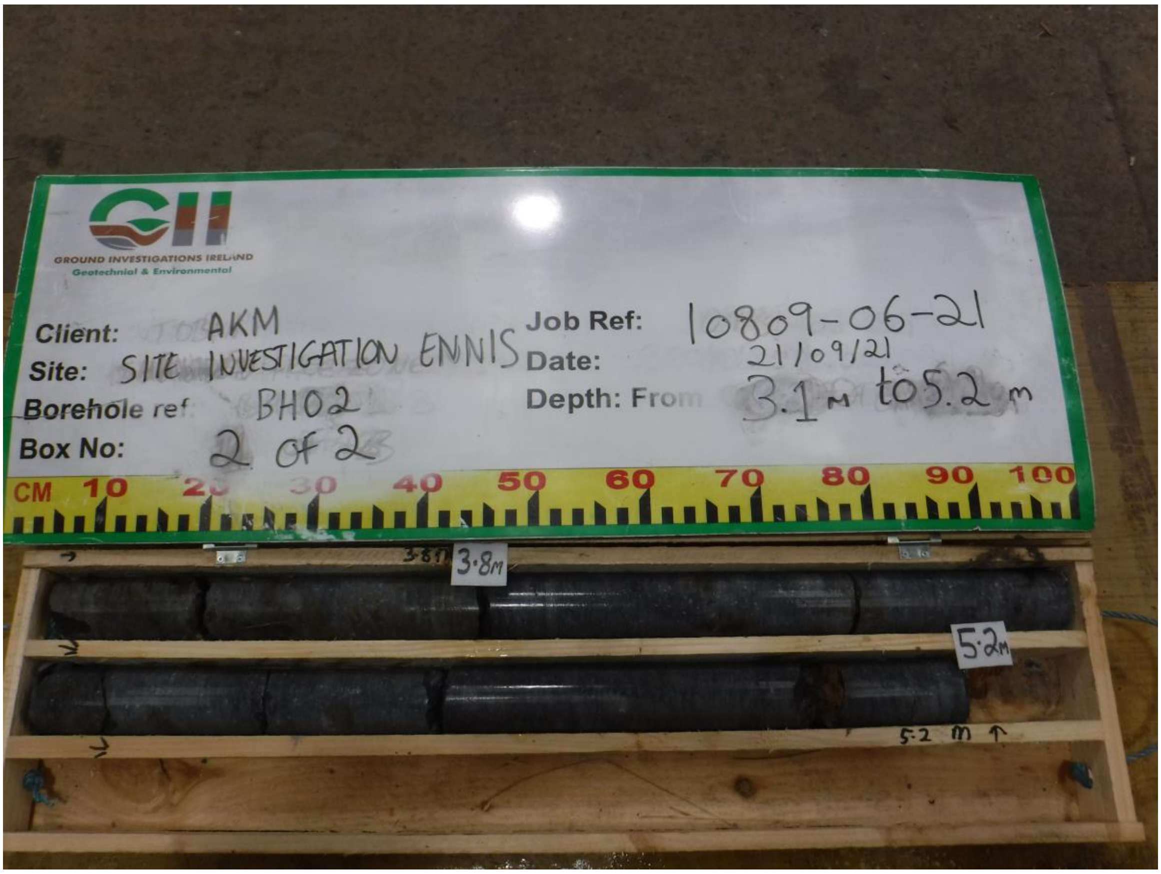
BH01


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: AKM
Site: SITE INVESTIGATION ENNIS
Borehole ref: BH01
Box No: 1 OF 2
Job Ref: 10809-06-21
Date: 21/09/21
Depth: From 0.00 m to 3.4 m
CM 10 20 30 40 50 60 70 80 90 100
1.3M
2.3M

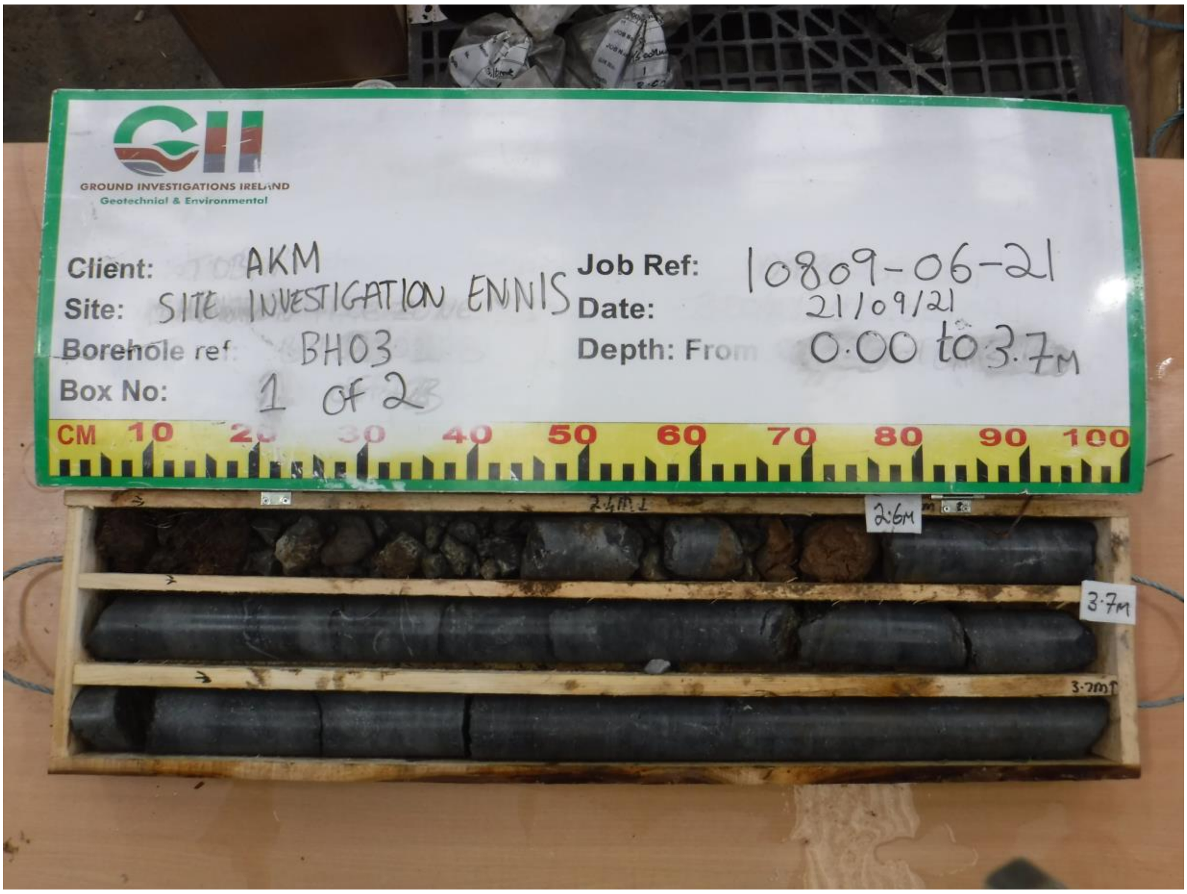

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: AKM
Site: SITE INVESTIGATION ENNIS
Borehole ref: BH01
Box No: 2 OF 2
Job Ref: 10809-06-21
Date: 21/09/21
Depth: From 3.40 m to 5.30 m
CM 10 20 30 40 50 60 70 80 90 100
3.9M
5.3M

BH02


GROUND INVESTIGATIONS IRELAND
Geotechnial & Environmental
Client: AKM
Site: SITE INVESTIGATION ENNIS
Borehole ref: BH02
Box No: 1 OF 2
Job Ref: 10809-06-21
Date: 21/09/21
Depth: From 0.0 m to 3.1 m
1.1m
2.2m

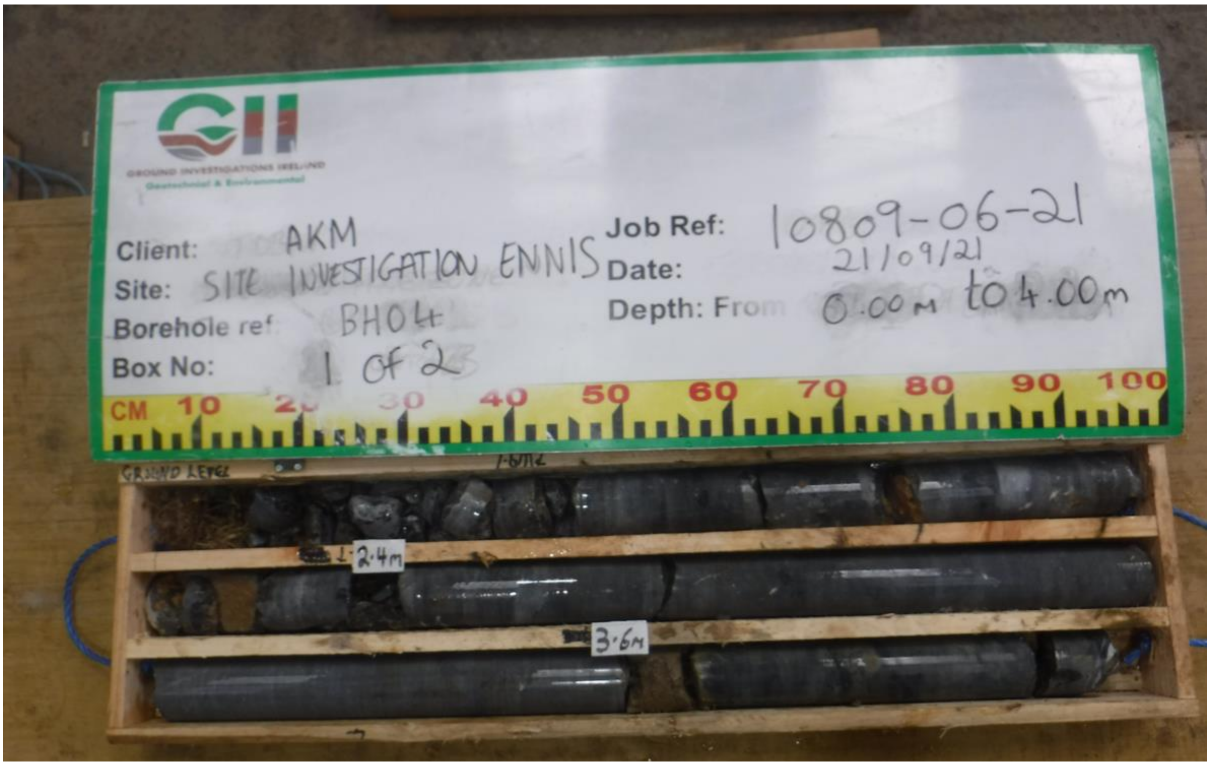

GROUND INVESTIGATIONS IRELAND
Geotechnial & Environmental
Client: AKM
Site: SITE INVESTIGATION ENNIS
Borehole ref: BH02
Box No: 2 OF 2
Job Ref: 10809-06-21
Date: 21/09/21
Depth: From 3.1 m to 5.2 m
3.8m
5.2m
5.2 m

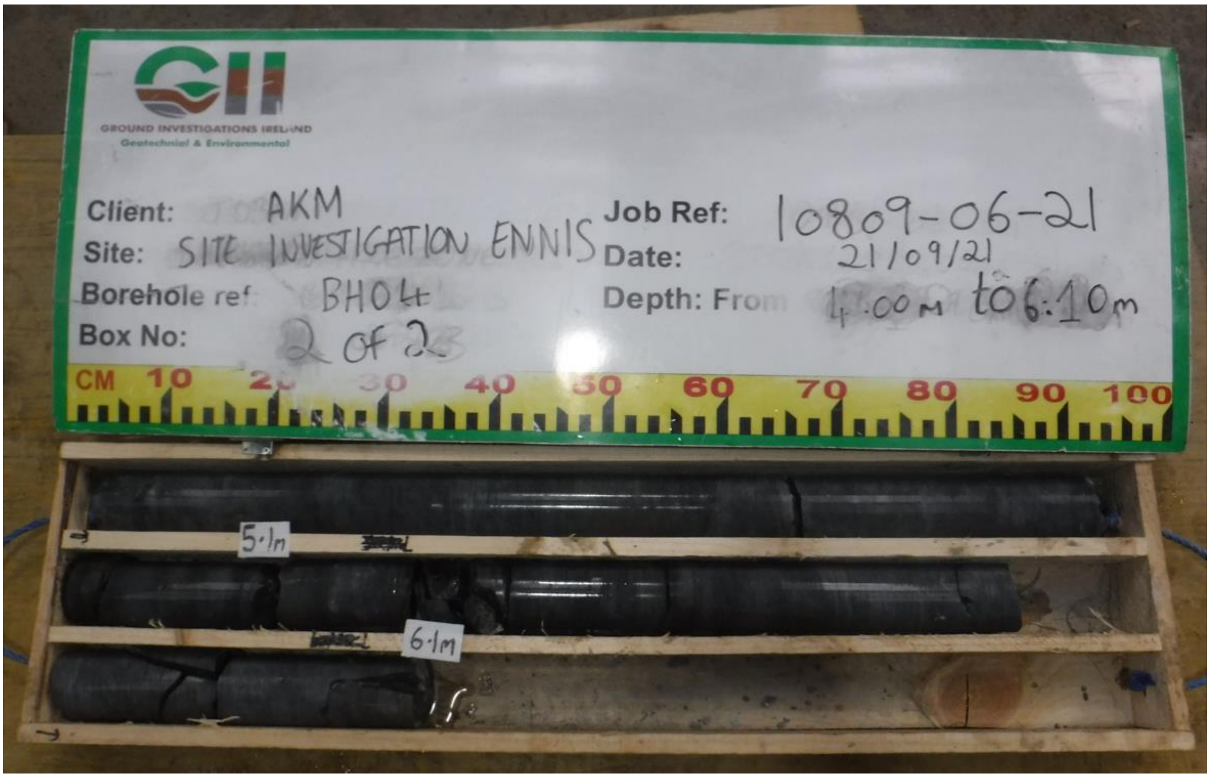
BH03


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: AKM
Job Ref: 10809-06-21
Site: SITE INVESTIGATION ENNIS
Date: 21/09/21
Borehole ref: BH03
Depth: From 0.00 to 3.7M
Box No: 1 OF 2
CM 10 20 30 40 50 60 70 80 90 100
2.6M
3.7M


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: AKM
Job Ref: 10809-06-21
Site: SITE INVESTIGATION ENNIS
Date: 21/09/21
Borehole ref: BH03
Depth: From 3.7M to 6.90m
Box No: 2 OF 2
CM 10 20 30 40 50 60 70 80 90 100
5.2M
6.9M

BH04


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: AKM
Site: SITE INVESTIGATION ENNIS
Borehole ref: BH04
Box No: 1 OF 2
Job Ref: 10809-06-21
Date: 21/09/21
Depth: From 0.00m to 4.00m
GROUND LEVEL
2.4m
3.6m


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Client: AKM
Site: SITE INVESTIGATION ENNIS
Borehole ref: BH04
Box No: 2 OF 2
Job Ref: 10809-06-21
Date: 21/09/21
Depth: From 4.00m to 6.10m
5.1m
6.1m

APPENDIX 8 – Laboratory Testing

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Aisling McDonnell
Date :	10th August, 2021
Your reference :	10809-06-21
Our reference :	Test Report 21/11667 Batch 1
Location :	Site Investigation Ennis
Date samples received :	30th July, 2021
Status :	Final Report
Issue :	1

Ten samples were received for analysis on 30th July, 2021 of which ten were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: 10 Lower Grosvenor Place, London, SW1W 0EN
Company Registration No: 11371415

Client Name: Ground Investigations Ireland
Reference: 10809-06-21
Location: Site Investigation Ennis
Contact: Aisling McDonnell
EMT Job No: 21/11667

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30			
Sample ID	TP01	TP03	TP07	TP07	TP08	TP09	TP10	TP10	TP11	TP12			
Depth	0.50	0.50	0.50	1.50	0.50	0.50	0.50	1.50	0.50	0.50			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021			
Antimony	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	TM30/PM15
Arsenic #	3.3	2.6	4.0	2.9	7.6	3.6	4.5	4.9	3.8	6.6	<0.5	mg/kg	TM30/PM15
Barium #	14	12	26	23	35	25	29	32	25	37	<1	mg/kg	TM30/PM15
Cadmium #	0.5	2.2	0.7	0.3	0.5	0.4	0.6	0.4	0.6	0.9	<0.1	mg/kg	TM30/PM15
Chromium #	22.0	20.8	54.8	32.3	66.4	34.6	55.0	26.7	40.5	65.2	<0.5	mg/kg	TM30/PM15
Copper #	5	6	7	5	7	6	10	9	7	12	<1	mg/kg	TM30/PM15
Lead #	<5	7	7	<5	18	6	7	7	6	16	<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM30/PM15
Molybdenum #	1.3	1.2	3.4	1.9	4.9	2.0	3.4	1.5	2.4	4.2	<0.1	mg/kg	TM30/PM15
Nickel #	11.5	10.9	13.6	8.9	25.0	12.5	16.0	15.1	13.9	24.4	<0.7	mg/kg	TM30/PM15
Selenium #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	TM30/PM15
Zinc #	12	53	17	13	46	16	20	21	17	34	<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
PAH 6 Total #	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	mg/kg	TM4/PM8
PAH 17 Total	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM4/PM8
Benzo(j)fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	TM4/PM8
PAH Surrogate % Recovery	92	91	104	111	110	108	114	109	111	107	<0	%	TM4/PM8
Mineral Oil (C10-C40) (EH_CU_1D_AL)	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	mg/kg	TM5/PM8/PM16

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10809-06-21
Location: Site Investigation Ennis
Contact: Aisling McDonnell
EMT Job No: 21/11667

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30			
Sample ID	TP01	TP03	TP07	TP07	TP08	TP09	TP10	TP10	TP11	TP12			
Depth	0.50	0.50	0.50	1.50	0.50	0.50	0.50	1.50	0.50	0.50			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021			
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)#	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)#	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)#	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_1D_AL)	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH+HS_1D_AL)	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	mg/kg	TM5/TM36/PM8/PM12/PM16
>C6-C10 (HS_1D_AL)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C25 (EH_1D_AL)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	mg/kg	TM5/PM8/PM16
>C25-C35 (EH_1D_AL)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	mg/kg	TM5/PM8/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)#	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)#	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_1D_AR)	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH+HS_1D_AR)	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40) (EH+HS_CU_1D_Total)	<52	<52	<52	<52	<52	<52	<52	<52	<52	<52	<52	mg/kg	TM5/TM36/PM8/PM12/PM16
>EC6-EC10 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC25 (EH_1D_AR)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	mg/kg	TM5/PM8/PM16
>EC25-EC35 (EH_1D_AR)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	mg/kg	TM5/PM8/PM16
MTBE#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Benzene#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Toluene#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Ethylbenzene#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
m/p-Xylene#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
o-Xylene#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
PCB 28#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 52#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 101#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 118#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 138#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 153#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 180#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
Total 7 PCBs#	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	ug/kg	TM17/PM8

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10809-06-21
Location: Site Investigation Ennis
Contact: Aisling McDonnell
EMT Job No: 21/11667

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30			
Sample ID	TP01	TP03	TP07	TP07	TP08	TP09	TP10	TP10	TP11	TP12			
Depth	0.50	0.50	0.50	1.50	0.50	0.50	0.50	1.50	0.50	0.50			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021			
Natural Moisture Content	9.4	6.6	9.8	8.1	13.9	9.5	14.6	10.1	8.7	14.6	<0.1	%	PM4/PM0
Moisture Content (% Wet Weight)	8.6	6.2	9.0	7.5	12.2	8.6	12.8	9.2	8.0	12.8	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Chromium III	22.0	20.8	54.8	32.3	66.4	34.6	55.0	26.7	40.5	65.2	<0.5	mg/kg	NONE/NONE
Total Organic Carbon #	0.21	0.28	0.20	0.03	0.57	0.18	0.14	0.13	0.13	0.40	<0.02	%	TM21/PM24
pH #	8.62	8.62	8.55	8.94	8.30	8.70	8.48	8.76	8.79	8.50	<0.01	pH units	TM73/PM11
Mass of raw test portion	0.0988	0.0963	0.1021	0.0971	0.1032	0.0988	0.1075	0.1044	0.0979	0.1444		kg	NONE/PM17
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09		kg	NONE/PM17

Client Name:	Ground Investigations Ireland	**Report :**	**CEN 10:1 1 Batch**
Reference:	10809-06-21		
Location:	Site Investigation Ennis	**Solids:**	V=60g VOC jar, J=250g glass jar, T=plastic tub
Contact:	Aisling McDonnell		
EMT Job No:	21/11667		

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	LOD/LOR	Units	Method No.
Sample ID	TP01	TP03	TP07	TP07	TP08	TP09	TP10	TP10	TP11	TP12			
Depth	0.50	0.50	0.50	1.50	0.50	0.50	0.50	1.50	0.50	0.50			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021			
Dissolved Antimony #	<0.002	<0.002	0.003	0.003	<0.002	0.003	<0.002	<0.002	<0.002	0.002	<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	<0.02	<0.02	0.03	0.03	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	mg/kg	TM30/PM17
Dissolved Barium #	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	0.016	<0.007	<0.007	<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	0.16	<0.07	<0.07	<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	0.005	<0.002	<0.002	<0.002	<0.002	0.008	0.003	<0.002	<0.002	0.003	<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	0.05	<0.02	<0.02	<0.02	<0.02	0.08	0.03	<0.02	<0.02	0.03	<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	0.009	0.003	<0.003	<0.003	0.007	0.004	0.043	0.016	0.005	0.006	<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	0.09	0.03	<0.03	<0.03	0.07	0.04	0.43	0.16	0.05	0.06	<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	mg/l	TM61/PM0
Mercury Dissolved by CVAF #	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	mg/kg	TM61/PM0
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM26/PM0
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM173/PM0
Fluoride	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	mg/kg	TM173/PM0
Sulphate as SO4 #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/l	TM38/PM0
Sulphate as SO4 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	mg/kg	TM38/PM0
Chloride #	0.8	<0.3	0.4	<0.3	0.9	0.3	0.6	0.3	0.3	0.7	<0.3	mg/l	TM38/PM0
Chloride #	8	<3	4	<3	9	3	6	3	<3	7	<3	mg/kg	TM38/PM0
Dissolved Organic Carbon	4	2	2	<2	3	3	3	<2	3	3	<2	mg/l	TM60/PM0
Dissolved Organic Carbon	40	20	<20	<20	30	30	30	<20	30	30	<20	mg/kg	TM60/PM0
pH	8.41	8.65	8.71	8.53	8.56	8.50	8.31	8.31	8.26	8.38	<0.01	pH units	TM73/PM0
Total Dissolved Solids #	51	42	46	<35	66	46	61	45	50	74	<35	mg/l	TM20/PM0
Total Dissolved Solids #	510	420	460	<350	660	460	610	450	500	740	<350	mg/kg	TM20/PM0

All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name:	Ground Investigations Ireland	**Report :**	**EN12457_2**
Reference:	10809-06-21		
Location:	Site Investigation Ennis	**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub	
Contact:	Aisling McDonnell		
EMT Job No:	21/11667		

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30						
Sample ID	TP01	TP03	TP07	TP07	TP08	TP09	TP10	TP10	TP11	TP12						
Depth	0.50	0.50	0.50	1.50	0.50	0.50	0.50	1.50	0.50	0.50						
COC No / misc																
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T						
Sample Date	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1	1	1	1	Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.
Date of Receipt	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021	30/07/2021						
Solid Waste Analysis																
Total Organic Carbon #	0.21	0.28	0.20	0.03	0.57	0.18	0.14	0.13	0.13	0.40	3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	6	-	-	<0.025	mg/kg	TM36/PM12
Sum of 7 PCBs #	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	1	-	-	<0.035	mg/kg	TM17/PM8
Mineral Oil	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	500	-	-	<30	mg/kg	TM5/PM8/PM16
PAH Sum of 6 #	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate																
Arsenic #	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium #	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	<0.03	20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium #	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	0.16	<0.07	<0.07	2	50	100	<0.07	mg/kg	TM30/PM17
Mercury #	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01	0.2	2	<0.0001	mg/kg	TM61/PM0
Molybdenum #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel #	0.05	<0.02	<0.02	<0.02	<0.02	0.08	0.03	<0.02	<0.02	0.03	0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony #	<0.02	<0.02	0.03	0.03	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc #	0.09	0.03	<0.03	<0.03	0.07	0.04	0.43	0.16	0.05	0.06	4	50	200	<0.03	mg/kg	TM30/PM17
Total Dissolved Solids #	510	420	460	<350	660	460	610	450	500	740	4000	60000	100000	<350	mg/kg	TM20/PM0
Dissolved Organic Carbon	40	20	<20	<20	30	30	30	<20	30	30	500	800	1000	<20	mg/kg	TM60/PM0
Dry Matter Content Ratio	90.9	93.5	88.5	92.6	87.4	90.9	84.1	86.2	92.1	62.1	-	-	-	<0.1	%	NONE/PM4
pH #	8.62	8.62	8.55	8.94	8.30	8.70	8.48	8.76	8.79	8.50	-	-	-	<0.01	pH units	TM73/PM11
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	-	-	<0.1	mg/kg	TM26/PM0
Fluoride	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	-	-	-	<3	mg/kg	TM173/PM0
Sulphate as SO4 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	1000	20000	50000	<5	mg/kg	TM38/PM0
Chloride #	8	<3	4	<3	9	3	6	3	<3	7	800	15000	25000	<3	mg/kg	TM38/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 10809-06-21
Location: Site Investigation Ennis
Contact: Aisling McDonnell

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
21/11667	1	TP01	0.50	1-3	No Interpretation Possible
21/11667	1	TP03	0.50	4-6	No Interpretation Possible
21/11667	1	TP07	0.50	7-9	No Interpretation Possible
21/11667	1	TP07	1.50	10-12	No Interpretation Possible
21/11667	1	TP08	0.50	13-15	No Interpretation Possible
21/11667	1	TP09	0.50	16-18	No Interpretation Possible
21/11667	1	TP10	0.50	19-21	No Interpretation Possible
21/11667	1	TP10	1.50	22-24	No Interpretation Possible
21/11667	1	TP11	0.50	25-27	No Interpretation Possible
21/11667	1	TP12	0.50	28-30	No Interpretation Possible

Client Name: Ground Investigations Ireland
Reference: 10809-06-21
Location: Site Investigation Ennis
Contact: Aisling McDonnell

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
21/11667	1	TP01	0.50	2	05/08/2021	**General Description (Bulk Analysis)**	soil/stones
					05/08/2021	**Asbestos Fibres**	NAD
					05/08/2021	**Asbestos ACM**	NAD
					05/08/2021	**Asbestos Type**	NAD
					05/08/2021	**Asbestos Level Screen**	NAD
21/11667	1	TP03	0.50	5	05/08/2021	**General Description (Bulk Analysis)**	soil/stones
					05/08/2021	**Asbestos Fibres**	NAD
					05/08/2021	**Asbestos ACM**	NAD
					05/08/2021	**Asbestos Type**	NAD
					05/08/2021	**Asbestos Level Screen**	NAD
21/11667	1	TP07	0.50	8	05/08/2021	**General Description (Bulk Analysis)**	soil/stones
					05/08/2021	**Asbestos Fibres**	NAD
					05/08/2021	**Asbestos ACM**	NAD
					05/08/2021	**Asbestos Type**	NAD
					05/08/2021	**Asbestos Level Screen**	NAD
21/11667	1	TP07	1.50	11	05/08/2021	**General Description (Bulk Analysis)**	soil
					05/08/2021	**Asbestos Fibres**	NAD
					05/08/2021	**Asbestos ACM**	NAD
					05/08/2021	**Asbestos Type**	NAD
					05/08/2021	**Asbestos Level Screen**	NAD
21/11667	1	TP08	0.50	14	05/08/2021	**General Description (Bulk Analysis)**	soil
					05/08/2021	**Asbestos Fibres**	NAD
					05/08/2021	**Asbestos ACM**	NAD
					05/08/2021	**Asbestos Type**	NAD
					05/08/2021	**Asbestos Level Screen**	NAD
21/11667	1	TP09	0.50	17	05/08/2021	**General Description (Bulk Analysis)**	soil
					05/08/2021	**Asbestos Fibres**	NAD
					05/08/2021	**Asbestos ACM**	NAD
					05/08/2021	**Asbestos Type**	NAD
					05/08/2021	**Asbestos Level Screen**	NAD
21/11667	1	TP10	0.50	20	05/08/2021	**General Description (Bulk Analysis)**	soil/stones
					05/08/2021	**Asbestos Fibres**	NAD
					05/08/2021	**Asbestos ACM**	NAD

Client Name: Ground Investigations Ireland
Reference: 10809-06-21
Location: Site Investigation Ennis
Contact: Aisling McDonnell

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
21/11667	1	TP10	0.50	20	05/08/2021	**Asbestos Type**	NAD
					05/08/2021	**Asbestos Level Screen**	NAD
21/11667	1	TP10	1.50	23	05/08/2021	**General Description (Bulk Analysis)**	Soil/Stones
					05/08/2021	**Asbestos Fibres**	NAD
					05/08/2021	**Asbestos ACM**	NAD
					05/08/2021	**Asbestos Type**	NAD
					05/08/2021	**Asbestos Level Screen**	NAD
21/11667	1	TP11	0.50	26	05/08/2021	**General Description (Bulk Analysis)**	Soil/Stones
					05/08/2021	**Asbestos Fibres**	NAD
					05/08/2021	**Asbestos ACM**	NAD
					05/08/2021	**Asbestos Type**	NAD
					05/08/2021	**Asbestos Level Screen**	NAD
21/11667	1	TP12	0.50	29	05/08/2021	**General Description (Bulk Analysis)**	soil/stones
					05/08/2021	**Asbestos Fibres**	NAD
					05/08/2021	**Asbestos ACM**	NAD
					05/08/2021	**Asbestos Type**	NAD
					05/08/2021	**Asbestos Level Screen**	NAD

Client Name: Ground Investigations Ireland
Reference: 10809-06-21
Location: Site Investigation Ennis
Contact: Aisling McDonnell

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 21/11667						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 21/11667

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 21/11667

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes

EMT Job No: 21/11667

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM61	Determination of Mercury by Cold Vapour Atomic Fluorescence - WATERS: Modified USEPA Method 245.7, Rev 2, Feb 2005. SOILS: Modified USEPA Method 7471B, Rev.2, Feb 2007	PM0	No preparation is required.	Yes		AR	Yes

EMT Job No: 21/11667

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	

Appendix 6.2 Bespoke Confirmation of Feasibility

August 2022

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UISCE ÉIREANN : IRISH WATER

Andy Kotze
Block S, Eastpoint Business Park
Alfie Byrne Road
Dublin 3
Co. Dublin
D03H3F4

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

26 November 2021

Re: CDS21003780 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 330 unit(s) at Golf Links Road, Ennis, Clare

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Golf Links Road, Ennis, Clare (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 upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	There is sufficient capacity in the Irish Water assets to facilitate the proposed development.
Wastewater Connection	Feasible subject to minor upgrades at the WWTP. WW network extension required with likely upgrades of the existing Irish Water owned pumping station and rising main also required. Further details can be discussed prior to connection application stage.

