August 2025

Environmental Impact Assessment Report (EIAR) - Volume 3 Appendices

Proposed Offshore Renewable Energy ('ORE') Capable Terminal on a 250m Quay Extension & Ancillary Operational Support Infrastructure

Calafort Phort Láirge
Port of Waterford

On behalf of

Port of Waterford

Port of Waterford, Belview, Co. Kilkenny

MALONE O'REGAN ENVIRONMENTAL

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Title: Environmental Impact Assessment Report (EIAR) - Volume 3 Appendices, Proposed ORE Capable Terminal on a 250m Quay Extension & Ancillary Operational Support Infrastructure, Port of Waterford, Port of Waterford, Belview, Co. Kilkenny

Job Number: E2068

Prepared By: Amelia Keane **Signed:** Amelia Keane

Checked By: Kevin O'Regan **Signed:** KOR

Approved By: Kevin O'Regan **Signed:** KOR

Revision Record

Issue No.	Date	Description	Remark	Prepared	Checked	Approved
01	29/08/25	EIAR Vol III - Appendices	FINAL	AK	AK	KOR

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Environmental Impact Assessment Report (EIAR) - Volume 3 Appendices
Proposed ORE Capable Terminal on a 250m Quay Extension & Ancillary Operational Support Infrastructure
Port of Waterford
Port of Waterford, Belview, Co. Kilkenny

APPENDICES

APPENDIX 1

Appendix 1-1: EIAR Consultation Responses

Appendix 1-2: An Coimisiún Pleanála ('ACP') Pre-Consultation Conclusion Letter

Appendix 1-3: National Parks and Wildlife Service ('NPWS') Meeting Notes

Appendix 1-4: Public Consultation Munster Express Advertisement

APPENDIX 2

Appendix 2-1: An Bord Pleanála Meeting Notes

APPENDIX 3

Appendix 3-1: Proposed Site Layout Drawings

Appendix 3-2: Preliminary Rehabilitation Plan

APPENDIX 6

Appendix 6-1: Bat Report

Appendix 6-2: Waterbird Report

Appendix 6-3: Benthic Report

Appendix 6-4: Biodiversity Management Plan

APPENDIX 7

Appendix 7-1: Onsite Sediment Samples

APPENDIX 8

Appendix 8-1: ABPmer Hydrodynamic Modelling Report

APPENDIX 9

Appendix 9-1: PM Monitoring Data Technical Note

APPENDIX 10

Appendix 10-1: Climate Vulnerability Assessment

Appendix 10-2: Climate Calculations

Appendix 10-3: Past Flood Events

Appendix 10-4: Port of Waterford Sustainability Policy

APPENDIX 11

Appendix 11-1: Glossary of Terms

Appendix 11-2: Noise Surveying Weather Data

Appendix 11-3: Acoustic Baseline Survey Results

Appendix 11-4: Daytime Noise Contours for Scenarios I & J

APPENDIX 12

Appendix 12-1: Underwater Survey Baseline Summary

APPENDIX 14

Appendix 14-1: Plates

Appendix 14-2**:** Historic Building Appraisal of Glass House (Hurley, M.F., 2000)

Appendix 14-3: Industrial Archaeological Survey of Gorteens Flour Mill (Hammond, F., 2001)

Appendix 14-4: Ballylough Archaeological Project Map

APPENDIX 16

Appendix 16-1: Traffic Counts

Appendix 16-2: Traffic Flow Sheets

Appendix 16-3: PICADAY Results

Appendix 16-4: ARCADY Results

APPENDIX 17

Appendix 17-1: Port of Waterford Environmental Management Policy

APPENDIX 18

Appendix 18-1: Uisce Éireann Confirmation of Feasibility

APPENDICES

APPENDIX 1

APPENDIX 1-1

December 2024

EIAR – Consultation Document Responses Received

Proposed ORE Capable Terminal on a 250m Quay Extension & Ancillary Operational Support Infrastructure

at

Port of Waterford, Belview, Co. Kilkenny

On behalf of

Port of Waterford

MALONE O'REGAN ENVIRONMENTAL

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EIAR – Consultation Document Responses Received
Proposed ORE Capable Terminal on a 250m Quay Extension & Ancillary Operational Support Infrastructure
Port of Waterford
Port of Waterford, Belview, Co. Kilkenny

Contents

Appendix A: Department of Agriculture, Food and the Marine

Appendix B: Department of Housing, Local Government and Heritage

Appendix C: Department of Transport

Appendix D:Envriomental Health Service

Appendix E: Fáilte Ireland

Appendix F: Gas Networks Ireland

Appendix G: Geological Survey Ireland

Appendix H: Inland Fisheries Ireland

Appendix I: Irish Aviation Authority

Appendix J: Kilkenny County Council

Appendix K: Transport Infrastructure Ireland

Appendix L: Uisce Éireann

Appendix M: Waterford Airport

APPENDIX A

Annie Coady

From: Environmental Co-ordination (Inbox) <Environmental_Co-ordination@agriculture.gov.ie>
Sent: Friday 10 February 2023 09:58
To: Annette Maguire
Subject: FW: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth
Attachments: 23 01 18 - E2068 - EIAR Consultation Doc Final Rev01.pdf

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To whom it concerns,

With regard to the above subject;

FISHERY HARBOUR CENTRES:
Dunmore East FHC is the nearest Fishery Harbour Centre to the proposed activity and potential development. Significant effects would not be expected but any assessment should be cognisant of the Fishery Harbour Centre's location and operations.
AQUACULTURE:
There are a number of licenced aquaculture sites within Waterford Estuary. The developer / applicant is directed towards https://dafm-maps.marine.ie/aquaculture-viewer/ for further details. These licenced sites & related facilities and activities (as per their licences) should form part of any EIA study or consultation.

No further comments or observations from MED (South) at this time.

Regards

Environmental Co-ordination Unit

From: Annette Maguire <amaguire@mores.ie>
Sent: Thursday 19 January 2023 12:13
To: Environmental_Co-ordination@agriculture.gov.ie>
Subject: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

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MOR Ref: E2068

By Email

Re: Cover Email Text - Environmental Impact Assessment (EIA) Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

To Whom It May Concern,

Please find attached an Environmental Impact Assessment (EIA) Consultation Document in relation to a proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m extension to the existing wharves at the Port of Waterford ('the Proposed Development').

We would welcome any feedback you many have on the scope of the EIA to be undertaken for the Proposed Development.
Any comments in relation to the attached consultation document should be sent to amaguire@mores.ie on or before the close of business on the **2nd March 2023**. Or alternatively, postal correspondence may be made out to the following address:

Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

To ensure that the response finds the relevant persons, in all correspondence please ensure to reference the project as:

- Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny.

Kind Regards,
Annette Maguire
Administrator

Working Hours:
Mon - Fri 9am – 1pm

for and on behalf of
Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
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Department of Agriculture, Food and the Marine

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An Roinn Talmhaíochta, Bia agus Mara

Tá an t-eolas sa ríomhphost seo, agus in aon cheangaltáin leis, faoi rún agus tá sé dírithe ar an bhfaighteoir/na faighteoirí beartaithe amháin agus níor cheart ach dóibh siúd é a úsáid. D'fhéadfadh an t-eolas seo a bheith faoi réir pribhléid dhlíthiúil agus ghairmiúil. Mura tusa faighteoir beartaithe an ríomhphoist seo, níor cheart duit an teachtaireacht seo, nó aon chuid di, a úsáid, a nochtadh, a chóipeáil, a dháileadh nó a choinneáil. Má fuair tú an ríomhphost seo go hearráideach, cuir an seoltóir ar an eolas láithreach agus scrios gach cóip den ríomhphost seo ó chóra(i)s do ríomhaire, le do thoil.

APPENDIX B

Annie Coady

From: Housing Manager DAU <Manager.DAU@npws.gov.ie>
Sent: Wednesday 15 March 2023 17:40
To: Annette Maguire
Subject: Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny
Attachments: G Pre00021-2023.pdf

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A chara,

Please find attached observations on the above referral.

Le meas,

Joanne

Joanne Lyons
Higher Executive Officer
___
Aonad na nIarratas ar Fhorbairt
Development Applications Unit
Oifigí an Rialtais
Government Offices
Bóthar an Bhaile Nua, Loch Garman, Contae Loch Garman, Y35 AP90
Newtown Road, Wexford, County Wexford, Y35 AP90
___

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

Your Ref: E2068
Our Ref: G Pre00021/2023
(Please quote in all related correspondence)

15/03/23

Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

Via email: amaguire@mores.ie

Re: Environmental Impact Assessment (EIA) Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny

A chara

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

Archaeology

The application and supporting documents, including the report entitled 'EIAR Consultation Document' (Malone O'Regan, January 2023)', have been reviewed by the Underwater Archaeology Unit of the National Monuments Service of the Department of Housing, Local Government and Heritage. It is noted that the terrestrial and underwater archaeological heritage of the proposed development area will be included in the EIAR. It is further noted the proposed development area is situated proximal to the Recorded Monument KK047-001---- castle-unclassified and built heritage structures are also noted within and in the environs of the proposed development area on the 25-inches to a mile (c. 1900) Ordnance Survey map. Recorded Monuments are subject to statutory protection in the Record of Monuments and Places established under Section 12 of the National Monuments (Amendment) Act 1930-2014. Under Section 12(c) of the National Monuments (Amendment) Act 1994 any person (including a landowner) proposing to carry out, or to cause or to permit the carrying out of, any work at or in relation to a Recorded Monument must give notice in writing to the Minister for Housing, Local Government and Heritage two months before commencing that work. Receipt of planning consultation is regarded as compliance with the Section 12 requirements.

Furthermore, the Wreck Inventory of Ireland contains numerous entries for losses in the River Suir, including in the environs of the proposed development area to the east of Little Island. The proposed development area there may contain wrecks or elements of lost vessels,

including archaeological objects underwater, which have been previously undocumented. Over 18,000 wrecks have been recorded to date from Irish waterways and the marine environment, ranging from small fishing boats, dugout canoes and coastal traders to steamships and ocean going ships. Though earlier sources have been included where obtainable, the Inventory is largely based on documentary sources available from after 1700AD. As such, previously unrecorded wreck sites, including those dating to earlier periods, may await discovery in the area under consideration here. Section 3 of the National Monuments (Amendment) Act 1987 is the primary piece of legislation for the protection of wrecks over 100 years old and archaeological objects underwater irrespective of age. Wrecks that are less than 100 years old and archaeological objects or the potential location of such a wreck or archaeological object can also be protected under Section 3 of the 1987 (Amendment) Act.

In light of the above and given that the proposed development includes in-water works that could potentially impact on archaeological materials in the river bed at this location the Department recommends that an Underwater Archaeological Impact Assessment (UAIA) report be compiled and submitted to this Department for review and comment. The UAIA should be undertaken and submitted to this Department prior to the EIAR being finalised and prior to the commencement of any construction works in order to facilitate the formulation of appropriate archaeological mitigation recommendations. The approved UAIA shall be incorporated into the Cultural Heritage chapter of the EIAR and as an appendix to the main document.

Archaeological Recommendations

1. The developer shall commission an Underwater Archaeological Impact Assessment (UAIA) report which shall include the following:

    a. A desktop assessment that addresses the underwater, archaeological and built (including riverine/maritime/fishing/industrial) heritage of the proposed development area. The assessment shall include a full inventory and mapping of the sites of all identified/previously recorded archaeological/cultural heritage features and structures (including those identified underwater) and shall also include maps/drawings that clearly indicate any proposed impacts on these assets/areas of archaeological potential arising from the proposed project. The UAIA shall assess all proposed in-water development and shall also assess any proposed Site Investigation impacts and potential secondary or indirect impacts such as construction works to facilitate access and areas of scouring as a result of potential changes in hydrology.

    b. The UAIA shall include the results of a geophysical survey of the proposed development area and its environs. At a minimum geophysical surveys shall include side scan, sonar, magnetometer and mutibeam echo sounder. The geophysical surveys shall be licenced under the National Monuments Acts 1930-2014. A Dive Survey Licence (Section 3 1987 National Monuments Act) and

Detection Device consent (Section 2 1987 National Monuments Act) will be required. Licence applications, accompanied by Method Statements, shall be sent for vetting to the National Monuments Service of the Department of Housing, Local Government and Heritage.

c. The UAIA shall include a licenced dive assessment centred on (but not confined to) the area(s) where in-water works are proposed, accompanied by a hand-held metal detection survey, undertaken by a suitably licenced and experienced underwater archaeologist with metal detection experience. All archaeological diving should comply with the Health and Safety Authority's Safety, Health and Welfare at Work (Diving) Regulations 2018/2019. A Dive Survey Licence (Section 3 1987 National Monuments Act) and Detection Device consent (Section 2 1987 National Monuments Act) will be required for all of these works. Please allow 5-6 weeks to facilitate the processing of archaeological licences.

d. Having completed the work, the archaeologist shall submit a written report to the National Monuments Service describing the findings of the UAIA, including the results of the geophysical and dive surveys. The report should comment on the degree to which the extent, location and levels of all proposed works and other sub-surface/in-water works required for a development may impact upon any archaeological remains. This report should be illustrated with appropriate plans, sections and photographs. Where archaeological materials are shown to be present, further mitigation measures will be required. These may include recommendations for institution of appropriate buffer zones, redesign to allow for preservation in situ, excavation and/or monitoring as deemed appropriate. The National Monuments Service will advise the developer with regard to these matters. No construction works shall commence until the National Monuments Service have had the opportunity to fully evaluate the findings of the UAIA and our recommendations have been received.

e. A Construction Environment Management Plan should incorporate any significant findings that emerge from the UAIA process, including but not limited to, the location of any archaeological or cultural heritage constraints relevant to a proposed development and present appropriate mitigation measures to protect the archaeological or cultural heritage environment.

2. Archaeological monitoring is to take place of all works that involve groundworks or any impacts to the riverbed and riverbanks, including any site investigation/geotechnical works, as below:

a. The services of a suitably qualified and suitably experienced underwater archaeologist shall be engaged to carry out the archaeological monitoring.

b. The archaeological monitoring shall be licensed by the Department of Housing, Local Government and Heritage and a detailed method statement that sets out the monitoring strategy is to accompany a licence application.

c. A Finds Retrieval Strategy shall be included in the methodology and all excavated deposits shall be spread and metal detected (under licence) to recover any archaeological objects that they may contain.

d. The monitoring archaeologist shall obtain a dive survey licence in order to facilitate investigation of underwater archaeological materials should they be uncovered/identified.

e. Please note vetting of licence applications by the Department takes 3-4 weeks.

f. A communication strategy is to form part of the monitoring strategy to ensure full communication is in place between the monitoring archaeologist and the plant operator(s) at all times during works. The archaeological personnel undertaking the monitoring will be in a position to monitor directly all elements of the works, to ensure they have unobstructed views of the excavations, and the plant and machinery operators shall be prepared to facilitate the archaeological personnel in the undertaking of their monitoring work.

g. Should archaeological materials be found during the course of monitoring, the archaeologist shall have work on the affected area of the site stopped pending further archaeological investigation and a decision by the National Monuments Service regarding appropriate mitigation. The developer shall be prepared to be advised by the National Monuments Service with regard to any mitigating action (preservation in-situ, test-excavations, monitoring and/or excavation). The developer shall facilitate the archaeologist in recording any material found.

h. The planning authority and the National Monuments Service and Dublin City Archaeologist shall be furnished with a final archaeological report describing the results of the monitoring and any subsequent required archaeological investigative work/excavation required, following the completion of all archaeological work on site and any necessary post-excavation specialist analysis. All resulting and associated archaeological costs shall be borne by the developer.

You are requested to send any further communications to this Department's Development Applications Unit (DAU) at manager.dau@npws.gov.ie, or to the following address:

The Manager, Development Applications Unit (DAU), Government Offices, Newtown Road, Wexford, Y35 AP90

Is mise, le meas



Joanne Lyons
Development Applications Unit
Administration

APPENDIX C

Annie Coady

From: Graham Clifford (Transport) <Graham.Clifford@transport.gov.ie>
Sent: Wednesday 25 January 2023 17:33
To: Annette Maguire
Cc: William Priestley (Transport); Stephen Riordan (Transport)
Subject: RE: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

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

Hi Annette,

Thank for your mail to the Department of Transport. Observations on Environmental Impact Assessments (EIA) are provided by the Marine Survey Office who are the maritime transport regulator for the safety, security, environmental protection and living and working conditions for vessels and ports in Ireland and Irish ships abroad.

Unfortunately, we are not in a position to provide observations on the Port of Waterford's EIA in relation to their proposed development. Under Act S.I. No. 353/2011 - Foreshore Regulations 2011, the Marine Survey Office are a prescribed body and observations will only be provided once an EIA is received through official channels under the Foreshore process.

Further details on applying for a foreshore application are available at the following link: How to apply for foreshore consent.

If you wish to discuss any of this further, please do not hesitate to contact me on 01 604 1510.

Regards,

Graham Clifford
Maritime Transport Division

An Roinn Iompair
Department of Transport

Lána Líosain, Baile Átha Cliath, D02 TR60
Leeson Lane, Dublin, D02 TR60

Graham.clifford@transport.gov.ie www.gov.ie/transport

From: Annette Maguire <amaguire@mores.ie>
Sent: Thursday 19 January 2023 12:14
To: Transport Department of Transport <info@transport.gov.ie>
Subject: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

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MOR Ref: E2068

By Email

Re: Cover Email Text - Environmental Impact Assessment (EIA) Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

To Whom It May Concern,

Please find attached an Environmental Impact Assessment (EIA) Consultation Document in relation to a proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m extension to the existing wharves at the Port of Waterford ('the Proposed Development').
We would welcome any feedback you many have on the scope of the EIA to be undertaken for the Proposed Development.
Any comments in relation to the attached consultation document should be sent to amaguire@mores.ie on or before the close of business on the **2nd March 2023**. Or alternatively, postal correspondence may be made out to the following address:

Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

To ensure that the response finds the relevant persons, in all correspondence please ensure to reference the project as:

- Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny.

Kind Regards,
Annette Maguire
Administrator

Working Hours:
Mon - Fri 9am – 1pm

for and on behalf of
Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y
+353 1 567 76 55
✉: *amaguire@mores.ie*
Web*: www.mores.ie*

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APPENDIX D

Annie Coady

From: Murphy, Siobhan <siobhan.murphy6@hse.ie>
Sent: Wednesday 1 March 2023 15:31
To: Annette Maguire
Subject: EIA Scoping – Consultation – Proposed Offshore Renewable Energy Berth on a 200-250m Quay Extension, Port of Waterford, Belview, Co Waterford
Attachments: EHIS 2993 Proposed Offshore Renewable Energy Berth, Belviw Port Co. Kilkenny.pdf

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Hi

Please find attached response from the HSE. I would be grateful if you would confirm receipt.