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.

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 Shane Mcmanus from the design team by email to shane.mcmanus@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,

Yvonne Harris

Yvonne Harris

Head of Customer Operations

Proposed Strategic Housing Development at Ballymacaula, Drumbiggle, Keelty, Circular Road, Ennis, Co. Clare

CHAPTER 8 **Hydrology and Hydrogeology**

Appendix 8.1 Surface Water Quality Data Claureen Bridge

Volume III

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August 2022

Glenveagh
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McCutcheon Halley
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Appendix 8.1 Surface Water Quality Data Claureen Bridge

August 2022

Glenveagh
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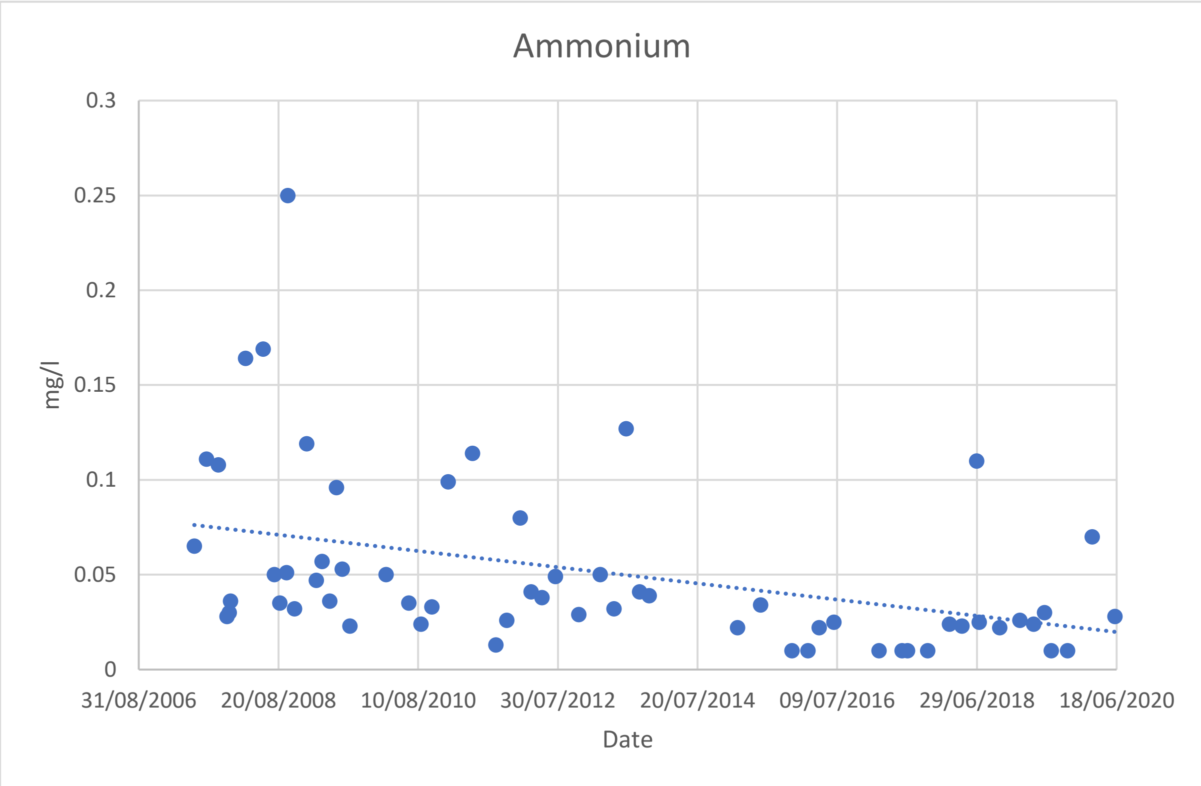
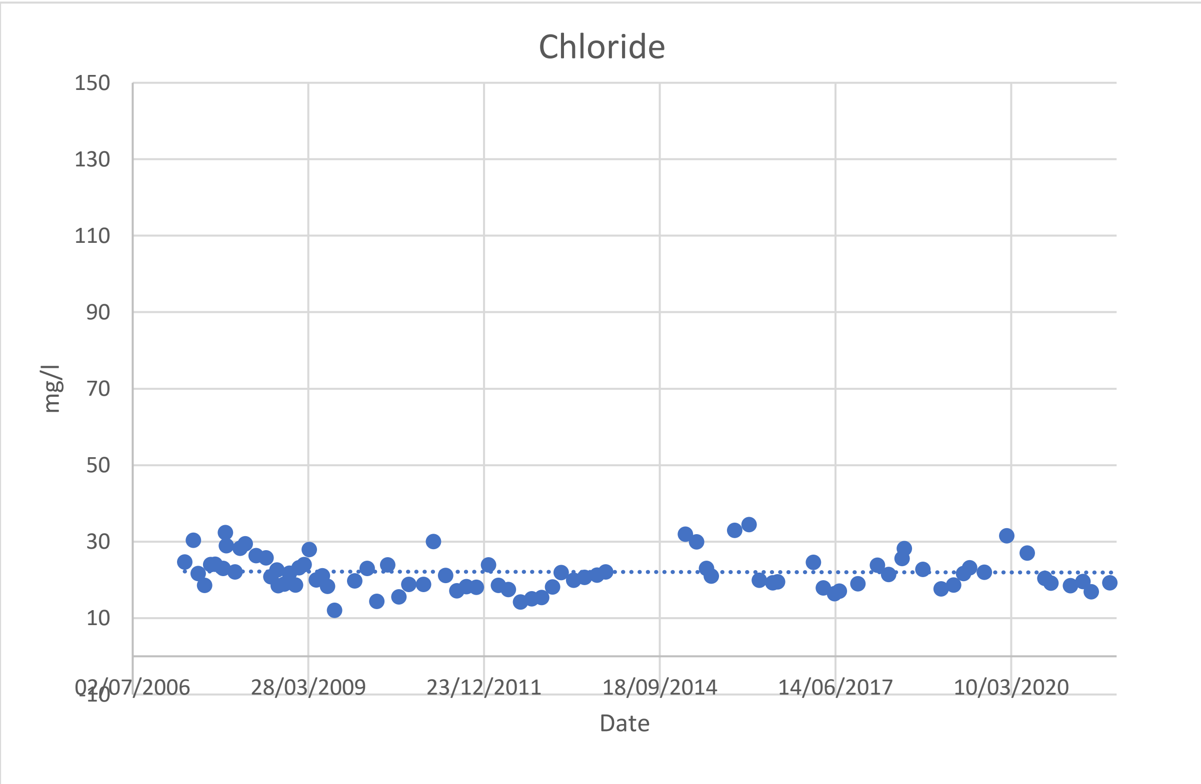
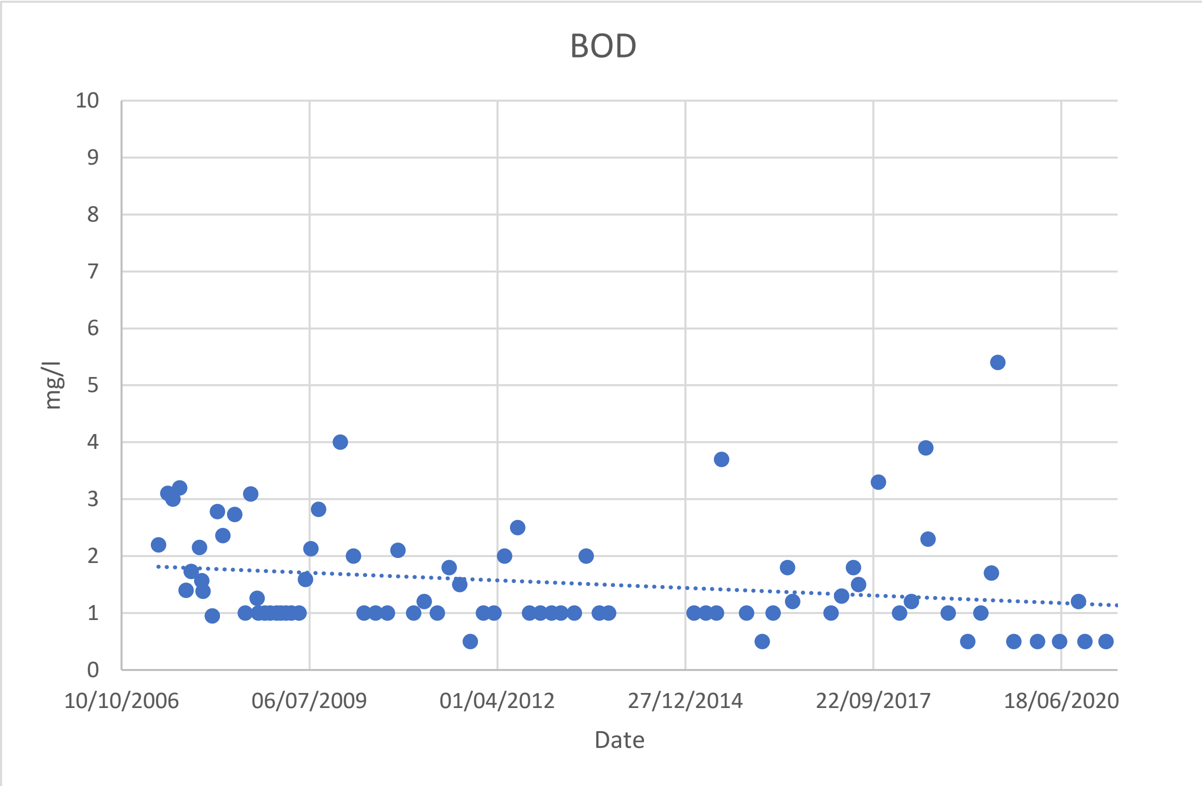


Ammonium
0.3
0.25
0.2
0.15
0.1
0.05
0
mg/l
31/08/2006
20/08/2008
10/08/2010
30/07/2012
20/07/2014
09/07/2016
29/06/2018
18/06/2020
Date



Chloride
150
130
110
90
70
50
30
10
-10
mg/l
02/07/2006
28/03/2009
23/12/2011
18/09/2014
14/06/2017
10/03/2020
Date


BOD
mg/l
0
1
2
3
4
5
6
7
8
9
10
10/10/2006
06/07/2009
01/04/2012
27/12/2014
22/09/2017
18/06/2020
Date

Proposed Strategic Housing Development at Ballymacaula, Drumbiggle, Keelty, Circular Road, Ennis, Co. Clare

CHAPTER 9 **Biodiversity**

Appendix 9.1 Bat Survey Report

Volume III

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August 2022

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Appendix 9.1 Bat Survey Report

August 2022

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McCutcheon Halley
CHARTERED PLANNING CONSULTANTS

2022

Bat Assessment: Ballymacaula, Circular Rd., Ennis, Co. Clare.

Dr Tina Aughney

Bat Eco Services

Bat Eco Services, Ulex House, Drumheel, Lisduff, Virginia, Co. Cavan. A82 XW62.

Licensed Bat Specialist: Dr Tina Aughney (tina@batecoservices.com, 086 4049468)

NPWS licence C13/2020 (Licence to handle bats, expires 31st December 2022);
NPWS licence 08/2020 (Licence to photograph/film bats, expires 31st December 2022) ;
NPWS licence DER/BAT 2022-36 (Survey licence, expires 24th March 2025).

Statement of Authority: Dr Aughney has worked as a Bat Specialist since 2000 and has undertaken extensive survey work for all Irish bat species including large scale development projects, road schemes, residential developments, wind farm developments and smaller projects in relation to building renovation or habitat enhancement. She is a monitoring co-ordinator and trainer for Bat Conservation Ireland. She is a co-author of the 2014 publication *Irish Bats in the 21st Century.* This book received the 2015 CIEEM award for Information Sharing. Dr Aughney is a contributing author for the Atlas of Mammals in Ireland 2010-2015.

All analysis and reporting is completed by Dr Tina Aughney. Data collected and surveying is completed with the assistance of a trained field assistant.

Mr. Shaun Boyle (Field Assistant) NPWS licence DER/BAT 2022-37 (Survey licence, expires 24th March 2025).

Applicant Name: Glenveagh Homes Ltd

Project Title: Residential Development

Application Address: Ballymacaula, Circular Road, Ennis, Co. Clare

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
16th August 2022	Draft 1	By email to Enviroguide Consulting
23rd August 2022	Final	By email to Enviroguide Consulting

Purpose

This document has been prepared as a Report for Enviroguide Consulting. Only the most up to-date report should be consulted. All previous drafts/reports are deemed redundant in relation to the named site.

Bat Eco Service accepts no responsibility or liability for any use that is made of this document other than by the client for the purposes for which it was originally commissioned and prepared.

Carbon Footprint Policy

It is the policy of Bat Eco Services to provide documentation digitally in order to reduce carbon footprint. Printing of reports etc. is avoided, where possible.

Bat Record Submission Policy

It is the policy of Bat Eco Services to submit all bat records to Bat Conservation Ireland database one year post-surveying. This is to ensure that a high level bat database is available for future desktop reviews. This action will be automatically undertaken unless otherwise requested, where there is genuine justification.

Executive Summary

Project Title: Ballymacaula, Circular Road, Ennis, Co. Clare

Application Address: Ballymacaula, Circular Road, Ennis, Co. Clare

Proposed work: Residential Development.

Bat Survey Results - Summary

Bat Species	Roosts	Foraging	Commuting
Common pipistrelle *Pipistrellus pipistrellus*		√	√
Soprano pipistrelle *Pipistrellus pygmaeus*		√	√
Nathusius' pipistrelle *Pipistrellus nathusii*			
Leisler's bat *Nyctalus leisleri*		√	√
Brown long-eared bat *Plecotus auritus*		√	√
Daubenton's bat *Myotis daubentonii*			
Natterer's bat *Myotis nattereri*		√	√
Whiskered bat *Myotis mystacinus*			
Lesser horseshoe bat *Rhinolophus hipposideros*		√	√

Bat Survey Duties Completed (Indicated by red shading)

Tree PBR Survey	●	Daytime Building Inspection	○
Static Detector Survey	●	Daytime Bridge Inspection	○
Dusk Bat Survey	●	Dawn Bat Survey	●
Walking Transect	●	Driving Transect	○
Trapping / Mist Netting	○	IR Camcorder filming	○
Endoscope Inspection	●	Other	○

Citation: Bat Eco Services (2022) Bat Assessment: Ballymacaula, Circular Road, Ennis, Co. Clare**. Unpublished report prepared for Enviroguide Consulting.**

Contents

1. Introduction

Bat Eco Services was commissioned by Enviroguide Consulting to undertake a bat survey of a proposed development site located at Ballymacaula, Circular Road, Ennis, Co. Clare and this entailed daytime inspection, dusk and dawn surveys, static surveillance and walking transects.

1.1 Relevant Legislation & Bat Species Status in Ireland

1.1.1 Irish Statutory Provisions

A small number of animals and plants are protected under Irish legislation (Nelson, *et al.,* 2019). The principal statutory provisions for the protection of animal and plant species are under the Wildlife Act 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. The Flora (Protection) Order 2015 (S.I. no. 356 of 2015) lists the plant species protected by Section 21 of the Wildlife Acts. See www.npws.ie/ legislation for further information.

The codes used for national legislation are as follows:

- WA = Wildlife Act, 1976, Wildlife (Amendment) Act, 2000 and other relevant amendments
- FPO = Flora (Protection) Order, 2015 (S.I. No. 356 of 2015)

1.1.2 EU Legislation

The Birds Directive (Directive 2009/147/EC) and Habitats Directive (Council Directive 92/43/EEC) are the legislative instruments which are transposed into Irish law, *inter alia,* by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) ('the 2011' Regulations), as amended.

The codes used for the Habitats Directive (Council Directive 92/43/EEC) are:

- Annex II Animal and plant species listed in Annex II
- Annex IV Animal and plant species listed in Annex IV
- Annex V Animal and plant species listed in Annex V

The main aim of the Habitats Directive is the conservation of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status. These annexes list habitats (Annex I) and species (Annexes II, IV and V) which are considered threatened in the EU territory. The listed habitats and species represent a considerable proportion of biodiversity in Ireland and the Directive itself is one of the most important pieces of legislation governing the conservation of biodiversity in Europe.

Under Article 11 of the Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive. In April 2019, Ireland submitted the third assessment of conservation status for 59 habitats and 60 species. There are three volumes with the third listing details of the species assessed.

Article 12 of the Habitats Directive requires Member States to take measures for the establishment of a strict protection regime for animal species listed in Annex IV(a) of the Habitats Directive within the whole territory of Member States. Article 16 provides for derogation from these provisions under defined conditions. These provisions are implemented under Regulations 51 and 54 of the 2011 Regulations.

1.1.3 IUCN Red Lists

The International Union for the Conservation of Nature (IUCN) coordinates the Red Listing process at the global level, defining the categories so that they are standardised across all taxa. Red Lists are also produced at regional, national and subnational levels using the same IUCN categories (IUCN 2012, 2019). Since 2009, Red Lists have been produced for the island of Ireland by the National Parks and Wildlife Service (NPWS) and the Northern Ireland Environment Agency (NIEA) using these IUCN categories. To date, 13 Red Lists have been completed. The Red Lists are an assessment of the risk of extinction of each species and not just an assessment of their rarity. Threatened species are those species categorised as Critically Endangered, Endangered or Vulnerable (IUCN, 2019) – also commonly referred to as 'Red Listed'.

1.1.4 Irish Red List - Mammals

Red Lists in Ireland refer to the whole island, i.e. including Northern Ireland, and so follow the guidelines for regional assessments (IUCN, 2012, 2019). The abbreviations used are as follows:.

- RE Regionally Extinct
- CR Critically Endangered
- EN Endangered
- VU Vulnerable
- NT Near Threatened
- DD Data Deficient
- LC Least Concern
- NA Not Assessed
- NE Not Evaluated

There are 27 terrestrial mammals species in Ireland, which includes the nine resident bat species listed. The terrestrial mammal, according to Marnell *et al.,* 2019, list for Ireland consists of all terrestrial species native to Ireland or naturalised in Ireland before 1500. The IUCN Red List categories and criteria are used to assess that status of wildlife. This was recently completed for the terrestrial mammals of Ireland. Apart from the two following two mammal species (grey wolf *Canis lupus* (regionally extinct) and black rat *Rattus rattus* (Vulnerable)), the remaining 25 species were assessed as least concern in the most recent IUCN Red List publication by NPWS (Marnell *et al*., 2019).

1.1.5 Irish Bat Species

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat *Rhinolophus hipposideros* is further listed under Annex II. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is an offence. The most recent guidance document is "Guidance document on the strict protection of animal species of Community interest un the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final".

Regulation 51(2) of the 2011 Regulations provides –

(*"(2) Notwithstanding any consent, statutory or otherwise, given to a person by a public authority or held by a person, except in accordance with a licence granted by the Minister under Regulation 54, a person who in respect of the species referred to in Part 1 of the First Schedule—*

(a) deliberately captures or kills any specimen of these species in the wild, (b) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,

(c) deliberately takes or destroys eggs of those species from the wild,

(d) damages or destroys a breeding site or resting place of such an animal, or

(e) keeps, transports, sells, exchanges, offers for sale or offers for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive,

shall be guilty of an offence."

The grant of planning permission does not permit the commission of any of the above acts or render the requirement for a derogation licence unnecessary in respect of any of those acts.

Any works interfering with bats and especially their roosts, may only be carried out under a derogation licence granted by National Parks and Wildlife Service (NPWS) pursuant to Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law).

There are eleven recorded bat species in Ireland, nine of which are considered resident on the island. Eight resident bat species and one of the vagrant bat species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure inside the pinna of the ear). Vesper bats are distributed throughout the island. Nathusius' pipistrelle *Pipistrellus nathusii* is a recent addition while the Brandt's bat has only been recorded once to-date (Only record confirmed by DNA testing, all other records has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf structure on the face, distinguishing it from the vesper bats. This species' current distribution is confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. The eleventh bat species, the greater horseshoe bat, was only recorded for the first time in February 2013 in County Wexford and is therefore considered to be a vagrant species. A total of 41 SACs have been designated for the Annex II species lesser horseshoe bat (1303), of which nine have also been selected for the Annex I habitat 'Caves not open to the public' (8310).

Irish bat species list is presented in Table 1 along with their current status.

Table 1: Status of the Irish bat fauna (Marnell *et al.*, 2019).

Species: Common Name	Irish Status	European Status	Global Status
Resident Bat Species ^			
Daubenton's bat *Myotis daubentonii*	Least Concern	Least Concern	Least Concern
Whiskered bat *Myotis mystacinus*	Least Concern	Least Concern	Least Concern
Natterer's bat *Myotis nattereri*	Least Concern	Least Concern	Least Concern
Leisler's bat *Nyctalus leisleri*	Least Concern	Least Concern	Least Concern
Nathusius' pipistrelle *Pipistrellus nathusii*	Least Concern	Least Concern	Least Concern
Common pipistrelle *Pipistrellus pipistrellus*	Least Concern	Least Concern	Least Concern
Soprano pipistrelle *Pipistrellus pygmaeus*	Least Concern	Least Concern	Least Concern
Brown long-eared bat *Plecotus auritus*	Least Concern	Least Concern	Least Concern
Lesser horseshoe bat *Rhinolophus hipposideros*	Least Concern	Least Concern	Least Concern
Possible Vagrants ^			
Brandt's bat Myotis brandtii	Data deficient	Least Concern	Least Concern
Greater horseshoe bat *Rhinolophus ferrumequinum*	Data deficient	Near threatened	Near threatened

^ Roche *et al.*, 2014

1.2 Relevant Guidance Documents

This report will draw on guidelines already available in Europe and will use the following documents:

- National Roads Authority (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes
- Collins, J. (Editor) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London
- McAney, K. (2006) A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- NPWS & VWT (2022) Lesser Horseshoe Bat Species Action Plan 2022- 2026. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.
- Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland (Version 1: Kelleher & Marnell, 2006).
- The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.
- Bat Conservation Trust (2018) Bats and artificial lighting in the UK: bats and the built environment series. Guidance Note 08/2019. BCT, London.
- Guidance document on the strict protection of animal species of Community interest un the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final.

- EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports.

Collins (2016) is the principal document used to provide guidance in relation to bat survey effort required but the level of surveying is assessed on a case-by-case basis taking into consideration the historical bat records for the survey area, presence of built, structures and trees potentially suitable for roosting bats and the presence of suitable bat habitats for foraging and commuting. Additional reference is made to this document in relation to determining the value of buildings, trees etc. as bat roosts. The tables referred to from this document are described in the following section and in the section on methodology.

Marnell *et al.* (2022) is referred to for guidance in relation to survey guidance (timing and survey design), derogation licences and mitigation measures.

1.2.1 Bat Survey Requirements & Timing

With reference to Collins (2016) and Marnell *et al.* (2022), the information presented in this section is used to determine the bat survey requirements for the proposed development site. Collins (2016) provides a trigger list in relation to determining if a bat survey is required and this is presented Appendix 3 (Figure B) for reference. In addition, Chapter 2 of Collins (2016) discusses that a bat survey is required when proposed activities are likely to impact on bats and their habitats. The level of surveying is to be determined by the ecologist and these are influenced by the following criteria:

- Likelihood of bats being present;
- Type of proposed activities;
- Scale of proposed activities;
- Size, nature and complexity of the site;
- Species concerned;
- No. of individuals.

Collins (2016) also provides the following table detailing when different survey components should be undertaken.

Table 2.2 Recommended UK survey times for survey types described in these guidelines.

Survey type	J	F	M	A	M	J	J	A	S	O	N	D
Preliminary ecological appraisal - fieldwork	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal
Preliminary roost assessment – structures[a]	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal
Emergence/re-entry survey for maternity or summer roosts[b]					optimal	optimal	optimal	optimal				
Emergence/re-entry[c] survey for transitional roosts[b]				weather or location dependent					weather or location dependent	weather or location dependent		
Emergence survey for mating roosts[b]								optimal	weather or location dependent	weather or location dependent		
Hibernation survey – structures[a]	optimal	optimal	weather or location dependent								weather or location dependent	optimal
Preliminary ground level roost assessment - trees[d]	optimal	optimal	optimal	sub-optimal	sub-optimal	sub-optimal	sub-optimal	sub-optimal	sub-optimal	sub-optimal	sub-optimal	optimal
Potential roost feature (PRF) inspection survey - trees	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal	optimal
Ground level bat activity survey – transects and automated/static				weather or location dependent	optimal	optimal	optimal	optimal	weather or location dependent	weather or location dependent		
Pre-, during and post-hibernation – automated/static bat activity survey	weather or location dependent	weather or location dependent	weather or location dependent								weather or location dependent	weather or location dependent
Swarming survey								optimal (second half)	optimal	optimal		
Back-tracking survey				weather or location dependent	optimal	optimal	optimal	optimal	weather or location dependent	weather or location dependent		
Trapping survey[e]					optimal	sub-optimal	sub-optimal (first half) / optimal (second half)	optimal	weather or location dependent	weather or location dependent		
Radio tagging and tracking survey[e]					optimal	sub-optimal	sub-optimal (first half) / optimal (second half)	optimal	weather or location dependent	weather or location dependent		

= optimal period
= sub-optimal period
= weather or location dependent (i.e. may not be suitable due to spring and autumn conditions in any one year or in more northerly latitudes). Note that October surveys are not acceptable in Scotland.

Figure 1a: Table 2.2 reproduced from Collins (2016).

1.2.1.1 Buildings & Structures

In Marnell *et al.* (2022), Table 3 (The applicability of survey methods) provides information on the type of surveys that can be undertaken according to the different seasons.

Marnell *et al.* (2022) states that it is more suitable to survey buildings in the summer months. The following is a summary of the principal points:

1. The presence of a significant bat roost (invariably a maternity roost) can normally be determined on a single visit at any time of year, provided that the entire structure is accessible and that any signs of bats have not been removed by others. However, a visit during the summer or autumn has the advantage that bats may be seen or heard.
2. Roosts used by a small number of bats, as opposed to maternity sites, can be particularly difficult to detect and may require extensive searching backed up (in summer) by bat detector surveys or emergence counts.
3. If the entire building is not accessible or signs of bats may have been removed by others, or by the weather, bat detector or exit count methodologies may be required to back up a limited search.

Table 3. The applicability of survey methods.

Season	Roost type	Inspection	Bat detectors and emergence counts
Spring (Mar – May)	Building	Suitable (signs, perhaps bats)	Limited, weather dependent
	Trees	Difficult (best for signs before leaves appear)	Rarely useful
	Underground	Suitable (signs only)	Static detectors may be useful
Summer (June-August)	Building	Suitable (signs and bats)	Suitable
	Trees	Difficult	Limited; use sunrise survey
	Underground	Suitable (signs only)	Rarely useful
Autumn (September –November)	Building	Suitable (signs and bats)	Limited, weather dependent
	Trees	Difficult	Rather limited weather dependent; use sunrise survey?
	Underground	Suitable (signs, perhaps bats)	Static detectors may be useful
Winter (December-February)	Building	Suitable (signs, perhaps bats))	Rarely useful
	Trees	Difficult (best for signs after leaves have gone)	Rarely useful
	Underground	Suitable (signs and bats)	Static detectors may be useful

Figure 1b: Table 3 reproduced from Marnell *et al.* (2022).

The following table is used to determine the level and timing of surveys for buildings/structures with reference to the surrounding habitat. Buildings are assessed to determine their suitability as a bat roost and are described using the parameters Negligible, Low, Medium or High suitability in view of Table 2 from Marnell *et al.* (2022). The level of suitability informs the level of surveying and timing of surveys required based on Table 7.3 of Collins, 2016 (Note: These two tables are presented in Appendix 1 but a summary is provided in the table below).

Table 2a: Building Bat Roost Classification System & Survey Effort (Adapted from Collins, 2016 and Marnell *et al.*, 2022).

Suitability Category	Description (examples of criteria)	Survey Effort (Timings)
Negligible	Building have no potential as a roost site Urban setting, heavily disturbed, building material unsuitable, building in poor condition etc.	No surveys required.
Low	Building has a low potential as a roost site. No evidence of bat usage (e.g. droppings)	One dusk or dawn survey.
Medium	Building with some suitable voids / crevices for roosting bats. Some evidence of bat usage Suitable foraging and commuting habitat present.	At least one survey in May to August, minimum of two surveys (one dusk and one dawn).
High	Building with many features deemed suitable for roosting bats. Evidence of bat usage. Largely undisturbed setting, rural, suitable foraging and commuting habitat, suitable roof void and building material.	At least two surveys in May to August, with a minimum of three surveys (at least one dusk survey and one dawn survey).

1.2.1.2 Trees

Marnell *et al.* (2022) recommends the following in relation to detecting roosts in trees:

- "The best time to carry out surveys for suitable cavities is between November and April, when the trunk and branches are not obscured by leaves. If inspection suggests that the tree has suitable cavities or roost sites, a bat detector survey at dusk or dawn during the summer may help to produce evidence of bats, though the nomadic nature of most tree-dwelling species means that the success rate is very low.
- It can also be difficult to pinpoint exactly which tree a bat emerged from. A dawn survey is more likely to be productive than a dusk one as swarming bats returning to the roost are much more visible than those leaving the roost. Because tree-dwelling bats move roosts frequently, a single bat-detector survey is unlikely to provide adequate evidence of the absence of bats in trees that contain a variety of suitable roosting places.
- Several dawn or dusk surveys spread over a period of several weeks from June to August will greatly increase the probability of detecting significant maternity roosts and is recommended where development proposals will involve the loss of multiple trees".

As a consequence, the BTHK (2018) Potential Roost Features (PRFs) list and the classification system adapted from Collins (2016) is recommended as part of the daytime inspection of trees to determine their PBR or Potential Bat Roost value. Details of the methodology followed is presented in Section 3.2.2.

1.2.1.3 Underground Structures

Marnell *et al.* (2022) recommends the following in relation to underground structures:

1. Underground structures are used mainly for hibernation, so surveys should generally be carried out during the winter.

1.2.2 Evaluation & Assessment Criteria

Based on the information collected during the desktop studies and bat surveys, an ecological value is assigned to each bat species recorded based on its conservation status at different geographical scales (Table 2b). For example, a site may be of national ecological value for a given species if it supports a significant proportion (e.g. 5%) of the total national population of that species.

Table 2b: The six-level ecological valuation scheme used in the CIEEM Guidelines (2016) Ecological Value

Ecological Value	Geographical Scale of Importance
International	International or European scale
National	The Republic of Ireland or the island of Ireland scale (depending on the bat species)
Regional	Province scale: Leinster
County	County scale: County Dublin
Local	Proposed development and immediate surroundings
Negligible	None, the feature is common and widespread

If bat roosts are recorded, their roost status is determined using Figure 20 from Marnell *et al.* (2022). This figure is presented below (Figure 1c). This figure is also used to determine the conservation significance of the roost in order to prepare appropriate bat mitigation measures.

Impacts on bats can arise from activities that may result in:

- Physical disturbance of bat roosts e.g. destruction or renovation of buildings
- Noise disturbance e.g. increase human presence, use of machinery etc.
- Lighting disturbance
- Loss of roosts e.g. destruction or renovation of buildings
- Modifications of commuting or foraging habitats
- Severance or fragmentation of commuting routes
- Loss of foraging habitats.

It is recognised that any development will have an impact on the receiving environment, but the significance of the impact will depend on the value of the ecological features that would be affected. Such ecological features will be those that are considered to be important and potentially affected by the proposed development.

The guidelines consulted recommend that the potential impacts of a proposed development on bats are assessed as early as possible in the design stage to determine any areas of conflicts. In particular the Table 4 (presented as Figure 1d below) and Figure 20 (presented as Figure 1c) from Marnell *et al.* (2022) are referenced during this process.

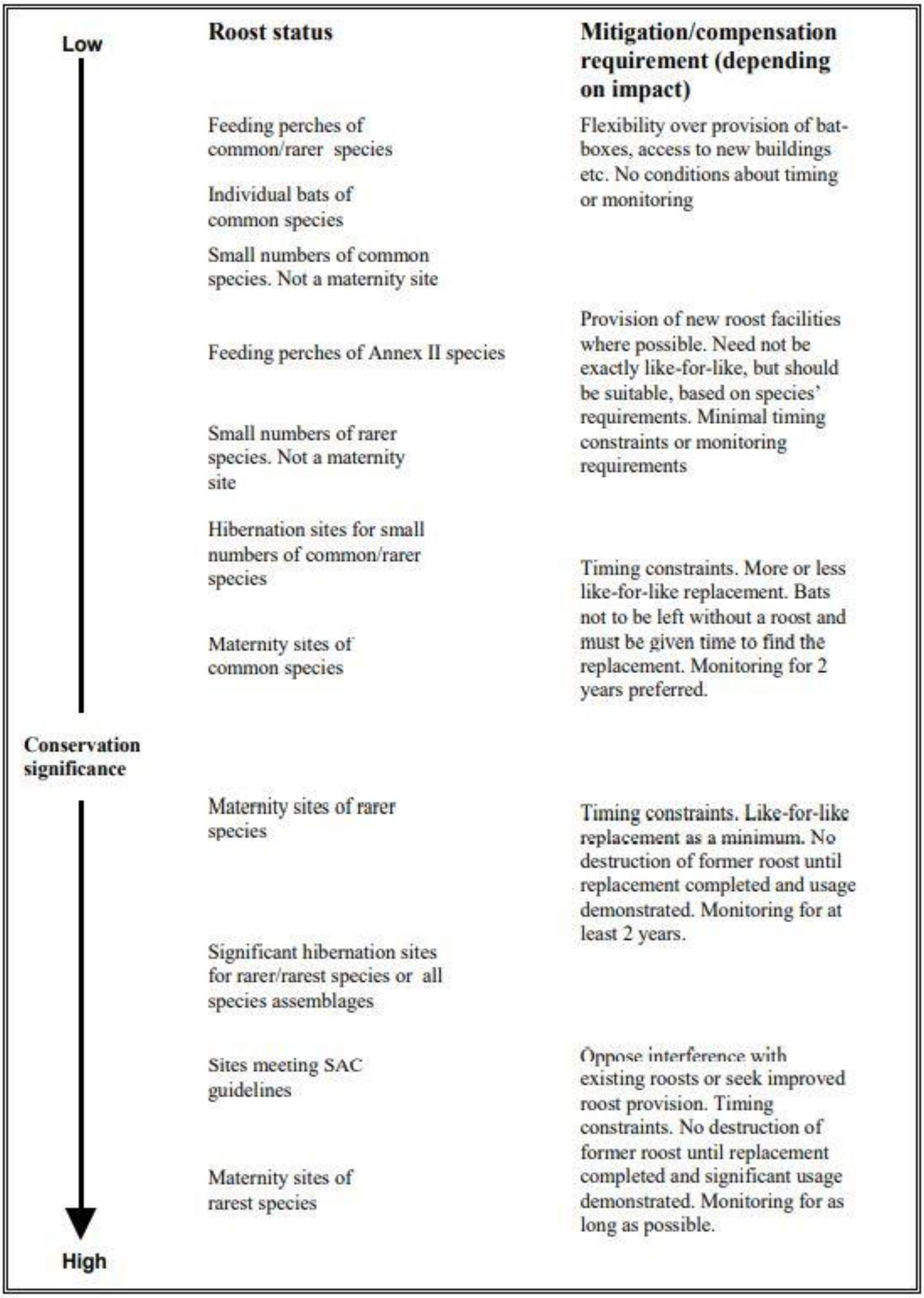


Figure 20 Guidelines for proportionate mitigation. The definition of common, rare and rarest species requires regional interpretation.

Figure 1c: Figure 20 (p 46) Reproduced from Marnell *et al.* (2022).

Table 4 The scale of main impacts at the site level on bat populations. [**NB** This is a general guide only and does not take into account species differences. Medium impacts, in particular, depend on the care with which any mitigation is designed and implemented and could range between high and low.]

Roost type	Development effect	Scale of impact		
		Low	Medium	High
Maternity	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Temporary disturbance outside breeding season	✓		
	Post-development interference			✓
Major hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference			✓
Minor hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction, modification		✓	
	Modified management		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference		✓	
	Temporary destruction, then reinstatement	✓		
Mating	Destruction		✓	
	Isolation caused by fragmentation		✓	
	Partial destruction	✓		
	Modified management	✓		
	Temporary disturbance	✓		
	Post-development interference	✓		
	Temporary destruction, then reinstatement	✓		
Night roost	Destruction	✓		
	Isolation caused by fragmentation	✓		
	Partial destruction	✓		
	Modified management	✓		
	Temporary disturbance	✓		
	Post-development interference	✓		
	Temporary destruction, then reinstatement	✓		

Figure 1d: Table 4 (p 44) Reproduced from Marnell *et al.* (2022).

Different parameters are considered for the overall assessment of the potential impact(s) of a proposed development on local bat populations.

The overall impacts of the proposed project on local bat populations is assessed using the following criteria:

- Impact Quality using the parameters Positive, Neutral or Negative Impact (based on EPA, 2022, Table 3.4)

Table 2c: Criteria for assessing impact quality based on EPA, 2022,

Quality of Effect	Criteria
Positive	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Negative	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

- Impact Significance of potential impact parameters on specific bat species in relation to particular elements (e.g. roosting sites, foraging area and commuting routes) are assessed with reference to the following:
    - Table 4 of Marnell *et al.* (2022) (Figure 1a);
    - the known ecology and distribution of the bat species in Ireland;
    - bat survey results including type of roosts (if any recorded), pattern of bat usage of the survey area, level of bat activity recorded etc.
    - and bat specialist experience.
- Impact Significance of the proposed development on local bat populations maybe determine, where applicable, using the parameters listed in Table 2d (based on EPA, 2022, Table 3.4).

Table 2d: Criteria for assessing significance of effects based on EPA, 2022.

Significance of Effects	Definition
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 most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics

The following terms will be used, where possible and applicable, when quantifying the probability and duration of the potential effects (selected from EPA, 2022, Table 3.4):

Describing the Probability of Effects Descriptions of effects should establish how likely it is that the predicted effects will occur so that the CA can take a view of the balance of risk over advantage when making a decision.	**Likely Effects** The effects that can reasonably be expected to occur because 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.
Describing the Duration and Frequency of Effects 'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	**Momentary Effects** Effects lasting from seconds to minutes.
	Brief Effects Effects lasting less than a day.
	Temporary Effects Effects lasting less than a year.
	Short-term Effects 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.
	Frequency of Effects Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).

Figure 1e: Criteria for assessing significance of effects based on EPA, 2022 (Taken from Table 3.4),

This table continues to provide terminology in relation to "Describing the Types of Effects" as presented below.

Describing the Types of Effects	**Indirect Effects (a.k.a. Secondary or Off-site Effects)** Effects 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 Effects The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.
	'Do-nothing Effects' The environment as it would be in the future should the subject project not be carried out.
	'Worst-case' Effects The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects When the full consequences of a change in the environment cannot be described.
	Irreversible Effects When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SOx and NOx to produce smog).

Figure 1f: Criteria for assessing significance of effects based on EPA, 2022 (Taken from Table 3.4),

1.2.3 Bat Mitigation Measures

1.2.3.1 Bats & Lighting

All European bat species, including Irish bat species, are nocturnal. Light levels as low as typical full moon levels, i.e. around 0.1 LUX, can alter the flight activity of bats (Voigt *et al.* 2018). Any level of artificial light above that of moonlight can mask the natural rhythms of lunar sky brightness and, thus, can disrupt patterns of foraging and mating and might, for instance, interfere with entrainment of the circadian system.

Artificial light pollution is an increasing global problem (Rich and Longcore, 2006) and Artificial light at night (ALAN) is considered a major threat to biodiversity, especially to nocturnal species. As urbanisation expands into the landscape, the degree of street lighting also expands. Its ecological impacts can have a profound affect the behaviour of nocturnal animals including impacts on reproductive behaviours, orientation, predator-prey interaction and competition among others, depending on the taxon and ecosystem in question (Longcore and Rich 2004). It is considered by Hölker *et al.* (2010) to be a key biodiversity threat to biodiversity conservation. In relation to bats, the potential impacts of artificial night lighting can result in habitat fragmentation (Hanski, 1998), delay in roost emergence (Downs *et al.,* 2003) and a reduction in prey items.

In the context of behavioural ecology, lights can work to attract or repel certain animals. Many groups of insects, including moths, lacewings, beetles, bugs, caddisflies, crane flies, midges, hoverflies and wasps, can be attracted to artificial light (Eisenbeis and Hassel 2000; Frank 1988; Kolligs 2000). Attraction depends on the spectrum of light. In the context of street lights, white (mercury vapour) lamps emit a white light that includes ultraviolet. High pressure sodium lights (yellow) emit some ultraviolet, while low pressure sodium lamps (orange) emit no ultraviolet light (e.g. Rydell 2006). As a result of the attractiveness of lights to aerial invertebrates, swarms of insects often occur in and around street lights and, particular bat species such as aerial insect predators, can exploit the swarming insects to their advantage. Such attraction can also take prey items away from dark zones where light sensitive species are foraging, thus reducing their likelihood of feeding effectively.

Rydell (2006) divides bats into four categories in terms of their characteristic behaviours at street lamps. The four categories are based on bat size, wing morphology and echolocation call characteristics which were highlighted by Norberg and Rayner (1987) to determine flight speed, manoeuvrability, and prey detection capabilities of bats. Rydell (2006) stated that the large, fast flying bats, which are confined to open airspace, fly high over lit areas and are rarely observed near ground level. None of these, typically large free-tailed bats (e.g. large species of the family Molossidae), are found in Ireland. The second category are the medium-sized fast flying species, including the *Nyctalus* species, which patrol the street well above the lights and can be seen occasionally as they dive for prey into the light cone. This group includes the Leisler's bat, which is found in Ireland. Rydell's third category describes the small but fast flying bats that are manoeuvrable enough to forage around light posts or under the lights, and includes the small *Pipistrellus* species of the old world, three of which are found in Ireland. The fourth category includes broad-winged slow flyers, most of which are seldom or never observed at lights. Slow flying bat species may be more vulnerable to predation by diurnal birds of prey and this may restrict their exploitation of insects around artificially illuminated areas (e.g. Speakman 1991). There are also the concerns that some bat species are more light sensitive and therefore actively avoid lit up areas. This is particularly relevant for lesser horseshoe bats. Therefore from this, we can categorise the suite of Irish bats species as follows (please note that the sensitivity category is the author's description):

Table 3: Potential light sensitivity of the Irish bat fauna using categories described by Rydell, 2006.

Species: Common Name	Rydell Category	Sensitivity
Daubenton's bat *Myotis daubentonii*	Category 4	Light sensitive
Whiskered bat *Myotis mystacinus*	Category 4	Light sensitive
Natterer's bat *Myotis nattereri*	Category 4	Light sensitive
Leisler's bat *Nyctalus leisleri*	Category 2	Light tolerant
Nathusius' pipistrelle *Pipistrellus nathusii*	Category 3	Semi-tolerant
Common pipistrelle *Pipistrellus pipistrellus*	Category 3	Semi-tolerant
Soprano pipistrelle *Pipistrellus pygmaeus*	Category 3	Semi-tolerant
Brown long-eared bat *Plecotus auritus*	Category 4	Light sensitive
Lesser horseshoe bat *Rhinolophus hipposideros*	Category 4	Light sensitive

The ability of different bat species to exploit insects gathered around street lights varies greatly. Gleaning species such as *Myotis* bats rarely forage around street lights (Rydell and Racey, 1995). The ecological effects of illuminating aquatic habitats are also poorly known. Moore *et al.* (2006) found that light levels in an urban lake, subject simply to sky glow and not direct illumination from lights, reached the same order of magnitude as full moonlight.

All European bat species, including Irish bat species, are nocturnal. As a consequence, the scientific literature provides evidence that artificial lighting does impacts on bats. The degree of impact depends on the light sensitivity of the bat species and the type of luminaire. Lesser horseshoe bats are light sensitive and therefore adversely effected by the presence of lighting in all aspects of their life strategies (e.g. foraging, commuting, drinking and roosting).

The potential impacts of street lighting can be summarised as follows:

- Attracting Prey Items

Lights can work to attract or repel certain animals. Many groups of insects can be attracted to artificial light and this attraction depends on the spectrum of light. As a result of the attractiveness of lights to aerial invertebrates, swarms of insects often occur in and around street lights. Such attraction can also take prey items away from dark zones where light sensitive species, such as lesser horseshoe bats, are foraging, thus reducing their likelihood of feeding effectively.

- Reducing Foraging Habitat

The research documents that there is less bat species diversity foraging in habitats lit up by artificial lighting. Only bat species considered to be light tolerant are generally able to exploit habitats with lighting present, but overall, all bat species activity tends to be less in lit up habitats compared to non-lit up habitats.

- Fragmenting The Landscape

Scientific evidence shows that lighting is a barrier to the movement of light sensitive bat species, such as lesser horseshoe bats. Light sensitive bat species will actively seek dark corridors to commute along and therefore the presence of lighting in commuting habitats will restrict their movement of such species in the landscape.

- Reducing Drinking Sites

There is increasing evidence that drinking sites for bats is an essential component for local bat population survival and that the presence of artificial lighting at waterbodies prevents bats from availing of this resource.

Lighting, including street lights come in an array of different types but for street lights they typically include High Pressure Sodium, Low Pressure Sodium, Mercury Vapour and the more modern Light Emitting Diodes (LED). An array of field-based research has been undertaken to document the potential impact of lighting on bat flight activity. LED lighting is predicted to constitute 70% of the outdoor and residential lighting markets by 2020. While the use of LEDs promotes energy and cost savings relative to traditional lighting technologies, little is known about the effects these broad-spectrum “white” lights will have on wildlife, human health, animal welfare, and disease transmission. As a consequence, a large array of research has been undertaken recently on the potential impact of LED on bats.

Stone *et al.* (2012) undertook research in relation to “Cool” LED street lights on an array of local bat species in England. Overall the presence of LED street lights had a significant negative impact on lesser horseshoe bats and *Myotis* spp. for all light treatments investigated while there was no sign impact of light treatment type on *Pipistrellus pygmaeus* (soprano pipistrelle – a common Irish bat species) or *Nyctalus* (Leisler’s bats is part of this bat family and is a common Irish bat species)/*Eptesicus* species. This research paper also documented behavioural changes for the different bat species. Lesser horseshoe bats and *Myotis* spp. did not avoid lights by flying along the other side of the hedge but altered their commuting behaviour altogether. It was concluded that LEDs can fragment commuting routes causing bats to alter their behaviour with potentially negative conservation consequences. Lesser horseshoe bat activity was significantly lower during high intensity treatment than medium, but at all treatment levels (even as low as 3.6 LUX), activity was significantly lower than unlit control (LUX level measurements were taken at 1.7m at the hedge below the light).

Russo *et al.* (2017) investigated the impact of LED lighting on drinking areas for bats in Italy. Drinking sites are considered to be important components for the survival of local bat populations. Drinking sites were illuminated with a portable LED outdoor light emitting (48 high-power LEDs generated a light intensity of 6480 lm (4000–4500 K) at 25°C, two peaks of relative luminous flux at 450 and 590 nm). *Plecotus auritus* (brown long-eared bat – resident in Ireland), *Pipistrellus pygmaeus* (soprano pipistrelle – resident in Ireland) and *Rhinolophus hipposideros* (lesser horseshoe bat – resident in Ireland) did not drink when troughs were illuminated.

Rowse *et al.* (2018) researched the impacts of LED lights (portable lights, 97W 4250K LED on 10m high poles) in England on local bat populations. Treatments were either 100% light intensity; dimmed (using pulse width modulation) at 50% or 25% light intensity; and unlit. Sites were in suburban areas along busy roads but with vegetation and tree lines adjacent. High light levels (50% & 100% light treatments) increased activity of opportunistic *Pipistrellus pipistrellus* (common pipistrelle – resident in Ireland) but reduced activity of *Myotis* species group. Conversely 25% and unlit sites had no difference from each other. The research paper conclude that dimming could be an effective strategy to mitigate ecological impacts of street lights.

Wakefield *et al.* (2017) stated that an important factor to be aware of in relation to LED is the direction of the light projected. Therefore it is recommended that highly focused/shielded LEDS designed to filter out short wavelengths of light may should be used as they attract relatively fewer insects. Less insects attracted to street lights means less insects leaving dark zones where light sensitive bat species primarily feed.

Martin *et al.* (2021) showed that LED street lights lead to a reduction in the total number of insects captured with light traps in a wide range of families. Coleoptera and Lepidoptera orders were the most sensitive groups to ecological light pollution in the study area. The paper suggested that LED was the least attractive light system for most of the affected groups both because of its very little emitted short-wavelength light and because of its lower light intensity. They also concluded that reduction in insect attraction to LED could be even larger with current LED technologies emitting warmer lights, since other research showed that LED emitting “warmer white” colour light (3000 K) involves significantly lower attraction for insects than “colder white” LED (6000 K).

Wilson *et al.* (2021) investigate the impact of LED on biting insects and concluded because LED is highly malleable with regard to spectral composition, they can be tailored to decrease or increase insect catches, depending on situation. Therefore this design control of LED could greatly assist in reducing impact of street lighting on local bat populations.

Stone *et al*. (2015) reviewed the impacts of ALAN on bat roosts and flight paths in order to provide recommendations in relation to street lighting. The principal recommendations were to avoid lighting places where bats are present and to ensure that there are interconnected light exclusion zones and variable light regimes with reduced intensity of light in specific areas (e.g. important foraging and commuting habitats) as responses to street lighting may vary between species. It recommends that there should be a 'light threshold'.

1.2.3.1.1 Lighting Guidelines – Effective Mitigation Measures

As a consequence of this extensive amount of research there are two principal guideline documents available for best practice for effective mitigation relating to outdoor lighting.

EUROBATS (Voigt *et al.,* 2018) guidelines recommends the following:

- ALAN should be strictly avoided, and artificial lighting should be installed only where and when necessary coupled with the following:
    - Dynamic lighting schemes, where possible.
    - Use a minimal number of lighting points and luminaires on low positions in relation to the ground for minimising light trespass to adjacent bat habitats or into the sky.
    - Use focused light, e.g. by using LED or shielded luminaires which limit the light flux only to the required areas and prevent light trespass into adjacent bat habitats.
    - Create screens, either by erecting walls or by planting hedgerows or trees, to prevent light trespass, e.g. from illuminated roads, to surrounding bat habitats.
    - Exits of bat roosts and a buffer zone around them should be protected from direct or indirect lighting to preserve the natural circadian rhythm of bats.

This BCT (2018) guidelines provides a list of recommendations in relation to luminaire design, which is based on the extensive research completed to-date on the potential impact of lighting on bats, and therefore provides best practice mitigation measures. These recommendations are the basis of mitigation measures pertaining to bats listed in this report and are summarised as follows:

- All luminaires used should lack UV/IR elements to reduce impact.
- A warm white spectrum (<2700 Kelvins should be used to reduce the blue light component of the LED spectrum).
- Luminaires should have a peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.
- Only luminaires with an upward light ratio of 0% and with good optical control should be used.
- Luminaires should be mounted on the horizontal, i.e. no upward tilt.
- Column heights should be carefully considered to minimise light spill. The shortest column height allowed should be used where possible.
- Bollard lighting should be considered for pedestrian, parks and greenway areas, if deemed necessary.

1.2.3.2 Bat Box Schemes

Bat Boxes are frequently used as part of bat mitigation to retain local bat populations within an area proposed to be development. The NPWS Bat Mitigation Guidelines (Marnell *et al.* 2022) considers that where roosts of low conservation significance (Figure 20, Marnell *et al.* (2022)) are to be lost due to a development, bat boxes may provide an appropriate form of mitigation and the effectiveness depends on the type of bat box provided, which should be appropriate to the bat species.

Table 7 The types of bat box used by different species.

Species	Summer/ maternity	Summer/non breeding	Hibernation*	Notes
Rhinolophus hipposideros	N/A	N/A	N/A	Horseshoe bats cannot use bat boxes
Myotis daubentonii	H	H		
Myotis mystacinus	H	H		
Myotis nattereri	H	?		
Pipistrellus nathusii	H	H		
Pipistrellus pipistrellus	C	C/H	C	H are rarely used as maternity roosts.
Pipistrellus pygmaeus	C	C/H	C	
Nyctalus leisleri	H	H	H?	
Plecotus auritus	H	H		Maternity roosts

Key

* Large well-insulated hibernation boxes may be more successful

N/A -not applicable; bat boxes should not be considered as replacement roosts

H – tree hollow-type box, providing a void in which bats can cluster

C – tree crevice-type box, with 25-35mm crevices

? – few data on which to base an assessment

Figure 1g: Table 7 (p 58) Reproduced from Marnell *et al.* (2022).