Regards

Siobhan

Siobhan Murphy
Principal Environmental Health Officer I Príomhoifigeach Sláinte Comhshaoil

Environmental Health Service I Seirbhís Sláinte Comhshaoil
Local Health Office, Cork Road, Waterford, X91 VX09 I Oifig Sláinte Áitiúil, Bóthar Corcaigh, Port Láirge, X91 VX09

051 842957 I 087 052 4170 I siobhan.murphy6@hse.ie

Need information and advice on COVID-19? Go to www.hse.ie/coronavirus

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Environmental Health Service
Local Health Office
Cork Road
Waterford

051 842955

Malone O'Regan Environmental (MOR),
Ground Floor – Unit 3 Bracken Business Park Bracken Road,
Sandyford Dublin 18,
D18 V32Y,

Email: enviro@mores.ie

Date: 1st March 2023

Proposed Development: *Proposed Offshore Renewable Energy Berth on a 200-250m Quay Extension (EIA Scoping)*

EHIS Reference: 2993

Dear Sir/Madam

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 the 23rd January 2023

- HSE South Emergency Management – David O'Sullivan
- Estates – Helen Maher/Stephen Murphy
- Director of National Health Protection – Eamonn O' Moore
- CHO – Kate Killeen White

If you have any queries regarding this report please contact Ms. Siobhan Murphy Principal Environmental Health Officer in the first instance.

Yours Sincerely

Siobhán Murphy

Ms. Siobhan Murphy
Principal Environmental Health Officer

Date: *27/02/2023*

EHIS Reference number: *2993*

Report to: Malone O'Regan Environmental (MOR), Ground Floor – Unit 3 Bracken Business Park Bracken Road, Sandyford Dublin 18, D18 V32Y, Email: enviro@mores.ie

Type of consultation*:* *EIA Scoping – Consultation – Proposed Offshore Renewable Energy Berth on a 200-250m Quay Extension*

Applicant: *Port of Waterford*

Location of proposed development: Port of Waterford, Belview, Co. Kilkenny

Proposal: The Port of Waterford are proposing to construct the Proposed Development as an ORE Berth in order to provide additional space at the Port to serve the future operation and maintenance of offshore windfarms. The proposed extension will also have capacity to facilitate other uses such as bulk carriers and cruise ships as required.

Details of the application were circulated to HSE stakeholders on the

- HSE South Emergency Management – David O'Sullivan
- Estates – Helen Maher/Stephen Murphy
- Director of National Health Protection – Eamonn O' Moore
- CHO – Kate Killeen White

General Introduction

The following documents should be taken into consideration when preparing the Environmental Impact Assessment Report:

- Guidelines on the information to be contained in EIS (2002), 187kb
- Advice Notes on Current Practice in the preparation of EIS (2003), 435kb
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment

https://www.housing.gov.ie/sites/default/files/publications/files/guidelines_for_planning_authorities_and_an_bord_pleanála_on_carrying_out_eia_-_august_2018.pdf

EU publication: Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report, EU, 2017

http://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf
Adoption of the Directive (2014/52/EU) in April 2014 initiated a review of the above guidelines. The draft new guidelines can be seen at:
http://www.epa.ie/pubs/consultation/reviewofdrafteisguidelinesadvicenotes

Generally, the Environmental Impact Assessment should examine all likely significant impacts and provide the following information for each:

a) Description of the receiving environment
b) The nature and scale of the impact
c) An assessment of the significance of the impact
d) Proposed mitigation measures

e) Residual impacts

Directive 2014/52/EU has an enhanced requirement to assess likely significant impacts on Population and Human Health. It is the experience of the Environmental Health Service (EHS) that impacts on human health are often inadequately assessed in EIAs in Ireland. It is recommended that the wider determinants of health and wellbeing are considered in a proportionate manner when considering the EIA. Guidance on wider determinants of health can be found at www.publichealth.ie
In addition to any likely significant negative impacts from the proposed development, any positive likely significant impacts should also be assessed.

The HSE will consider this **EAI Scoping** and will make comments on the methodology used for assessing the likely significant impacts and the evaluation criteria used in assessing the significance of the impact.

Background

The current commercial port comprises some 960m of marginal quays at Belview and 280m of layby quarry at Waterford City Centre, known as the Frank Cassin Wharf. The Frank Cassin Wharf is currently use for cruise vessels on an occasional basis. This Wharf in conjunction with the open and covered storage areas and warehouses within a 265ha area located at Belview have been designated as the Belview Port Zone. Port of Waterford operates with a focus on bulk, general cargoes and container handing through its licenced stevedores. This particular port can accommodate large vessels with ship drafts of up to 9m and lengths of up to 190m.

The proposed development is required in order to facilitate the Ports objective of being a key port for the ORE Sectors. The proposed Development will provide additional space at the Port primarily to provide more berthing space for ships serving the construction, maintenance and operation of offshore wind farms.

Proposed Development

The Port of Waterford are proposing to construct the Proposed Development as an ORE Berth in order to provide additional space at the Port to serve the future operation and maintenance of offshore windfarms. The proposed extension will also have capacity to facilitate other uses such as bulk carriers and cruise ships as required.

The proposed development is based on the current preliminary design the Proposed Development will comprise of a 200m – 250m extension to the existing wharves at the container/ Bulk Handling Terminal

The prosed development is outlined to be a continuation of the existing wharves and will comprise a reinforced concrete suspended deck supported on reinforced concrete beams and steel piles and a retaining structure to the rear. The works will require land reclamation covering an area of approx. 1.25ha. This are will be primarily filled with imported quarry rock. At this preliminary juncture, it is proposed that the fill materials will be sourced from local commercial quarries. At the stage is envisaged that any capital dredged materials will be reused as fill materials within the reclaimed area.

Generally, the Environmental Impact Assessment should examine all likely significant impacts and provide the following information for each:

a) Description of the receiving environment b) The nature and scale of the impact; c) An assessment of the significance of the impact; d) Proposed mitigation measures; e) Residual impacts.

Directive 2014/52/EU has an enhanced requirement to assess likely significant impacts on Population and Human Health. It is recommended that the wider determinants of health and wellbeing are considered in a proportionate manner when considering the EIA. Guidance on wider determinants of health can be found at www.publichealth.ie In addition to any likely significant negative impacts from the proposed development, any positive likely significant impacts should also be assessed.

This report only comments on Environmental Health Impacts of the EAI Scoping. It is based on an assessment of the correspondence submitted to this office.

The Environmental Health Service (EHS) recommends that the following matters are included and assessed in the EIA Scoping:

- Public Consultation
- Population and Human Health
- Water (Hydrology and Hydrogeology)
- Land and Soils
- Air, Dust and Odour
- Climate Change and Opportunity for Health Gain
- Noise and Vibration
- Waste Management
- Ancillary Facilities
- Cumulative Impacts Public Consultation

Noise

The potential impacts for noise and vibration from the proposed development on all noise sensitive locations must be clearly identified in the EIAR. The EIAR must also consider the appropriateness and effectiveness of all proposed mitigation measures to minimise noise and vibration.

Noise from the proposed development is likely to be significant during the construction phase of the project. It is recommended that baseline noise measurements should be taken as part of the EIA and these to include the existing night time noise environment within the residential areas. It is recommended that predictive noise monitoring and continuous noise monitoring be carried out during the construction phase of the proposed development particularly at noise sensitive locations including nursing homes, preschools and hospitals etc. and during night time hours.

Detailed mitigation measures should be identified during the Environmental Impact Assessment including a noise management plan implemented for the construction phase for drilling, blasting, grinding, crushing, transporting and excavating etc.

Air Quality

Due to the nature of the proposed construction works generation of airborne dust has the potential to have significant impacts on sensitive receptors. A **Construction Environmental Management Plan** (CEMP) should be included in the EIAR which details dust control and mitigation measures.

Ancillary Facilities

The EIAR should include details of the location of all site office, construction compound, fuel storage depot, sanitary accommodation and canteen, First Aid facilities, disposal of wastewater and the provision of a potable water supply to the site canteen.

Cumulative Impacts

All existing or proposed developments in the vicinity should be clearly identified in the EIAR. The impact on sensitive receptors of the proposed development combined with any other industry/ developments in the vicinity should be considered. The EIAR should include a detailed assessment of any likely significant cumulative impacts of the proposed renewable energy development.

Later Consents Required

A discharge Licence for the disposal of test water. Waste collection permit

Public Consultation

It is required that meaningful public consultation take place. The EIAR should record the public consultation process and demonstrate how the outcomes of the consultation were made part of the decision making process.

Traffic

The proposed development may result in increased levels of road traffic in strategic traffic routes during construction works. The proposed traffic management, modelling and monitoring measures identified in the scoping document should be fully implemented to minimise the impact on local residents and commuters.

All potential impacts in relation to traffic should be assessed in detail during the EIA including restriction of access routes to emergency vehicles, the elderly and less able to any healthcare facilities.

Vibration

It is recommended that continuous monitoring be carried out during the construction phase of the proposed development particularly at vibration sensitive locations. Detailed mitigation measures should be identified during the Environmental Impact Assessment

Air Quality

It is recommended that continuous air monitoring be carried out during the construction phase of the proposed development particularly of dust emitted from construction areas and impacts of traffic and exhaust emissions on air quality.

Detailed mitigation measures should be identified during the Environmental Impact Assessment to ensure air quality standards for Nitrogen Oxide are not breached and dust from transportation, material storage and handling does not become a public health nuisance. It is recommended to include baseline data on current N02 emissions along the route in the EIS.

Water

It is recommended that regular water quality monitoring/sampling of any surface water bodies, water courses, streams, ditches and groundwater be carried out during construction an

operational phases of the proposed development. Chemical and quantitative analysis of buoys located within Waterford Estuary should be continuously monitored against a broad range of parameters.

Detailed mitigation measures should be identified during the Environmental Impact Assessment including visual leak detection in relevant and vulnerable water bodies/courses including regular inspection of the pipeline monitoring and control equipment.

Waste

The safe storage and disposal of any waste materials arising from construction activities stockpiled onsite must be considered so as not to pollute groundwater's, watercourses and aquifers by wind, run-off or rain waters. As documented in the scoping report that it is expected that dredged sediments will be reused for reclamation during the construction phases however is requirement for disposal arises. It is recommended that excavated material be stored separately and re-instated in the same areas as soon as possible.

Mitigation measures should be put in place to prevent the erosion of soils to watercourses. It is recommended that a sampling and monitoring protocol in the event of discovering contaminated materials in the proposed development and should be outlined in the EIS and detail appropriate measures for the recovery or disposal of this material in accordance with the relevant waste management legislation.

Climate Factors

A flood impact assessment should be carried out to consider any potential flood impact associated with the proposed Development. This should account for climate change impacts to pluvial and fluvial flooding.

Waste Water

It is recommended that test water is disposed of in a controlled manner to an appropriate water body in accordance with a discharge licence as identified in the scoping document.

Environment & Health Submissions

It is recommended that a company procedure for dealing with public queries or complaints arising from the construction or operation phases of the proposed development should be implemented.



Siobhan Murphy
Environmental Health Officer
Principal Environmental Health Officer

All correspondence or any queries with regard to this report including acknowledgement of this report should be forwarded to:

Siobhan Murphy Principal Officer Environmental Health Service Local Health Office, Cork Road, Waterford, X91 VX09

Waterford.PEHO@hse.ie

Annie Coady

From: Murphy, Siobhan <siobhan.murphy6@hse.ie>
Sent: Thursday 2 March 2023 12:02
To: Annette Maguire
Subject: Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny
Attachments: ETHANE Aide Memoire 2.pdf; HSE South Emergency Management Consultation Report EMENV 155.pdf

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Hi

Please find attached response from HSE Emergency Management.

Regards

Siobhan

Siobhan Murphy
Principal Environmental Health Officer I Príomhoifigeach Sláinte Comhshaoil

Environmental Health Service I Seirbhís Sláinte Comhshaoil
Local Health Office, Cork Road, Waterford, X91 VX09 I Oifig Sláinte Áitiúil, Bóthar Corcaigh, Port Láirge, X91 VX09

051 842957 I 087 052 4170 I siobhan.murphy6@hse.ie

From: Annette Maguire <amaguire@mores.ie>
Sent: 19 January 2023 12:01
To: Environmental Health <environmental.health@hse.ie>
Subject: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

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MOR Ref: E2068

By Email

Re: Cover Email Text - Environmental Impact Assessment (EIA) Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

To Whom It May Concern,

Please find attached an Environmental Impact Assessment (EIA) Consultation Document in relation to a proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m extension to the existing wharves at the Port of Waterford ('the Proposed Development').
We would welcome any feedback you many have on the scope of the EIA to be undertaken for the Proposed Development.
Any comments in relation to the attached consultation document should be sent to amaguire@mores.ie on or before the close of business on the **2nd March 2023**. Or alternatively, postal correspondence may be made out to the following address:

Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

To ensure that the response finds the relevant persons, in all correspondence please ensure to reference the project as:

- Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny.

Kind Regards,
Annette Maguire
Administrator

Working Hours:
Mon - Fri 9am – 1pm

for and on behalf of
Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y
+353 1 567 76 55
✉: *amaguire@mores.ie*
Web*: www.mores.ie*

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EMH EMERGENCY MANAGEMENT HEALTH

Dial 999 / 112 – Request the service you require: An Garda Síochána, Ambulance Service and / or Fire and Rescue Service

WHEN YOU ARE CONNECTED TO THE REQUISITE SERVICE(S)

GIVE THE FOLLOWING INFORMATION **This is:_____Eircode_____** (Name, Telephone Number and Eircode Address of site) ***An incident has occurred at this site - standby for ETHANE message***	
E	
	Exact location of the incident
T	
	Type of incident, e.g.; fire, explosion, gas leak, etc
H	
	Hazards – current and potential
A	
	Access and Egress – what is the safest approach route for responding emergency services and where is your emergency services meeting point (RVP)
N	
	Number of casualties and their condition – specify adult / children if known
E	
	The emergency services present and required
N.B. If you require another emergency service stay on the line and repeat the steps again	



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EMH EMERGENCY MANAGEMENT HEALTH

HSE South Emergency Management Consultation Report

Report to	**Siobhan Murphy, PEHO, Waterford**	**Date**	**23rd Jan., 2023**
Type of consultation: EIS □ Scoping X Screening □ EIAR □ EPA □ Other (please specify):			
Authority	**HSE / EPA**		
Authority Reference Number	**EHIS 2993**		
EM Reference Number	**EMENV 155**		
Applicant	**Malone & O'Regan Environmental, Sandyford, Dublin 18, for Port of Waterford**		
Proposal	**Proposed Offshore Renewable Energy (ORE) Berth on a 200 m - 250 m Quay Extension and Ancillary Works, at Port of Waterford**		

HSE South Emergency Management Observations: Please be advised that the HSE South Emergency Management function does not have any specific observations to make with respect to this application. However, please note the following recommendations within the context of site operations:

1. Should an incident occur at the site and the site operator requires the assistance of the emergency services, the incident information should be provided in the `ETHANE` format (please see attached).
2. Emergency Services access to the site should be clearly identified. This should be undertaken via appropriate high visibility signage, i.e.; a green sign with a yellow border and white lettering citing the abbreviation RVP
3. The site should have a mechanism in place to account for personnel during an evacuation in order to provide the responding emergency services with an estimate of the number of people accounted and unaccounted for.
4. The site should identify any critical / vulnerable facilities within the geographical catchment area, such as hospitals, schools, nursing homes, etc, that could be directly or indirectly affected by an incident at the site.
5. Where the `off-site` impacts of an incident at the site affects a vulnerable cohort / population such as children within crèches, schools; patients / clients / residents within nursing homes, etc; the emergency services will require assistance from the site operator in determining the impact on the local community.
6. The site operator is encouraged to develop a business continuity plan that includes a plan for severe weather. For more advice on this, please see the Department of Business, Enterprise and Innovation, *Business Continuity Planning in Severe Weather.* https://dbei.gov.ie/en/Publications/Publication-files/Business-Continuity-Planning-in-Severe-Weather-Check-List-for-Businesses.pdf

All correspondence or any queries with regard to this report should be forwarded to Ms. Maryanne Horgan, Emergency Management Office, HSE South, Eye, Ear and Throat Hospital, Western Road, Cork, T12 WP62 or maryanne.horgan@hse.ie

APPENDIX E

Annie Coady

From: planning applications <planning.applications@failteireland.ie>
Sent: Monday 13 February 2023 12:15
To: Annette Maguire
Subject: RE: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth
Attachments: Fáilte Ireland EIAR Guidelines.pdf

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

Hello Annette,

Thank you for your email and the Environmental Impact Assessment (EIA) Consultation Document in relation to a proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m extension to the existing wharves at the Port of Waterford ('the Proposed Development').

Please see attached a copy of Fáilte Ireland's Guidelines for the Treatment of Tourism in an EIA, which you may find informative for the preparation of the Environmental Impact Assessment for the proposed project. The purpose of this report is to provide guidance for those conducting Environmental Impact Assessment and compiling an Environmental Impact Assessment Reports (EIAR), or those assessing EIARs, where the project involves tourism or may have an impact upon tourism. These guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines outlined in section 2.

Regards,

Yvonne

Yvonne Jackson
Product Development-Environment & Planning Support | Fáilte Ireland

88-95 Amiens Street, Dublin 1, D01 WR86
M +353 (0)86 0357590

Fáilte Ireland

LinkedIn | Twitter | YouTube | Facebook



From: Annette Maguire <amaguire@mores.ie>
Sent: Thursday 19 January 2023 12:20
To: planning applications <planning.applications@failteireland.ie>
Subject: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

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MOR Ref: E2068

By Email

Re: Cover Email Text - Environmental Impact Assessment (EIA) Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

To Whom It May Concern,

Please find attached an Environmental Impact Assessment (EIA) Consultation Document in relation to a proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m extension to the existing wharves at the Port of Waterford ('the Proposed Development').
We would welcome any feedback you many have on the scope of the EIA to be undertaken for the Proposed Development.
Any comments in relation to the attached consultation document should be sent to amaguire@mores.ie on or before the close of business on the **2nd March 2023**. Or alternatively, postal correspondence may be made out to the following address:

Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

To ensure that the response finds the relevant persons, in all correspondence please ensure to reference the project as:

- Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny.

Kind Regards,
Annette Maguire
Administrator

Working Hours:
Mon - Fri 9am – 1pm

for and on behalf of
Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
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+353 1 567 76 55
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Web*: www.mores.ie*

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Fáilte Ireland
National Tourism Development Authority

EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects



An tÚdarás Náisiúnta Forbartha Turasóireachta
Áras Fáilte, 88–95 Sráid Amiens
Baile Átha Cliath 1
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Éire

National Tourism Development Authority
Áras Fáilte, 88 - 95 Amiens Street
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Phone 1890 525 525
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Contents

1. Introduction 1
2. Background to this Document 1
3. Legislation and Statutory Guidance 2
4. Assessing Tourism 4
5. Guiding Principles of EIAR 5
6. Consideration of Competency and Qualifications 5
7. EIAR Requirements 5
   - Population and Human Health 7
   - Biodiversity 7
   - Land, Soils and Geology 7
   - Water 8
   - Air Quality and Climate 8
   - Noise and Vibration 8
   - Material Assets; Traffic and Transport 8
   - Cultural Heritage 8
   - Archaeology 8
   - Material Assets; Waste Management 8
   - Material Assets 8
   - Landscape 8
8. Sources of information on Tourism 9
   - Information available online 9

1. Introduction

Tourism is a growing sector and substantial part of the Irish Economy. It contributes to both urban and rural economies in every part of the country. The impact and interaction of tourism with the environment is complex and the assessment of environmental impacts is of utmost importance to creating a sustainable tourism economy and protecting the natural resources that are so often a tourism attraction.

The purpose of this report is to provide guidance for those conducting Environmental Impact Assessment and compiling an Environmental Impact Assessment Reports (EIAR), or those assessing EIARs, where the project involves tourism or may have an impact upon tourism. These guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines outlined in section 2.