1.2.3.2.1 Effectiveness of Bat Boxes as a Mitigation Measure

Two publications that provide good scientific advise in relation to the effectiveness of bat boxes are presented below. McAney & Hanniffy (2015) reviewed the use of bat boxes in Ireland in relation to the bat usage of the following bat box schemes: 62 Schwegler boxes of three models erected in Portumna Forest Park (Bat box scheme consisted of 30x 1FF design, 30x 2FN design and 2x 1FW design); 50 2FN boxes erected in Coole-Garryland Nature Reserve and 50 2FN boxes erected in Knockma Nature Reserve of which 40 were later transferred to Glengarriff Nature Reserve County Cork. The bat box schemes were set up in March 1999 and data was collected up to 2015. Eight of the nine resident bat species were recorded roosting in bat boxes (lesser horseshoe bats cannot use bat boxes due to their need to fly, rather than crawl, into roosts). The main summary points are as follows:

- Leisler's, brown long-eared and *Pipistrellus* spp. were recorded in boxes at all three Galway woods, Daubenton's bat was only recorded in Garryland, Natterer's bat was only recorded in Glengarriff and whiskered/Brandt's was recorded just twice.
- There was a 31% chance of encountering a bat at Portumna Forest Park compared to 11.5% and 10% at Coole-Garryland Nature Reserve and Knockma Nature Reserve respectively.
- Pipistrellus spp. preferred 1FF boxes as this bat box design offer crevice-like roosting conditions. This species group also showed a seasonal preference with more bats present later in the season (visual observations confirmed the bats were using the boxes as mating roosts) and their numbers increased from the time that the bat box scheme was originally established.
- Brown long-eared bats preferred 2FN boxes that mimic holes in trees, the natural roosting sites for this species. This species also showed no seasonal pattern to their occurrence in the boxes. However one aspect of 2FN boxes that this report mentions is the high occupancy

by birds which can be an issue in relation to nesting material reducing the availability of bat boxes for roosting bats.

- Leisler's bat showed no preference for box model but showed a seasonal preference with more bats present later in the season.
- Aspect was not a significant factor for occupancy but most boxes received dappled sunshine for part of the day.
- The other factor that proved significant was the length of time the boxes were in place, with occupancy rates increasing for all three species, although in the case of pipistrelles this increase appears to have stabilised. So, although the boxes were occupied very quickly, it took several years before they were regularly occupied and before clusters of bats were formed and breeding was confirmed.

Collins *et al.* (2020) investigated the implementation and effectiveness of bat roost mitigation, which included bat boxes, in building developments completed between 2006 and 2014 in England and Wales. The bat species studied were: common and soprano pipistrelle, brown long-eared bat and *Myotis* species, all of which are present in Ireland. A summary of the main points relating to bat boxes are as follows:

- Bat boxes were the most frequently deployed roosting provision (i.e. alternative roosts), being installed at 64% (n = 71) of sites surveyed as a compensation or enhancement measure.
- Box frequencies ranged from 1 to 41 at sites where they were installed, with an average of 6.6 boxes per site.
- Bats, or evidence of bats, were recorded in 20% of these bat boxes.
- Bat boxes mounted externally on buildings showed the highest occupation rate regardless of species while Common pipistrelle showed a preference for these over tree mounted boxes; the opposite was true for soprano pipistrelle.
- The four most popular bat box models used by consultants in the study were all Schwegler woodcrete bat boxes. Bat presence was highest in the 1FF bat box design (32%, n = 53) and lowest for birds (8%). The tree-mounted 2F and wall-integrated 1FR/2FR models both demonstrated similar bat presence rates of 23% (n = 43) and 25% (n = 32) respectively. The 2FN tree-mounted model showed the lowest presence rate for bats (11%, n = 19) and the highest for birds (58%). There were also 26 timber bat boxes, none of which were used by bats.

The author has also erected a number of bat box schemes and, where possible, has completed occasional monitoring visits. One such example is a bat box scheme erected in Kileshandra, Co. Cavan which consists of 8 Schwegler woodcrete bat boxes of various designs. The bat boxes were erected on mature trees located in a linear woodland adjacent to a river. This bat box scheme was erected in 2012 as part of mitigation for the demolishment of a large derelict building where small satellite roosts were recorded for *Pipistrellus* spp. and Daubenton's bat. Two site visits have been completed since 2012 and during these visits the bat boxes were checked for evidence of bat usage. The first site visit was on 25/8/2015 and one bat box was occupied by a single Leisler's bat while the additional seven bat doxes had evidence of bat droppings (*Pipistrellus* spp. and *Myotis* spp.). During the second site visit (27/7/2019) four bat boxes were occupied by bats (Soprano pipistrelle x1 individual (adult male), Leisler's bat x1 individual (adult male) and two bat boxes with x16 Daubenton's bats and x10 Daubenton's bats respectively). Biometrics was recorded for the 12 of the bats (which included 10 of the Daubenton's bats recorded in the bat box with 16 individuals) and five of these Daubenton's bats were lactating females with the remaining five Daubenton's bats recorded as juveniles, thereby indicating that this bat box was used as a maternity roost. The remaining four bat boxes all had droppings within for *Pipistrellus* spp and Leisler's bats. This bat box scheme, while just one example, demonstrates that when bat boxes are erected in an area with good bat habitat (bat survey documented a high level of bat activity for the named bat species), a high level of occupancy of bat boxes will occur.

In relation to bat boxes, Marnell *et al.* (2022), a document that provides guidelines that are considered to be practical and effective based on past experience, recommends that the design life of potential bat boxes, including essential maintenance, should be about 10 years, as this would be comparable with the lifespan of the tree roosts that bat boxes are designed to mimic. The guidelines continues by stating that the "This lifespan can be achieved with good quality wooden boxes and exceeded by woodcrete bat boxes or other types of construction that ensure any softwoods are protected from the weather and attack by squirrels" (note – this includes woodstone bat boxes).

In relation to the number of bat boxes recommended to be erected, Lintott & Mathews (2018) found that the greater the number of bat boxes deployed, the greater the probability of at least one of the boxes becoming occupied and that the odds of bats occupying at least one box increased by approximately 7% with each additional bat box that was deployed. Bat boxes are erected, as part of this proposed development, to mitigate for the loss of potential roosts in trees. Therefore the number of bat boxes are calculated according to the number of trees with additional boxes added for greater bat conservation value.

Therefore Schwegeler woodcrete bat boxes are recommended as a bat mitigation measure and the authors preference to use 1FF designs as this box is open at the bottom which reduces build-up of droppings (i.e. it is a self-cleaning bat box). Both McAney & Hannify (2015) and Collins *et al.* (2020) demonstrated that usage of this bat box design by bat species recorded in this survey report. This bat box is also less likely to be used by birds and therefore retaining it for bat usage between monitoring visits. To increase occupancy of bat boxes by bats it is important to erect bat boxes 4m or higher (to ensure that bat boxes are out of reach from disturbance by humans and predation by other mammals) and that they should be located where bats have been documented foraging and commuting. The aspect of the bat box is not an influencing factor in relation to occupancy. These recommendations have all been included in this report.

1.2.3.3 Landscaping For Bats

Bats depend on the landscape for foraging, roosting and commuting. Different bat species will travel different distances, to and from their principal roosting sites, depending on their morphology, life stage and preferred foraging areas. Bats in Ireland are insect eating mammals and feed on an array of insects, whose populations are ultimately supported by vegetation. Areas of rich vegetation habitat tend to support higher abundances of insect populations and therefore a higher abundance of bats. In addition, many bat species rely on continuous linear habitats (e.g. treelines and hedgerows) to commute along. As a consequence landscaping as part of a proposed development project is an important element to the goal of retaining local bat populations.

The Bat Conservation Trust publication "Landscape and Urban Design for bats and biodiversity" (Gunnell *et al.,* 2012) is a resource for planning landscape design in our urban areas. This resource encourages measures to enhance existing bat foraging habitat, create water features such as ponds (drinking sites for bats and as a source of emerging insects), manage species rich grassland and planting of tall vegetation to ensure that exiting treelines and hedgerows are linked. It also recommends that use of landscaping as a means to creating dark zones or dark corridors for this mammal group to fly along in our lit urban areas. This is also support by the BCT Lighting Guidelines (BCT, 2018) where landscape design can be utilised to buffer potential light spillage from developments.

1.2.3.4 Seasonality of Bat Mitigation Measures

The NPWS Bat Mitigation Guidelines (Marnell *et al.* 2022) provides best practice guidance in relation to the timing of bat mitigation measures. It states that the most common and effective method of avoiding potential harm to a bat is to carry out the work at an appropriate time of the year. The following table provides a summary of timings.

Table 5 Optimum season for works in different types of roosts.

Bat usage of site	Optimum period for carrying out works (some variation between species)
Maternity	1st October – 1st May
Summer (not a proven maternity site)	1st September – 1st May
Hibernation	1st May – 1st October
Mating/swarming	1st November – 1st August

Figure 1h: Table 5 (p 50) Reproduced from Marnell *et al.* (2022).

Timing of bat mitigation measures is relevant to the proposed tree felling of Potential Bat Roosts (PBRs). Felling is recommended outside the principal maternity season and during mild weather conditions (to avoid cold weather that would encourage bats to hibernate). This coupled with dusk/dawn surveys and additional daytime inspections is best practice to ensure that tree felling is completed without causing harm to potentially roosting bats. The preferred tree felling months also avoids the bird nesting season.

1.3 Project Description

1.3.1 Site Location

The application site is located at Ballymacaula, Circular Road, Ennis, Co. Clare. It is located between the N85 national road, Ennis Golf Course and local road network.

Figure 2a: Red line boundary of proposed development (Supplied by Enviroguide Consulting).

1.3.2 Proposed Project

The Proposed Development will consist of the following components:

1. The construction of 289 no. residential units comprising a mixture of 12 no. 1 bed apartments, 78 no. 2 bed townhouse/duplex units, 165 no. 3 bed dwelling houses, and 34 no. dwelling houses which will have an option of a 3 or 4 bedroom house-type;
2. A 400.7m2 creche/childcare facility;
3. The provision of landscaping, open space and amenity areas, including play/exercise equipment, a linear amenity walkway, informal play areas and local play areas;
4. The provision 2 no. pedestrian connections to the existing public footpath along the N85, 2 no. pedestrian connections into Ballymacaula View Estate, improvements/upgrades to the pedestrian footpaths along Circular Road including an uncontrolled pedestrian crossing and pedestrian footpath provision along part of the Drumbiggle and Cahercalla Roads;
5. All associated infrastructure and services including 1 no. vehicular access point onto Circular Road, car parking and bin storage, lighting, 2 no. ESB substations, drainage and 1 pumping station, boundary treatments at Ballymacaula, Drumbiggle, Circular Road, Ennis, Co. Clare.

Figure 2b: Layout of proposed development (Supplied by Enviroguide Consulting).

2. Bat Survey Methodology

2.1 Daytime Inspections

One purpose of daytime inspections is to determine the potential of bat roosts within the survey area. Due to the transient nature of bats and their seasonal life cycle, there are a number of different type of bat roosts. Where possible, one of the objectives of the surveys is to be able to identify the types of roosts present, if any. However, the determination of the type of roost present depends on the timing of the survey and the number of bat surveys completed. Consequently, the definition of roost types, in this report, will be based on the following:

Table 5a: Bat Roost Types (adapted from Collins 2016).

Roost Type	Definition	Time of Survey
Day Roost	A place where individual bats or small groups of males, rest or shelter in the daytime but are rarely found by night in the summer.	Anytime of the year
Night Roost	A place where bats rest or shelter in the night but are rarely found in the day. May be used by a single bat on occasion or it could be used regularly by the whole colony.	Anytime of the year
Feeding Roost	A place where individual bats or a few bats rest or feed during the night but are rarely present by day.	Anytime of the year
Transitional Roost	A place used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.	Outside the main maternity and hibernation periods.
Swarming Site	Where large numbers of males and females gather. Appear to be important mating sites.	Late summer and autumn
Mating Site	Where mating takes place.	Late summer and autumn
Maternity Site	Where female bats give birth and raise their young to independence.	Summer months
Hibernation Site	Where bats are found, either individually or in groups in the winter months. They have a constant cool temperature and humidity.	Winter months in cold weather conditions
Satellite Roost	An alternative roost found in close proximity to the main nursery colony and is used by a few individuals throughout the breeding season.	Summer months

2.1.1 Tree Potential Bat Roost (PBRs) Inspection

Trees that may provide a roosting space for bats were classified using the Bat Tree Habitat Key (BTHK, 2018) and the classification system adapted from Collins (2016). The Potential Roost Features (PRFs) listed in this guide were used to determine the PBR value of trees.

Trees identified as PBRs were inspected during the daytime (1st and 6th August 2022), where possible, for evidence of bat usage. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present on stonework) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past.

Daytime inspections were undertaken of all of the trees within the proposed development site. These inspections followed the Phase 1 guidance (Collins, 2016) in order to make a list of trees within the proposed development site that may be suitable as roosting sites for bats. Inspections were undertaken visually, from the ground, with the aid of a strong torch beam (LED Lenser P14.2) during the daytime searching for PRFs.

Table 5b: Tree Bat Roost Category Classification System (adapted from Collins, 2016).

Tree Category	Description
1 High	Trees with multiple, highly suitable features (Potential Roosting Features = PRFs) capable of supporting larger roosts
2 Moderate	Trees with definite bat potential but supporting features (PRFs) suitable for use by individual bats;
3 Low	Trees have no obvious potential although the tree is of a size and age that elevated surveys may result in cracks or crevices being found or the tree supports some features (PRFs) which may have limited potential to support bats;
4 Negligible	Trees have no potential.

2.1.2 Bat Habitat & Commuting Routes Mapping

The survey site was assessed during daytime walkabout surveys (1st & 6th August 2022), in relation to potential bat foraging habitat and potential bat commuting routes. Such habitats were classified according to Fossit, 2000 (Appendix 1, Table 1.B) while hedgerows were classified according to BATLAS 2020 classification (Bat Conservation Ireland, 2015) (Appendix 1, Table 1.A). Bat habitats and commuting routes identified were considered in relation to the wider landscape to determine landscape connectivity for local bat populations through the examination of aerial photographs.

2.2 Night-time Bat Detector Surveys

2.2.1 Dusk, Dawn & Walking Transect Bat Surveys

Dusk, Dawn and Walking Transect Bat Surveys were completed on the 6th and 7th August 2022 from 10 minutes before sunset to 110 minutes post sunset and the surveyors position themselves within the proposed development site to determine the general bat activity of the proposed development site. This was following by a walking transect of the proposed development site and immediate vicinity of the proposed development site. A dusk survey was to be completed on the 1st August 2022 but this was cancelled due to poor weather conditions.

The following equipment was used:
Surveyor 1: Anabat Walkabout Bat Detector and Pettersson D200 Heterodyne Bat Detector.

Surveyor 2: Bat Logger M2 Full Spectrum Bat Detector and Pettersson D200 Heterodyne Bat Detector.

2.2.2 *Passive Static Bat Detector Survey*

A Passive Static Bat Surveys involves leaving a static bat detector unit (with ultrasonic microphone) in a specific location and set to record for a specified period of time (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for analysis post surveying). The bat detector is effectively used as a bat activity data logger. This results in a far greater sampling effort over a shorter period of time. Bat detectors with ultrasonic microphones are used as the ultrasonic calls produced by bats cannot be heard by human hearing.

The microphone of the unit was positioned horizontally to reduce potential damage from rain. Bat Logger A+ units and Wildlife Acoustics Song Meter SM2, SM2 BAT+ SM4 Bat FS and SM3 BAT Platform Units use Real Time recording as a technique to record bat echolocation calls and using specific software, the recorded calls are identified. It is these sonograms (2-d sound pictures) that are digitally stored on the SD card (or micro SD cards depending on the model) and downloaded for analysis. These results are depicted on a graph showing the number of bat passes per species per hour/night. Each bat pass does not correlate to an individual bat but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence or bat pass is more likely to be indicative of individual bats.

The recordings are analysed using Wildlife Acoustics Kaleidoscope Pro. Each sequence of bat pulses are noted as a bat pass to indicate level of bat activity for each species recorded. This is either expressed as the number of bat passes per hour or per survey night. The following static units were deployed during this static bat detector survey (1st to 6th August 2022).

Table 6: Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Unit Code	Bat Detector Type	Recording Function	Microphone
Mini 2, 7, 11	Wildlife Acoustics SongMeter Mini Bat	Passive Full Spectrum	SMM-U2

2.3 Desktop Review

2.3.1 Bat Conservation Ireland Database

Bat Conservation Ireland acts as the central depository for bat records for the Republic of Ireland. Its' bat database is comprised of >60,000 bat records. The database primarily contains bat records from the following datasets:

- Irish Bat Monitoring Programme

The Irish Bat Monitoring Programme is comprised of four surveys (Car-based Bat Monitoring Scheme (2003-), All Ireland Daubenton's Bat Waterways Survey (2006-), Brow Long-eared Bat Roost Monitoring Scheme (2007-) and Lesser Horseshoe Bat Monitoring Scheme (1980s-). Apart from the latter survey, all monitoring data is stored on the BCIreland database.

- BATLAS 2020 & 2010

BCIreland has undertaken two all-Ireland species distribution surveys (2008-2009 for BATLAS 2010 and 2016-2019 for BATLAS 2020) of four target bat species (Common and soprano pipistrelle, Leisler's bats and Daubenton's bat).

- Ad Hoc Bat Records

Ad hoc bat records from national bat groups, ecological consultants and BCIreland members are also stored on the BCIreland database.

- Roost Records

These records are only report at a 1km level to protect the location of private dwellings and to protect such important bat records.

A 1km radius search was requested for the Irish Grid Reference O2152823161.

2.3.2 Bat Conservation Ireland Bat Landscape Favourability Model

Bat Conservation Ireland produced a landscape conservation guide for Irish bat species using their database of species records collated during the 2000 - 2009 survey seasons. An analysis of the habitat and landscape associations of all bat species deemed resident in Ireland was undertaken and reported in Lundy *et al*., 2011. The geographical area suitable for individual species was used to identify the core favourable areas of each species. This was produced as a GIS layer for local authorities and planners in order to provide a guide to the consideration of bat conservation. The island is divided into 5km squares and the landscape favourability of each 5km square for each species of bat was modelled. A caveat is attached to the model and it is that the model is based on records held on the BCIreland database, while core areas have been identified, areas outside the core area should not be discounted as unimportant as bats are a landscape species and can travel many kilometres between roosts and foraging areas nightly and seasonally. This model was used as part of the desktop study for this report.

2.3.3 International & National Site Designations

National Parks and Wildlife Service mapping provides the locations and details of environmental designations (Source: www.npws.ie). This mapping facility was queried for a 15km radius of the proposed development site.

2.4 Past Bat Survey Results

A preliminary bat survey was undertaken in September 2021. The following bat species were recorded: common pipistrelle, soprano pipistrelle, Leisler's bat, lesser horseshoe bat, Natterer's bat and brown long-eared bat. The following map taken from the bat survey report depicts the location of the bat encounters.

Report: Ash Ecology (2021) Preliminary Bat Survey Report: Golf Links Road, Ennis, Co. Clare. Report prepared for Enviroguide Consulting.

Table 5 Bat Results Summary Data – 7th September 2021

Species Name – Common	Species Name – Latin	Number of Passes	Peak Frequency (kHz)
Common Pipistrelle	*Pipistrellus pipistrellus*	10	46.5
Soprano Pipistrelle	*Pipistrellus pygmaeus*	15	55.5
Leisler's Bat	*Nyctalus leisleri*	6	26.9
Brown Long Eared Bat	*Plecotus auritus*	1	35.0
Natterer's Bat	*Myotis nattereri*	8	50.0
Lesser Horseshoe Bat	*Rhinolophus hipposideros*	5	109.8

Figure 3a: 2021 Bat Survey Results (Taken from Ash Ecology, 2021).

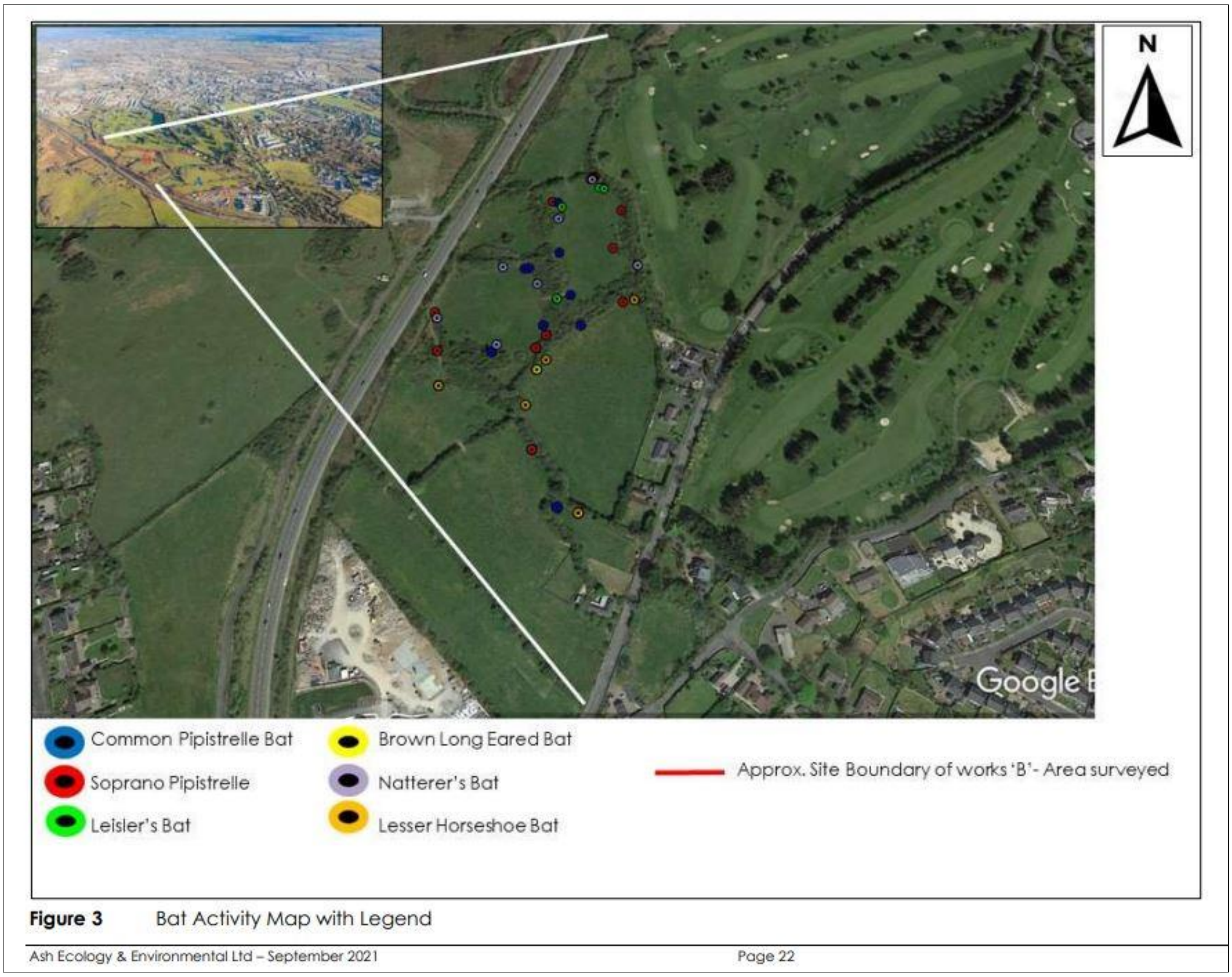


Figure 3: 2021 Bat Survey Results (Taken from Ash Ecology, 2021).

3. Bat Survey Results

3.1 Daytime Inspections

3.1.1 Building & Structure Inspection

There are no buildings within the proposed development site.

3.1.2 Tree Potential Bat Roost (PBRs) Inspection

The majority of tall vegetation within the proposed development site consisted of scrub and hedgerows along the boundaries. There are mature trees present.

The arboriculture report states that a total of 23 individual trees plus nine hedgerows were surveyed for the entire site. The arboriculture impact of the proposed development on the site will include the removal of seven individual trees along with four hedgerow removals and two partial hedgerow removals. The following table indicates the trees proposed to be removed. Of this list, the following is considered to have a Potential Bat Roost (PBR) potential (value Category 2): 3980, T4 and T5 (x2 Ash trees).

Table 1: Schedule of trees to be removed to accommodate the design (To be read in conjunction with Appendix 1 and the Tree Protection Plan

Tree number	Species	Age Class	Tree category
3980	Willow	Mature	B2
T4	Ash	Mature	B2
T5	ash	Mature	C2
T8	Ash	Mature	C2
T5	Ash	Mature	B2
T6	Ash	Mature	C2
T11	Ash	Mature	C2

Figure 4a: Tree proposed to be felled (Source: Arboriculture Impact Assessment report).

3.1.3 Bat Habitat & Commuting Routes Mapping

The habitat types, with reference to Fossit (2000) were recorded both within the survey area and adjacent to the survey area. This proposed development site is predominately a green field site with scrub and grassland areas surrounded by hedgerows and trees. There are mature trees within the boundaries.

Table 7a: Habitat types present within survey area.

Habitat	Yes	Habitat	Yes	Habitat	Yes	Habitat	Yes
Cultivated land		Salt marshes		Exposed rock		Fens/flushes	
Built land	√	Brackish waters		Caves		Grasslands	√
Coastal structures		Springs		Freshwater marsh		Scrub	√
Shingle/gravel		Swamps		Lakes/ponds		Hedges/treelines	√
Sea cliffs/islets		Disturbed ground	√	Heath		Conifer plantation	
Sand dunes		Watercourse		Bog		Woodland	

The surrounding landscape is primarily rural with individual houses with large gardens.

Table 7b: Habitat types present adjacent to survey area.

Habitat	Yes	Habitat	Yes	Habitat	Yes	Habitat	Yes
Cultivated land		Salt marshes		Exposed rock		Fens/flushes	
Built land	√	Brackish waters		Caves		Grasslands	√
Coastal structures		Springs		Freshwater marsh		Scrub	√
Shingle/gravel		Swamps		Lakes/ponds		Hedges/treelines	√
Sea cliffs/islets		Disturbed ground	√	Heath		Conifer plantation	
Sand dunes		Watercourse		Bog		Woodland	

3.2 Night-time Bat Detector Surveys

The primary purpose of the night-time surveys were to determine the bat activity usage of the survey area. While there was no access to adjacent private buildings, where possible the surveyors located themselves at different accessible points within the survey area to determine direction of commuting bats from possible roosting sites in local buildings. The R474 and N85 road network was also surveyed to document bat distribution in the local area.

3.2.1 Dusk, Dawn & Walking Transect Bat Surveys

Bat detector surveys were completed on 6/8/2022 (Dusk Survey & Walking Transect - Weather conditions: 17oC, clear skies, calm and dry) and 7/8/22 (Dawn Survey – weather conditions: 8oC, patchy cloud cover, calm and dry).

3.2.1.1 Dusk Survey & Walking Transect 6/8/2022

Two surveyors were present for this survey. Surveyor 1 was located to rear of private dwelling at the southern end of the survey site while Surveyor 2 was located to the rear of buildings along the eastern boundary of the proposed development site adjacent to the boundary with Ennis Golf course. The surveyors were to determine if there are roosts present in adjacent buildings and to determine the direction of commuting bats into the proposed development site.

The following is a synopsis of the bat activity recorded during the Dusk Survey 1:

Surveyor 1: No roosts were noted in the building surveyed. It was noted that one of the hedgerows located in this area was used as a commuting route and/or foraging for a number of bat species. A single lesser horseshoe bat (2 passes) was recorded commuting along the hedgerow from a west to east direction. Along this same hedgerow, Natterer's bats (2 passes) were recorded commuting and foraging. Soprano pipistrelles were also recorded commuting through the survey area from west to east while individuals of soprano pipistrelles and common pipistrelles foraged along the hedgerows.

Surveyor 2: No roosts were noted in the buildings surveyed. Leisler's bats were noted commuting through the area. During the walking transects, Natterer's bats (4 passes) were recorded along the boundary hedgerow with Ennis Golf Course while soprano pipistrelles, common pipistrelles and Leisler's bats were recorded foraging along the internal hedgerow network.

During the walking transects of the local road network the following was noted:

- Lesser horseshoe bats were recorded (3 passes) at three points along the road between the two sections of Ennis Golf Club. The section of the road is unlit and treelined on both sides allowing this light-sensitive bat species to commute through the landscape.
- Common pipistrelles and soprano pipistrelles were frequently encountered along the R474.
- Brown long-eared bat was encountered at the Drumbiggle Road junction with the R474.

- Leisler's bats was most frequently encountered along the boundary with the N85 foraging around street lights. This bat species is light-tolerant.

3.2.1.2 Dawn Survey 7/8/2022

During the Dawn Survey, Surveyor 1 was located along the R474 to observe potential bat roosts (i.e. detect swarming bats). Surveyor 2 undertook a walking transect of the middle section of the proposed development site. Seven soprano pipistrelles were recorded commuting from the proposed development site across the R474 to a private dwelling that is likely to be a roosting site. Swarming of this species was noted within the large mature trees in the mature garden of the dwelling. No tree roosts within the proposed development site was recorded.

The following maps provide a summary of the bat encounters recorded during the bat surveys. Soprano pipistrelles were the most frequently recorded bat species (134 bat passes) followed by common pipistrelle (116 bat passes) and Leisler's bat (92 bat passes). Natterer's bats were encountered 6 times, lesser horseshoe bats were encountered five times and brown long-eared bats were recorded at two locations.

Guides to maps :

Circles = bat encounters

Arrows = commuting routes and indicating direction of commuting recorded.

Figure 4b: Distribution of bat encounters of soprano pipistrelles during bat surveys.

Figure 4c: Distribution of bat encounters of common pipistrelles during bat surveys.

Figure 4d: Distribution of bat encounters of Leisler's bats during bat surveys.

Figure 4e: Distribution of bat encounters of lesser horseshoe bats during bat surveys.

Figure 4f: Distribution of bat encounters of Natterer's bats and brown long-eared bats.

3.2.2 *Passive Static Bat Detector Survey*

3.2.2.1 Static Surveillance

The following tables provides details with regards to the static units deployed in 2022 (Please see Figure 5 for locations) during the bat survey. Three static units were deployed for five nights and were located on trees in treelines/hedgerows to document foraging and commuting bats. A full break down of the static surveillance results are presented in the Appendices but these results are also presented as graphs below for each bat species recorded.

Figure 5: Location of static units during static surveillance.

Lesser horseshoe bats were only recorded on the static unit Mini 2 located along the boundary with Ennis Golf Course. All other five bat species recorded during night-time surveys are detected on all three static units: common pipistrelle, soprano pipistrelle, Leisler's bat, Natterer's bat and brown long-eared bat. This is a high level of bat biodiversity for a small survey area indicating the importance of the tree and hedgerow network in this landscape coupled with the Ennis Golf Course.

Table 8a: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Code	Location Description	Survey Period	Results
Mini 2	ITM 532239, 677203 Boundary with gold course	1/8/2022 to 6/8/2022 (5 nights)	Leisler's bat, common pipistrelle, soprano pipistrelle, brown long-eared bat, lesser horseshoe bat and Natterer's bat.
Mini 7	ITM 532072, 676752	1/8/2022 to 6/8/2022 (5 nights)	Leisler's bat, common pipistrelle, soprano pipistrelle, brown long-eared bat, lesser horseshoe bat and Natterer's bat.
Mini 11	ITM 532193, 676996	1/8/2022 to 6/8/2022 (5 nights)	Leisler's bat, common pipistrelle, soprano pipistrelle, brown long-eared bat, lesser horseshoe bat and Natterer's bat.

Static Unit Mini 2 (located in the north of the survey site, along the boundary with Ennis Golf Course) had the highest level of Leisler's bat and common pipistrelle activity. The highest level of soprano pipistrelle activity was recorded on Static Unit Mini 11, located in the area of scrub in the middle of the proposed development site.

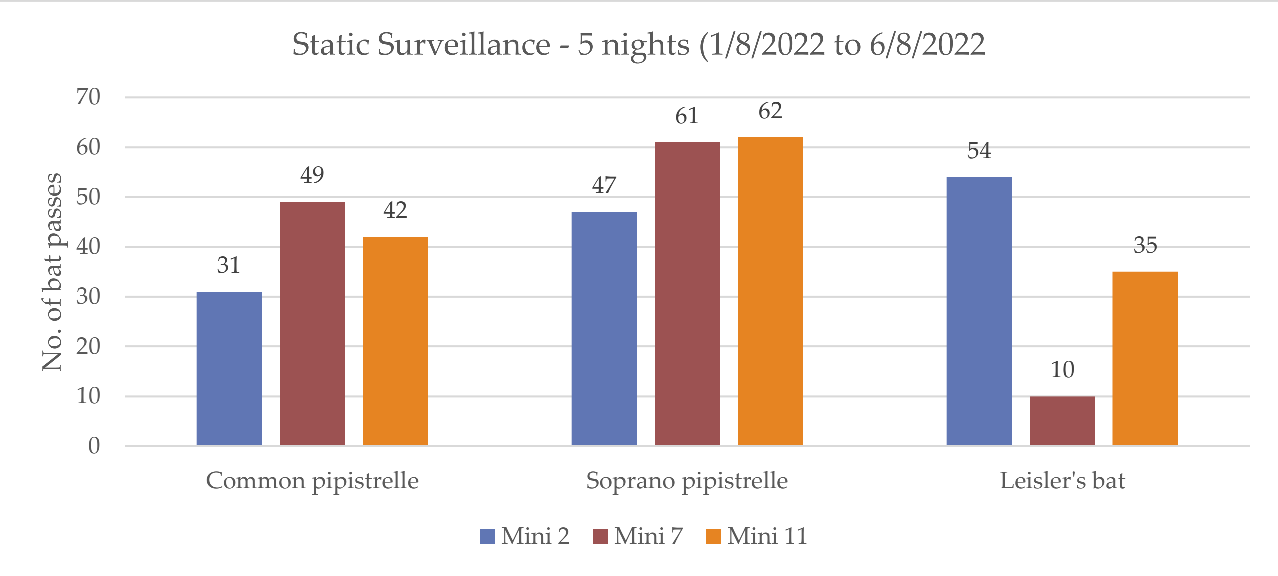


Figure 6a: Static surveillance results for common bat species on all static units.

The remaining three bat species are recorded in lower number of bat passes, but this is to be expected as these are less common bat species in Ireland. Brown long-eared bats and Natterer's bats were recorded on all three static units with higher level on Static Unit Mini 11 (located in the area of scrub in the middle of the proposed development site) while a single lesser horseshoe bat pass was recorded on Static Unit Mini 2 (located in the north of the survey site, along the boundary with Ennis Golf Course).

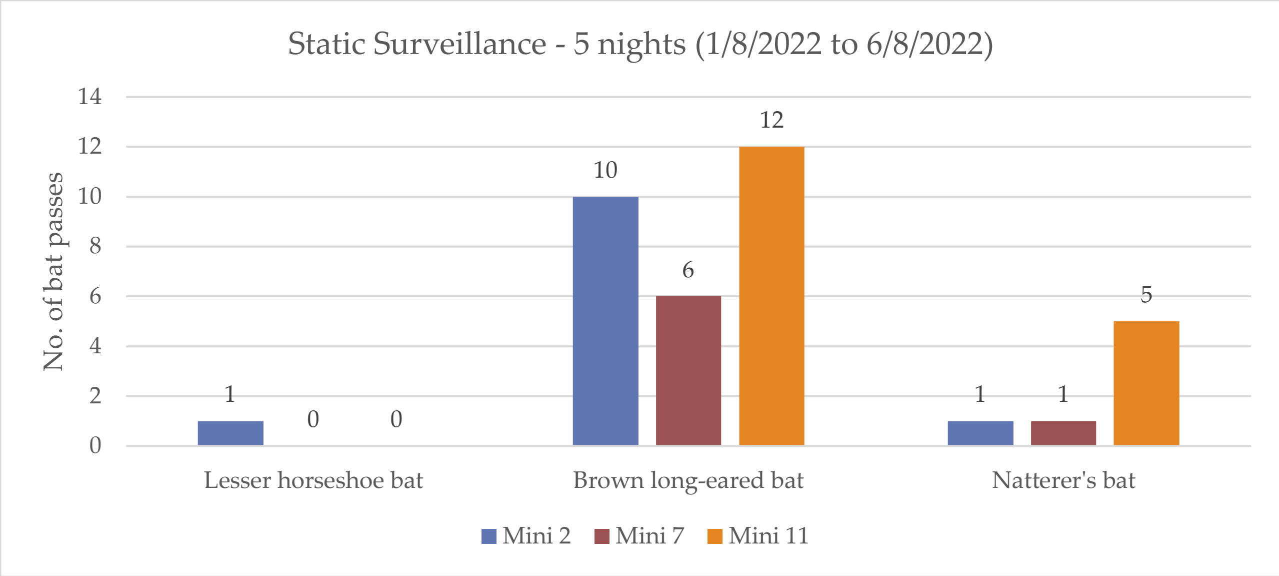


Figure 6b: Static surveillance results for less common bat species on all static units.

As a general guide, activity level is determined by the author as follows: Low = <10 bat passes/hr; Medium = >10 - <50 bat passes/hr; High = >50 bat passes/hr). At this time of the year, 8 hours per night is generally available to foraging bats (21:30 hrs to 05:30 hrs). (Please see tables in Appendices for nightly breakdown of activity).

NOTE: The behaviour of bats during commuting and foraging greatly influences the level of bat passes recorded on static units. The number of bat passes do not equate to the number of bats flying past the static unit. Pipistrellus species tend to foraging as they commute and therefore are regularly observed flying up and down a treeline or hedgerow before moving on in the landscape. Leisler's bats fly high in the sky and therefore can be observed flying fast through the landscape, occasionally foraging over treetops as they commute. As a consequence, Pipistrellus species bat activity tends to result in a higher number of bat passes recorded on static units compared to Leisler's bats. In relation to other bat species recorded, as they tend to be less common in the landscape compared to common pipistrelles, soprano pipistrelles and Leisler's bats, their recorded presence is notable. Exceptions to this would include Daubenton's bats on a waterway or a static located adjacent to a known bat roost.

Over the course of the surveillance period, the average level of bat activity per hr recorded on the static units was calculated for each bat species based on the total number of bat passes. All bat species were recorded at a Low level of bat activity. However, due to the quiet echolocation calls of lesser horseshoe bats, Natterer's bats and brown long-eared bats, their presence is significant.

Table 8b: Level of bat activity recorded on Static Bat Detectors deployed during Static Bat Detector Surveys.

	Leisler's bat	Common pipistrelle	Soprano pipistrelle	Lesser horseshoe bat	Brown long-eared bat	*Natterer's bat*
Mini 2	Low	Low	Low	Low	Low	Low
Mini 7	Low	Low	Low	None	Low	Low
Mini 11	Low	Low	Low	None	Low	Low

3.3 Desktop Review

3.3.1 Bat Conservation Ireland Database

One roost record and one Hoc bat records are listed within a 1km radius of the proposed development on the Bat Conservation Ireland database. The number of records for each species is as follows:

Lesser horseshoe bat	1 roost record;
Common pipistrelle	1 Ad Hoc record;
Soprano pipistrelle	1 Ad Hoc record.

The bat surveys undertaken for this proposed development site provides additional bat species records for the 1km zone with new bat records for brown long-eared bat, Natterer's bat and Leisler's bat.

3.3.2 Bat Conservation Ireland Bat Landscape Favourability Model

Figure 7 depicts the BCIreland Bat Landscape Favourability Model (Lundy *et al.,* 2011) for all bat species (individual species values are presented in the table below). The county is divided into 5km squares and the darker the shading of the square, the higher favourability of the 5km square for bats. This GIS layer is hosted on the NBDC website www.biodiversityireland.ie. The proposed development site is approximately located in the Blue Box. The 5km square has a High favourability for bats. For the bat species recorded during this bat survey, the 5km square has a High favourability value for six recorded bat species recorded during the surveys: common pipistrelle, soprano pipistrelle, Natterer's bat, lesser horseshoe bat, brown log-eared and Leisler's bat.

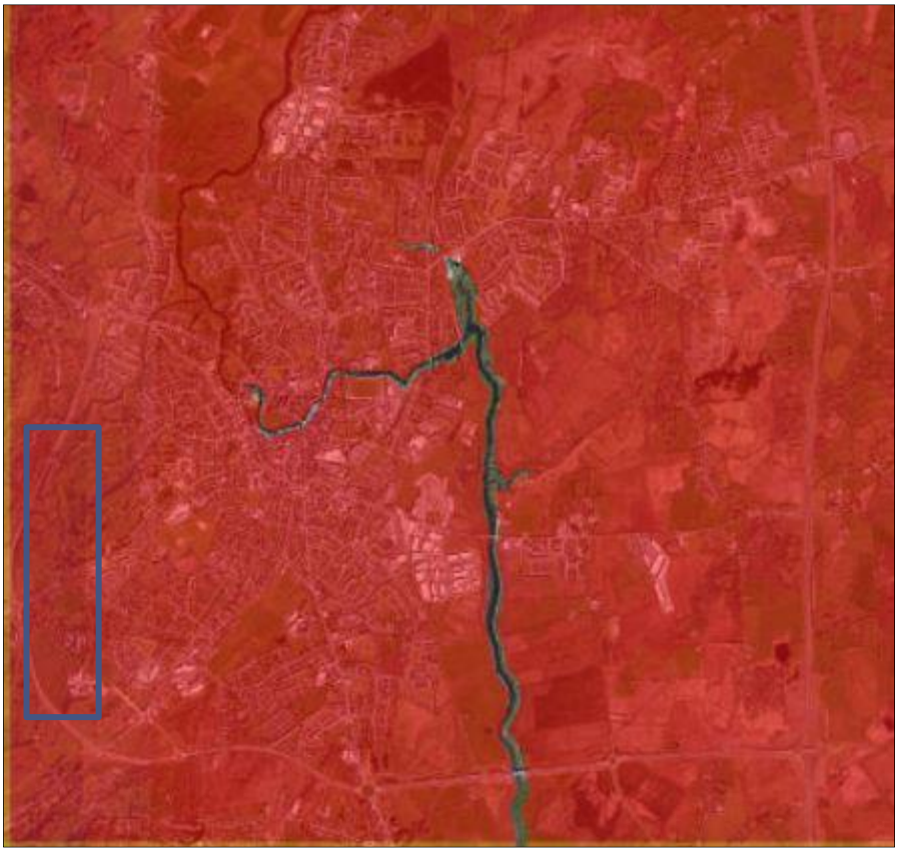


Figure 7: Bat Landscape Favourability Model (All Bats) (Source: NBDC) – Blue Box = approximate location of proposed development area.

Table 9: Bat Conservation Ireland Bat Landscape Favourability Model – 5km Square value.

Bat species	5km Square
Common pipistrelle	61% (High)
Soprano pipistrelle	57% (High)
Nathusius' pipistrelle	13% (Low to Medium)
Leisler's bat	68 % (High)
Brown long-eared bat	79% (High)
Daubenton's bat	53% (High)
Natterer's bat	62% (High)
Whiskered bat	64% (High)
Lesser horseshoe bat	51% (High)

3.3.3 International & National Site Designations

National Parks and Wildlife Service mapping provides the locations and details of environmental designations (Source: www.npws.ie). This mapping facility was queried for a 15km radius of the proposed development site.

Within a 15km buffer of the proposed development site the following Special Area of Conservation (SACs) is present:

- Pouladatig Cave SAC (Site Code 000037)
    - Lesser horseshoe bat is listed as a qualifying interest for this SAC.

Pouladatig Cave SAC has been selected for lesser horseshoe bat because of the presence of one internationally important winter roost (roost id. 58 in NPWS database).

The conservation objectives, in relation to lesser horseshoe bat, as presented in the list publications.

NPWS (2018) Conservation Objectives: Pouladatig Cave SAC 000037. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht

The Site Synopsis for this SAC site states the following:

"Pouladatig cave is a natural limestone cave situated near Inch bridge, west of Ennis, Co. Clare. It is used as a hibernating site for the Lesser Horseshoe Bat.

The site comprises a relatively short, active stream cave with some rock falls and small chambers. The cave entrance is small and is sheltered by Hawthorn (*Crataegus monogyna*) trees. After the entrance there is a low bedding crawl but the cave then opens out into roomier passageways. Cave habitats include flowing water, mud banks, boulders, rock roof and walls.

The bats hang from the roof and along the walls of the main passageway. The surrounding scrub vegetation and hedgerows are included in the site as they provide suitable foraging habitat areas and shelter for the bats.

Lesser Horseshoe Bats have been using this cave for many years and approximately 100 bats have been recorded at this site each winter since 1986. The site is therefore of international importance.

Although there is an active stream in the cave, this does not pose any threat of flooding to the bats. This site is not subject to visitor disturbance and is considered to be a safe hibernating site for the Lesser Horseshoe Bat."

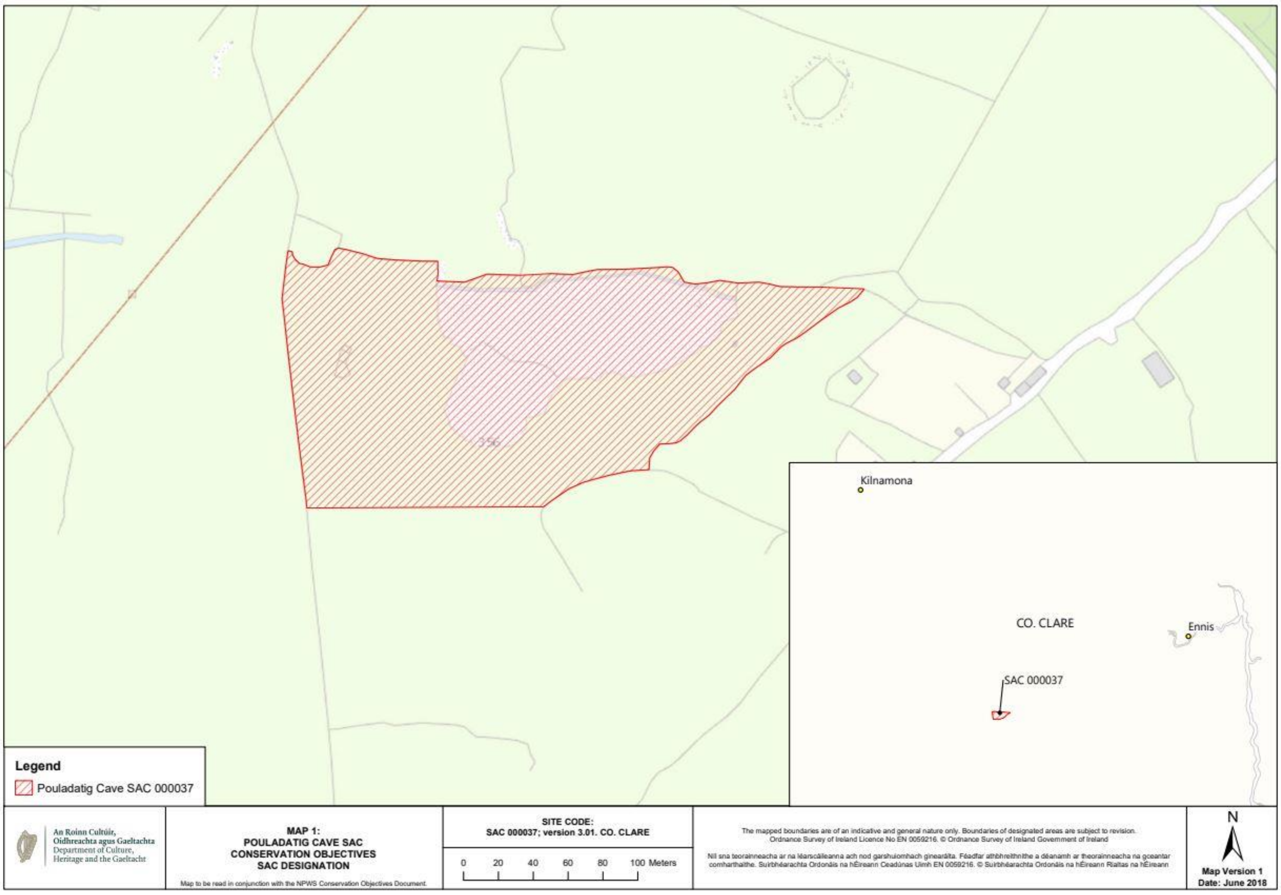


Figure 8a : Location of Pouladatig Cave SAC (Site Code 000037), Co. Clare (Source: NPWS).

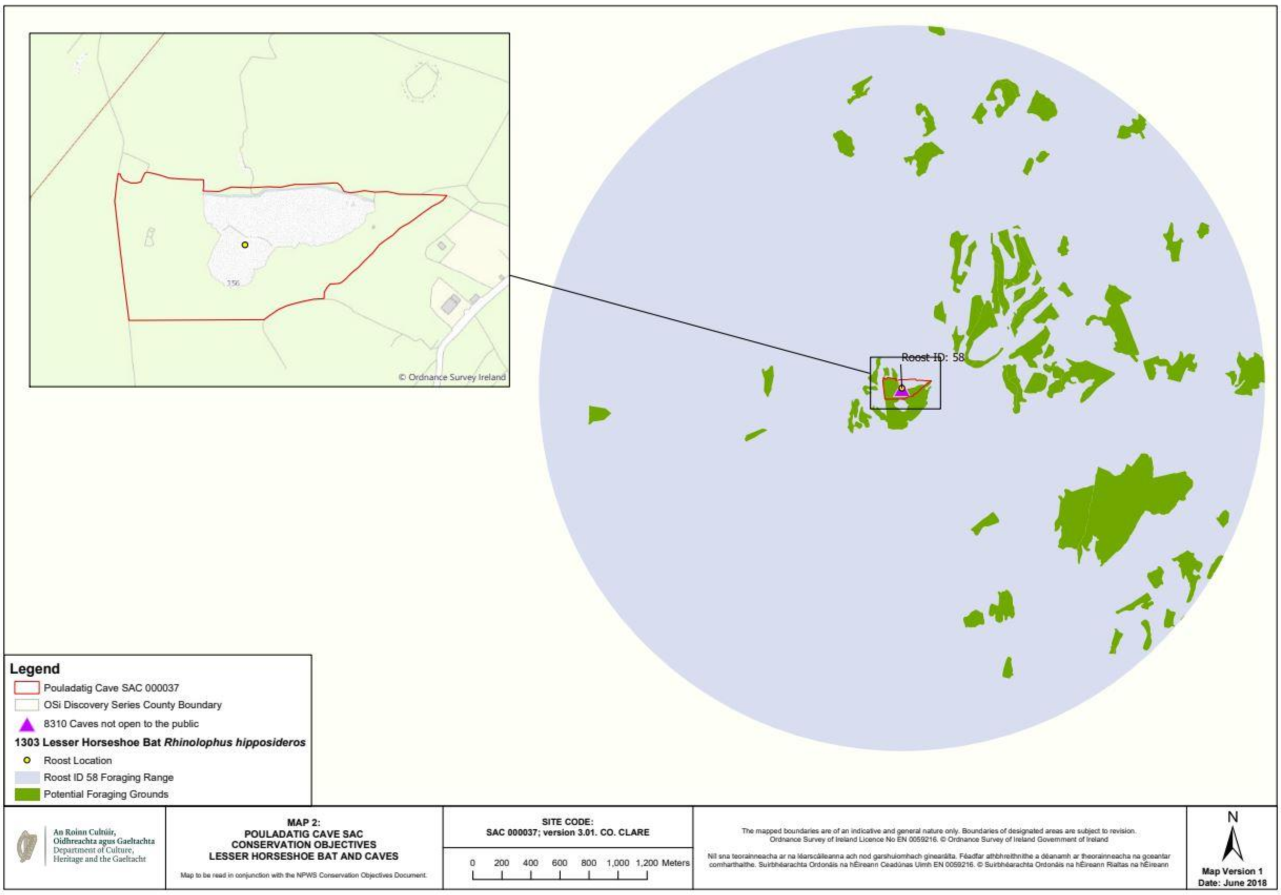


Figure 8b: 2.5km Buffer foraging zone of Pouladatig Cave SAC (Site Code 000037), Co. Clare (Source: NPWS).

Within a 15km buffer of the proposed development site the following Special Area of Conservation (SACs) is also present:

- Newhall & Edenvale Complex SAC (Site Code 002091)
    - Lesser horseshoe bat is listed as a qualifying interest for this SAC.

Newhall and Edenvale Complex SAC has been selected for lesser horseshoe bat because of the presence of one internationally important summer roost (roost id. 44 in NPWS database) and two internationally important winter roosts (roost id. 53 and roost id. 54 in NPWS database). Therefore, within this complex, there are three bat roost locations.

The conservation objectives, in relation to lesser horseshoe bat, as presented in the list publications.

NPWS (2018) Conservation Objectives: Newhall and Edenvale Complex SAC 002091. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

The Site Synopsis for this SAC site states the following:

"Newhall and Edenvale Complex SAC is situated approximately 4 km south of Ennis in Co. Clare. It consists of three distinct locations which are used, at various times throughout the year, by the Lesser Horseshoe Bat.

Newhall and Edenvale Caves are natural fossil limestone caves. Newhall is a narrow, dry passage formed along an inclined joint. The main passage of Edenvale Cave runs into a cliff for 15 m and is crossed by a number of other passages. The side passages run in two directions at acute angles to each other, forming many intersections, hence the local name "The Catacombs". The two caves are used as winter hibernation sites by the bats, while a two-storey farm out-building is used as a breeding site. Two of the locations, Newhall Cave and the farm building, are in the grounds of Newhall House, and the second cave, Edenvale Cave, is in the grounds of Edenvale House, within 1 km of Newhall House. The bats have uninterrupted access to all sites. In 1983 grilles were fitted to both caves.

The surrounding areas of mature mixed woodland, parkland and lakes provide ideal foraging habitat and shelter for the bats throughout the year and are included within the site.

Bats have been recorded at this site since 1983 and the population is estimated at more than 500 individuals. The site is of international importance for Lesser Horseshoe Bat, and ranks as one of the most important sites in Europe for the species".