This guidance document has been prepared by Cunnane Stratton Reynolds on behalf of Fáilte Ireland to update their EIA guidelines in line with changes in legislative requirements.

2. Background to this Document

Tourism is one of the largest and most important sectors of the economy, providing employment for approximately **260,000 people**, an economic contribution of **€8.4 billion**, and exchequer revenue of **€1.78 billion** in 2018, which helps fund other key public services.

In 2018 Ireland welcomed **10.6 million overseas visitors.**

Fáilte Ireland is the National Tourism Development Authority. Fáilte Irelands role is to support the tourism industry and work to sustain Ireland as a high-quality and competitive tourism destination. They provide a range of practical business supports to help tourism businesses better manage and market their products and services.

Fáilte Ireland also work with other state agencies and representative bodies, at local and national levels, to implement and champion positive and practical strategies that will benefit Irish tourism and the Irish economy.

Fáilte Ireland promotes Ireland as a holiday destination through a domestic marketing campaign (DiscoverIreland.ie) and manage a network of nationwide tourist information centres that provide help and advice for visitors to Ireland.

Tourism related projects cover a broad range of plans, programmes and developments, from the Wild Atlantic Way to a single hotel conversion. These guidelines apply to projects involving or impacting upon tourism. A tourism plan, strategy or programme where it is part of the statutory plan making process under the Planning and Development Acts (as amended), may be more appropriately assessed by a Strategic Environmental Assessment (SEA) as discussed in the next section.

It should be borne in mind that EIA is required where there is anticipated to be a significant impact on the environment, where tourism projects are of a prescribed type or meet thresholds identified below.

Where Natura 2000 Designated Sites are potentially affected by tourism development Appropriate Assessment must be carried out by the appropriate authority in accordance with Article 6(3) of the EU Habitats Directive.

3. Legislation and Statutory Guidance

Environmental Impact Assessment is a procedure that ensures that the environmental implications of decisions are taken into account before planning based decisions are made. The assessment results in a report, called an Environmental Impact Assessment Report (EIAR).

Legislation

These guidelines are produced under current EIAR legislative requirements, having regard to Directive 2011/92/EU (known as 'Environmental Impact Assessment' – EIA Directive), as amended by Directive EU 2014/52 which came into effect in May of 2017. These requirements were transposed into Irish Law on 1 September 2018 as most of the provisions of the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) came into effect. The principle of both Directives is to ensure that plans, programmes and projects likely to have significant effects on the environment are made subject to an environmental assessment, prior to their approval or authorisation.

Statutory Guidance

In response to the changes to the EIAR requirements under Directive EU 2014/52, the Environmental Protection Agency (EPA) developed Draft guidelines on the information to be contained in Environmental Impact Assessment Reports in August 2017. At the time of this document the guidelines have not been adopted from draft.

In addition to the EPA statutory guidance, the Department of Housing has produced Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment in August 2018.

The process of EIA is set out in the EPA EIAR Guidelines, which this document should be read in conjunction with and used as supplementary guidance to. The process for ascertaining whether an EIAR is required is known as ‘screening’ and the process to determine the breath and scope of an EIAR is known as ‘scoping’. Guidance on this can be found in Section 3.2 of the EPA Guidelines.

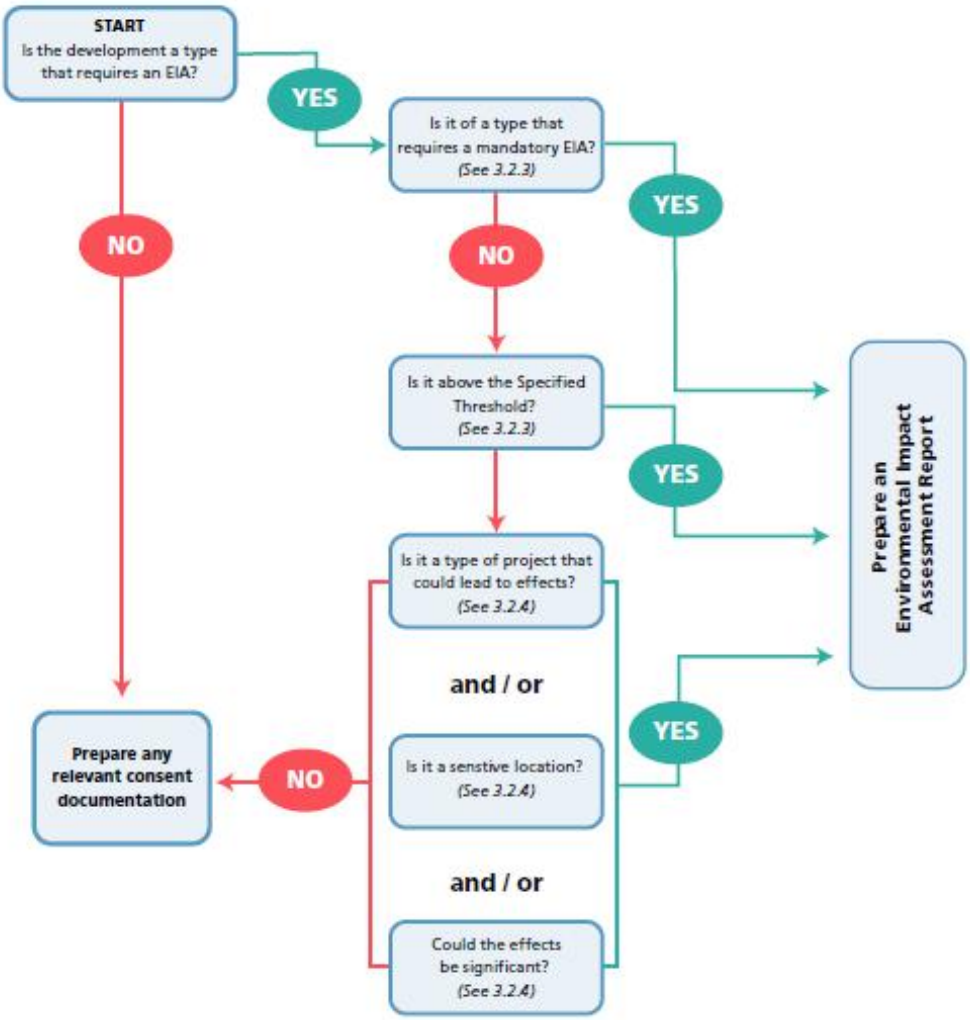
Screening

Through EIAR Screening, developments are either considered as requiring an EIAR due to the project type or because they exceed a threshold level. The screening process begins by establishing whether the proposal is a ‘project’ as understood by the Directive (as amended).

The prescribed development types and thresholds are set out in Annex I and II of the EIA Directive as transposed into Schedule 5 of the Planning and Development Regulations 2010-2018 (as amended). Development which do not exceed these thresholds but may require an EIAR are called sub threshold. Sub-Threshold considerations are outlined in Schedule 7 of European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) as transposed from Annex III of the Directive. The Guidelines on Environmental Impact Assessment Reports note that projects at first glance may not appear to come under the Schedule

but on closer examination when the process is further examined, they may do so because of the sensitivity or significance of the receiving environment etc. Sub threshold developments require an EIAR if they are likely to have significant environmental impacts and must undergo assessment for likely significant impacts through an EIAR screening report. The contents of a screening report for subthreshold development are contained in Annex III of the EIA Directive.

Figure 1: EIAR Screening Process



(Taken from Fig 3.2 of the EPA Guidelines)

Tourism locations should be identified as sensitive receptors in screening assessments for particular impacts, depending on scale and sensitivity, as they would in a full EIAR. Section 6 below can act as guidance for Screening Reports as well as for full EIAR.

The screening process for considering where an EIAR is necessary, is summarised below in Figure 1 (excerpted from Figure 3.2 of the EPA Guidelines).

Strategic Environmental Assessment (SEA) is a more strategic level of environmental assessment that examines plans, policies, objectives and programmes specifically rather than projects. For some tourism developments it may be more appropriate that they be examined through SEA, while individual projects or specific proposals are likely to be more assessed through EIAR. If a project is part of a plan, programme or policy/objective assessed by SEA there will still be a requirement for an EIAR for that development.

EIAR Scoping

Scoping an EIAR is an opportunity to look at the breadth of issues and ensure that any areas of possible significant impact are assessed. Identifying sensitivities and stakeholders should take account of tourism facilities and consider Fáilte Ireland in scoping requests where necessary.

4. Assessing Tourism

There is no legal definition of 'tourism' in Irish legislation. The UNWTO definition of sustainable tourism is *"Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities"* . This is widely accepted as a key definition of tourism as we move to a more sustainable future.

Tourism assessments are frequently carried out by economic consultants and by specific tourism consultants. It is always advisable, particular for tourism projects, that suitably qualified and experienced personnel are used to determine the impact of tourism related projects or to assess the impact of more general proposals on a tourism asset identified in a particular location. There is a requirement for EIAR under current legislation to contain a statement of competency within all EIAR documents, including screening and scoping reports.

Projects which involve a tourism element

Tourism projects are wide ranging and diverse. While there are some projects which cater to tourism and are easily identified as such - Hotels, Museums, etc. there are other projects where tourism is a key service or element, but which may not be immediately obvious - forest trails, community facilities and others. EIAR conducted for developments containing tourist elements should be completed in accordance with the current guidance from the EPA.

Projects which include a tourism element have potential particular environmental effects which differ from a non-tourism development. These impacts can be intermittent, event related, inconsistent, dependent on weather, temporal, temporary or seasonal. This is considered within the prescribed environmental topics for EIAR outlined in Section 7 below.

Projects which may have an impact upon tourism

While tourism projects may be diverse, the projects which can impact tourism are considerably more wide ranging, from large infrastructural developments to local energy developments. Disruption to or suppression of a tourist resource or amenity can have very local or more strategic impacts, directly or indirectly- for example energy projects in a rural area can have both a negative and positive impact in different regards. There can be temporary, periodic or even seasonal impacts occurring during construction or operational periods.

According to the Fáilte Ireland Tourism Facts 2018 Report, the most important factors in determining the attractiveness of tourism destinations for visitors to Ireland are;

- Beautiful Scenery and Unspoiled Environment
- Hospitality
- Safety
- Nature, Wildlife and Natural Attractions
- History and Culture
- Pace of Life

These factors used for the promotion of tourism in Ireland are also barometers of sensitivity to change in tourism sensitive or dominant locations where development may have an impact upon the tourism asset. The potential for development to impact these sensitivities, and the environmental criteria under which they can be considered, are identified in section 7 of the guidelines.

5. Guiding Principles of EIAR

As outlined in the EPA Draft EIAR Guidelines, the fundamental principles to be followed when preparing an EIAR, including screening and scoping, are:

- Anticipating, avoiding and reducing significant effects
- Assessing and mitigating effects
- Maintaining objectivity
- Ensuring clarity and quality
- Providing relevant information to decision makers
- Facilitating better consultation.

Environmental assessment should be undertaken in accordance with the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.

6. Consideration of Competency and Qualifications

As per Section 2.5 of the EPA Guidelines, EIAR is required to be completed by 'competent experts'.

Contributors to the preparation of environmental impact assessment reports, including screening and scoping assessments, should be qualified and competent. Sufficient expertise, in the relevant field of the project concerned, is required for the purpose of its examination by the competent authorities in order to ensure that the information provided by the developer is complete and of a high level of quality so that a full and proper assessment can be undertaken.

For tourism related projects, or projects likely to affect tourism assets, competent experts in the area of tourism should be utilised in the environmental assessment.

The competency of all involved in the production of an EIAR or any related report (eg. Screening and scoping) is required to be stated at the beginning of the EIAR report with further details as necessary in each following chapter.

Where tourism projects involve for example heritage or cultural components, input from heritage consultants, conservation architects, or historians may be required.

7. EIAR Requirements

The following are the key requirements for an EIAR under the current guidance. This is not a definitive list and should be read in conjunction with regulations.

- project description;
- assessment of alternatives considered;

- baseline assessment;
- impact assessment;
- cumulative impact
- interaction of impacts
- mitigation.

Project Description

Project descriptions are required to describe the whole project including site, scale, design and key factors. It is important that the EIAR and design team have a consistent understanding of the development description in full. The key requirements are outlined in section 3.5 of the EPA Guidelines however they identify the following;

- the location of the project
- the physical characteristics of the whole project
- the main characteristics of the operational phase of the project
- an estimate, by type and quantity, of the expected residues and emissions

The location of the project should include identifying key sensitive receptors (including tourism receptors). In the operational phase of the project any tourism based, or potentially tourism related activity, should be identified.

Assessment of Alternatives

The assessment of alternatives is a requirement of EIAR

Where tourism projects are location dependent the assessment of alternatives should consider alternative methods and technologies, detail the key considerations culminating in the selection of the design, the reasoning for these and the environmental effect of these decisions. This is particularly important for tourism projects which are often location tied. The developer is expected to consider reasonable alternatives. What is considered reasonable my vary from case to case.

Baseline Assessment

Baseline descriptions are evidence based, current descriptions of environmental characteristics with consideration of likely changes to the baseline environment evidenced in planning histories, unimplemented permissions, and applications pending determination. Baseline assessments should identify any tourism sensitivities in the zone of influence of a development. This zone of influence of a development is highly dependant on its **Context, Character, Significance,** and **Sensitivity**, as outlined in the Draft Guidelines. These characteristics apply to both the development and the environment.

For example, in a tourism context;

The location of sensitive tourism resources that are likely to be directly affected should be highlighted, and other premises which although located elsewhere, may be the subject of in combination impacts such as alteration of traffic flows or increased urban development.

The character of an area from a tourism perspective should be described and the principal types of tourism in the area. Where relevant, the specific environmental resources or attributes in the existing environment which each group uses or values should be stated and where relevant, indicate the time, duration or seasonality of any of those activities.

The significance of the tourism assets or activities likely to be affected should be highlighted. Reference to any existing formal or published designation or

recognition of such significance should be. Where possible the value of the contribution of such tourism assets and activities to the local economy should be provided.

If there are any significant concerns or opposition to the development known to exist among tourism stakeholders and interest groups, this should be highlighted. Identify, where possible, the particular aspect of the development which is of concern, together with the part of the existing tourism resource which may be threatened or impacted.

In addition, the baseline should include any methodologies employed in the study to obtain information, if particular databases are used to locate sensitive receptors they should be acknowledged. In relation to tourism information, the suggested information sources at the end of this document are a non-exhaustive list which may be of assistance in identifying tourism receptors.

Impact Assessment

The topics for consideration of impact are prescribed in the EIA Directive and transcribed into Irish law by the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018). Impact assessment should contain the likely significant effects of a development arising from both construction and operation of a development. Advice on describing the effects is contained within the Draft Guidelines and includes the **quality, significance, extent, probability, type** and **duration** of the effect, with particular descriptors for each. In describing effects upon tourism receptors these descriptors should take account of the particular aspects and sensitivities of tourism, for example a temporary annual effect from a development may have different impacts upon tourism if it falls at peak season rather than off-peak.

Impact assessment should be carried out as per EPA guidelines and the best practice for that prescribed topic. It may be considered appropriate to consider impact on tourism assets under the 'material assets' topic below.

Population and Human Health

The consideration of tourism projects within the Population and Human Health is extensive, with impacts ranging from rural employment population impacts of seasonal tourism, to the health impact of air pollution from increased traffic in urban areas.

The impact upon tourism can be considered within this section through the sensitivities of Hospitality, Safety and Pace of Life. Changes in population can impact the perception of pace of life or safety in a particular location. Impacts upon these issues in areas which rely heavily on tourism or have a particular sensitive tourism generator should be considered in this section.

Biodiversity

Particular tourist activities can have a significant impact upon biodiversity. Landscapes which are 'unspoiled' can be attractors of tourism. However, the disturbance to ecology must be managed to minimise impact. Biodiversity is also a tourism asset and should be protected as such from other development and should be provided for in proposals where possible.

Land, Soils and Geology

A link between tourism and this prescribed environmental factor, beyond the normal development impacts, is rare, however particular activities or facilities which use geological features may have an impact upon soils and geology, such as mountain biking trails, recreational uses of old quarries etc. Indirect impacts such as material use for extensive landscaping and public realm should also be considered.

Water

Tourism uses can be water intense, depending on development type. Recreational use of a surface water feature, water-based leisure centres etc have different impacts to standard development.

Air Quality and Climate

Tourism impact upon air quality is dependent on activity proposed and sensitivity of the location.

Noise and Vibration

A link between tourism and this prescribed environmental factor, beyond the normal development impacts, is rare, however the impact upon tourism of issues of noise and vibration can be significant. Construction adjoining hotels for example should consider the sensitivity of the development and ensure mitigation is in place.

Material Assets; Traffic and Transport

The different transport patterns associated with tourism activities is a key impact of tourism and should be considered especially for tourism projects. These produce temporal and seasonal changes on the norm and specialist consideration and interpretation should be given. Tourism proposals should, where possible, be well served by public transport and should be accessible by modes other than the car. The impact of traffic on tourism assets can be substantial and can vary in severity according to season, the weather, etc. The impact of construction traffic can be a particular concern in tourism sensitive areas in terms of noise pollution and visual impact. The construction programme of developments should work to avoid peak tourism periods in tourism areas and should consider planned or anticipated tourism events and festivals.

Cultural Heritage

Cultural heritage can be a key component of tourism projects and the impact of tourism on the maintenance of cultural heritage should be given the utmost consideration, whether positive or negative. As a tourism attraction, cultural heritage should be strongly considered in non-tourism developments and the impact upon tourism considered as a potential impact.

Archaeology

Archaeology can be of tourism interest and can be an attractive or key component of tourism projects. Archaeology can be a tourism attractor but is generally not kept in situ except in key cases which could also be considered under cultural heritage.

Material Assets; Waste Management

Tourism is a resource heavy activity and can impact waste streams and waste segregation. Impacts here should be considered strongly and with knowledge of the variation that arises from the particular tourist activity. Waste and Waste disposal issues can also impact the perception of an unspoiled environment, effecting tourism, which should be considered.

Material Assets

Material assets are utilities and infrastructure. Tourism itself could be considered a material asset as its impact upon the economy and the infrastructure in place to support it is a material consideration in assessing economic impact.

Landscape

The visual impact of a tourism development, especially in locations which are visually sensitive or renowned for their scenic or landscape beauty, should be considered carefully. A

development intended to utilise or enjoy a particular vista or environment should minimise impact upon that environment.

Major Accident and Natural Disaster

There is a requirement for tourist developments to describe expected significant effects on the environment of the proposed development's vulnerability to major accidents and/or natural disasters relevant to it. Where appropriate measures should be identified to prevent or mitigate the significant adverse effects of such accidents or disasters, including resulting from climate change, on the environment and detail the preparedness for the proposed response.

Interaction of Effects

Where two or more environmental impacts combine or interact they should be considered under the prescribed topics. It is best practice to provide a table of interactions within an EIAR or EIAR Screening Report.

Mitigation

Mitigation should follow the hierarchy of minimisation in descending order of preference- Avoid, Reduce, Remedy

Avoid sensitive tourism resources- such as views, access and amenity areas including habitats as well as historical or cultural sites and structures.

Reduce the exposure of sensitive resources to excessive environmental impact

Reduce the adverse effects to tourism land uses and patterns of activities, especially through interactions arising from significant changes in the intensity of use or contrasts of character or appearance.