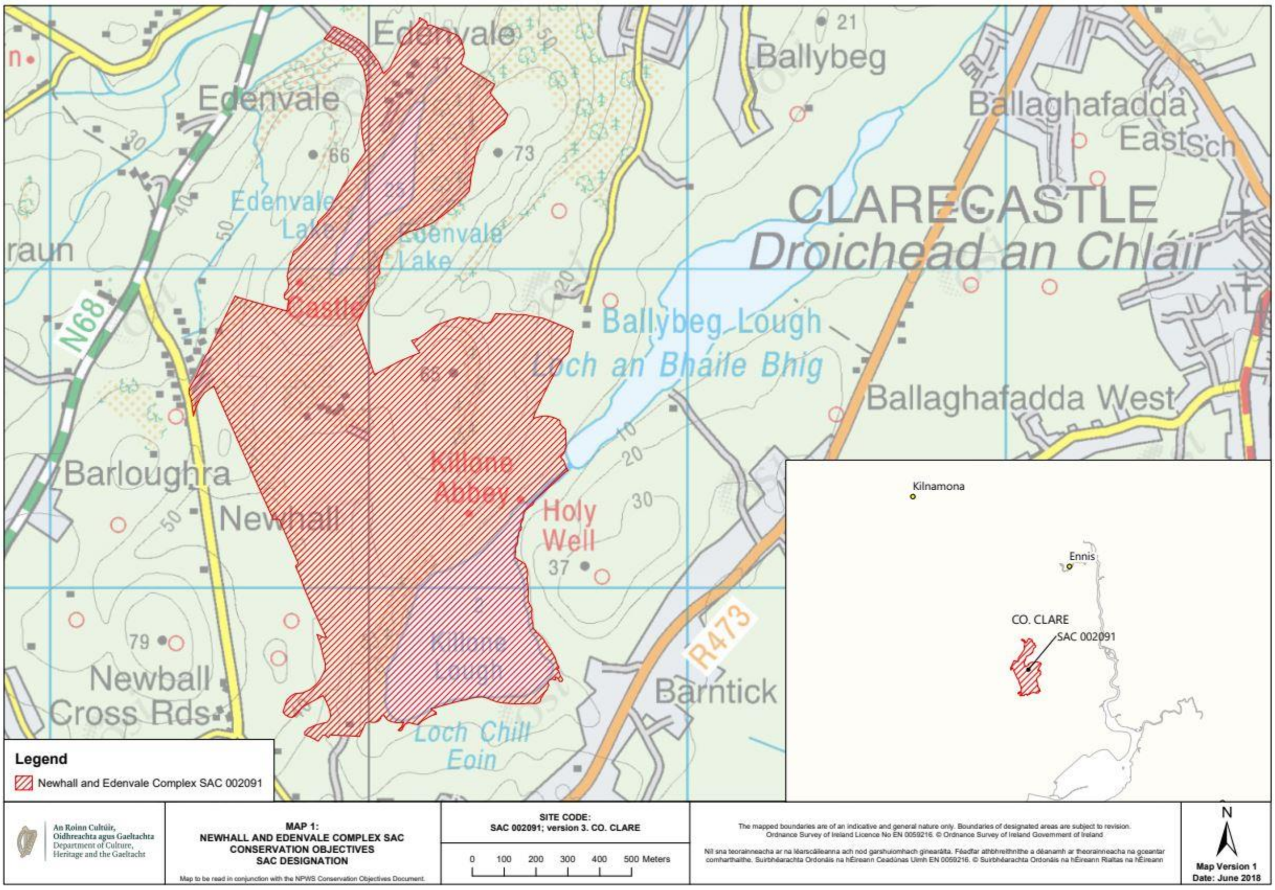


Figure 8c: Location of Newhall & Edenvale Complex SAC (Site Code 002091), Co. Clare (Source: NPWS).

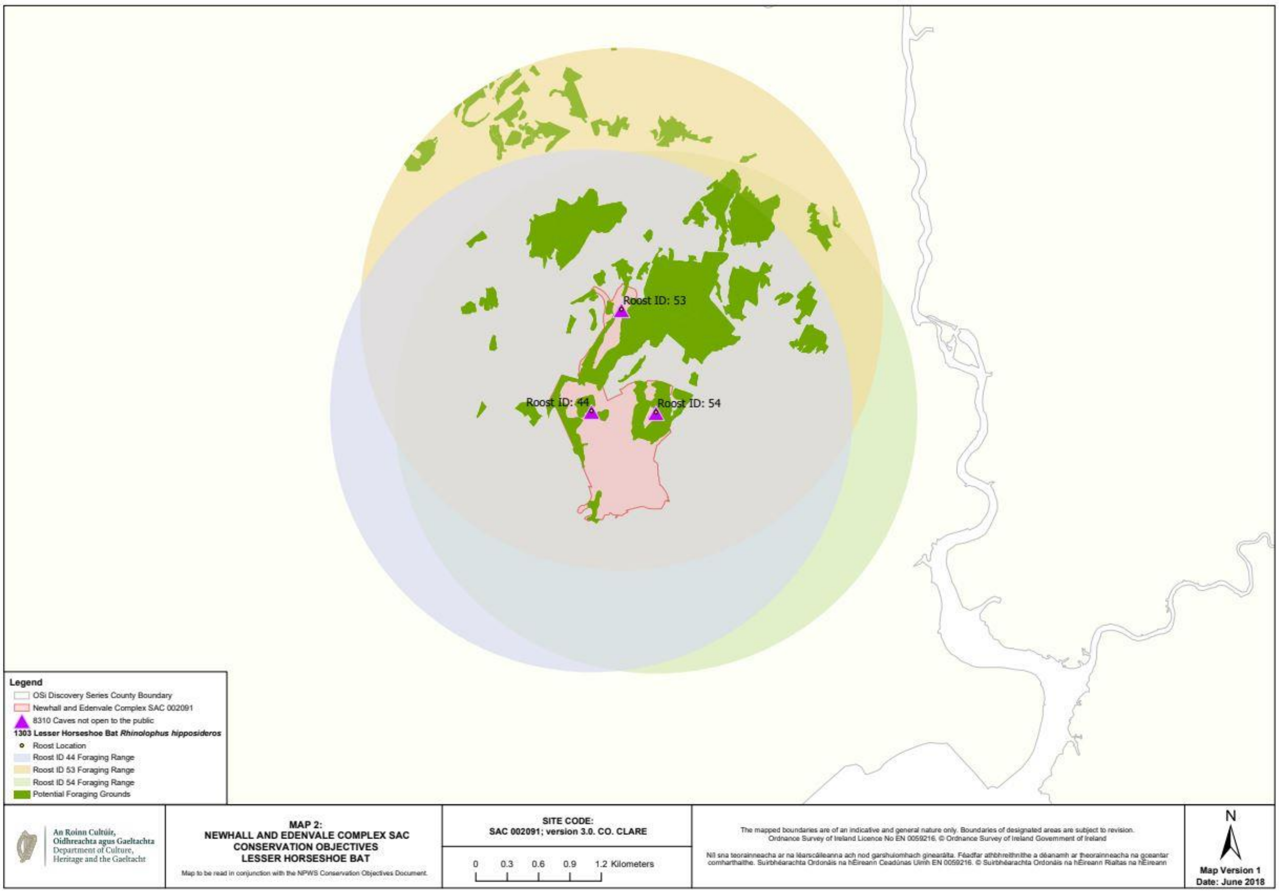


Figure 8d: 2.5km Buffer foraging zone of Newhall & Edenvale Complex SAC (Site Code 002091), Co. Clare (Source: NPWS).

The primary conservation objectives for the two SAC sites relevant to the proposed development is as follows:

Extent of potential foraging habitat	Hectares	No significant decline within 2.5km of qualifying roost	Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008). See map 2 which shows a 2.5km zone around the above roost and identifies potential foraging grounds
Linear features	Kilometres	No significant loss within 2.5km of qualifying roost. See map 2	This species follows commuting routes from its roost to its foraging grounds. Lesser horseshoe bats will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species within 2.5km around each roost (Schofield, 2008)
Light pollution	Lux	No significant increase in artificial light intensity adjacent to named roost or along commuting routes within 2.5km of the roost. See map 2	Lesser horseshoe bats are very sensitive to light pollution and will avoid brightly lit areas. Inappropriate lighting around roosts may cause abandonment; lighting along commuting routes may cause preferred foraging areas to be abandoned, thus increasing energetic costs for bats (Schofield, 2008)

Figure 8e: Conservation Objectives relating to lesser horseshoe bats.

NPWS & VWT (2002) states that it is essential, that existing foraging habitat supporting colonies is retained, and that steps are taken to provide new habitat. The optimal foraging habitats for this species are deciduous woodlands, riparian vegetation and mature hedgerows within a few kilometres of a roost. In the absence of woodland, areas of scrub close to roosts are also deemed important and should be retained.

NPWS & VWT (2022) also recommends that there is no significant increase in artificial lighting adjacent to roosts of importance, or along commuting routes within 2.5km of these roosts, and that a list of recommendations should be provided to each local authority on how to reduce or mitigate existing high levels of light intensity in the vicinity of roosts or foraging areas.

3.3.3.1 Lesser Horseshoe Bat Population Trends & Distribution Gaps

Lesser horseshoe bat roosts are counted by NPWS and VWT staff as part of the Lesser Horseshoe Bat Roost Monitoring (managed by Bat Conservation Ireland under the Irish Bat Monitoring Programme). This involves annual winter and summer counts and using the summer roost and hibernacula count data BCIreland have analysed population trends for the species to winter and summer 2021.

Counts of lesser horseshoe bats in hibernaculum was undertaken at 156 sites and contribute to the winter trend analysis was completed as part of the Lesser Horseshoe Bat Roost Monitoring. The trend has been increasing since the start of the survey with the exception of a five year period between 2007 and 2011 when numbers were stable. Over the past 20 years (2002-2021), the trend index increased by 81.5%, which is equivalent to a 3% annual increase (Aughney *et al.,* 2022). Similar to the increasing trend in hibernation counts, there has been a significant increase in lesser horseshoe bats in summer. Between 1992 and 2021 the index increased by 98%. Over the past 20 years the index has increased by 2.98% per annum. Over the past six years the annual increase in summer has been 2.1%, which is slightly lower than that seen in winter sites (Aughney *et al.,* 2022).

However, while the current population trend is favourable, the NPWS & VWT (2022) emphasises that there is growing evidence that lesser horseshoe populations are becoming isolated. For example studies undertaken by the VWT have indicated that a gap of over 45km had opened between the still occupied roosts in Rathkeale (Limerick) and those at Castleisland and Tralee (north Kerry) and this increased to 70km between roosts with more than 25 bats (Lyons, 2014). Another VWT GIS study completed by Finch & McAney (2020) to investigate the interaction between all roosts in all regions at landscape scale with specific emphasis on the following regions: between the northern and central regions, between the central and southern regions and between roosts in south Limerick and east Kerry. The results of this study indicate there are high levels of local connectivity between roosts within each of the three regions but limited connectivity between the regions (NPWS & VWT, 2022). The high level of artificial illumination (e.g. outdoor street lighting) associated with the cities of Galway and Limerick may be a barrier to movement by this species (Finch & McAney, 2020) and therefore this is a concern in relation to urban developments.

Genetic studies over the last decade has also highlighted the concern relating population isolation. One such study undertaken by Harrington (2018) examined the population genetics of the species, focusing on the northern part of its range, using DNA extracted from droppings collected at roosts. This study confirmed that there is consistent genetic structuring within the Irish lesser horseshoe bat population that has created three subpopulations described as southern (Cork/Kerry), central (Limerick, Clare and south Galway) and northern (north Galway and Mayo) (see figure below). As a consequence, distribution gaps are leading to genetic sub-populations within the range of the lesser horseshoe bat in Ireland, from Harrington (2018).

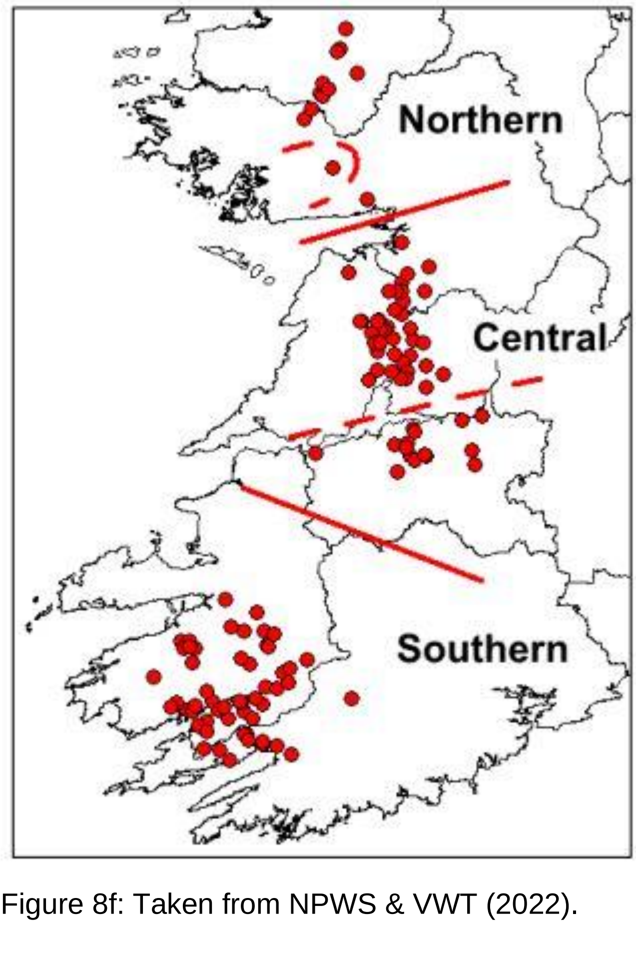


Figure 8f: Taken from NPWS & VWT (2022).

3.4 Survey Effort, Constraints & Survey Assessment

The following table details any Survey Constraints encountered and a summary of Scientific Assessment completed.

Table 10: Survey Effort, Constraints & Survey Assessment Results.

Category	Discussion
Timing of surveys **Surveying meets Collins, 2016 guidelines.**	2022 Summer bat survey: 1st to 7th August 2022 – bat surveys
Survey Type Full suite of surveys completed to ensure sufficient information was collated for bat assessment. Surveys completed according Collins, 2016 guidelines.	Bat Survey Duties Completed (Indicated by red shading) Tree PBR Survey ● – Daytime Building Inspection ○ Static Detector Survey ● – Daytime Bridge Inspection ○ Dusk Bat Survey ● – Dawn Bat Survey ● Walking Transect ● – Driving Transect ○ Trapping/Mist Netting ○ – IR Camcorder filming ○ Endoscope Inspection ● – Other (Thermal Imagery) ○
Weather conditions	Suitable weather conditions for bat surveys on the 2nd to 7th August 2022.
Survey Constraints	None
Survey effort **TOTAL = 136 hrs**	2022 - Summer bat survey: Daytime inspection – 3 hrs Dusk & Dawn Surveys, Walking Transects (x2, 2 surveyors) – 12 hrs Static Surveillance (x3 units, 5 nights) – 72 hrs
Extent of survey area	Summer bat survey: proposed development area and local road network
Equipment	All equipment in good working order.

The extent of the surveys undertaken has achieved to determine:

- Presence / absence of bat within the survey area;
- A bat species list for the survey area;
- Extent and pattern of usage by bats within the survey area.

It is therefore deemed that the Scientific Assessment completed is Appropriate in order to complete the aims of the bat survey.

4. Bat Ecological Evaluation

4.1 Bat Species Recorded & Sensitivity

Six species of bat was recorded within the survey area: Leisler's bat, soprano pipistrelle, common pipistrelle, lesser horseshoe bat, Natterer's bat and brown long-eared bat. The first three species were recorded during bat detector surveys and static surveillance bat activity levels were indicative of commuting and foraging individuals. The latter three bat species were recorded at a lower level of bat passes, which is to be expected as these three bat species are less common.

Soprano pipistrelles were the most frequently recorded bat species (134 bat passes) followed by common pipistrelle (116 bat passes) and Leisler's bat (92 bat passes). Natterer's bats were encountered 6 times, lesser horseshoe bats were encountered five times and brown long-eared bats were recorded at two locations.

Overall, the survey results demonstrate that bats commuted to the proposed development site from a easterly, westerly and northerly direction and foraged, primarily along the boundary habitats. The eastern boundary, with Ennis Golf Course, is particularly important for foraging local bat populations and this may be due to the mature hedgerow and the fact that there is no outdoor lighting in this area. A medium level of bat activity common and more light-tolerant bat species were recorded along the boundary with the N85, where outdoor lighting is present. None of the three light sensitive bat species (lesser horseshoe bat, brown long-eared bat and Natterer's bat) were recorded along this boundary.

All bat species were recorded at a Low level of bat activity during the static surveillance. However, due to the quiet echolocation calls of lesser horseshoe bats, Natterer's bats and brown long-eared bats, their presence is significant.

Lesser horseshoe bat

- Lesser horseshoe bat is an Annex II bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national lesser horseshoe bat population is considered to be significantly increasing trend (Aughney *et al.,* 2022).
- The modelled Core Area for Leisler's bats is a small area confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork (5,993km^2). It is considered that this small core area represents the only suitable range for this species in the country. The Bat Conservation Ireland Irish Landscape Model indicated that the lesser horseshoe bat habitat preference for deciduous woodland and riparian vegetation within a few kilometres of roosts and relies on linear landscape features to commute from roosts to feeding areas (Roche *et al.,* 2014)..

Leisler's bat

- Leisler's bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national Leisler's bat population is considered to be significantly increasing trend (Aughney *et al.,* 2022).
- The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.,* 2014). The landscape model emphasised that this is a

species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km.

Common pipistrelle

- Common pipistrelle is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national common pipistrelle population is considered to be significantly increasing trend (Aughney *et al.,* 2022).
- The modelled Core Area for common pipistrelle is a relatively large area that covers much of the island of Ireland (56,485km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Common pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanization (<30%) (Roche *et al.,* 2014).

Soprano pipistrelle

- Soprano pipistrelle is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national soprano pipistrelle population is considered to be significantly increasing trend (Aughney *et al.,* 2022).
- The modelled Core Area for soprano pipistrelle is a relatively large area that covers much of the island of Ireland (62,020km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the soprano pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.,* 2014).

Brown long-eared bat

- Brown long-eared bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national brown long-eared bat population is considered to be stable (Aughney *et al.,* 2021).
- The modelled Core Area for brown long-eared bat is a relatively large area that covers much of the island of Ireland (49,929 km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the brown long-eared bat habitat preference is for areas with broadleaf woodland and riparian habitats on a small scale of 0.5km emphasising the importance of local landscape features for this species (Roche *et al.,* 2014).

Natterer's bat

- Natterer's bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national Natterer's bat population is currently unknown.
- The modelled Core Area for Natterer's bat is a relatively large area that covers much of the island of Ireland (52,864km^2).The Bat Conservation Ireland Irish Landscape Model indicated that the Natterer's bat selects areas with broadleaf woodland, riparian habitats and areas with larger scale provision of mixed forest (Roche *et al.,* 2014). Therefore, it is likely that this species is more widespread within the survey area.

Annex II bat species (i.e. lesser horseshoe bat) was recorded within the survey. This species of bat was recorded during dusk surveys, walking transects and static surveillance. Two SACs designated for this species of bat are located with 2.5km of the proposed development site.

There are no recorded bat roosts within the proposed development site and therefore no assessment is completed for bat roosts. Four trees were recorded as Potential Bat Roosts (PBRs) are proposed to be felled.

The proposed development site is a small area and an overall medium level of bat activity was recorded and the results indicate that the boundaries and internal network of hedgerows/treelines/scrub of the proposed development site are commuting and foraging habitat for local bat populations.

4.2 Bat Foraging Habitat & Commuting Routes

The northern and eastern boundary of the proposed development site with Ennis Golf Course is an active bat commuting and foraging habitat and therefore an important linear habitat feature. This is reflected by the level of bat activity and the number of bat species recorded during the bat surveys and the static surveillance results. Figure 9a indicates the linear habitats proposed to be removed (marked in Red). With reference to this figure depicting the loss of hedgerows, Hedge No. H was recorded as a commuting route for both lesser horseshoe bats and Natterer's bats and therefore is an important linear habitat feature. The internal scrub area was recorded as a foraging area for four of the six bat species recorded.

An examination of the commuting routes recorded during the bat survey also indicates that bats are commuting to the Ennis Golf Course to forage in this dark zone. Two lesser horseshoe bat SACs are located within 2.5km of the proposed development site. These are located west and south of the proposed development site. If individuals from these roosts are commuting towards the proposed development site, due to their morphology and type of echolocation calls, they will commute along dark linear habitats. One such linear habitat is the Inch River which flows along the northern boundary of the proposed development site (Please see Figure 9b for location of the river in relation to the proposed development site). It is likely that this river facilitates the movement of lesser horseshoe bats into the survey area, including the Ennis Golf Course and therefore if is an important linear habitat to protect, particularly from light spillage.

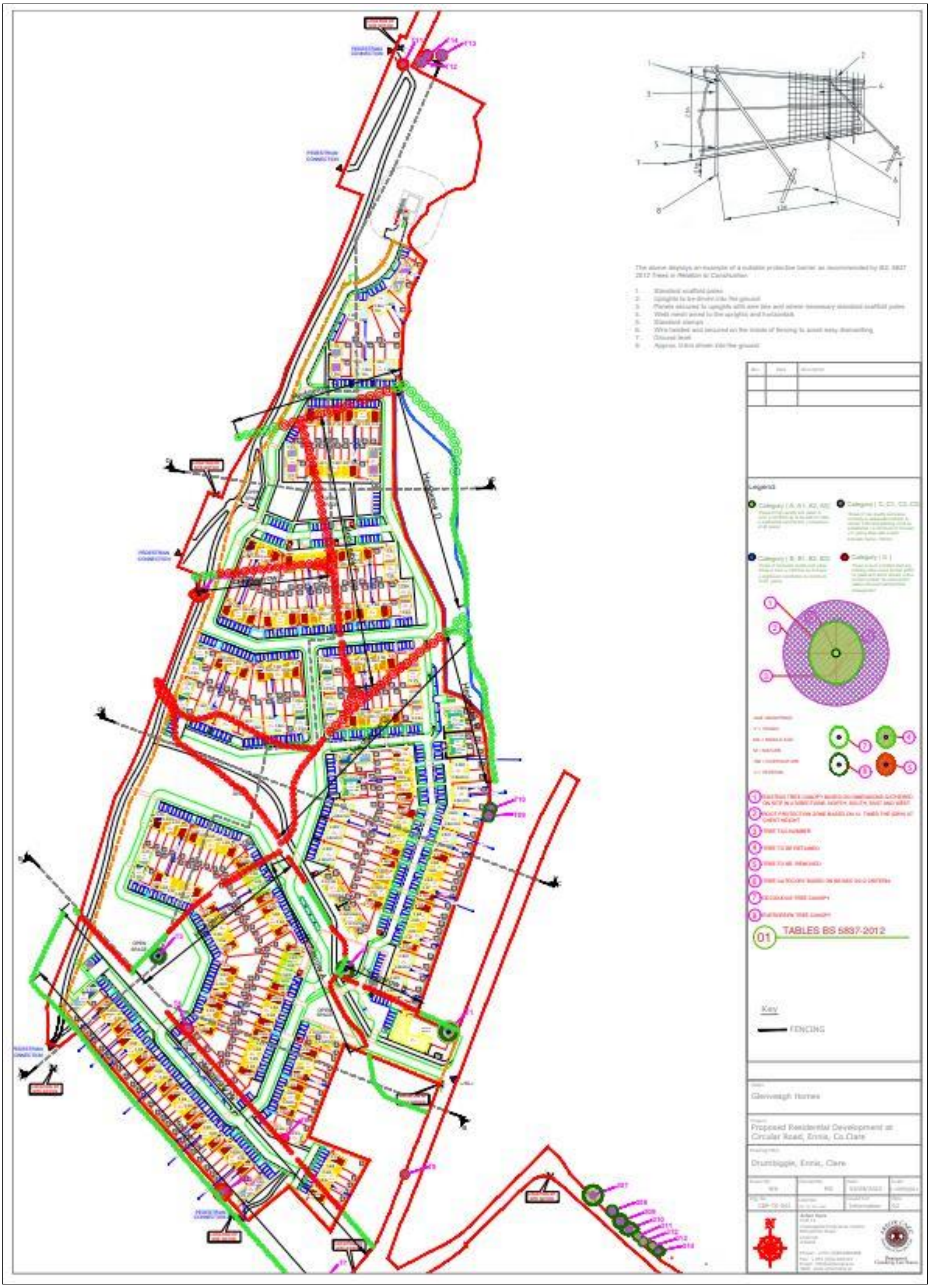


Figure 9a: Linear habitat removal as part of the proposed development.

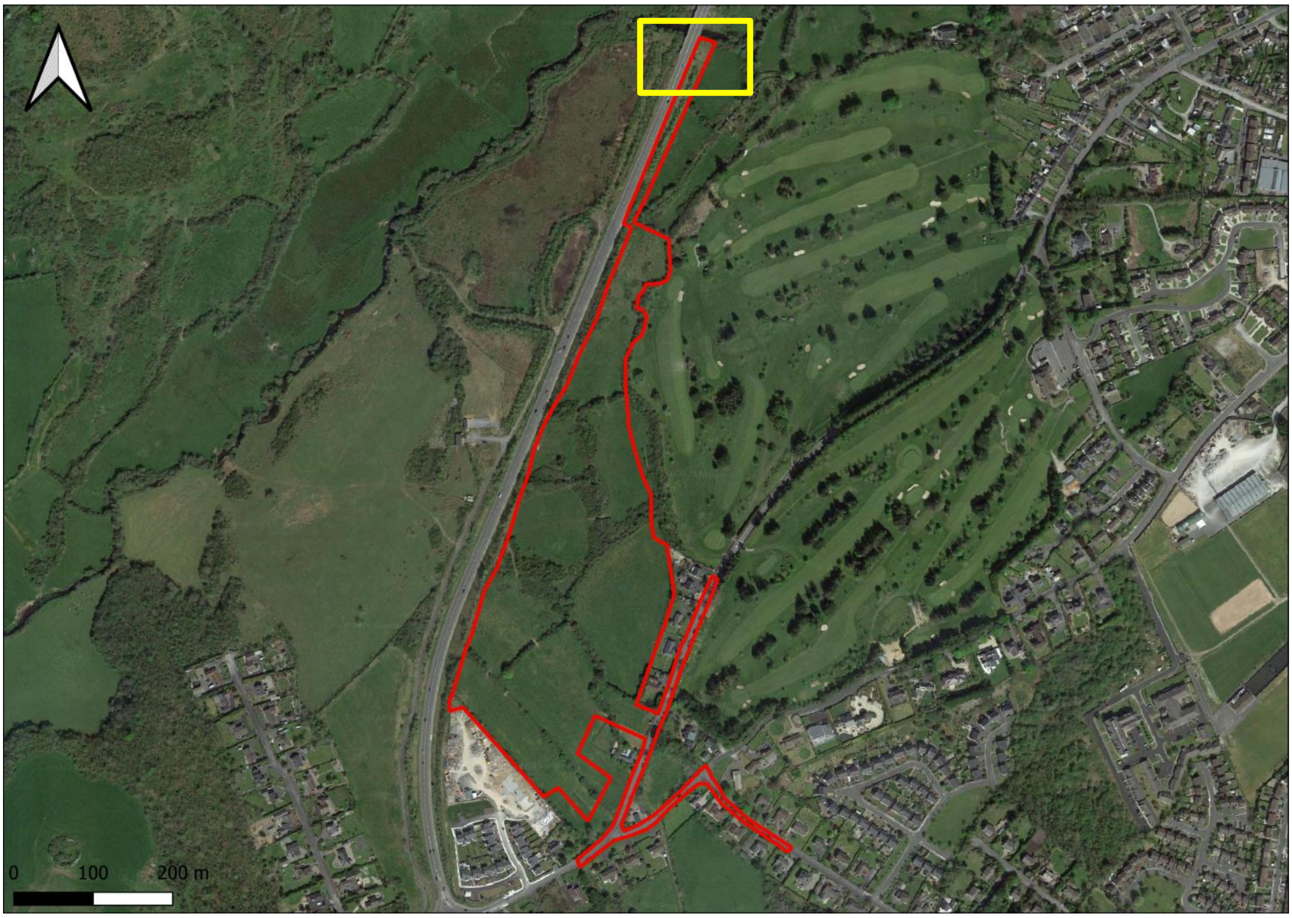


Figure 9b: Red line boundary of proposed development and Yellow Box to indicate location of Inch River (Supplied by Enviroguide Consulting).

4.3 Zone of Influence – Bat Landscape Connectivity

The proposed development site is located on the western edge of the urban area of Ennis, Co. Clare. While there is existing street lighting along theN85, the Inch River flows under the N85 and along the northern boundary of the proposed development site. It is likely that this river facilitates the movement of lesser horseshoe bats into the survey area, including the Ennis Golf Course. As a consequence there is landscape connectivity for local bat populations to move to and from the proposed development site.

However, the proposed development will increase human activity (associated noise and lighting), particularly, along the western boundary of the Ennis Golf Course, which is currently the principal area for foraging and commuting bats.

The Conservation Objectives for lesser horseshoe bat SACs is to ensure that there is not a significant loss of foraging and commuting habitat within a 2.5km of the designated sites. The proposed development is located within the 2.5km zone of two SACs (4 roosts) and therefore the potential loss of foraging and commuting habitat is to be considered. In addition, due to the fact that this species is a "Light Sensitive" bat species, the potential negative impact of lighting, which can act as a barrier to lesser horseshoe movement, may also impact on connectivity within the 2.5km zone. Lundy et al., (2011) indicated that the current distribution of habitats favoured by lesser horseshoe bats is limited and the most recent Article 17 report (NPWS, 2019) states that the short-term trend for foraging habitat for this species is decreasing (NPWS & VWT, 2022). This small core area represents the only suitable range for this species in the country and that the conservation of exiting suitable foraging and commuting habitat is important for this bat species. Therefore NPWS & VWT (2002) states that it is essential, that existing foraging habitat supporting colonies is retained, and that steps are taken to provide new habitat. The optimal foraging habitats for this species are deciduous woodlands, riparian vegetation and mature hedgerows within a few kilometres of a roost. In the absence of woodland, areas of scrub close to roosts are important and should be retained.