Remedy any unavoidable significant residual adverse effects on tourism resources or activities.

Mitigation measures must be measurable and achievable within the bounds of the project.

Cumulative Impact

The cumulative impact is that of the project combined with any known likely project which will interact or compound an environmental impact.

Transboundary Impact

Transboundary impacts should be included in EIAR. In the case of tourism, especially international travel, the transboundary impacts may not be proximate to the EIAR site.

8. Sources of information on Tourism

Information available online

Fáilte Ireland

Fáilte Ireland offers detailed research analysis and insights into the Irish Tourism Industry. The National Tourism Development Authority has a portfolio of research across a number of areas including facts an figures, briefing papers and reports and visitor feedback. The Fáilte Ireland website has a dedicated research library which can be accessed here

Tourism Ireland

Tourism Ireland is responsible for marketing the island of Ireland overseas as a holiday and business tourism destination. Tourism Ireland publishes a range of research documents including; visitor facts and figures, seasonal updates and industry insights which are accessible here

Local Authorities

Local Authorities are an invaluable source of information. They produce tourism strategies and audits of tourism assets within their jurisdiction. Local authorities will also produce landscape and seascape studies. Protected views and prospects as well as the record of protected structures and other designated protected buildings are contained within the Statutory Development Plans.

Regional Authorities

Regional Authorities can also be consulted on high level strategic tourism and potential Regional Spatial and Economic Strategies (RSESs) should be consulted.

Central Statistics Office

The Central Statistics Office (CSO) is Ireland's national statistical office and their purpose is to impartially collect, analyse and make available statistics about Ireland's people, society and economy. The Tourism and Travel Section of the Central Statistics Office is the major source for tourism statistics in Ireland and is updated regularly.

APPENDIX F

Annie Coady

From: Donal O'Caoimh <Donal.OCaoimh@gasnetworks.ie>
Sent: Monday 30 January 2023 10:28
To: Annette Maguire
Subject: RE: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

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Hi Annette,

GNI have no comment to make on this proposal. Our closest gas pipeline is approx. 1.3km from the site.

Regards,

Dónal Ó Caoimh | *Senior Pipeline Safety Engineer*

Gas Networks Ireland
P.O. Box 51,Gasworks Road, Cork, Ireland

T +353 21 4534003 | **M** +353 87 2841209
E Donal.OCaoimh@gasnetworks.ie

gasnetworks.ie | Find us on Twitter

Gas Networks Ireland

From: Annette Maguire <amaguire@mores.ie>
Sent: Thursday 19 January 2023 12:24
To: DIG <Dig@gasnetworks.ie>
Cc: Networksinfo <Networksinfo@gasnetworks.ie>
Subject: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

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MOR Ref: E2068

By Email

Re: Cover Email Text - Environmental Impact Assessment (EIA) Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

To Whom It May Concern,

Please find attached an Environmental Impact Assessment (EIA) Consultation Document in relation to a proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m extension to the existing wharves at the Port of Waterford ('the Proposed Development').

We would welcome any feedback you many have on the scope of the EIA to be undertaken for the Proposed Development.
Any comments in relation to the attached consultation document should be sent to amaguire@mores.ie on or before the close of business on the **2nd March 2023**. Or alternatively, postal correspondence may be made out to the following address:

Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

To ensure that the response finds the relevant persons, in all correspondence please ensure to reference the project as:

- Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny.

Kind Regards,
Annette Maguire
Administrator

Working Hours:
Mon - Fri 9am – 1pm

for and on behalf of
Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y
+353 1 567 76 55
✉: *amaguire@mores.ie*
Web: *www.mores.ie*

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Warning: All files in our office are regularly scanned for viruses, nonetheless, it is the responsibility of the recipient to scan all incoming email messages and attached files before opening.

Tá an fhaisnéis á seachadadh dírithe ar an duine nó ar an eintiteas chuig a bhfuil sí seolta amháin agus féadfar ábhar faoi rún, faoi phribhléid nó ábhar atá íogair ó thaobh tráchtála de a bheith mar chuid de. Tá aon athsheachadadh nó scaipeadh den fhaisnéis, aon athbhreithniú ar nó aon úsáid eile a bhaint as, nó aon ghníomh a dhéantar ag brath ar an bhfaisnéis seo ag daoine nó ag eintitis nach dóibh siúd an fhaisnéis seo, toirimiscthe agus féadfar é a bheith neamhdhleathach. Níl Líonraí Gáis Éireann faoi dhliteanas maidir le seachadadh iomlán agus ceart na faisnéise sa chumarsáid seo nó maidir le haon mhoill a bhaineann léi. Ní ghlacann Líonraí Gáis Éireann le haon dliteanas faoi ghnímh nó faoi iarmhairtí bunaithe ar úsáid thoirmiscthe na faisnéise seo. Níl Líonraí Gáis Éireann faoi dhliteanas maidir le seachadadh ceart agus iomlán na faisnéise sa chumarsáid seo nó maidir le haon mhoill a bhaineann léi. Má fuair tú an teachtaireacht seo in earráid, más é do thoil é, déan teagmháil leis an seoltóir agus scrios an t-ábhar ó gach aon ríomhaire.
Féadfar ríomhphost a bheith soghabhálach i leith truaillithe, idircheaptha agus i leith leasaithe neamhúdaraithe. Ní ghlacann Líonraí Gáis Éireann le haon fhreagracht as athruithe nó as idircheapadh a rinneadh ar an ríomhphost seo i ndiaidh é a sheoladh nó as aon dochar do chórais na bhfaighteoirí déanta ag an teachtaireacht seo nó ag a ceangaltáin. Más é do thoil é, tabhair faoi deara chomh maith go bhféadfar monatóireacht a dhéanamh ar theachtaireachtaí chuig nó ó Líonraí Gáis Éireann chun comhlíonadh le polasaithe agus le caighdeáin Líonraí Gáis Éireann a chinntiú agus chun ár ngnó a chosaint. Líonraí Gáis Éireann cuideachta ghníomhaíochta ainmnithe, faoi theorainn scaireanna, atá corpraithe in Éirinn leis an uimhir chláraithe 555744 agus a tá hoifig chláraithe ag Bóthar na nOibreacha Gáis, Corcaigh, T12 RX96.

Go raibh maith agat as d'aird a thabhairt.

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Thank you for your attention.

APPENDIX G

Annie Coady

From: GSI Planning <GSIPlanning@GSI.ie>
Sent: Tuesday 28 February 2023 09:03
To: Annette Maguire
Cc: Clare Glanville; GSI Planning
Subject: RE: EIS 23/20 Proposed Offshore Renewable Energy Berth Port of Waterford, Co. Kilkenny
Attachments: 23_20 Proposed offshore renewable energy berth.pdf; GSI datasets relevant to EIA & SEA_20210421.pdf

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Dear Annette,

With reference to your email received on the 19 February 2023, concerning the Proposed Offshore Renewable Energy (ORE) Berth, Port of Waterford, Co. Kilkenny, please find attached response and dataset sheet from Geological Survey Ireland.

If you have any further queries or if we can be of further assistance, please do not hesitate to contact me Trish Smullen, or my colleague Clare Glanville at GSIPlanning@gsi.ie.

Yours sincerely,

Trish Smullen
Geological Survey Ireland

From: GSI Planning <GSIPlanning@GSI.ie>
Sent: Thursday 19 January 2023 15:18
To: Clare Glanville <Clare.Glanville@decc.gov.ie>; Sophie O'Connor <Sophie.OConnor@decc.gov.ie>; Monica Lee <Monica.Lee@gsi.ie>; Taly Hunter Williams <Taly.HunterWilliams@gsi.ie>; Sean Cullen <Sean.Cullen@gsi.ie>; Charise McKeon <Charise.McKeon@gsi.ie>; Jim Hodgson <jim.hodgson@gsi.ie>; Eoin McGrath <Eoin.McGrath@gsi.ie>; Trish Smullen <Trish.Smullen@gsi.ie>
Cc: GSI Planning <GSIPlanning@GSI.ie>
Subject: EIS 23/20 - EIA Consultation Document - Proposed Offshore Renewable Energy Berth

EIS 23/20

EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth, Port of Waterford, Belview, Co Kilkenny. Request for observations by Malone O'Regan Environmental. Document is enclosed.

Regards,

John

From: Annette Maguire <amaguire@mores.ie>
Sent: Thursday 19 January 2023 11:59
To: Taly Hunter Williams <Taly.HunterWilliams@gsi.ie>
Subject: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

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MOR Ref: E2068

By Email

Re: Cover Email Text - Environmental Impact Assessment (EIA) Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

To Whom It May Concern,

Please find attached an Environmental Impact Assessment (EIA) Consultation Document in relation to a proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m extension to the existing wharves at the Port of Waterford ('the Proposed Development').
We would welcome any feedback you many have on the scope of the EIA to be undertaken for the Proposed Development.
Any comments in relation to the attached consultation document should be sent to amaguire@mores.ie on or before the close of business on the **2nd March 2023**. Or alternatively, postal correspondence may be made out to the following address:

Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

To ensure that the response finds the relevant persons, in all correspondence please ensure to reference the project as:

- Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny.

Kind Regards,
Annette Maguire
Administrator

Working Hours:
Mon - Fri 9am – 1pm

for and on behalf of
Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y
+353 1 567 76 55
✉: *amaguire@mores.ie*
Web*: www.mores.ie*

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Tá eolas sa teachtaireacht leictreonach seo (agus b'fhéidir sa chomhaid ceangailte leis) a d'fhéadfadh bheith príobháideach nó faoi rún. Is le h-aghaidh an duine/na ndaoine nó le h-aghaidh an aonáin atá ainmnithe thuas agus le haghaidh an duine/na ndaoine sin amháin atá an t-eolas. Murab ionann tusa agus an té a bhfuil an teachtaireacht ceaptha dó bíodh a fhios agat nach gceadaítear nochtadh, cóipeáil, scaipeadh nó úsáid an eolais agus/nó an chomhaid seo. Más trí earráid a fuair tú an teachtaireacht leictreonach seo cuir, más é do thoil é, an té ar sheol an teachtaireacht ar an eolas láithreach. Deimhnítear leis seo freisin nár aims odh víreas sa phost seo tar éis a scanadh.

An Roinn Comhshaoil,
Aeráide agus Cumarsáide
Department of the Environment,
Climate and Communications

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

28 February 2023

Re: Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny

Your Ref: E2068
Our Ref: 23/20

Dear Sir/Madam,

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 19 February 2023, concerning the Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny, 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 audits for Co. Waterford and Co.Kilkenny were completed in 2012 and 2007 respectively. The full report details can be found here and here. **Our records show that there are no CGSs in the vicinity of the proposed offshore renewable energy berth.**

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 an aquifer classed as a 'Regionally Important Aquifer - Fissured bedrock' underlies the proposed development.

The Groundwater Vulnerability map indicates the 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.

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 Survey Ireland has completed Groundwater Protection Schemes (GWPSs) in partnership with Local Authorities, and there is now national coverage of GWPS mapping. A Groundwater Protection Scheme provides guidelines for the planning and licensing authorities in carrying out their functions, and a framework to assist in decision-making on the location, nature and control of developments and activities in order to protect groundwater. **The Groundwater Protection Response overview and link to the main reports is here: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/projects/protecting-drinking-water/what-is-drinking-water-protection/county-groundwater-protection-schemes/Pages/default.aspx**

Geological Mapping

Geological Survey Ireland maintains online datasets of bedrock and subsoils geological mapping that are reliable and accessible. Our subsoils or Quaternary maps provide information regarding the type of sediments present in the subsoils and the geomorphology of the deposits. We would encourage you to use these data which can be found here, in your future assessments.

Please note we have recently launched QGIS compatible bedrock (100K) and Quaternary geology map data, with instructional manuals and videos. This makes our data more accessible to general public and external stakeholders. QGIS compatible data can be found in our downloadable bedrock 100k .zip file on the Data & Maps section of our website.

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.

Geohazards

Geohazards can cause widespread damage to landscapes, wildlife, human property and human life. In Ireland, landslides, flooding and coastal erosion are the most prevalent of these hazards. We recommend that geohazards be taken into consideration, especially when developing areas where these risks are prevalent, and we encourage the use of our data when doing so.

Geological Survey Ireland has information available on landslides in Ireland via the National Landslide Database and Landslide Susceptibility Map both of which are available for viewing on our dedicated Map Viewer. Associated guidance documentation relating to the National Landslide Susceptibility Map is also available.

Geological Survey Ireland also engaged in a national project on Groundwater Flooding. The data from this project may be useful in relation to Flood Risk Assessment (FRA) and management plans, and is described in more detail under 'Groundwater' above.

Coastal Vulnerability while seen as a potential geohazard, is discussed in more detail under our marine and coastal unit information below.

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 development are sustainably sourced from properly recognised and licensed facilities, and that consideration of future resource sterilization is considered.

Geochemistry of soils, surface waters and sediments
Geological Survey Ireland provides baseline geochemistry data for Ireland as part of the Tellus programme. Baseline geochemistry data can be used to assess the chemical status of soil and water at a regional scale and to support the assessment of existing or potential impacts of human activity on environmental chemical quality. Tellus is a national-scale mapping programme which provides multi-element data for shallow soil, stream sediment and stream water in Ireland. At present, mapping consists of the border, western and midland regions. Data is available at https://www.gsi.ie/en-ie/data-and-maps/Pages/Geochemistry.aspx.

Marine and Coastal Unit
Our marine environment is hugely important to our bio-economy, transport, tourism and recreational sectors. It is also an important indicator of the health of our planet. Geological Survey Ireland's Marine and Coastal Unit in partnership with the Marine Institute, jointly manages INFOMAR, Ireland's national marine mapping programme; providing key baseline data for Ireland's marine sector. The programme delivers a wide range of benefits to multi-sectoral end-users across the national blue economy with an emphasis on enabling our stakeholders. Demonstrated applications for the use of INFOMAR's suite of mapping products include Shipping & Navigation, Fisheries Management, Aquaculture, Off-shore Renewable Energies, Marine Leisure & Tourism and Coastal Behaviour.

INFOMAR also produces a wide variety of seabed mapping products that enable public and stakeholders to visualize Ireland's seafloor environment https://www.infomar.ie/maps/downloadable-maps/maps. Story maps have also been developed providing a different perspective of some of the bays and harbors of the Irish coastline. We would therefore recommend use of our Marine and Coastal Unit datasets available on our website and Map Viewer.

The Marine and Coastal Unit also participate in coastal change projects such as CHERISH (Climate, Heritage and Environments of Reefs, Islands, and Headlands) and are undertaking mapping in areas such as coastal vulnerability and coastal erosion. Further information on these projects can be found here.

Coastal Vulnerability Index
Geological Survey Ireland is undertaking a new coastal vulnerability mapping initiative. Maps produced by this project will provide an insight into the relative susceptibility of the Irish coast to adverse impacts of sea-level rise through the use of a Coastal Vulnerability Index (CVI). Currently the project is being carried out on the east coast and will be rolled out nationally, detailed information and maps are available here. These index-based maps will offer a simple, easy visual representation of sensitive areas based on robust methods and conceptualised metrics from latest research, adapted to the Irish context. This will enable coastal managers to prioritize or concentrate efforts on adaptation.

Guidelines
The following guidelines may also be of assistance:

- Institute of Geologists of Ireland, 2013. Guidelines for the Preparation of the Soils, Geology and Hydrogeology Chapters of Geology in Environmental Impact Statements.

- EPA, 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)

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,





Dr. Clare Glanville
Senior Geologist
Geological Survey Ireland

Trish Smullen
Geoheritage and Planning Programme
Geological Survey Ireland

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

An Roinn Comhshaoil, Aeráide agus Cumarsáide
Department of the Environment, Climate and Communications

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

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 / Limitations	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.

APPENDIX H

Annie Coady

From: Cormac Goulding <Cormac.Goulding@fisheriesireland.ie>
Sent: Wednesday 1 March 2023 09:49
To: Annette Maguire
Cc: Donnachadh Byrne; Oliver McGrath
Subject: FW: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth
Attachments: IFI_Response_ORE Berth Port of Wd.pdf

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

Description: Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works

Location: Port of Waterford, Co. Kilkenny

Hi Annette,

Please find attached a submission from Inland Fisheries Ireland in response to the EIAR Scoping Request for the above proposed development.

Regards,

Cormac

Cormac Goulding
Fisheries Environmental Officer

Cormac.Goulding@fisheriesireland.ie • +353 (0)52 6180 055 • www.fisheriesireland.ie • E91 RD25



Help us protect Ireland's rivers, lakes and coastlines by reporting illegal fishing, water pollution or invasive specie
Our confidential phone number is 0818 34 74 24, which is open 24 hours a day / 7 days a week.

To read our Privacy Policy and Email Disclaimer Notice, Please visit www.fisheriesireland.ie

From: Environmental Planning <environmentalplanning@fisheriesireland.ie>
Sent: Monday 23 January 2023 16:02
To: Cormac Goulding <Cormac.Goulding@fisheriesireland.ie>
Subject: FW: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

From: info <info@fisheriesireland.ie>
Sent: Thursday 19 January 2023 12:38

To: Environmental Planning <environmentalplanning@fisheriesireland.ie>
Subject: FW: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

---

From: Annette Maguire <amaguire@mores.ie>
Sent: Thursday 19 January 2023 11:40
To: info <info@fisheriesireland.ie>
Subject: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

MOR Ref: E2068

By Email

Re: Cover Email Text - Environmental Impact Assessment (EIA) Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

---

To Whom It May Concern,

Please find attached an Environmental Impact Assessment (EIA) Consultation Document in relation to a proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m extension to the existing wharves at the Port of Waterford ('the Proposed Development').
We would welcome any feedback you many have on the scope of the EIA to be undertaken for the Proposed Development.
Any comments in relation to the attached consultation document should be sent to amaguire@mores.ie on or before the close of business on the **2nd March 2023**. Or alternatively, postal correspondence may be made out to the following address:

Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

To ensure that the response finds the relevant persons, in all correspondence please ensure to reference the project as:

- Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny.

Kind Regards,
Annette Maguire
Administrator

Working Hours:
Mon - Fri 9am – 1pm

for and on behalf of
Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y
+353 1 567 76 55
✉: *amaguire@mores.ie*
Web: *www.mores.ie*

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Iascach Intíre Éireann
Inland Fisheries Ireland

Ms. Annette Maguire,
Malone O'Regan Environmental
Ground Floor – Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

1 March 2023

Re:	EIAr Scoping Request
Description:	Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works,
Location:	Port of Waterford, Co. Kilkenny

Via Email to: amaguire@mores.ie

Dear Ms. Maguire,

Inland Fisheries Ireland (IFI) is the statutory authority tasked under section 7(1) of the Inland Fisheries Act 2010 (No. 10 of 2010) with responsibility for the protection, management, and conservation of the inland fisheries resource. In respect of the statutory ecological surveys proposed by MKO, IFI wish to make the following observations:

The proposed development is located in the Lower Suir Estuary, which has a current ecological status of *Moderate*, having deteriorated from a status of *Good* in the most recent EPA report. It is considered *At Risk* of not reaching Good Status within the current RBMP cycle.

Article 5 of the Surface Water Regulations (SI 272 of 2009) states that there should be no deterioration in Ecological Status. Article 28(2) of the Regulations states that a surface water body whose status is determined to be less than Good shall be restored to at least Good status. The proposed surveys / reports must demonstrate how this project would cause no deterioration to the above surface water bodies and is consistent with their restoration to good ecological status.

During the construction and operational phases, the applicant should adhere to the recommendations and guidelines outlined in IFI's *Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters* 2016. A copy of this document is available here.

IFI requests that the following assessments be provided:

- Baseline ecological assessments of freshwater, estuarine or marine habitats potentially affected by the proposed development, including fish species as well as other biological and physico-chemical surveys
- An assessment of the potential adverse effects of the proposed works on all relevant aquatic receptors, including fish.
- An assessment of the impact on the conservation objectives of species listed as qualifying interests in the Barrow – Nore SAC, which includes Lamprey species and Atlantic Salmon

- An assessment of the cumulative effects of the proposed development along with other existing or approved projects
- The proposed mitigation measures to prevent deleterious matter from adjacent waters

Proposed mitigation measures must ensure that the storage, management and conveyance of materials on site does not permit deleterious matter to reach surface waters directly or indirectly.

There should be no interference with the bed, gradient, profile or alignment of watercourses without the prior notification and the written agreement of Inland Fisheries Ireland. Proposed instream works must be accompanied by a site-specific method statement provided to IFI. The applicant should provide a commitment to provide these at least ten working days before works commence. Written approval from IFI should be obtained before works proceed.

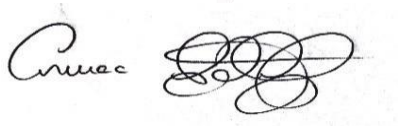
Among the sources which may be used for fish ecological status and data are http://wfdfish.ie/ and https://opendata-ifigis.hub.arcgis.com/datasets/IFIgis::water-framework-directive-fish-ecological-status-2008-2021. In addition to environmental assessments (EIAR, NIS etc.), the application for planning should include a Construction Environmental Management Plan (CEMP), and a Surface Water Management Plan (SWMP).

Before works commence the applicant or the appointed contractor should provide contact details for the Ecological Clerk of Works to Inland Fisheries Ireland. In the event of any non-compliant discharge or incident which threatens an aquatic zone, IFI must be informed immediately at the contact details below.

At all times the precautionary principle should be applied throughout the development. Records should be kept of biological and chemical monitoring of undertaken before and during the construction phase and after the works, and during the operational phase for the development. Records should also be kept of inspections of mitigation measures. These records should be made available upon request to any authorised person as defined under the Local Government (Water Pollution) Acts.

Future correspondence or any requests for clarification can be sent via email to cormac.goulding@fisheriesireland.ie or by post to the address below.

Yours sincerely,



Cormac Goulding
Fisheries Environmental Officer
South-Eastern River Basin District

CC: Donnachadh Byrne, Senior Fisheries Environmental Officer
Oliver McGrath, Fisheries Environmental Officer

APPENDIX I

Irish Aviation Authority
The Times Building
11–12 D'Olier Street
Dublin 2, D02 T449,
Ireland

Údarás Eitlíochta na hÉireann
Foirgneamh na hAmanna
11–12 Sráid D'Olier
Baile Átha Cliath 2, D02 T449,
Éire

T: +353 1 671 8655
F: +353 1 679 2934
www.iaa.ie

31st January 2023

Ms. Annette Maguire
Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road
Sandyford
Dublin 18
D18 V32Y

E2068
Received
03/02/2023

Reference: ***EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth***
Applicant: ***Port of Waterford***

Description: Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m extension to the existing wharves at the Port of Waterford ('the Proposed Development'). We would welcome any feedback you many have on the scope of the EIA to be undertaken for the Proposed Development at Port of Waterford Co. Kilkenny.

Dear Ms. Maguire,

Thank you for your letter/scoping report and request for comments in relation to the proposed Quay Extension Port of Waterford, Belview, Co Kilkenny. The development appears to be approximately 8km North of Waterford Airport, as such, it is recommended that the developer engage directly with Waterford airport to make them aware of the proposal and ensure appropriate screening from an aviation safety perspective.

Your sincerely

P.P. G. O'Leary

Deirdre Forrest
Corporate Affairs

Bord Stiúrthóirí/Board of Directors
Peter Kearney (Príomhfheidhmeannach/Chief Executive)
Cian Blackwell, Marie Bradley, Ernie Donnelly,
Gerry Lumsden, Joan McGrath, Diarmuid Ó Conghaile,
Eimer O'Rourke

Oifig Chláraithe:
Foirgneamh na hAmanna, 11-12 Sráid D'Olier
Baile Atha Cliath 2, D02 T449, Éire
Uimhir Chláraithe: 211082. Áit Chláraithe: Éire
Cuideachta Dliteanais Theoranta

Registered Office:
The Times Building, 11-12 D'Olier Street
Dublin 2, D02 T449, Ireland
Registered No. 211082. Registered in Ireland
A Limited Liability Company

APPENDIX J

Amelia Keane

From: Sarah Kelly <Sarah.Kelly@kilkennycoco.ie>
Sent: Tuesday 4 April 2023 14:16
To: Annette Maguire
Subject: RE: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth
Attachments: IR 632 PDF.pdf

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Hi Annette,

Please see attached submission from Kilkenny County Council.

I have passed your email to Claire Kelly (Acting) Senior Planner with regards to a meeting. If you would like to contact Claire in the future her email is claire.kelly@kilkennycoco.ie.

Kind Regards,
Sarah Kelly.

From: Annette Maguire <amaguire@mores.ie>
Sent: Tuesday 4 April 2023 09:48
To: Sarah Kelly <Sarah.Kelly@kilkennycoco.ie>
Cc: Amelia Keane <akeane@mores.ie>
Subject: FW: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

Hi Sarah,

Following on from your email dated 28th February below, could you revert back to me with an update on the status of your submission, and what your availability would be for a meeting?

Many thanks,

Kind Regards,
Annette Maguire
Administrator

Working Hours:
Mon - Fri 9am – 1pm

for and on behalf of
Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y
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✉: amaguire@mores.ie
Web: www.mores.ie

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From: Sarah Kelly <Sarah.Kelly@kilkennycoco.ie>
Sent: Tuesday, February 28, 2023 10:16 AM
To: Annette Maguire <amaguire@mores.ie>
Subject: FW: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

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Hi Annette,

Would it be acceptable to have an extension of a 3 week period on the submission deadline date of 2nd March 2023?

There has been a delay in getting our referrals out to the statutory bodies and we would like to give the statutory bodies the time to respond.

Kind Regards,
Sarah Kelly.

From: Annette Maguire <amaguire@mores.ie>
Sent: Thursday 19 January 2023 11:47
To: Planning - County Council <planning@kilkennycoco.ie>
Subject: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

MOR Ref: E2068

By Email

Re: Cover Email Text - Environmental Impact Assessment (EIA) Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

To Whom It May Concern,

Please find attached an Environmental Impact Assessment (EIA) Consultation Document in relation to a proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m extension to the existing wharves at the Port of Waterford ('the Proposed Development').
We would welcome any feedback you many have on the scope of the EIA to be undertaken for the Proposed Development.
Any comments in relation to the attached consultation document should be sent to amaguire@mores.ie on or before the close of business on the **2nd March 2023**. Or alternatively, postal correspondence may be made out to the following address:

Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

To ensure that the response finds the relevant persons, in all correspondence please ensure to reference the project as:

- Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny.

Kind Regards,
Annette Maguire
Administrator

Working Hours:
Mon - Fri 9am – 1pm

for and on behalf of
Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
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Register for our free service **Kilkenny Alerts** at http://alerts.kilkennycoco.ie



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The applicant is advised of the opinion of Kilkenny County Council in response to Scoping Document as part of EIAR Scoping process for a EIA Scoping Report for proposed off shore renewable Energy Berth on a 200-250m Quay extension at Belview Port

The applicant shall formally consult inter-alia the following bodies:

External Bodies

- Irish Water
- TII
- Inland Fisheries
- HSE
- Bord Failte
- An Taisce
- Dept of the Environment, Climate and Communications
- Dept of Housing, Local Government and Heritage
- Dept of Agriculture Food and Marine
- National Monuments Service
- National Parks and Wildlife Service
- Waterford County Council

With regard to the EIAR Scoping the following should be considered:

Kilkenny County Council
Planning Department:

- The applicant is advised to fully comply with the requirements of Directive 2014/52/EU on the effects of certain public and private projects on the Environment (EIA Directive) and any resulting amendments to the Planning and Development Act 2000 as amended and the Planning and Development Regulations 2001, as amended. The applicants should also comply with the requirements of the '*Guidelines for Planning Authorities and An Bord Pleanala on carrying out Environmental Impact Assessment*' and any updates subsequent to the above Directive.

- The site is located within SAC and the impact of the development on the SAC will need to assessed.

- The applicant shall detail the exact activities which will be carried out at the extended port facility.

Road Design Section:
With regard to the EIAR Scoping the following road and transportation aspects should be considered:

- The completion of a traffic Impact Assessment is noted to be referenced in the EIAR scoping. In terms of the operational phase the applicant will need to clarify if for example replacement turbine components or the like will require to use the road network or perhaps will be brought directly in and out to the off shore farms on ships by passing the requirement to use the road network. If components do require to use the road network then this needs to be detailed and referenced.
- Parking Assessment in terms of numbers of persons employed etc and how they will be catered for.

- Outline Construction and Environmental Management Plan (OCEMP) Likely more for the planning application itself but aspects may need to be considered.
- Construction Traffic Management Plan. The detail for the planning application but it will form part of the considerations for the construction phase.

Environment Section

- **Flooding –** The applicant shall carry out a flood impact assessment for the proposed development. The assessment shall consider fluvial and pluvial flooding as part of the assessment.

- **Noise/Vibration** The applicant shall carry out a noise impact assessment for the potential noise pollution which may occur both during the construction and operational phase of the development. Noise & dust monitoring locations shall also be submitted as part of the overall assessment. Any mitigation and residual affects shall also be outlined.
  i. The applicant shall also confirm the suitability of the water being proposed for the item of work involving dust suppression.
  ii. The applicant shall insure that all activities at the site shall not give rise to noise levels off site at the nearest inhabited dwellings, which exceed the following sound pressure limits;
    - DAY: 45dB(A) L_{A90} (10 minutes).
    - NIGHT: 43dB(A) L_{A90} (10 minutes).

Dredging/Land Reclamation – the applicant shall carry out an assessment to investigate an environmental impact if any dredging of material or land reclamation is required at the river bank along with a complete scope of works and sediment control techniques to be implemented during construction. Sediment sampling and chemistry analysis shall be undertaken and sent to a suitably accredited laboratory for testing. These test results shall be analysed before being considered for re-use or removed off site for onwards recovery.

- **Surface Water**

The applicant shall consider the following details

Clearly labelled and dimensioned layout drawings showing the location of all drainage channels, boxed culverts, pipe drain crossings, inceptor ditches, spreaders and pipework with their gradients, which will clearly identify how surface water is dealt with for the overall site. The ultimate discharge point of the waters should also be indicated.

b. The applicant shall carry out an assessment by a suitably qualified hydrologist/engineer to assess the current flow bath in the River Suir SAC and any changes that may occur as a result of any port extension.
c. The applicant shall provide a Surface Water Management Plan. Prior to the operation of the site works the applicant shall also confirm details of the sediment control techniques to be used on the surface water drainage system at the various locations, its maintenance requirements to include all oil separators and the management regime to be employed to oversee such maintenance.
d. All staff on-site will be inducted as to the requirements of the Surface Water Management Plan.
e. The applicant shall carry out water monitoring on the River Suir, during and after construction to ensure no adverse effect on the adjacent watercourses. All sampling location shall be submitted on a suitable scaled site layout drawing.
f. The applicant shall submit details of the materials (including hazardous material) that will be stored on the proposed port extension and what measures are put in place for the protection of both groundwater and surface water.

- **Waste**

The applicant shall design and undertake development so as to facilitate the minimization of waste production, prepare a Waste Management Plan in accordance with Department of the Environment, Heritage and Local Government's Best Practice Guidelines on the Preparation of Resource Management Plans for Construction and Demolition Projects. During the construction, operation & decommissioning stages, the applicant shall provide sufficient space for the segregation of all wastes into recyclable, biodegradable and residual waste streams. The plan shall outline measures for the management of any waste including oils or fuels. In addition, and prior to the commencement of the development the applicant shall:

a. Provide for the monitoring of these works by a suitably qualified and indemnified Environmental Engineer / Ecologist, who will be on-site for the duration of the works.

- **Wastewater**

The applicant is requested to submit details for the treatment of wastewater for the proposed development. This may include connections into existing port services and engagement agreements with Irish Water for additional loadings of wastewater on the mains network or any other proposals. A site layout drawing shall be submitted showing the existing and proposed wastewater infrastructure and connection point to the mains network.

END

APPENDIX K

Annie Coady

From: INFO <Information@tii.ie>
Sent: Friday 10 February 2023 09:37
To: Annette Maguire
Subject: RE: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

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

Dear Ms. Maguire,

I acknowledge receipt of your email of 19 January 2023 relating to the above EIAR Scoping exercise.

Transport Infrastructure Ireland (TII) will endeavour to consider and respond to planning applications referred to it given its status and duties as a statutory consultee under the Planning Acts. The approach to be adopted by TII in making such submissions or comments will seek to uphold official policy and guidelines as outlined in the Section 28 Ministerial Guidelines 'Spatial Planning and National Roads Guidelines for Planning Authorities' (DoECLG, 2012). Regard should also be had to other relevant guidance available at www.TII.ie.

The issuing of this correspondence is provided as best practice guidance only and 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.

With respect to EIAR scoping issues, the recommendations indicated below provide only general guidance for the preparation of an EIAR, which may affect the national road network.

The developer/scheme promoter should have regard, inter alia, to the following:

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

- TII would be specifically concerned as to potential significant impacts the development would have on the national road network (and junctions with national roads) in the proximity of the proposed development; M9, N25 and N29, national primary roads, and associated junctions,

- The developer should assess visual impacts from existing national roads,

- The developer should have regard to any Environmental Impact Statement and all conditions and/or modifications imposed by An Bord Pleanála regarding road schemes in the area. The developer should in particular have regard to any potential cumulative impacts,

- The developer, in preparing an EIAR, should have regard to TII Publications (formerly DMRB and the Manual of Contract Documents for Road Works),

- The developer, in preparing an EIAR, should have regard to 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),

- The EIAR/EIS 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 to reduce noise impacts (see Guidelines for the Treatment of Noise and Vibration in National Road Schemes (1st Rev., National Roads Authority, 2004)),

• It would be important that, where appropriate, subject to meeting the appropriate thresholds and criteria and having regard to best practice, a Traffic and Transport Assessment (TTA) be carried out in accordance with relevant guidelines, noting 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. While it is noted that the EIAR Scoping Report makes reference to the use of the IHT Guidelines for Traffic Impact Assessment, in relation to national roads, TII's Traffic and Transport Assessment Guidelines (2014) should be referred to. The scheme promoter is also advised to have regard to Section 2.2 of the NRA/TII TTA Guidelines which addresses requirements for sub-threshold TTA. Any improvements required to facilitate development should be identified. It will be the responsibility of the developer to pay for the costs of any improvements to national roads to facilitate the private development proposed as TII will not be responsible for such costs,

• The designers are asked to consult TII Publications to determine whether a Road Safety Audit is required,

• In the interests of maintaining the safety and standard of the national road network, the EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network.

• TII recommends that the applicant/developer should clearly identify haul routes proposed and fully assess the network to be traversed. Where abnormal 'weight' loads are proposed, separate structure approvals/permits and other licences may be required in connection with the proposed haul route and all structures on the haul route through all the relevant County Council administrative areas should be checked by the applicant/developer to confirm their capacity to accommodate any abnormal 'weight' load proposed.

Notwithstanding any of the above, the developer should be aware that this list is non-exhaustive and therefore site and development specific issues should be addressed in accordance with best practice.

I trust that the above comments are of use in your EIAR preparation.

Yours sincerely,

Alban Mills
Senior Regulatory & Administration Executive
Ref No. TII23-121665

TII Bonneagar Iompair Éireann Transport Infrastructure Ireland
www.tii.ie info@tii.ie +353 (0)1 646 3600

From: Annette Maguire <amaguire@mores.ie>
Sent: Thursday 19 January 2023 11:59
To: INFO <Information@tii.ie>
Subject: EIA Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

MOR Ref: E2068

By Email

Re: Cover Email Text - Environmental Impact Assessment (EIA) Consultation Document - Proposed Offshore Renewable Energy (ORE) Berth

To Whom It May Concern,

Please find attached an Environmental Impact Assessment (EIA) Consultation Document in relation to a proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m extension to the existing wharves at the Port of Waterford ('the Proposed Development').
We would welcome any feedback you many have on the scope of the EIA to be undertaken for the Proposed Development.
Any comments in relation to the attached consultation document should be sent to amaguire@mores.ie on or before the close of business on the **2nd March 2023**. Or alternatively, postal correspondence may be made out to the following address:

Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

To ensure that the response finds the relevant persons, in all correspondence please ensure to reference the project as:

- Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny.

Kind Regards,
Annette Maguire
Administrator

Working Hours:
Mon - Fri 9am – 1pm

for and on behalf of
Malone O'Regan Environmental
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y
+353 1 567 76 55
✉: *amaguire@mores.ie*
Web: *www.mores.ie*

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Próiseálann BIÉ sonraí pearsanta a sholáthraítear dó i gcomhréir lena Fhógra ar Chosaint Sonraí atá ar fáil ag https://www.tii.ie/about/about-tii/Data-Protection/?set-lang=ga

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APPENDIX L

Annie Coady

From: Cillian Claffey (C) <cillian.claffey@water.ie>
Sent: Friday 20 January 2023 16:00
To: MORES
Cc: Planning
Subject: Uisce Éireann's response to EIA Scoping Request for Proposed Offshore Renewable Energy (ORE) Berth
Attachments: IrishWater_EIAScopingOpinion_Port of Waterford.pdf

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

Good afternoon Annette,

Please find attached Uisce Éireann's response to your EIA scoping request relating to the forthcoming planning application for a Offshore Renewable Energy (ORE) Berth in Waterford.

Also, just to note going forward that I am the planning lead for the North / West / Southern region and will act as interface for Irish Water on this application.

Could you please notify myself **OR** planning@water.ie when the applicant is submitting this application so that we can get a heads up and ensure we receive the referral in adequate time.

If you have any questions, please let me know and I will do my best to assist you with your query.

Kind regards,

Cillian Claffey
Development Management Planning

Uisce Éireann
Blackwater House, Mallow P51 K3CX
T + 01 89 25187
M +353 89 260 3904
cillian.claffey@water.ie
www.water.ie
Facebook | Twitter | LinkedIn

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Thank you for your attention.