The proposed development site is a small area but there is a good network of hedgerows with individual trees present. The proposed development will result in the loss of this internal linear habitat network (Total length of linear habitat proposed to be removed is 1.16km (Source: Enviroguide Consulting). In addition, there is an additional 0.26 ha of scrub that is proposed to be removed. This represents 3% of the total area of the proposed development site (Total area = 11.32 ha). As the proposed development site is located within the 2.5km Buffer Radius for the two SACs located to the west and south of the proposed development site, it is important to ensure that the landscape plan incorporates compensatory planting to mitigate for this linear habitat loss and scrub habitat loss.

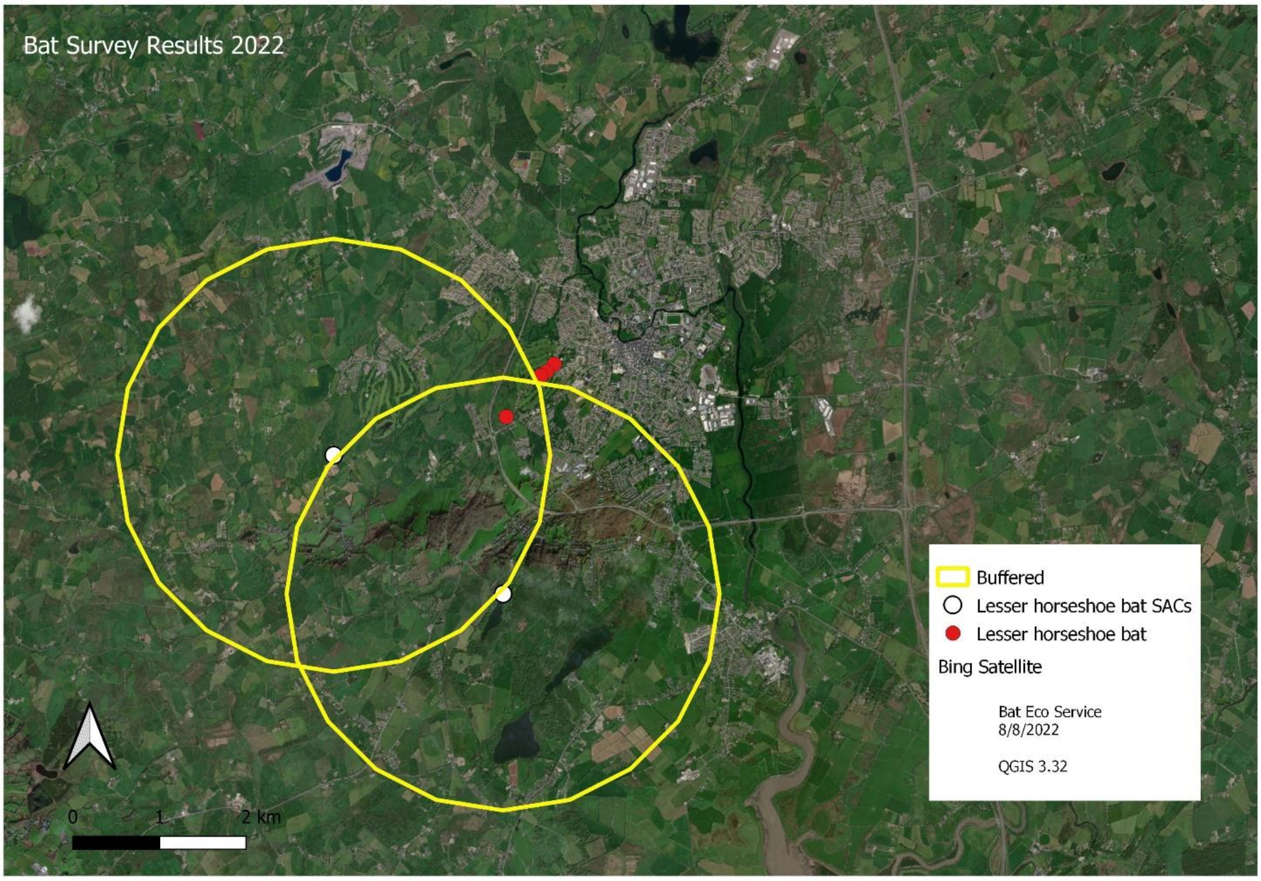


Figure 9c: 2.5km Buffer Radius around Lesser horseshoe bat SACs with reference to lesser horseshoe bat records collated during 2022 bat surveys.

4.4 Landscape Plan & Tree Protection Plan

The Landscape Plan proposed the following:

- New native hedgerow length – 553m
- Area of native woodland mix – 1898 m^2 (0.1898 ha)
- Area of meadow grass – 4088 m^2
- Approximate number of specimen trees to be planting - open space trees approx. 321 no. & 93 no. Street trees (Please note - this does not include whips for woodland planting).
- Length of hedgerow to be retained 729m
- No. of feature trees to be retained. – 5 no within red line boundary

Landscaping is an important tool to provide a buffer against light spillage. Therefore it is important that there is a continuous tall vegetation boundary along the proposed development, particularly along the northern and eastern boundary with Ennis Golf Course. This will ensure that there is a dark commuting corridor for local bat populations.

Native tree and hedgerow planting will also be required to compensate for the loss of the internal linear hedgerow network. The length of hedgerow proposed to be removed will required to be planted and planting should be of a similar plant mix of the hedgerows proposed to be removed.

4.5 Lighting Plan

The proposed lighting plan indicates that there will lighting along pedestrian access from the N85 and increased lighting along the local road R474 and adjacent to the boundary with the Ennis Golf Club. While the lower range of LUX will be tolerated by light tolerant or semi-tolerant bat species (Please see Table 3: common pipistrelle, soprano pipistrelle and Leisler's bats), the entire range of LUX will prevent light-sensitive bat species from utilising the area. Therefore, strict bat-friendly lighting is required to reduce the potential impact of the lighting plan on local bat populations. As boundary with the Ennis Golf Course is an important boundary for local bat populations, additional steps are required to reduce the potential impact on local bat populations.

To minimise impact on bat life, the lighting design has incorporated the following:

- LED luminaires will be used as they have low UV output, sharp cut-off, lower intensity, good colour rendition and dimming capability.

- Luminaire is a fixture that is mounted horizontally, ensuring minimal up-light.

- As per BCT recommendations luminaires should be mounted on poles of minimum height possible (preferably 6m and less).

- The LEDs used are 2700K or less, which is deemed acceptable by the BCT guidelines to preserve bat life. However, as there are lesser horseshoe bats present within the survey area, it is recommended that 2200K is used to further reduce potential impact on local bat populations.

- Glare shields will be utilized in order to minimise any unnecessary light spill onto bat routes along the boundary if this site.

On examination of the horizontal luminance map, the LUX means that glare shields are essential to further reduce light spillage along these linear habitats, particularly the eastern boundary. Specific lamp posts were requested to be moved to reduce light spillage on the boundary with the Ennis Golf Course.

Commitment was made to ensure to ensure that the measures listed relation to bat friendly lighting will be implemented:

"Following consultation with Bat Ecologist latest revision specifies 2200K version of light types C and D mounted on reduced height 5M columns. This will help mitigate light spill into hedging at boundaries of estate." (Taken from lighting report).

5. Impact Assessment & Mitigation

Six species of bat was recorded within the survey area: Leisler's bat, soprano pipistrelle, common pipistrelle, lesser horseshoe bat, Natterer's bat and brown long-eared bat. The first three species were recorded during bat detector surveys and static surveillance bat activity levels were indicative of commuting and foraging individuals. The latter three bat species were recorded at a lower level of bat passes, which is to be expected as these three bat species are less common.

Soprano pipistrelles were the most frequently recorded bat species (134 bat passes) followed by common pipistrelle (116 bat passes) and Leisler's bat (92 bat passes). Natterer's bats were encountered 6 times, lesser horseshoe bats were encountered five times and brown long-eared bats were recorded at two locations.

Overall, the survey results demonstrate that bats commuted to the proposed development site from a easterly, westerly and northerly direction and foraged, primarily along the boundary habitats. The eastern boundary, with Ennis Golf Course, is particularly important for foraging local bat populations and this may be due to the mature hedgerow and the fact that there is no outdoor lighting in this area. A medium level of bat activity common and more light-tolerant bat species were recorded along the boundary with the N85, where outdoor lighting is present. None of the three light sensitive bat species (lesser horseshoe bat, brown long-eared bat and Natterer's bat) were recorded along this boundary.

All bat species were recorded at a Low level of bat activity during the static surveillance. However, due to the quiet echolocation calls of lesser horseshoe bats, Natterer's bats and brown long-eared bats, their presence is significant.

There are no recorded bat roosts within the proposed development site but there are four trees recorded as Potential Bat Roosts (PBRs) are proposed to be felled. The majority of the internal network of hedgerows and the scrub habitat will be removed as part of the proposed development.

Due to the fact that bats are nocturnal mammals outdoor lighting will impact on local bat populations. Therefore, the lighting plan is an important element of the proposed development that needs to consider its potential impact on commuting and foraging bats. Consultation was undertaken and measures have been agreed to reduce this potential impact of outdoor lighting on commuting and foraging bats, especially lighting located adjacent to boundary habitats with particular reference to the lesser horseshoe bat requirements.

There will be an increase in human activity (noise and light levels) (Operational Operations) as a result of the proposed development and due to the high level of bat biodiversity and low bat activity, it is considered that this will impact on local bat populations.

Therefore the potential impact of the proposed development is, overall, considered to be Permanent Negative and to have a scale of impact of Moderate impact on named bat species (according to criteria set out in Tables 2c and d, Section 1.2.2). This is primarily in relation to the lighting plan for the proposed development scheme, removal of linear and scrub habitats, loss of mature trees and the presence of light-sensitive bat species.

Bat mitigation measures are presented in order to reduce the potential impact of the lighting scheme for the proposed development with additional measures relating to tree felling and the erection of a bat box scheme. Additional bat conservation measures are also presented for the conservation of local lesser horseshoe bat populations (e.g. erection of a night roost). If the mitigation measures presented below are strictly implemented, the scale of impact is likely to be reduced to Slight Negative impact on local bat populations.

5.1 Bat Mitigation Measures

5.1.1 Lighting Plan

This element of the proposed planning application is important aspect in relation to local bat populations. All European bat species, including Irish bat species, are nocturnal. They usually hide in roosts during the daytime, while fly to feeding areas or drinking sites using commuting routes during the night. Annually bats will hibernate in the winter, swarm in the autumn and give birth in the summer months. In all aspects of the bat lifestyle, Artificial Light at Night (ALAN) may significantly change their natural behaviour in relation to roosting, commuting and feeding. While bats are naturally exposed only to very low lighting levels produced by moonlight, starlight and low intensity twilight, light levels greater than natural light levels can impact on the lifestyle of bats.

Bats are light sensitive species, hence their nocturnal activities. The three bat species recorded commuting and foraging within the survey area are Light Tolerant or Semi-tolerant bat species. However, it is still important that strict lighting guidelines are required to reduce the potential impact of the proposed development on local bat populations as standard best practice.

Luminaire design is extremely important to achieve an appropriate lighting regime. Luminaires come in a myriad of different styles, applications and specifications which a lighting professional can help to select. The following should be considered when choosing luminaires. This is taken from the most recent BCT Lighting Guidelines (BCT, 2018). Consultation was undertaken with the lighting specialists to reduce the potential impact on local bat populations.

- All luminaires used will lack UV/IR elements to reduce impact.
- LED luminaires will be used due to the fact that they are highly directional, lower intensity, good colour rendition and dimming capability.
- A warm white spectrum (<2700 Kelvins (i.e. 2200 Kelvins) will be used to reduce the blue light component of the LED spectrum).
- Luminaires will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.
- Column heights should be carefully considered to minimise light spill. The shortest column height allowed should be used where possible.
- Only luminaires with an upward light ratio of 0% and with good optical control will be used.
- Luminaires will be mounted on the horizontal, i.e. no upward tilt.
- Any external security lighting will be set on motion-sensors and short (1min) timers.
- As a last resort, accessories such as baffles, hoods or louvres will be used to reduce light spill and direct it only to where it is needed.

Any external lighting for the proposed development should strictly follow the above guidelines and these should be strictly implemented during construction and operation phase of the proposed development. The following table provides details of which of the BCT, 2018 measures will be implemented as part of the proposed lighting plan.

Table 11: Lighting Recommendations to be implemented to reduce impact on local bat populations.

BCT, 2018 Guidelines	Included in Lighting Plan	Action
All luminaires used will lack UV/IR elements to reduce impact	YES	Yes
LED luminaires will be used due to the fact that they are highly directional, lower intensity, good colour rendition and dimming capability	YES	LED will be used
A warm white spectrum (<2700 Kelvins will be used to reduce the blue light component of the LED spectrum).	Yes <2700 Kelvins is proposed.	2,200 Kelvins will be used.
Luminaires will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats	YES	Yes
Column heights should be carefully considered to minimise light spill. The shortest column height allowed should be used where possible	Minimum height	6m poles and 5m poles (where possible) to meet local authority guidelines.
Only luminaires with an upward light ratio of 0% and with good optical control will be used.	YES	Yes
Luminaires will be mounted on the horizontal, i.e. no upward tilt.	YES	Yes
Any external security lighting will be set on motion-sensors and short (1min) timers	No external security lighting proposed	No action required
As a last resort, accessories such as baffles, hoods or louvres will be used to reduce light spill and direct it only to where it is needed. **Monitoring is recommended to determine that this action is reducing lighting spillage.**	For luminaires where <1 LUX level is not achieved along bat commuting routes, this is required.	Glare shields will be utilized in order to minimise any unnecessary light spill onto bat routes along the eastern boundary of this site.

As a consequence of consultation, the proposed lighting plan meets the recommendations of the guidelines BCT, 2018.

Additional measures were also recommended:

- Removal of specific luminaires to prevent light spillage on the boundary with the golf course.

5.1.2 PBR Tree Felling

In relation to trees proposed to be felled and identified as PBRs, these should be resurveyed in consultation with the tree contractors. The following is recommended:

i) A Phase Two PBR survey is recommended for the four trees identified as a PBR and proposed to be felled. This should be undertaken at least one month prior to tree felling in order to propose a tree felling plan in conjunction with tree contractors.
ii) Alternative roosting sites (i.e. summer bat boxes) will be erected prior to the removal of trees. These are recommended to be erected 6 months prior to tree felling to allow local bat populations to become aware of them prior to removal of the trees.
iii) Trees proposed to be removed, should be felled on mild days during the autumn months of September, October or November or Spring months of February and March (felling during the spring or autumn months avoids the periods when the bats are most active).
iv) An assessment of trees according to their PBR value determines the methodology of felling. Trees with PBR Category 1 are highly suitable for roosting bats and require more intensive procedures prior to felling. The trees identified within the survey area are PBR Category 2. The procedure to fell these is as follows:

    a. Category 2: Any ivy covered trees which require felling will be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape.

5.1.3 Bat Box Scheme

The total number of bat boxes required to mitigate for general conservation of local bat populations:
- 4 summer bat boxes (Schwegler Woodcrete 1FF bat box or equivalent – source www.nhbs.com or www.veldshop.nl) to be erected on mature trees within the proposed development site.

Bat boxes scheme be sited carefully and this will be undertaken by a bat specialist. Bat boxes will be erected prior to construction works. The bat specialist will erect the bat boxes with assistance from the contractor. Some general points that will be follow include:

- Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 1 metre above and below position of bat box.
- Diameter of tree should be wide and strong enough to hold the required number of boxes.
- Locate bat boxes in areas where bats are known to forage or adjacent to suitable foraging areas. Locations should be sheltered from prevailing winds.
- Bat boxes should be erected at a height of 4-5 metres to reduce the potential of vandalism and predation of roosting bats.
- Locations for bat boxes should be selected to ensure that the lighting plan for the proposed site does not impact on the bat boxes. Therefore the bat boxes are to be erected mature trees to the rear of the proposed development site and away from public street lighting.

5.1.4 Lesser Horseshoe Bat Conservation Measures

Due to the presence of lesser horseshoe bats within the survey area and the fact that the proposed development is within 2.5km radius of two SACs, it is important that additional measures are undertaken to conservation local lesser horseshoe bat populations. These measures will entail the following:

- Compensatory planting for the removal of linear habitats.
- Compensatory planting for the removal of scrub habitats.

- Specific measures to reduce lighting impacts (Please see Section 5.1.1)
- Lesser horseshoe bat conservation zone – zone of land along a linear strip to the north of the proposed development site and connected to the boundary of the Inch River. This area has been selected because it is outside the Lighting Plan zone and it is adjacent to the Inch River which is deemed as the likely commuting route for lesser horseshoe bats to the proposed development area. This river also allows direction commuting to lands with the Ennis Golf Course where lesser horseshoe bat activity was also recorded.
- This area is approximately 20m wide and 170m long and it is proposed that the following measures are undertaken:
    - Erection of Day Roost (VWT design – 2m x 2m x 3.325 (Please see Figure 10b).

This is a small structure building of concrete block (externally plastered) with a natural slate roof and bituminous felt. It is designed according to VWT Day Roost recommendations and full details of the plans are provided in the appendices. The provision of such features within the 2.5km radius of Lesser Horseshoe Bat SACs is considered by VWT as an important component to the support network for maternity and hibernation roosts.

- Dark free zone connected to Inch River no lighting permitted withing this area.
- Landscaping in vicinity of Day Roost and Inch River.
    - Approximately 200m of hedge planting (Hawthorn).
    - Approximately 10 small trees (e.g. Rowan, Birch and Crab Apple).

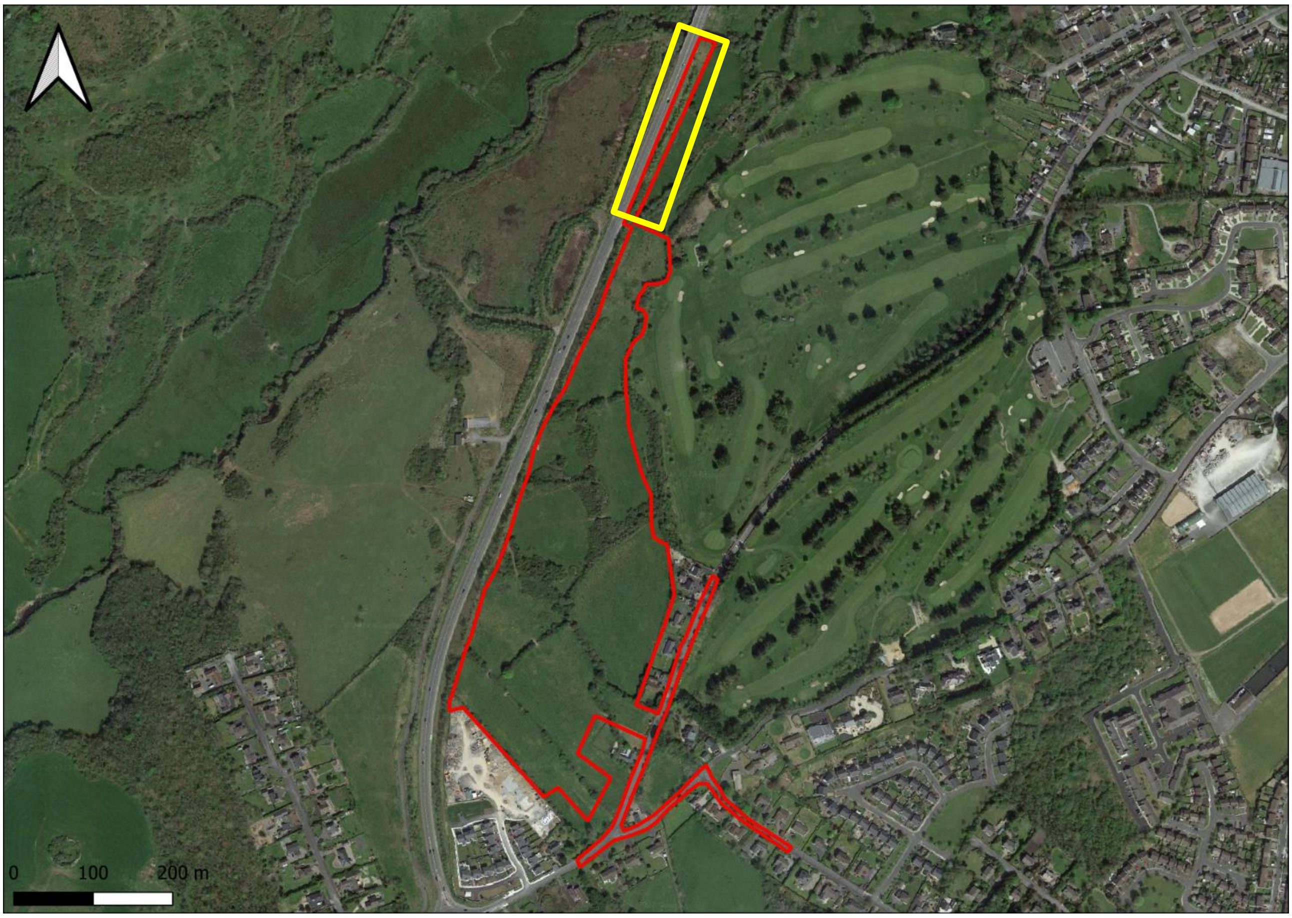
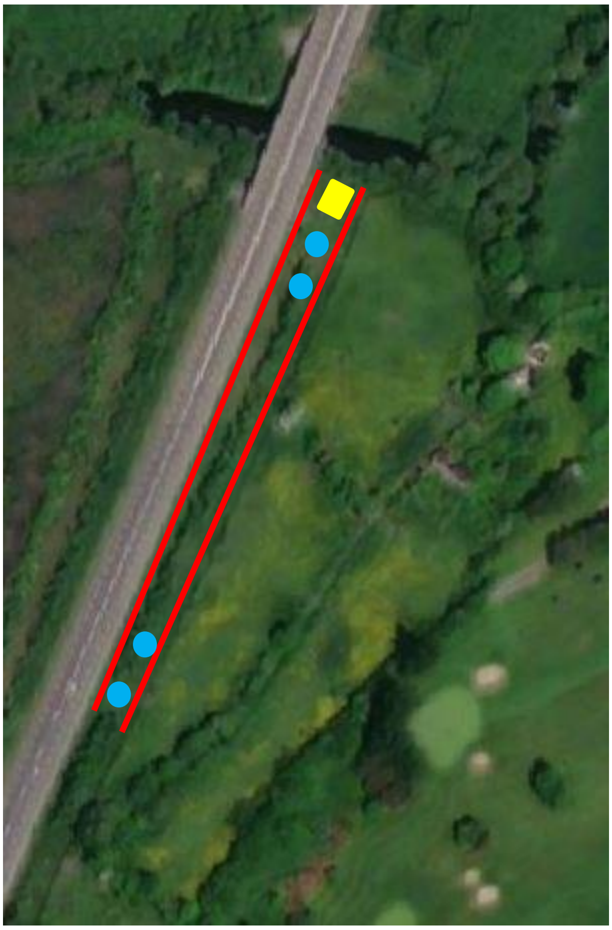


Figure 10a: Red line boundary of proposed development and Yellow Box to indicate location of Lesser Horseshoe Bat Conservation Measures (Supplied by Enviroguide Consulting).



Yellow Box – location of Day Roost.

Red Lines – Hedge planting.

Blue Circles – Tree planting.

Figure 10b: Location of Lesser Horseshoe Bat Conservation Measures.

5.1.5 Landscaping

It is recommended that native tree, shrub and plant species are included in the landscaping plan. It is recommended that night-scented planting is also undertaken to encourage foraging areas for local bat populations.

It is essential that the northern and eastern boundary with the Ennis Golf Course is protected. Any gaps or opportunity to undertaken planting to increase the height and width of this boundary should be undertaken and planting should be with native tree and shrub species.

It is highly recommended that the Lesser Horseshoe Bat Conservation Measures described above are incorporated into the Landscape Pan. These additional measures will add to the compensatory requirement to ensure that there is no accumulative loss of linear habitats within the 2.5km zone for Lesser Horseshoe Bat SACs.

5.1.6 PBR Tree Felling

In relation to trees proposed to be felled and identified as PBRs, these should be resurveyed in consultation with the tree contractors. The following is recommended:

v) A Phase Two PBR survey is recommended for the three trees identified as a PBR and proposed to be felled. This should be undertaken at least one month prior to tree felling in order to propose a tree felling plan in conjunction with tree contractors.

vi) Alternative roosting sites (i.e. summer bat boxes) will be erected prior to the removal of trees. These are recommended to be erected 6 months prior to tree felling to allow local bat populations to become aware of them prior to removal of the trees.

vii) Trees proposed to be removed, should be felled on mild days during the autumn months of September, October or November or Spring months of February and March (felling during the spring or autumn months avoids the periods when the bats are most active).

viii) An assessment of trees according to their PBR value determines the methodology of felling. Trees with PBR Category 1 are highly suitable for roosting bats and require more intensive procedures prior to felling. The trees identified within the survey area are PBR Category 2. The procedure to fell these is as follows:

a. Category 2: Any ivy covered trees which require felling will be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape.
b. Category 2: Any PBR with deadwood should be survey prior to felling and felling should entail slow dismantling of the tree (i.e. large dead limbs to be removed prior to felling of main tree).

5.1.7 Monitoring

Monitoring is recommended post-construction works. This monitoring should involve the following aspects:

- Inspection of bat boxes within one year of erection of bat box scheme/rocket box. Register bat box scheme with Bat Conservation Ireland. This should be undertaken for a minimum of 2 years.
- Monitoring of Day Roost: Monitoring should involve:
  - Inspection of internal space for evidence of bat usage once per year for two years;
  - Static surveillance for a minimum of 10 days/year to record any bat activity during the summer months in Year 2.
  - Installation of a temperature data logger for 2 year surveillance.
- Monitoring of any other bat mitigation measures. All mitigation measures should be checked to determine that they were successful. A full summer bat survey is recommended post-works.
- Specific monitoring is recommended in relation to the proposed lighting scheme to determine that a level of <1 Lux is achieved along the boundaries of the proposed development site.

6. Survey Conclusions

Six species of bat was recorded within the survey area: Leisler's bat, soprano pipistrelle, common pipistrelle, lesser horseshoe bat, Natterer's bat and brown long-eared bat. The first three species were recorded during bat detector surveys and static surveillance bat activity levels were indicative of commuting and foraging individuals. The latter three bat species were recorded at a lower level of bat passes, which is to be expected as these three bat species are less common.

Overall, the survey results demonstrate that bats commuted to the proposed development site from a easterly, westerly and northerly direction and foraged, primarily along the boundary habitats. The eastern boundary, with Ennis Golf Course, is particularly important for foraging local bat populations and this may be due to the mature hedgerow and the fact that there is no outdoor lighting in this area. A medium level of bat activity common and more light-tolerant bat species were recorded along the boundary with the N85, where outdoor lighting is present. None of the three light sensitive bat species (lesser horseshoe bat, brown long-eared bat and Natterer's bat) were recorded along this boundary.

All bat species were generally recorded at a Low level of bat activity during the static surveillance. However, due to the quiet echolocation calls of lesser horseshoe bats, Natterer's bats and brown long-eared bats, their presence is significant.

There are no recorded bat roosts within the proposed development site but there are four trees recorded as Potential Bat Roosts (PBRs) are proposed to be felled. The majority of the internal network of hedgerows and the scrub habitat will be removed as part of the proposed development.