Tá an fhaisnéis á seachadadh dírithe ar an duine nó ar an eintiteas chuig a bhfuil sí seolta amháin agus féadfar ábhar faoi rún, faoi phribhléid nó ábhar atá íogair ó thaobh tráchtála de a bheith mar chuid de. Tá aon athsheachadadh nó scaipeadh den fhaisnéis, aon athbhreithniú ar nó aon úsáid eile a bhaint as, nó aon ghníomh a dhéantar ag brath ar an bhfaisnéis seo ag daoine nó ag eintitis nach dóibh siúd an fhaisnéis seo, toirimiscthe agus féadfar é a bheith neamhdhleathach. Níl Uisce Éireann faoi dhliteanas maidir le seachadadh iomlán agus ceart na faisnéise sa chumarsáid seo nó maidir le haon mhoill a bhaineann léi. Ní ghlacann Uisce Éireann le haon dliteanas faoi ghnímh nó faoi iarmhairtí bunaithe ar úsáid thoirmiscthe na faisnéise seo. Níl Uisce Éireann faoi dhliteanas maidir le seachadadh ceart agus iomlán na faisnéise sa chumarsáid seo nó maidir le haon mhoill a bhaineann léi. Má fuair tú an teachtaireacht seo in earráid, más é do thoil é, déan teagmháil leis an seoltóir agus scrios an t-ábhar ó gach aon ríomhaire. Féadfar ríomhphost a bheith soghabhálach i leith truaillithe, idircheaptha agus i leith leasaithe neamhúdaraithe. Ní ghlacann Uisce Éireann le haon fhreagracht as athruithe nó as idircheapadh a rinneadh ar an ríomhphost seo i ndiaidh é a sheoladh nó as aon dochar do chórais na bhfaighteoirí déanta ag an teachtaireacht seo nó ag a ceangaltáin. Más é do thoil é, tabhair faoi deara chomh maith go bhféadfar monatóireacht a dhéanamh ar theachtaireachtaí chuig nó ó Uisce Éireann chun comhlíonadh le polasaithe agus le caighdeáin Uisce Éireann a chinntiú agus chun ár ngnó a chosaint. Fochuideachta gníomhaíochta de chuid Ervia is ea Uisce Éireann atá faoi theorainn scaireanna, de bhun fhorálacha an tAcht um Sheirbhísí Uisce 2013, a bhfuil a bpríomh ionad gnó ag 24-26 Teach Colvill, Sráid na Talbóide, BÁC 1.

Go raibh maith agat as d’aird a thabhairt.

Uisce Éireann
Bosca OP 6000
Baile Átha Cliath 1
D01 WA07
Éire

Irish Water
PO Box 6000
Dublin 1
D01 WA07
Ireland

T: +353 1 89 25000
F: +353 1 89 25001
www.water.ie

For the attention of Annette Maguire
Malone O'Regan Environmental,
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

Date: 20th January 2023

By Email: enviro@mores.ie

Re: EIA Scoping Request – Proposed Offshore Renewable Energy (ORE) Berth on a 200m – 250m Quay Extension and Ancillary Works, Port of Waterford, Co. Kilkenny.

Dear Annette Maguire,

Uisce Éireann has received notification of your Environmental Impact Assessment (EIA) scoping request relating to The Port of Waterford's forthcoming application for an Offshore Renewable Energy (ORE) Berth.

Please see attached, Uisce Éireann's scoping opinion in relation to Water Services. On receipt of the planning referral, Uisce Éireann 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

PP. *Ali Robinson*

Yvonne Harris

Connections and Developer Services

Stiúrthóirí / Directors: Tony Keohane (Chairman), Niall Gleeson (CEO), Christopher Banks, Fred Barry, Gerard Britchfield, Liz Joyce, Patricia King, Eileen Maher, Cathy Mannion, Michael Walsh
Oifig Chláraithe / Registered Office: Teach Colvill, 24–26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24–26 Talbot Street, Dublin 1 D01 NP86
Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Irish Water is a designated activity company, limited by shares.
Uimhir Chláraithe in Éirinn / Registered in Ireland No.: 530363

IW-HP-MD

REV013

Uisce Éireann's Response to EIA Scoping Requests

At present, Uisce Éireann 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 Uisce Éireann Drinking Water Source(s), the applicant shall provide details of measures to be taken to ensure that there will be no negative impact to Uisce Éireann's 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 Uisce Éireann 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 Uisce Éireann to determine the feasibility of connection to the Uisce Éireann 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 Uisce Éireann 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 Uisce Éireann 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 Uisce Éireann 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 Uisce Éireann for public supply should be identified within the report.

n) Where a development proposes to connect to an Uisce Éireann 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 Uisce Éireann 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 Uisce Éireann ahead of any planning application.

- Uisce Éireann will not accept new surface water discharges to combined sewer networks.

APPENDIX M

Annie Coady

From: Capt Darren Doyle <dd@portofwaterford.com>
Sent: Tuesday 25 April 2023 15:20
To: Amelia Keane; Kevin ORegan
Subject: FW: Port of Waterford EIAR Consultation Document

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

Hi Folks,

Please find below response from Waterford Airport on our EIAR consultation document.

Kind Regards

Darren

Capt. Darren Doyle
Harbour Master

brings you closer
Email:
dd@portofwaterford.com

www.portofwaterford.com

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From: aidan.power@waterfodairport.ie <aidan.power@waterfordairport.ie>
Sent: Tuesday 25 April 2023 14:59
To: Capt Darren Doyle <dd@portofwaterford.com>
Subject: FW: Port of Waterford EIAR Consultation Document

Hi Darren,

Thank you for forwarding the document for review.

In the main the new quay extension will have no material effect on aviation. However consideration needs to be given if the construction entails the use of cranes. Due to the location of the site approximately 5 nautical miles distance, under the approach flight path for the main runway, as per SI No 215/2005 – Irish Aviation Authority (obstacles to aircraft in flight) Order 2005; if there is an intention to use cranes at the site, the developer will need to undertake an assessment to ensure the height of the crane operations have no effect on the flight paths / published instrument flights procedures for the airport, and the crane operator is required to give the airport at least 30 days' notice before crane operations commence. The airport will be happy to provide any guidance and advice re the

above and recommends contact with the Airport Authority at an early stage if any crane operations are to be conducted on site.

Wishing you every success with the project.

Aidan.

Aidan Power

Airport Manager
Waterford Airport

aidan.power@waterfordairport.ie
Telephone: + 353 (0) 51 84 66 00
Mobile@ +353 87 2321574

From: Capt Darren Doyle [mailto:dd@portofwaterford.com]
Sent: Tuesday 14 March 2023 11:09
To: aidan.power@waterfordairport.ie
Subject: Port of Waterford EIAR Consultation Document

Good morning Aidan,

Great to talk with you again.
As discussed could you please kindly find time to review the attached EIAR consultation document with regards to a proposed quay extension here in Belview Port for the offshore renewable sector.
I would be very grateful if you could please reply with any comments that you may have.
Many thanks.

Kind Regards

Darren

Capt. Darren Doyle
Harbour Master

brings you closer
Email:
dd@portofwaterford.com

www.portofwaterford.com

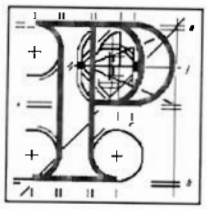
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APPENDIX 1-2

An Bord Pleanála



Inspector's Report.

Case Ref. No:	**ABP-319047-24**
Issue:	**Marine Development Consultation**
Proposed Development:	**Offshore Renewable Energy (ORE) Terminal on a 250m quay extension and ancillary works**
Location:	**Port of Waterford, Belview, County Kilkenny**
Applicants:	**Port of Waterford**
Planning Authority:	**Kilkenny County Council**
Inspector:	**Kevin Moore**

1.0. Introduction

1.1. The Board received a request on 10th January, 2024 from Port of Waterford to enter into pre-application consultation in accordance with section 287 of the Planning and Development Act 2000, as amended. Further details were provided by correspondence dated 6th February, 2024.

1.2. A Pre-Application Consultation meeting took place between An Bord Pleanála (the Board) and the prospective applicant on 21st March, 2024.

1.3. This Report is prepared following the completion of the Pre-Application Consultations between the applicant and the Board. This Report provides an overview of the proposed project, details relevant legislative provisions, provides a summary of the meeting and the advice provided by the Board, and recommends a list of Prescribed Bodies who should be forwarded copies of any future application to An Bord Pleanála.

2.0. Site Location

2.1. The Port of Waterford is located at Belview, approximately 5 miles downstream of Waterford City. It is the fifth largest commercial port in the State in terms of total tonnage. It is designated a Port of National Significance (Tier 2) within the terms of the National Ports Policy. It provides commercial shipping operations, offering facilities for bulk and breakbulk, liquid bulk and container cargoes. The port at present has approximately 960m of marginal quays at Belview and 280m of layby quay at Waterford city centre, the Frank Cassen Wharf, which is used for cruise ships on an occasional basis, together with open and covered storage areas and warehouses within a 265-hectare area of the designated Belview Port Zone. The port can accommodate large vessels, with ship drafts up to 9m and lengths of up to 190m.

2.2. The port is managed and operated by Port of Waterford, which is a State-owned commercial company.

2.3. The port has direct access onto the N29 National Primary Road which links Belview Port with the N25 National Primary Road (Cork-Rosslare Europort via Waterford) at Slieverue roundabout approximately 3km to the north-west. Four rail sidings come into the port, which allow for container loading to and from ships and from road transport.

3.0. The Proposed Development

3.1. The proposed development provides for a 250m extension to the existing wharves at the Container / Bulk Handling Terminal. It is proposed to be a continuation of the existing wharves, comprising a reinforced concrete suspended deck supported on reinforced concrete beams and steel piles and a retaining structure to the rear. Land reclamation, covering an area of approximately 1.25 hectares, forms part of the proposal. This area would be filled primarily with imported rock intended to be sourced from local commercial quarries. Two separate ORE facilities are proposed at the downstream area of the port, each with building facilities, berthing pontoons, yard areas, and staff parking. Further office facilities and parking are proposed on the north side of the railway. The proposed route for foul water drainage forms part of the design proposals.

3.2. In consideration of the loss of habitat resulting from the proposal, a site adjacent and to the north-east has been identified as a potential area for the provision of a biodiversity enhancement area.

3.3. The proposed development seeks to facilitate the Port's objective of being a key port for the Offshore Renewable Energy (ORE) sector. It would provide additional space primarily to provide more berthing space for ships serving the construction

of off-shore wind farms and thereafter the maintenance and operation of offshore wind farms. It would also provide additional space for the handling and temporary storage of wind turbines.

4.0. Pre-Application Consultation History

4.1. Port of Waterford previously entered into pre-application consultation under section 37B of the Planning and Development Act 2000, as amended, in relation to a 200m-250m extension of the existing wharves at the Container / Bulk Handling Terminal at the Port of Waterford to facilitate the development of the port as a key port for the Offshore Renewable Energy (ORE) sector (ABP-315199-22). Two pre-application consultation meetings were held. In light of legislative provisions under the Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023 and the consequent amendment of section 287 of the Planning and Development Act 2000, as amended, the applicant has now ceased this consultation process and engaged with the Board in accordance with section 287(4).

4.2. The changes in the current pre-application process from that previously are stated to be as follows:

- The length of quay extension is confirmed as 250m;
- Two ORE facilities are proposed, each with access gangway and landing pontoon;
- Offices and parking are included in an area to the north of the railway line;
- Foul water connection to the public network would be developed; and
- A site for biodiversity enhancement is included.

5.0. Legislative Provisions

5.1. *Planning and Development Act, 2000, as amended*

Part XXI - Maritime Development

Chapter III – Other Development in Maritime Area

Section 285

(1) Subject to *subsection (2)*, this Chapter applies to—

(*a*) development situated—

(i) wholly in the outer maritime area,

(ii) partly in the outer maritime area and partly in—

(I) the nearshore area of a coastal planning authority, or

(II) the nearshore areas of more than one coastal planning authority,

(iii) partly in the outer maritime area, partly in—

(I) the nearshore area of a coastal planning authority, or

(II) the nearshore areas of more than one coastal planning authority,and partly on land, or

(iv) partly in the outer maritime area and partly on land,

(*b*) development situated—

(i) wholly in the nearshore areas of more than one coastal planning authority,

(ii) partly on land and partly in the nearshore areas of more than one coastal planning authority,

and

(*c*) development of a class specified in the *Eighth Schedule* situated—

(i) wholly in—

(I) the nearshore area of a coastal planning authority, or

(II) the nearshore areas of more than one coastal planning authority,

or

(ii) partly on land and partly in—

(I) the nearshore area of a coastal planning authority, or

(II) the nearshore areas of more than one coastal planning authority.

Section 287

(1) Subject to *subsection (4)*, a person (in this Chapter referred to as a "prospective applicant") who—

(*a*) having regard to *subsection (3)* of *section 286*, is eligible to apply for permission to carry out development to which this Chapter applies, and

(*b*) proposes to make an application under *section 291* for such permission,

shall, before making the application, consult with the Board in relation thereto.

(2) The Board may, upon being consulted by a prospective applicant in accordance with *subsection (1)*, provide its opinion to the prospective applicant

regarding the making of the application concerned and, in particular, as respects—

(*a*) the procedures to be followed by the prospective applicant when making the application and by the Board when considering the application,

(*b*) the documents required to accompany the application,

(*c*) the need for the prospective applicant to create an internet website for the purpose of publishing the application and all documentation accompanying the application,

(*d*) the publication of notices in accordance with this Act, the furnishing of documentation to persons referred to in *subsection (3)* of *section 291* and the making of submissions and observations in relation to an application under that section,

(*e*) such persons as may be prescribed for the purposes of this Chapter,

(*f*) some or all of the matters that the Board is likely to take into consideration relating to—

(i) the National Marine Planning Framework,

(ii) objectives of maritime spatial planning,

(iii) principles of proper planning and sustainable development, and

(iv) the environment or any European site,

when making a decision under *section 293* in relation to the application,

(*g*) the fees payable to the Board in relation to the making of the application, and

(*h*) compliance by the prospective applicant with any direction of the Board under *subsection (3)* of *section 291*.

(3) The Board may, at any time, conclude a consultation under this section where it considers it appropriate to so do.

(4) (*a*) Subject to *paragraph (b)*, a prospective applicant for permission to carry out development consisting of port infrastructure to facilitate the deployment, maintenance or operation of offshore renewable energy infrastructure may consult with the Board in accordance with *subsection (1)* notwithstanding that the prospective applicant is not the holder of a maritime area consent granted for the occupation of a maritime site for the purposes of such proposed development.

(*b*) *Paragraph (a)* shall not be construed to entitle the prospective applicant referred to in that paragraph to make an application under *section 291* for permission for the development referred to in that paragraph without being the holder of the maritime area consent referred to in that paragraph.

Eighth Schedule – Classes of Development Specified for Purposes of Chapter III of Part XXI

21. A harbour or port installation, including ...

(e) areas for the weighing, handling or transport of goods or the movement or transport of passengers (including customs or passport control facilities), and any associated offices or other similar facilities that would – ...
(iii) involve the construction of a quay greater than 100 metres in length ...

6.0. Applicant's Submission

6.1. The Prospective Applicant submits that, under section 285(1)(c)(ii) of the Planning and Development Act 2000, as amended, the proposed development is of a class specified in the Eighth Schedule and is partly located on land and partly in the nearshore area of a coastal planning authority (Kilkenny County Council). It is further submitted that the key need for the proposed development is that it will facilitate the Port of Waterford objective of being a key port to serve Ireland's growing ORE sector over the next 10-15 years.

7.0. Outline of Pre-Application Consultation

7.1. At the meeting held on 21st March, 2024, it was noted that consultation was previously undertaken relating to ABP-315199-22 and that a complete restating of issues previously discussed was not required, with focus of the meeting being on providing an update on the project and main issues arising.

7.2. The prospective applicant outlined statutory processes relating to the proposal, noting that a Marine Area Consent (MAC) application had been submitted to the Maritime Area Regulatory Authority (MARA) in December 2023. Details of the project, on the Port of Waterford and on its Master Plan were outlined. Reference was made to government policy and the proximity of the port to proposed wind farms in the Celtic Sea. It was submitted that dredged materials may be reused as fill materials within the reclaimed area. The main update was stated to be the proposal for two ORE facilities. Baseline environmental surveys, public consultations, and stakeholder consultations were outlined. Details were provided on the proposed biodiversity enhancement area and consultations with NPWS.

7.3. Discussions related to clarification on the proposed biodiversity area, on the potential need for a dumping at sea licence, on National Ports Policy update, and issues of concern at public consultation. Procedural matters relating to an application were also discussed.

7.4. The main issues discussed on foot or previous consultations under ABP-515199-22 and remaining of relevance to the proposed development were outlined for the record of the meeting.

7.5. By letter dated 19th April, 2024, the prospective applicant clarified two items on the record of the meeting.

8.0. Assessment

8.1. Compliance with the Eighth Schedule

The proposed development would provide for a 250m extension to the existing wharves at the Container / Bulk Handling Terminal at the Port of Waterford. This complies with Class 21 of the Eighth Schedule of the Planning and Development Act, 2000, as referenced above.

I recommend that the Board determines that the development falls within Class 21 of the Eighth Schedule of the Act in the first instance as it involves quay development that would exceed 100 metres in length.

9.0. Conclusion

9.1. Further to section 287 of the Planning and Development Act 2000, as amended, the Port of Waterford entered into consultations with the Board prior to submitting an application for a proposed Onshore Renewable Energy Terminal. The Board has given advice to the Port of Waterford regarding the procedures involved and

what considerations relating to the effects of the proposed development on the environment and the proper planning and sustainable development may have on its decision in relation to the application. During the meetings held, advice was provided as noted on the file attached.

9.2. Having regard to section 287(3) of the Planning and Development Act 2000, as amended, the Board will note that, unlike a request under section 37B of the Planning and Development Act, it lies with the Board to close the consultation process. I recommend that the consultation process be closed to allow for the making of the application to the Board.

9.3. A recommended list of Prescribed Bodies, who should be forwarded copies of the application documentation, is as follows:

(a) Department of Housing, Local Government and Heritage
(b) Department of the Environment, Climate and Communications
(c) Department of Transport
(d) Department of Defence
(e) Department of Agriculture, Food and the Marine
(f) Environmental Protection Agency
(g) Maritime Area Regulatory Authority
(h) Department of Rural and Community Development
(i) Marine Institute
(j) Inland Fisheries Ireland
(k) Health and Safety Authority
(l) Commission for Regulation of Utilities
(m) Fáilte Ireland
(n) An Taisce
(o) Kilkenny County Council
(p) Waterford County Council
(q) Southern Regional Assembly
(r) National Transport Authority

(s) Sustainable Energy Authority of Ireland

(t) EirGrid

(u) Commissioner of Irish Lights

(v) Irish Coastguard

(w) Uisce Éireann

(x) Transport Infrastructure Ireland

(y) Córas Iompair Éireann

Kevin Moore
Senior Planning Inspector
24th April, 2024

Our Case Number: ABP-319047-24
Your Reference: Port of Waterford

An Bord Pleanála

SCA Planning
17A Bridgecourt Office Park
Walkinstown Avenue
Dublin 12
D12 VH61

Date: 10 May 2024

Re: Proposed Offshore Renewable Energy (ORE) Terminal located on a 250m quay extension and ancillary works
at Port of Waterford, Belview, Co. Kilkenny.

Dear Sir / Madam,

I have been asked by An Bord Pleanála to refer further to the pre-application consultation request in relation of the above-mentioned proposed development.

Please note the Board now considers it appropriate to conclude the consultation in respect of this matter.

Attached is a list of prescribed bodies to be notified of the application for the proposed development.

1. Department of Housing, Local Government and Heritage
2. Department of the Environment, Climate and Communications
3. Department of Transport
4. Department of Defence
5. Department of Agriculture, Food and the Marine
6. Environmental Protection Agency
7. Maritime Area Regulatory Authority
8. Department of Rural and Community Development
9. Marine Institute
10. Inland Fisheries Ireland
11. Health and Safety Authority

Teil	**Tel**	(01) 858 8100
Glao Áitiúil	**LoCall**	1800 275 175
Facs	**Fax**	(01) 872 2684
Láithreán Gréasáin	**Website**	www.pleanala.ie
Ríomhphost	**Email**	bord@pleanala.ie

64 Sráid Maoilbhríde
Baile Átha Cliath 1
D01 V902

64 Marlborough Street
Dublin 1
D01 V902

12. Commission for Regulation of Utilities
13. Fáilte Ireland
14. An Taisce
15. Kilkenny County Council
16. Waterford County Council
17. Southern Regional Assembly
18. National Transport Authority
19. Sustainable Energy Authority of Ireland
20. EirGrid
21. Commissioner of Irish Lights
22. Irish Coastguard
23. Uisce Éireann
24. Transport Infrastructure Ireland
25. Córas Iompair Éireann

In accordance with section 146(5) of the Planning and Development Act, 2000 as amended, the Board will make available for inspection and purchase at its offices the documents relating to the decision within 3 working days following its decision. This information is normally made available on the list of decided cases on the website on the Wednesday following the week in which the decision is made.

The attachment contains information in relation to challenges to the validity of a decision of An Bord Pleanála under the provisions of the Planning and Development Act, 2000, as amended.

If you have any queries in the meantime, please contact the undersigned officer of the Board or email marine@pleanala.ie quoting the above mentioned An Bord Pleanála reference number in any correspondence with the Board.

Yours faithfully,

PP EGM

Ellen Moss
Executive Officer
Direct Line: 01-8737285

OC08A

Teil	**Tel**	(01) 858 8100
Glao Áitiúil	**LoCall**	1800 275 175
Facs	**Fax**	(01) 872 2684
Láithreán Gréasáin	**Website**	www.pleanala.ie
Ríomhphost	**Email**	bord@pleanala.ie

64 Sráid Maoilbhríde
Baile Átha Cliath 1
D01 V902

64 Marlborough Street
Dublin 1
D01 V902

Judicial review of An Bord Pleanála decisions under the provisions of the Planning and Development Acts (as amended).

A person wishing to challenge the validity of a Board decision may do so by way of judicial review only. Sections 50, 50A and 50B of the Planning and Development Act 2000, as amended, contain provisions in relation to challenges to the validity of a decision of the Board.

The validity of a decision taken by the Board may only be questioned by making an application for judicial review under Order 84 of The Rules of the Superior Courts (S.I. No. 15 of 1986). Sub-section 50(6) of the Planning and Development Act 2000 requires that any application for leave to apply for judicial review must be made within 8 weeks of the date of the decision of the Board, save for decisions made pursuant to a function transferred to the Board under Part XIV of the Planning and Development Act 2000, where any application for leave to apply for judicial review must, as set out in sub-section 50(7), be made within 8 weeks beginning on the date on which notice of the decision of the Board was first sent (or as may be the requirement under the relevant enactment, functions under which are transferred to the Board, was first published). These time periods are subject to any extension which may be allowed by the High Court in accordance with sub-section 50(8).

Section 50A(3) states that leave for judicial review shall not be granted unless the Court is satisfied that (a) there are substantial grounds for contending that the decision is invalid or ought to be quashed and (b) the applicant has a sufficient interest in the matter which is the subject of the application or, in cases involving environmental impact assessment, is a body complying with specified criteria.

Section 50B contains provisions in relation to the costs of certain judicial review proceedings in the High Court; pursuant to Section 50B(1), Section 50B applies to the following proceedings:

(a) proceedings in the High Court by way of judicial review, or of seeking leave to apply for judicial review, of—

(i) any decision or purported decision made or purportedly made,

(ii) any action taken or purportedly taken,

(iii) any failure to take any action, pursuant to a statutory provision that gives effect to

(I) a provision of the EIA Directive 85/337/EEC as amended to which Article 10a (as inserted by Directive 2003/35/EC) of that Directive applies,
(II) the SEA Directive 2001/42/EC, or
(III) a provision of the IPPC Directive 2008/1/EC which Article 16 of that Directive applies, or
(IV) Article 6(3) or 6(4) of the Habitats Directive; or

(b) an appeal (including an appeal by way of case stated) to the Supreme Court from a decision of the High Court in a proceeding referred to in paragraph (a);

(c) proceedings in the High Court or the Supreme Court for interim or interlocutory relief in relation to a proceeding referred to in paragraph (a) or (b).

The general provision contained in section 50B(2) is that in proceedings to which the section applies each party shall bear its own costs. The Court however may award costs against any party in specified circumstances. There is also provision for the Court to award the costs of proceedings or a portion of such costs to an applicant to the extent that the applicant succeeds in obtaining relief against a respondent or notice party, or both, to the extent that the action or omission of the respondent or notice party contributed to the relief being obtained.

General information on judicial review procedures is contained on the following website, www.citizensinformation.ie.

Disclaimer: The above is intended for information purposes. It does not purport to be a legally binding interpretation of the relevant provisions and it would be advisable for persons contemplating legal action to seek legal advice.

Fógra faoi Athbhreithniú Breithiúnach

Athbhreithniú breithiúnach ar chinneadh an Bhoird Pleanála faoi fhorálacha na nAchtanna um Pleanáil agus Forbairt (arna leasú).

Ní fhéadfaidh duine ar mian leis nó léi agóid a dhéanamh in aghaidh bhailíocht an chinnidh Bhoird é sin a dhéanamh ach trí athbhreithniú breithiúnach. Tá forálacha ann in Alt 50, 50A agus 50B den Acht um Pleanáil agus Forbairt 2000, arna leasú, maidir le dúshláin i leith bhalíocht an chinnidh Bhoird.

Ní féidir bailíocht cinnidh arna ghlacadh ag an mBord a cheistiú ach amháin trí iaratas a dhéanamh ar athbhreithniú breithiúnach faoi Ordú 84 de Rialacha na nUaschúirteanna (S.I. Uimh 15 de 1986). Ceanglaíonn fo-alt 50(6) den Acht um Pleanáil agus Forbairt 2000 go gcaithfear aon iarratas ar chead chun iarratas a dhéanamh ar athbhreithniú breithiúnach a dhéanamh laistigh de 8 seachtaine ó dháta chinnidh an Bhoird, seachas cinntí a dhéantar de bhun feidhme aistrithe chuig an mBord faoi Chuid XIV den Acht um Pleanáil agus Forbairt 2000, i gcás nach mór aon iarratas ar chéad chun iarratas a dhéanamh ar athbhreithniú breithiúnach, mar atá leagtha amach i bhfo alt 50(7), a dhéanamh laistigh de 8 seachtaine ag tosú ar an dáta a thugadh fógra faoi chinneadh an Bhoird ar dtús (nó mar a cheanglófar faoín achtú ábharta, a aistríodh feidhmeanna faoi chuig an mBord, a foilsíodh den chéad uair). Tá na tréimhsí ama seo faoi réir aon síneadh a fhéadfaidh an Ard-Chúirt a cheasú de réir fho-alt 50(8).

Sonraítear in alt 50A(3) nach deonófar cead d'athbhreithniú breithiúnach mura bhfuil an Chúirt sásta (a) go bhfuil forais shubstaintiúla ann chun a áitiú go bhfuil an cinneadh neamhbhailí nó gur chóir é a chuir ar neamhní agus (b) go bhfuil leas leordhóthanach ag an iarratasóir san ábhar is ábhar don iarratas nó i gcásanna a bhaineann le measúnú tionchair timpeallachta ar comhlacht é a chomhlíonann critéir shonraithe.

Tá forálacha ann in alt 50B maidir le costais imeachtaí athbhreithnithe bhreithiúnaigh áirithe san Ard-Chúirt; de bhun Alt 50B(1), tá feidhm ag alt 50B maidir leis na himeachtaí seo a leanas:

(a) imeachtaí san Ard-Chúirt mar athbhreithniú breithiúnach, nó trí chead a lorg chun iarratas a dhéanamh ar athbhreithiúnach breithiúnach ar—

(i) aon chinneadh nó cinneadh airbheartaithe a rinneadh nó a airbheartaitear a rinneadh,

(ii) aon ghníomh a rinneadh nó a airbheartaítear a rinneadh,

(iii) aon mhainneachtain aon ghníomh a dhéanamh, de bhun forála reachtúla a thugann éifeacht

I. d'fhoráil de Threoir EIA 85/337/CEE arna leasú lena mbaineann Airteagal 10a (arna cur isteach le Threoir 2003/35/CE) den Treoir sin, nó
II. do Threoir SEA 2001/42/CE, nó
III. d'fhoráil de Threoir IPPC 2008/1/CE a bhfuil feidhm ag Airteagal 16 den Treoir sin maidir lei, nó
IV. d'Airteagak 6(3) nó 6(4) den Treoir maidir le Gnáthóga, nó

(b) achomharc (lena n-áirítear achomharc de chás ráite) chun na Cúirte Uachtaraí i gcoinne breithe ón Ard-Chúirt in imeacht dá dtagraítear i mír (a);

(c) imeachtaí san Ard-Chúirt nó sa Chúirt Uachtarach le haghaidh faoisimh eatramhach nó idirbhreitheach i ndáil le himeacht dá dtagraítear i mír (a) nó (b).

Is í an fhoráil ghinearálta atá in alt 50B(2) ná go n-íocfaidh gach páirtí in imeachtaí lena mbaineann an t-alt a chostais féin. Féadfaidh an Chúirt áfach, costais a dhámhachtain in aghaidh aon pháirtí in imithosca sonraithe. Tá foráil ann freisin go ndéanfaidh an Chúirt costais imeachtaí nó chuid de chostais den sort sin a dhámhachtain d'iarratasoir, a mhéid a éiríonn leis an iarratasóir faoiseamh a fháil, i gcoinne freagróra nó páirtí fógra, nó an dá chean, a mhéid a chuir an chaingean nó an t-easnamh ar thaobh an fhreagróra nó an pháirtí fógra go pairteach leis an bhfaoiseamh atá á fháil.

Tá eolas ginearálta ar nósanna imeachta athbhreithnithe bhreithiúnaigh ar fáil anseo a leanas www.citizensinformation.ie.

Séanadh: Mar eolas atá an méid thuas ceaptha. Ní airbheartaíonn sé a bheith ina léirmhíniú ceangailteach ó thaobh dlí ar na forálacha ábhartha agus bheadh sé inmholta do dhaoine atá ag smaoineamh ar chaingean dlí comhairle dlí a lorg.

APPENDIX 1-3

MEETING NOTES

Ground Floor – Unit 3, Bracken Business Park, Bracken Road, Sandyford
Dublin 18, D18 V32Y Tel: +353-1-567 7655 e-mail: enviro@mores.ie

MALONE O'REGAN ENVIRONMENTAL

Project: Port of Waterford Masterplan - Proposed Offshore Renewable Energy (ORE) Capable Facility on a 250m Quay Extension

Dept.HLGH Ref: G Pre00214/2021

MOR Ref: E2068

Location: Teams Meeting

Date of Meeting: 10/05/2023

Attendance:

Ciara Flynn	NPWS
David Sinnott	POW
Capt. Darren Doyle	POW
Kevin O'Regan	MOR
Dyfrig Hubble	MOR
Amelia Keane	MOR
Eimear Sharkey	MOR

ITEM	DESCRIPTION
1	A presentation was provided by the Port of Waterford and the design team. Please see attached PDF Presentation.
2	NPWS accepted that due to the site constraints, specifically the adjoining railway line that some buildings would be required on the proposed quay extension.
3	NPWS were satisfied with the comprehensive scope of survey work that has been completed, or is ongoing, in support the planning application and provided complimentary comments on the scope of survey work. The NPWS did not have further comments on the scope of survey work.
4	NPWS considered that the project will proceed under Article 6(3) due to the fact that there will be no loss of annex I habitats for which the Lower River Suir SAC is designated.
5	NPWS were satisfied that the desk-based fish studies to be undertaken by a recognised expert, Dr Martin O'Farrell, would be sufficient. The assessments must fully consider the impacts on designated species for both the Lower River Suir SAC and River Barrow SAC such as twaite shad and lamprey. Sediment modelling that has been completed would need to form an important part of these assessments.
6	NPWS discussed potential indirect effects from the project. It was confirmed that both the NIS and EIAR will fully assess all potential direct and in-direct impacts resulting from the project.
7	NPWS discussed net gain and no net loss as per the National Biodiversity Plan. NPWS recommended that like-for-like compensation of the habitats lost (i.e. mudflats and estuaries) would be preferred; however, should this not be possible then a potential package of measures may be presented with reasoning as to why like-for-like is not viable.
8	NPWS will revert back to MOR should any further comments or queries arise following a further review of the presentation. MOR would welcome any such further consultation.
9	The target date for planning lodgement is before the end of Q3 2023 – albeit this programme could vary depending on the timing of the establishment of MARA.

APPENDIX 1-4



Shona Kenny from Waterford was the winner of a Kia Niro HEV in the SuperValu Real Rewards promotion "Scan To Win".

She is pictured here with Pat Sinnott, Manager, Caulfields SuperValu; Laura Curley, Loyalty Partner Manager, SuperValu Real Rewards; Cathal Kearley, Head of Marketing & PR, Kia Ireland, and Caulfields SuperValu staff members Eric Curran, Marie Dalton, Orla Dunphy and Emma Baldwin.

Inset: Shona receiving the keys to her new car from Michael Breslin, Sales Manager, Sheridan Kia. PHOTO: NOEL BROWNE

'Autism-Friendly City' ambition



Gerard Hurley: seeking champions



Waterford Chamber is working with the Waterford Autism-Friendly City Committee in the hope of achieving the status of Ireland's first Autism-Friendly City.

Autistic people, who comprise at least 3% of the city's population, "have huge strengths and abilities but face accessibility barriers on a daily basis," says Chamber CEO Gerard Hurley. "Tasks such as going shopping, using public transport, or joining a sports club can be overwhelming [and] making small changes in how our city works could be the difference between a person struggling and thriving."

AsIAm's Autism-Friendly Towns Award recognises communities who make the extra effort. Since 2018, twenty communities have been recognised but no city has achieved the designation yet.

"A key requirement for the committee is to recruit a cross-section of Autism-Friendly Champions, companies who commit to learning how to meet the needs of customers and staff who are Autistic and put in place one or two small accommodations which will make life better for our city's Autism community," Mr Hurley explains.

In Year 1, Champions who sign up will receive access to a training opportunity for managers and personnel, based on the size of the company. In Years 2 and 3, the committee will work with Champions to put in place sensory accommodations (e.g. a quiet space or quiet time) and visual guides (pictures which tell a person what to expect when using a service), as well as promoting the participating Champions through social media and other communications.

"Becoming an AsIAm Autism-Friendly City will not only improve life for Autistic people and their families living in our community, but can also put our community on the map as an inclusive, understanding place to visit or even holiday," the Chamber CEO adds.

Port of Waterford - Proposed ORE Berth - Public Consultation Newspaper Notice

Port of Waterford

Comhairliúchán Poiblí – Beart Fuinnimh In-athnuaite Amach ón gCósta ag Calafort Belview

Mar chuid dá Mháistirphlean, 2020-2044, tá sé molta ag Port Phort Láirge Beart Fuinnimh In-athnuaite Amach ón gCósta (ORE) a fhorbairt ar shíneadh 250m i dtreo bhéal na habhann ar na céanna atá ann faoi láthair ag Calafort Belview, Co. Chill Chainnigh.

Tá an obair ag céim an réamhdhearaidh faoi láthair agus, mar chuid den obair sin, iarrann an Port ar gach páirtí leasmhar páirt a ghlacadh in imeacht comhairliúcháin phoiblí a bheidh ar siúl ag: **An 3ú hurlár, Pointe na Mara, Calafort Belview, Port Láirge, X91 W0XW ó 16:00 go 20:00 ar an Luan, 20 Feabhra 2023.**

Foilseofar an fhaisnéis maidir leis an am agus leis an ionad ar shuíomh gréasáin an Phoirt freisin (www.portofwaterford.com).

Public Consultation – Offshore Renewable Energy Berth at Belview Port

As part of its 2020 – 2044 Masterplan, the Port of Waterford is proposing to develop an Offshore Renewable Energy (ORE) berth on a 250m downstream extension to the existing wharves at the Belview Port, Co. Kilkenny.

This project is at a preliminary design stage and as part of this work, the Port invites all interested stakeholders to take part in a public consultation event to be held at: **3rd Floor, Marine Point, Belview, Waterford, X91 W0XW from 16:00 to 20:00 on Monday, 20th February 2023.**

The time and venue information will also be posted on the Port's website (www.portofwaterford.com).

APPENDIX 2

APPENDIX 2-1

Our Case Number: ABP-315199-22

Your Reference: Port of Waterford

An Bord Pleanála

Malone O'Regan Environmental Services
Unit 3 Bracken Business Park
Bracken Road
Sandyford
Dublin 18

MALONE O'REGAN ENVIRONMENTAL

E2068
Received
28/02/2023

Date: 27 February 2023

Re: Proposed Offshore Renewable Energy (ORE) Terminal located on a 200-250 metre quay extension and ancillary works
Port of Waterford, Belview, Co. Kilkenny

Dear Sir / Madam,

I have been asked by An Bord Pleanála to refer further to the above-mentioned pre-application consultation request.

Please find enclosed a copy of the written record of the meeting of the 16 February 2023.

If you have any queries in relation to the matter please contact the undersigned officer of the Board.

Please quote the above-mentioned An Bord Pleanála reference number in any correspondence or telephone contact with the Board.

Yours faithfully,

pp Sarah Caulfield
Executive Officer
Direct Line: 01-8737287

PC07

Teil	**Tel**	(01) 858 8100
Glao Áitiúil	**LoCall**	1800 275 175
Facs	**Fax**	(01) 872 2684
Láithreán Gréasáin	**Website**	www.pleanala.ie
Ríomhphost	**Email**	bord@pleanala.ie

64 Sráid Maoilbhríde
Baile Átha Cliath 1
D01 V902

64 Marlborough Street
Dublin 1
D01 V902

An Bord Pleanála

Record of Meeting ABP-315199-22 1st meeting

Description	ABP-315199-22 – Proposed Offshore Renewable Energy (ORE) Terminal located on a 200-250 metre quay extension and ancillary works at Port of Waterford, Belview, Co. Kilkenny		
Case Type	Pre-application Consultation		
1st / 2nd / 3rd Meeting	1st Meeting		
Venue	Virtually by Microsoft Teams		
Date	16/02/2023	**Time**	11:00am – 12:17pm

Representing An Bord Pleanála		
Stephen Kay, Assistant Director of Planning (Chair)		
Kevin Moore, Senior Planning Inspector		
Sarah Caulfield, Executive Officer	s.caulfield@pleanala.ie	01-8737287
Representing the Prospective Applicant		
Kevin O'Regan – Malone O'Regan		
Eimear Sharkey – Malone O'Regan		
David Sinnott – Port of Waterford		
Capt. Darren Doyle – Port of Waterford		
Simon Clear – Simon Clear & Associates		
Darran Quaile – Simon Clear & Associates		

Introduction:

The Board referred to the letter received from the prospective applicant on the 25th November 2022, requesting pre-application consultations and advised the prospective applicant that the instant meeting essentially constituted an information-gathering exercise for the Board; it also invited the prospective applicant to outline the nature of the proposed development and to highlight any matters that it wished to receive advice on from the Board. The Board mentioned the following general procedures in relation to the pre-application consultation process:

- The Board will keep a record of this meeting and any other meetings, if held. Such records will form part of the file which will be made available publicly at the conclusion of the process. The record of the meeting will not be amended by the Board once finalised, but the prospective applicant may submit comments on the record which will form part of the case file.
- The Board will serve notice at the conclusion of the process as to the strategic infrastructure status of the proposed development. It may form a preliminary view at an early stage in the process on the matter.
- A further meeting or meetings may be held in respect of the proposed development.
- Further information may be requested by the Board and public consultations may also be directed by the Board.
- The Board may hold consultations in respect of the proposed development with other bodies.
- The holding of consultations does not prejudice the Board in any way and cannot be relied upon in the formal planning process or in any legal proceedings.