Due to the fact that bats are nocturnal mammals outdoor lighting will impact on local bat populations. Therefore, the lighting plan is an important element of the proposed development that needs to consider its potential impact on commuting and foraging bats. Consultation was undertaken and measures have been agreed to reduce this potential impact of outdoor lighting on commuting and foraging bats, especially lighting located adjacent to boundary habitats with particular reference to the lesser horseshoe bat requirements.

There will be an increase in human activity (noise and light levels) (Operational Operations) as a result of the proposed development and due to the high level of bat biodiversity and low bat activity, it is considered that this will impact on local bat populations.

Therefore the potential impact of the proposed development is, overall, considered to be Permanent Negative and to have a scale of impact of Moderate impact on named bat species (according to criteria set out in Tables 2c and d, Section 1.2.2). This is primarily in relation to the lighting plan for the proposed development scheme, removal of linear habitats and the presence of light-sensitive bat species.

A large number of bat mitigation measures have been provided to reduce the potential impact of the proposed development on local bat populations. Due to the presence of lesser horseshoe bats within the survey area and the fact that the proposed development is within 2.5km radius of two SACs, additional measures are recommended to conserve local lesser horseshoe bat populations.

If bat mitigation measures are all fully committed too and implemented, the proposed development will have less of an impact on local bat populations and this is likely to be Permanent Negative scale of Slight-Moderate.

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8. Appendices

8.1 Appendix 1 Bat Habitat & Commuting Route Classifications

Table 1.A: Hedgerow Category (Bat Conservation Ireland, 2015)

Type of Hedgerow / Treeline	Code	Description / Bat Potential
Small Hedgerow	**SH**	Hedgerow is less than approximately 1.5 m high, there are no, or very few, protruding bushes or trees. This type of hedgerow would provide little shelter to bats. 
Medium Hedgerow	**MH**	Hedgerow is approximately 1.5 to 3 m high. This type of hedgerow will provide foraging and commuting potential for bats. 
Sparse Treeline Hedgerow	**ST**	Hedgerow, low or medium in height, with individuals trees (where tree canopies, for the most part, do not touch).

		
Dense Treeline Hedgerow	**DT**	Large uncut hedgerows or treelines, dominated by mainly large tree or very tall scrub species (e.g. tall hawthorn, blackthorn or hazel), where the canopies are mostly touching. 

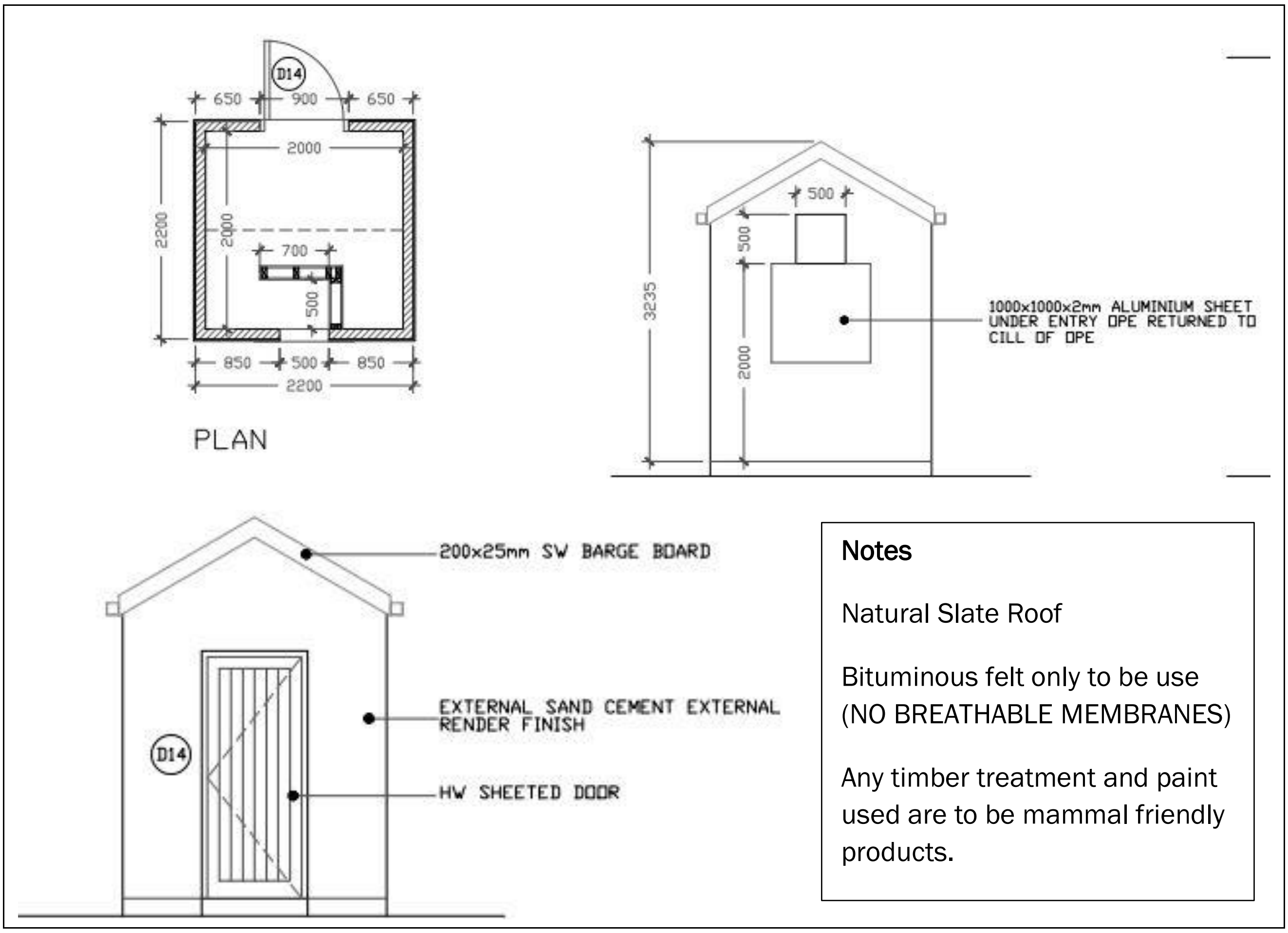
Table 1.B: Habitat Classification (Bat Conservation Ireland, 2015, based on Fossit, 2000)

Cultivated land		Salt marshes		Exposed rock		Fens/flushes	
Built land		Brackish waters		Caves		Grasslands	
Coastal structures		Springs		Freshwater marsh		Scrub	
Shingle/gravel		Swamps		Lakes/ponds		Hedges/treelines	
Sea cliffs/islets		Disturbed ground		Heath		Conifer plantation	
Sand dunes		Watercourse		Bog		Woodland	

8.2 Appendix 2 Summer Bat Boxes & Day Roost

Woodcrete Bat Boxes (IFF Design) – to be erected on trees

Day Roost – Design



Notes

Natural Slate Roof

Bituminous felt only to be use (NO BREATHABLE MEMBRANES)

Any timber treatment and paint used are to be mammal friendly products.

Plate A: Day Roost – front and rear views of Night Roost described in plans.

8.3 Appendix 3 Bat Assessment Tables

Table 4.1 Guidelines for assessing the potential suitability of proposed development sites for bats, based on the presence of habitat features within the landscape, to be applied using professional judgement.

Suitability	Description Roosting habitats	Commuting and foraging habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions[a] and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation[b]). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.[c]	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions[a] and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions[a] and surrounding habitat.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

[a] For example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.
[b] Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in the autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten *et al.*, 2015). This phenomenon requires some research in the UK but ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in large buildings in highly urbanised environments.
[c] This system of categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

Figure A: Table 4.1 (p 35) Reproduced from Collins (2016).

(1) Conversion, modification, demolition or removal of buildings (including hotels, schools, hospitals, churches, commercial premises and derelict buildings) which are:

- agricultural buildings (e.g. farmhouses, barns and outbuildings) of traditional brick or stone construction and/or with exposed wooden beams;
- buildings with weather boarding and/or hanging tiles that are within 200m of woodland and/or water;
- pre-1960 detached buildings and structures within 200m of woodland and/or water;
- pre-1914 buildings within 400m of woodland and/or water;
- pre-1914 buildings with gable ends or slate roofs, regardless of location;
- located within, or immediately adjacent to woodland and/or immediately adjacent to water;
- Dutch barns or livestock buildings with a single skin roof and board-and-gap or Yorkshire boarding if, following a preliminary roost assessment, the site appears to be particularly suited to bats.

(2) Development affecting built structures:

- tunnels, mines, kilns, ice-houses, adits, military fortifications, air-raid shelters, cellars and similar underground ducts and structures; unused industrial chimneys that are unlined and brick/stone construction;
- bridge structures, aqueducts and viaducts (especially over water and wet ground).

(3) Floodlighting of:

- churches and listed buildings, green space (e.g. sports pitches) within 50m of woodland, water, field hedgerows or lines of trees with connectivity to woodland or water;
- any building meeting the criteria listed in (1) above.

(4) Felling, removal or lopping of:

- woodland;
- field hedgerows and/or lines of trees with connectivity to woodland or water bodies;
- old and veteran trees that are more than 100 years old;
- mature trees with obvious holes, cracks or cavities, or that are covered with mature ivy (including large dead trees).

(5) Proposals affecting water bodies:

- in or within 200m of rivers, streams, canals, lakes, reed beds or other aquatic habitats.

(6) Proposals located in or immediately adjacent to:

- quarries or gravel pits;
- natural cliff faces and rock outcrops with crevices or caves and swallets.

(7) Proposals for wind farm developments of multiple wind turbines and single wind turbines (depending on the size and location) (NE TIN 051 – undergoing updates at the time of writing).

(8) All proposals in sites where bats are known to be present[1]

This may include proposed development affecting any type of buildings, structures, feature or location.

Notes:

1. Where sites are of international importance to bats, they may be designated as SACs. Developers of large sites 5–10km away from such SACs may be required to undertake a HRA.

Figure B: Reproduced from Collins (2016) – page 13.

Table 2 Factors affecting the probability of bats being present.

Factors affecting the probability of a building being used by bats in summer	
Increased probability	Disused or little used; largely undisturbed Large roof void with unobstructed flying spaces Large dimension roof timbers with cracks, joints and holes Uneven roof covering with gaps, though not too draughty Entrances that bats can fly in through Hanging tiles or wood cladding, especially on south-facing walls Rural setting Close to woodland and/or water Pre-20th century or early 20th century construction Roof warmed by the sun Within the distribution area of horseshoe bats
Decreased probability	Highly urbanised area with few feeding places Small or cluttered roof void (esp. for brown long-eared bat) Heavily disturbed Modern construction with few gaps around soffits or eaves (but be aware these may be used by pipistrelles in particular) Prefabricated with steel and sheet materials Active industrial premises Roof shaded from the sun
Factors affecting the probability of trees being used by roosting bats	
Increased probability	In ancient woodland or parkland Large trees with complex growth form Species that typically form cavities, such as beech, willow, oak or ash Visible damage caused by rot, wind, lightning strike *etc.* Loose bark providing cavities
Decreased probability	Coniferous plantation with no specimen trees Young trees with simple growth form and little damage
Factors affecting the probability of underground sites being used by roosting bats	
Increased probability	Large enough to develop stable temperature in winter High humidity Undisturbed Close to woodland or water (but note that bats will also use upland sites) Many cracks and crevices suitable for bats
Decreased probability	Small and draughty Heavily disturbed In urbanised areas Smooth surfaces with few roosting opportunities

Figure C: Table 2 Reproduced from Marnell *et al.* (2022).

8.4 Appendix 4 – Static Surveillance 2022

Mini 2	CP	SP	Leis	LHB	BLE	Myotis
01/08/2022	0	0	0	0	0	0
02/08/2022	3	3	16	0	2	0
03/08/2022	16	20	15	1	3	1
04/08/2022	5	14	11	0	4	0
05/08/2022	7	10	12	0	1	0
	31	**47**	**54**	**1**	**10**	**1**
Mini 7	CP	SP	Leis	N Pip	BLE	Myotis
01/08/2022	11	8	4	0	0	0
02/08/2022	16	5	2	0	0	0
03/08/2022	19	39	4	0	6	1
04/08/2022	3	9	0	0	0	0
05/08/2022	0	0	0	0	0	0
	49	**61**	**10**	**0**	**6**	**1**
Mini 11	CP	SP	Leis	N Pip	BLE	Myotis
01/08/2022	1	4	2	0	0	0
02/08/2022	11	29	8	0	6	2
03/08/2022	12	17	16	0	4	3
04/08/2022	6	12	7	0	2	0
05/08/2022	12	0	2	0	0	0
	42	**62**	**35**	**0**	**12**	**5**

9. Bat Species Profile

9.1 Leisler's bat

Ireland's population is deemed of international importance and the paucity of knowledge of roosting sites, makes this species vulnerable. However, it is considered to be widespread across the island. The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.,* 2014). The landscape model emphasised that this is a species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km. In addition, of all Irish bat species, Leisler's bats have the most specific roosting requirements. It tends to select roosting habitat with areas of woodland and freshwater.

Irish Status	Near Threatened
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	73,000 to 130,000 (2007-2013) Ireland is considered the world stronghold for this species
Estimate Core Area (Lundy *et al. 2011*)	52,820 km^2

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

The principal concerns for Leisler's bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Selection of maternity sites is limited to specific habitats;
- Relative to the population estimates, the number of roost sites is poorly recorded;
- Tree felling, especially during autumn and winter months; and
- Increasing urbanisation.

9.2 Common pipistrelle

This species is generally considered to be the most common bat species in Ireland. The species is widespread and is found in all provinces. The modelled Core Area for common pipistrelles is a large area that covers much of the island of Ireland (56,485km^2) which covers primarily the east and south east of the area (Roche *et al.,* 2014). The Bat Conservation Ireland Irish Landscape Model indicated that the Common pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanization (<30%) (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	1.2 to 2.8 million (2007-2012)
Estimate Core Area (km^2) (Lundy *et al. 2011*)	56,485

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Common pipistrelles in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements
- This species has complex habitat requirements in the immediate vicinity of roosts. Therefore, careful site specific planning for this species is required in order to ensure all elements are maintained.
- Renovation or demolition of derelict buildings.
- Tree felling
- Increasing urbanisation (e.g. increase in lighting)

9.3 Soprano pipistrelle

This species was the second most recorded species along the proposed development site and it generally considered to be the second most common bat species in Ireland. The species is widespread and is found in all provinces, with particular concentration along the western seaboard. The modelled Core Area for soprano pipistrelle is a large area that covers much of the island of Ireland (62,020km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the soprano pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	0.54 to 1.2 million (2007-2012)
Estimate Core Area (km^2) (Lundy *et al. 2011)*	62,020

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Soprano pipistrelles in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosts;
- Renovation or demolition of structures;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).

9.4 Brown long-eared Bat

This species is generally considered to be widespread across the island. The modelled Core Area for Brown long-eared bats is a relatively large area that covers much of the island of Ireland (52,820km^2) with preference suitable areas in the southern half of the island. The Bat Conservation Ireland Irish Landscape Model indicated that the Brown long-eared bat habitat preference is for areas with broadleaf woodland and riparian habitats on a small scale of 0.5km emphasising the importance of local landscape features for this species (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2008-2013 Stable
Estimated Irish Population Size	64,000 -115,000 (2007-2012)
Estimate Core Area (Lundy *et al. 2011)*	49,929 km²

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for brown long-eared bats are poorly known in Ireland, but those that are relevant for this survey area are as follows:

- Selection of maternity sites is limited to specific habitats;
- Lack of knowledge of winter roosts;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

9.5 Natterer's bat

There are three species included in the *Myotis* species family and their echolocation calls are very similar across these three species. The modelled Core Area for Natterer's bats is a relatively large area that covers much of the island of Ireland (52,864km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Natterer's bat selects areas with broadleaf woodland, riparian habitats and areas with larger scale provision of mixed forest (Roche *et al.,* 2014). Therefore, it is likely that this species is more widespread within the survey area.

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	Unknown
Estimated Irish Population Size	Unknown
Estimate Core Area (Lundy *et al. 2011)*	52,864

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Natterer's bats in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements;
- This species has complex habitat requirements in the immediate vicinity of roosts. Therefore careful site specific planning for this species is required in order to ensure all elements are maintained;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).

Proposed Strategic Housing Development at Ballymacaula, Drumbiggle, Keelty, Circular Road, Ennis, Co. Clare

CHAPTER 11 Air Quality and Climate Change

Volume III

List of Appendices

August 2022

Appendix 11.1 Ambient Air Quality Standards

August 2022

Glenveagh
Home of the new.

McCutcheon Halley
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APPENDIX 11.1 Ambient Air Quality Standards

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time which was the issue of acid rain. As a result of this sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.

In recent years the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, has been passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002), and has set limit values which came into operation on 17th June 2002. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM_{10}, 40% for the hourly and annual limit value for NO_2 and 26% for hourly SO_2 limit values. The margin of tolerance commenced from June 2002, and started to reduce from 1 January 2003 and every 12 months thereafter by equal annual percentages to reach 0% by the attainment date. A second daughter directive, EU Council Directive 2000/69/EC, has published limit values for both carbon monoxide and benzene in ambient air. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08 which has been transposed into Irish Law as S.I. 180 of 2011. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. The margins of tolerance specific to each pollutant were also slightly adjusted from previous directives. In regards to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for $PM_{2.5}$ are included in Directive 2008/50/EC. The approach for $PM_{2.5}$ was to establish a target value of 25 $\mu g/m^3$, as an annual average (to be attained everywhere by 2010) and a limit value of 25 $\mu g/m^3$, as an annual average (to be attained everywhere by 2015), coupled with a target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target will range from 0% (for $PM_{2.5}$ concentrations of less than 8.5 $\mu g/m^3$ to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 $\mu g/m^3$). Where the AEI is currently greater than 22 $\mu g/m^3$ all appropriate measures should be employed to reduce this level to 18 $\mu g/m^3$ by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008 - 2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 $\mu g/m^3$ was set to be complied with by 2015 again based on the AEI.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 96/62/EC as “a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 96/62/EC”. These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).
The Margin of Tolerance is defined in Council Directive 96/62/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the attainment date. The Upper Assessment Threshold is defined in Council Directive 96/62/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

An annual average limit for both NO_X (NO and NO_2) is applicable for the protection of vegetation in highly rural areas away from major sources of NO_X such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex VI of EU Directive 1999/30/EC identifies that monitoring to demonstrate compliance with the NO_X limit for the protection of vegetation should be carried out distances greater than:

- 5 km from the nearest motorway or dual carriageway
- 5 km from the nearest major industrial installation
- 20 km from a major urban conurbation
- As a guideline, a monitoring station should be indicative of approximately 1000 km^2 of surrounding area.

Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other things, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

Appendix 11.2 Dust Minimisation Plan

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APPENDIX 11.2 Dust Minimisation Plan

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 management plan has been formulated by drawing on best practice guidance from Ireland, the UK (IAQM (2014), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997). The following measures have been incorporated into the Outline Construction & Demolition Management Plan (OC&DMP) prepared for the site.

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 (see Figure 11.1 for the windrose for Shannon Airport). As the prevailing wind is predominantly south-westerly to south-easterly, locating construction compounds and storage piles downwind of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

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 0.2mm/day, dust generation is generally suppressed (IAQM, 2014; UK ODPM, 2002). 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 favourable in general for the suppression of dust for a significant period of the year. Nevertheless, 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;
- 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;
- 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;
- 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.

- 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 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.

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.

Proposed Strategic Housing Development at Ballymacaula, Drumbiggle, Keelty, Circular Road, Ennis, Co. Clare

CHAPTER 12 **Cultural Heritage and Archaeology**

Appendix 12.1 Field Survey Photos
Appendix 12.2 Excavation Database Entries

Volume III

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Appendix 12.1 Field Survey Photos

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Appendix 12.1: Photographic Record

Field numbers assigned during site inspection are indicated on Figure 12.4 within the chapter.

Plate 12.1: View of sloping terrain in Field 1

Plate 12.2: View of field boundary wall

Plate 12.3: View of undulating terrain in Field 2

Plate 12.4: View of level terrain in Field 3

Plate 12.5: View of gradual slope within Field 4

Plate 12.6: View of level terrain in Field 5

Plate 12.7: View of level terrain in Field 6

Plate 12.8: View of sloping terrain in Field 7


Plate 12.9: View of level terrain in Field 8


Plate 12.10: View of slightly sloping terrain in Field 9

Appendix 12.2 Excavation Database Entries

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Appendix 12.2: Excavation Database entries

Townland: Keelty
Licence: 03E0857
Author: Dermot Nelis
The N18 Ennis Bypass would involve the construction of a 13.8km eastern bypass of Ennis from Latoon, outside Newmarket, to north of Barefield, at Cragard, along with a 7.1km western relief road from Killow to Claureen, outside Ennis. Site AR39 was recorded as a circular enclosure or raised area of approximately 20m in diameter in the environmental impact statement. It is depicted on the first-edition 6-inch OS map. A slightly raised area of stones defines the site. It was considered that the site's low-lying location on the edge of the flood-plain of the Claureen River would suggest that it was possibly a crannog. The area surrounding the potential crannog was also considered to have a high potential for the presence of remains of archaeological significance due to the presence of a number of identified archaeological sites and its location on the flood-plain. The excavation of six test-trenches totalling 252m2 within site AR39 failed to produce any material of archaeological significance. In all trenches the topsoil directly sealed the natural subsoil. It is suggested that this is not the site of a crannog but rather an area of non field-clearance. The solid geology of large boulders was not cleared, with the result that no farming practices took place in this immediate area and the tree cover was allowed to grow. Conversation with the landowner confirmed that the wider area had previously been cleared. This project was funded by Clare County Council.

Townland: Keelty
Licence: 04E0025
Author: Graham Hull
A substantial, stone-built limekiln dating to the second half of the 19th century was excavated on the N18 Ennis bypass. The limekiln is thought to be an element of an estate, probably associated with the Keane family, notorious land agents at the time of the potato failure and after. Artefacts (clay tobacco pipe, china and a high-quality glass inkpot) support cartographic and documentary evidence indicating 19th-century semi-industrial activity. Excavation and historical research has demonstrated that the structure was built after 1840 (and probably after 1855) and was a ruin by 1894. The 40-year period in which the kiln could have operated is relatively well documented and it will be interesting to examine further the social and economic environment of the time. It is very possible that the Keelty limekiln was a commercial venture of the wealthy Keane family. Limekilns are not uncommon in Ireland; indeed, many townlands had their own. In the west of the country small round kilns were typical. The larger, well-built types with arched recessed fronts, built onto hillsides, are characteristic of richer farm areas and were often associated with local estates. Limekilns convert limestone to highly alkaline burnt lime. Burnt lime was primarily used to reduce the acidity of boggy land in order to improve fertility. No direct evidence of the type of fuel used in the Keelty kiln was found during the excavation but it is very likely that peat, for fuel, was the reciprocal goods for the wagon-loads of alkaline burnt lime that were required to bring acid bogs into cultivation. Other uses of burnt lime in the 19th century included house rendering and disinfectant, water purification, and applications in the tanning industry. Limekilns were in use in rural County Clare until the 1950s, but, more generally, the demise of the limekiln came first with the import of South American guano in the later 19th century and then with commercial limestone crushing in the 20th century.

Townland: Claureen
Licence: 04E0026
Author: Dermot Nelis
A near perfectly circular gully with a diameter of 6m was excavated on the N18 Ennis bypass. The gully was 0.5-1m wide and had a typical depth of 0.15-0.2m. The gully profile was V-shaped with a steeper edge at the inside. Charcoal-rich patches, in some cases with cremated bone, formed discrete deposits in the gully. It is very likely that the enclosure is prehistoric in date and the cremated bone indicates a funerary function. Similar small funerary enclosures have been excavated nearby (for example

excavations by Thaddeus Breen and the writer at Ballygirreen on the N18 Newmarket-on-Fergus bypass, Excavations 2000, No. 45, 00E0284). Three tiny glass beads (two yellow and one blue) were found in the sieved soil from the ring-gully. The beads did not seem to have been affected by heat and were probably placed in the ground with the dead person's (or persons') burnt remains. The low weight of the bone in each deposit indicated that they may not have been in situ pyre deposits but rather redeposited material or only representative memorial or cenotaph burials. It is noteworthy that ring-barrow and ring-gully funerary patterns in the later centuries BC and early centuries AD involved cremation with occasional small or token bone deposits and sometimes with small but significant items of glass or bronze. The Claureen burial site may thus be Later Iron Age in date.

Townland: Ballymacaula
Licence: 17E0336
Author: Red Tobin
In advance of the development of this site a test excavation was carried out as part of an archaeological assessment. The desk top survey and site inspection was supplemented by a test excavation which demonstrated that the development site maintains a uniform stratigraphy unbroken by any evidence for archaeological activity.

Townland: Drumbiggle
Licence: 03E1029
Author: Martin Jones
Topsoil-stripping was monitored at the proposed location of 34 of a total of 69 detached and semi-detached houses and their ancillary works at Drumbiggle, Golf Links Road, Ennis, Co. Clare, between 7 and 9 July 2003. The site is located on a low east-facing slope in rough pasture. No known archaeological sites are recorded in the vicinity of the subject site. The area stripped measured approximately 300m east–west by 130m. The stratigraphy consisted of a mid- to dark-brown clay loam over a mid-brown gravelly clay loam which was absent from the eastern area of the site. These topsoil deposits overlay an orange to mid-brown sandy silty clay containing medium to large stones. Small and irregular deposits of sterile pink till containing limestone gravel and bedrock outcrops were also visible intermittently below the topsoil deposits. Nothing of archaeological significance was noted during the course of monitoring. A single cut feature identified was modern and associated with a nearby house.

Townland: Drumbiggil
Licence: 06E1223
Author: Graham Hull
Test-trenching in advance of construction of 116 residential units, one crèche, four offices, two retail units and a nursing home on a 6.5ha site to the west of Ennis did not locate archaeological deposits.

Townland: Cahercalla More
Licence: 13E0308
Author: Tracy Collins
Monitoring was carried out of groundworks associated with the extension of a hospital at Cahercalla Woods, Cahercalla Road, Ennis, Co. Clare. Ringfort-rath CL033-171—- is nearby. Approximately two thirds of the site had been stripped of topsoil prior to the engagement of an archaeologist. The site consisted of an open grass covered grazing field. Two areas (Areas 1 and 2) were stripped as part of the development. Area 1 was located at the north-western corner of the site and measured 42m north-south by 8m with a topsoil depth ranging from 0.2-0.35m. The topsoil consisted of a dark brown clayey silt and the natural consisted of a light orangey brown clayey silt with occasional large stones. No archaeological features were noted. Area 2 was located at the western side of the site and measured 43m east-west by 17m with a topsoil depth ranging from 0.2-0.3m. A stone-lined well with an iron pipe built into the southern wall was located to the eastern end of Area 2. Also located to the south of Area 2 was a possible water trough. The well and trough appear to be associated with the

nearby Cahercalla House and outbuildings. The well and trough are probably of 19th-century date. They were covered over and remain intact subsurface. No archaeological features were found in Areas 1 and 2.

Townland: Cahercalla More
Licence: 09E0170
Author: Red Tobin
Cuan An Chláir are developing part of the Cahercalla Hospital property to accommodate twelve sheltered housing units and a daycare centre for the elderly. The site will be fully serviced including parking and access through the grounds of Cahercalla Hospital. The planning application was returned with a request for further information, including a request for archaeological information. An assessment was requested involving a research component alongside a programme of test excavation. Fifteen trenches were proposed to assess this site fully. Test-trenching was carried out on 22 and 23 April 2009. Over 1.5km of test-trenches were excavated over the three test areas. No features or deposits of archaeological origin were identified during the trenching exercise.
In the area designated for later development as a link road and further housing, directly north of the farmyard and coach yard, a number of archaeological sites were identified. These were a bivallate ringfort, which had not been previously identified and a two-part perforated stone, perhaps the base of a standpipe or a wheelwright's stone. One of the test-trenches was excavated across the ramparts of the ringfort, clarifying the presence of two heavily denuded dump-construction banks with external ditches. The features were covered with heavy gauge plastic and backfilled. Both sites were reported to the National Monuments Service and the County Clare archaeologist.