Presentation by the prospective applicant:

The prospective applicant began its presentation by providing a brief introduction to the project team and topics to be discussed during the meeting. The Port of Waterford is a state-owned commercial company responsible for the management and development of the Port and is the fifth largest of the state commercial ports in terms of total tonnage. The Port is Ireland's closest multi-model port to mainland Europe and enjoys excellent transport links with Ireland's major cities. It is a Tier 2 port under the National Ports Policy.

The Port of Waterford Master Plan 2020-2044 was published in October 2019, and it provides the framework to allow the Port progress essential developments for planning and consent purposes. The Master Plan was supported by Strategic Environmental Assessment (SEA), Appropriate Assessment (AA) and Strategic Flood Risk Assessment (SFRA). Seven key projects were identified within the Master Plan, with 2 focusing on extensions to the quays.

The prospective applicant said the need for the proposed development is in response to a need identified by Government for ports to create capability to support offshore energy developments. It said the requirement for Offshore Renewable Energy facilities were not known and therefore not considered when the Masterplan was being prepared. Additionally, it stated that the port location is close to proposed windfarms in the Celtic Sea and could also support windfarms in the Irish Sea. It is also located 2.5km from Great Island Power Station, which is the site of the Greenlink interconnector.

Current bulk activity within the port is 1.7 million tonnes. Total capacity at the port following the proposed development would be 4 million tonnes which is the volume indicated for 2035 within the Masterplan.

The proposed development comprises a 250-metre extension to the existing wharves at the container/bulk handling terminal. The development will be a continuation of the existing wharves and will comprise a reinforced concrete suspended deck supported on reinforced concrete beams and steel piles and a retaining structure to the rear. Land reclamation will be required and is expected to

be in the region of 1.2 hectares. Quarry rock sourced from local commercial quarries will be utilised within the project and dredged material used as fill in the reclaimed area. The total volume of fill is estimated at c.6,000 cubic metres.

The prospective applicant stated that the proposed development would be located within the Lower River Suir Special Area of Conservation (Site Code: 002137) and near the River Barrow and River Nore Special Area of Conservation (Site Code: 002162) and that they are cognisant of this sensitive environment. Based on the ecological studies completed to date, the prospective applicant said it can conclude that the proposed development would not result in any loss of habitat for which the Lower River Suir SAC is designated or the loss of any priority habitat. Additionally, it stated that following a Natura Impact Statement (NIS), it could confidently conclude that there would be no adverse impacts on the integrity of the SAC and therefore that it was not intended to progress to stage 4, Article 6(4) of the Habitats Directive.

In relation to potential visual impacts, the prospective applicant said a full landscape and visual assessment will be completed, supported by a number of photomontages from key and sensitive viewpoints in the immediate vicinity of the site.

The prospective applicant said the Environmental Impact Assessment Report (EIAR) would be underpinned by comprehensive and robust scientific data including 2 years of summer and winter wetland bird surveys and 2 years of otter surveys. Surveys relating to badgers, bats, aquatic ecology, noise and archaeology would also be incorporated. Stated that the two years survey data collection will be complete within the next couple of months.

The following reports would be submitted with the application, an EIAR, NIS, Preliminary Construction Environmental Management Plan, Traffic & Transport Plan, Flood Risk Assessment and other planning and design reports.

In relation to consultations, a public consultation event is scheduled to take place on the 20th February 2023, which was advertised in local media outlets and is an opportunity for the prospective applicant to present the proposed development to the community at an early design stage. Consultations are ongoing with the National Parks & Wildlife and Inland Fisheries Ireland in respect of the proposed

development. A non-statutory EIAR consultation document was issued, and responses are being received up to the 2nd March 2023. Feedback received from stakeholders will also be taken into consideration.

The prospective applicant is of the opinion that the proposed development would fall within the Seventh Schedule of the Planning and Development Act 2000, as amended, under Transport Infrastructure and within the category, a harbour or port installation which would involve the construction of one or more quays which or each of which would exceed 100 metres in length, and which would enable a vessel of over 1350 tonnes to enter within it. Furthermore, it was stated that the proposed development would satisfy the criteria of section 37A of the Planning Act as a development of strategic, economic or social importance to the State and to the region.

It is the prospective applicant's current intention to lodge a planning application for the proposed development in June 2023 however, it stated that their programme is dependent on the establishment of the Maritime Area Planning Act (MARA) and obtaining a Maritime Area Consent (MAC). The prospective applicants stated that pending the establishment of MARA they were not in a position to apply for a MAC.

Discussion

The following matters were discussed:

- A general discussion was held in relation to the Maritime Area Planning Act, Maritime Area Consent and Foreshore Lease applications. The Board's representatives noted that the form of development proposed appeared to be such as to come within the scope of development set out in the Seventh Schedule of the Planning and Development Act, 2000 as well as Schedule 10 of the MAP Act. The Board's representatives stated that it would therefore appear that the form of development proposed was such that it would comprise development that required permission under section XXI of the MAP Act, and which had been commenced. The Board's representatives also noted the position of the prospective applicant in that they cannot currently apply for a

MAC and progress their proposal through the procedures set out in the MAP Act, including the relevant pre application consultation procedures under that legislation. The Board's representatives further stated that they were not aware of any provisions in either the Planning and Development Act or the MAP Act which prevented the prospective applicant from submitting and progressing a pre application consultation under s.37 and also that they were not aware of any arrangements that would facilitate the prospective applicant to transition to the process under the MAP Act at a future date. In view of the above, it was agreed that the pre application consultation would proceed pending any transitional arrangements or legislative changes being put in place.

- In relation to the ports role in offshore renewable energy projects, the prospective applicant said it anticipates providing some support during the construction phase of these projects, however their key role is expected to be in the operation and maintenance (O&M) phase.

- In response to a query on the matter, the prospective applicant said there is no formal strategy in relation to the role of ports in assisting offshore renewable energy or the identification of particular ports for this role. A National Ports Policy was published in 2013, before ORE came to prominence. An updated policy is currently being prepared but it is not yet known when this will be published. The Board's representatives advised that in the event of an application the prospective applicant should detail why Waterford is an appropriate location for this activity over other port locations.

- The prospective applicant said the Port of Waterford has excellent connectivity, with rail and road linkages. It was noted that the N29 road runs directly to the main gate of the Port.

- In response to a query on the matter, the prospective applicant said they are not aware of any issues relating to erosion in the area.

- In relation to the environmental sensitivities of the area, the prospective applicant said the location of the proposed works is not located within a designated shellfish area.

- In response to a query on the matter, the prospective applicant said the Port of Waterford Master Plan 2020-2044 clearly identifies extension works at the quays as one of its key projects.

- The prospective applicant said ecological surveys are continuing and historical scientific data is available and would be utilised and submitted as part of the application.

- The Board's representatives stated their preliminary opinion is that the proposed development would constitute strategic infrastructure development but noted that the ultimate decision is a matter for the Board.

- A general discussion was had around habitat creation and biodiversity net-gain. The prospective applicant said several options are currently being appraised and it is their intention that these areas would eventually fall under the control of the Port. In relation to community gain, the prospective applicant said parkland access and education is also being considered. The Board's representatives stressed the importance that any proposals for biodiversity net gain would clearly demonstrate how such areas / works were within the control of the applicant to undertake.

- In response to a query on the matter, the prospective applicant said discussions have taken place with the National Parks & Wildlife and a further meeting is anticipated in the future. The Board's representatives stressed the importance of consulting with the National Parks & Wildlife Service prior to submitting the planning application.

- A discussion was had with regard to the extent of ancillary works that would accompany any application and whether these works would also be considered to be strategic infrastructure. The presentation made to the Board indicated a number of relatively small scale structures / warehouses located within the proposed infill area. The extent of ancillary works would need to be clarified prior to the closure of the pre application consultation process.

Conclusion

The record of the meeting will issue to the prospective applicant, and it will then be a matter for the prospective applicant to submit any comments on this if it wishes to do so. It will be a matter for the prospective applicant to revert to the Board if it requires a further meeting or if it wishes to close the pre-application consultation process.

Stephen Kay.

Stephen Kay
Assistant Director of Planning

An Bord Pleanála

Record of Meeting
ABP-315199-22
2nd meeting

Case Reference / Description	ABP-315199-22 - Proposed Offshore Renewable Energy (ORE) Terminal located on a 200-250 metre quay extension and ancillary works at Port of Waterford, Belview, Co. Kilkenny		
Case Type	Pre-application Consultation		
1st / 2nd / 3rd Meeting	2nd		
Date	22/06/2023	**Start Time**	11:00am
Location	Virtually by Microsoft Teams	**End Time**	12:15pm

Representing An Bord Pleanála
Stephen Kay – Assistant Director of Planning (Chair)
Kevin Moore – Senior Planning Inspector
Evan McGuigan – Administrative Assistant

Representing the Prospective Applicant
Kevin O'Regan – Malone O'Regan
Eimear Sharkey – Malone O'Regan
Amelia Keane – Malone O'Regan
David Sinnott – Port of Waterford

Capt. Darren Doyle – Port of Waterford
Simon Clear – Simon Clear & Associates
Darran Quaile – Simon Clear & Associates

Introduction:

The meeting commenced at 11:00am.

The Board's representatives confirmed the receipt of the letter dated 2nd June 2023 from the prospective applicant requesting the second pre-application meeting and stated that the items mentioned in this letter would be discussed following the prospective applicant's presentation. The Board's representatives also referred to the contents of the introduction in the record of the previous meeting held with the prospective applicant on 16th February 2023.

Presentation by the prospective applicant:

The prospective applicant began its presentation with a brief recap of the project and some updates since the first meeting. It submitted that plans for the proposed development had been progressing since the government introduced its ORE policy and that the Port of Waterford would be providing an update to the Minister on 25th July regarding the development. It also submitted that the National Ports Policy will be updated soon and that, according to pre-liminary discussions, ORE would be included in this. The prospective applicant stated that there was interest from energy developers in the proposed development and that a potential collaboration with South East Technological University regarding ORE studies was being explored.

It is estimated by prospective applicant that the proposed development would accommodate the needs of 2 operators. It also stated that it would ensure the avoidance of conflict with existing users of the port. A berth extension would service existing and ORE expansion plans and the proposed development would be primarily focused on support and maintenance for ORE operations. The proposed development has been amended since the first meeting and is now proposed to include two pontoons for crew transfer vessels, onshore buildings (for materials

storage, administration, welfare and accommodation for crews) and car parking/access.

An update was provided by the prospective applicant regarding consultations. A public consultation event was held at the Port of Waterford offices on 20th February 2023 and was described by the prospective applicant as well-attended. A meeting was held with the Cheekpoint and Faithlegg Development Group – which comprises residents based on the opposite side of the bank to the port – on 3rd May 2023. A meeting was also held with Councillor Jody Power on 3rd May 2023, where a number of concerns were raised from local constituents and discussed. These consultations were all described by the prospective applicant as being constructive, and that it was taking all feedback on board.

As a result of feedback from the Cheekpoint and Faithlegg Development Group regarding noise data, an 8-week programme of additional ambient noise monitoring has been commenced and is currently ongoing. It was submitted by the prospective applicant that additional viewpoints for photomontages and more detail regarding light impact assessments were also being considered following feedback from the residents.

In terms of stakeholder consultation, the prospective applicant stated that it had received further responses regarding EIAR scoping and that meetings with Inland Fisheries Ireland and Bord Iascaigh Mhara had taken place. It also stated that discussions had taken place with Kilkenny County Council regarding traffic issues.

A meeting was held between the prospective applicant and the National Parks and Wildlife Service on 10th May 2023. According to the prospective applicant, the NPWS confirmed that the project could proceed under Article 6(3) and that they did not think the project would require Article 6(4) to be invoked. It was also submitted that the NPWS had reacted positively to the scope of surveys undertaken regarding the proposed development.

Following feedback from the meeting with the NPWS, the prospective applicant has now included a proposed biodiversity enhancement area as part of the project. The 4-and-a-half-hectare site identified is a field located north of the proposed extension area and north-east of the existing port facility (this area is shaded purple on the

slide titled '*Biodiversity Enhancement / Net Gain*' in the prospective applicant's presentation to the Board). The prospective applicant submitted that this area is owned by one of the operators in the port and that it was engaging with the landowners. It also submitted that this site was currently the preferred option for a biodiversity enhancement area and that studies regarding it are ongoing.

The prospective applicant stated that engagements with several ORE operators are also ongoing, and that the recent consultations had influenced the design of the buildings to be located in the proposed development. It was submitted by the prospective applicant that the ORE operators would require warehousing, offices and transport facilities during the operational phase of offshore wind farms.

It was further submitted by the prospective applicant that an EIAR for the proposed development was currently being drafted and that it would be underpinned by a wide range of surveys and scientific data. These surveys included terrestrial ecology, aquatic ecology, noise, archaeology, and landscape & visual. The surveys concerning aquatic ecology and noise were described as ongoing, as were surveys concerning bats and birds.

In terms of design updates, the prospective applicant stated that the proposed wharf extension is still 250m in length and that there would now be two pontoons in the proposed development. Carparking and pedestrian routes for the operations and maintenance facilities were also updated, and the prospective applicant submitted that an existing downstream ramp will be removed. The prospective applicant also submitted their expectation that around 25 crew members would be on site each day and that work regarding traffic issues is being investigated and is ongoing.

In terms of the statutory process, the prospective applicant stated that it has been engaging with the Department regarding updates on MARA, foreshore licensing and the potential transitional arrangements from consultations under section 37 to Part XXI. It expected that updates on these issues would be available soon. Regarding the requirement for a MAC, the prospective applicant stated their belief that legislation currently being progressed under the Monuments Act would state that a MAC would not be required for national ports. The prospective applicant also stated their intention to prepare an application for this proposed development as an Article 6(3) project.

The prospective applicant referred to the scope of a potential application, including an EIAR. The application would also consist of a NIS, CEMP, traffic & transport plan, flood impact assessment, design reports, planning reports, supporting drawings and a website.

In terms of next steps, the prospective applicant stated that their timeline for the proposed development would be dependent on the issues regarding obtaining a MAC and the establishment of MARA. The prospective applicant stated their intention to end the consultations, receive an opinion from the Board, and target the lodgement of an application by the end of August 2023. However, it also stated that, depending on what happens regarding the establishment of MARA or the Monuments Act, a further meeting may be required before ending the consultations.

Discussion:

- A general discussion was had between the Board's representatives and the prospective applicant regarding the statutory process, transitional arrangements and MAC requirements. The Board's representatives stated that there had been no update from the Department yet regarding transitional arrangements and that they were not aware of any potential transitional arrangement to be introduced whereby national ports would not require MAC. The prospective applicant said it believed that under this development, MAC would not be required for consultations but would be required for the application stage. In response to a question from the prospective applicant, the Board's representatives stated that they believed that the Department is aware of the need for transitional arrangements for cases and consultations currently before the Board.
- Regarding MAC requirements, the Board's representatives noted that s.286(4) of the MAP act states that MAC would not be required should the applicant receive the consent of the owner of land. They asked the prospective applicant if this option been considered. The prospective applicant stated that it was exploring various options regarding this issue but had been advised about going to the relevant bodies for MAC first as opposed to the Minister (who owns the land). In response to a question from the

prospective applicant, the Board's representatives stated that the consent of the owner of land would be enough to negate the requirement for MAC and that the other criteria listed in the section of the legislation (including the requirement to obtain a MAC) would not need to be satisfied as a result.

- In response to a question from the Board's representatives, the prospective applicant stated its intention to proceed with the application as a SID should the consultations under s.37 be ended (and an opinion issued by the Board) and that a transition phase to a process under the MAP act would be used should it be required. The Board's representatives noted that the proposed development appears to come under the type that would require permission under section XXI of the MAP act. They also noted that the issue for the prospective applicant is therefore how they can transition from the current pre application consultation process under s.37 to that prescribed in Part XXI of the Act or how they can commence pre applications under Part XXI. Pending the publication of legislation covering transitional arrangements the Boards representatives stated that they could not give definitive advice to the prospective applicants as to how they should proceed or advise them to withdraw the current pre application request under s.37.
- The prospective applicant acknowledged this and stated that it would take this information – concerning the statutory process, transitional arrangements, and MAC requirements – into account when considering how it would proceed with the consultations going forward.
- In response to a query from the Board's representatives, the prospective applicant stated that the proposed development would still include the storage of parts for wind turbines on site, but that it would be mostly involve spare parts – as opposed to large parts of the structures such as blades – and possibly cables.
- In response to a question from the Board's representatives, the prospective applicant submitted that the NPWS was definitive in their discussions that the proposed development would not involve Article 6(4). It stated that the NPWS had confirmed this verbally and had not raised any issues on the notes produced following the discussions. The prospective applicant also stated that

there would be no impact on designated species within the special area of conservation.

- A general discussion was had between the Board's representatives and the prospective applicant regarding the proposed biodiversity enhancement area. The prospective applicant stated that it was considering a number of proposals – including the creation of a pond or the realignment of a nearby stream – and that it intended to conduct a flood study of the area. It stated that these proposals would benefit the species located in close proximity to the area and could lead to the natural regeneration of wetlands. It also confirmed that feedback from the NPWS had played a role in plans for this area.
- Following a question from the Board's representatives regarding buildings and associated structures on the proposed development, the prospective applicant said that it was engaging with several ORE operators and receiving feedback on this issue. The prospective applicant submitted that one operator had stated a preference for a warehouse for storage and office space, and that another operator had stated a preference for a hub to be used by people being transferred to offshore wind farms or structures. The prospective applicant confirmed that it had visited sites in Scotland to investigate similar types of developments and warehouses. It envisaged that plans for the insides of the buildings and associated structures would be developed overtime as engagement with the operators continues and stated that detailed plans would be included in a full application.
- The Board's representatives advised the prospective applicant to be mindful of language used when it comes to a full application and the description of the habitat area, especially to ensure that there is no reference to compensatory habitat.
- The prospective applicant stated that they were happy with the levels of local engagement in the proposed development and stressed that importance of community gain associated with the project. It also reiterated that it is exploring arrangements regarding a possible collaboration with the South East Technological University over ORE studies.

- The Board's representatives reiterated that the proposed development would probably come under Part XXI, that consent from the Minister regarding the lands the subject of the proposed development would potentially remove the requirement for MAC and that the Department had yet to provide an update regarding transitional arrangements. The prospective applicant said that it would take these factors into consideration when discussing its next steps and that it would only confirm its intention to end consultations with the Board in writing.

Conclusion:

The record of the meeting will issue in due course and the prospective applicant can submit any comments it may have in writing or alternatively bring any comments for discussion at the time of any further meeting. The onus is on the prospective applicant to either request a further meeting.

The meeting concluded at 12:15pm.

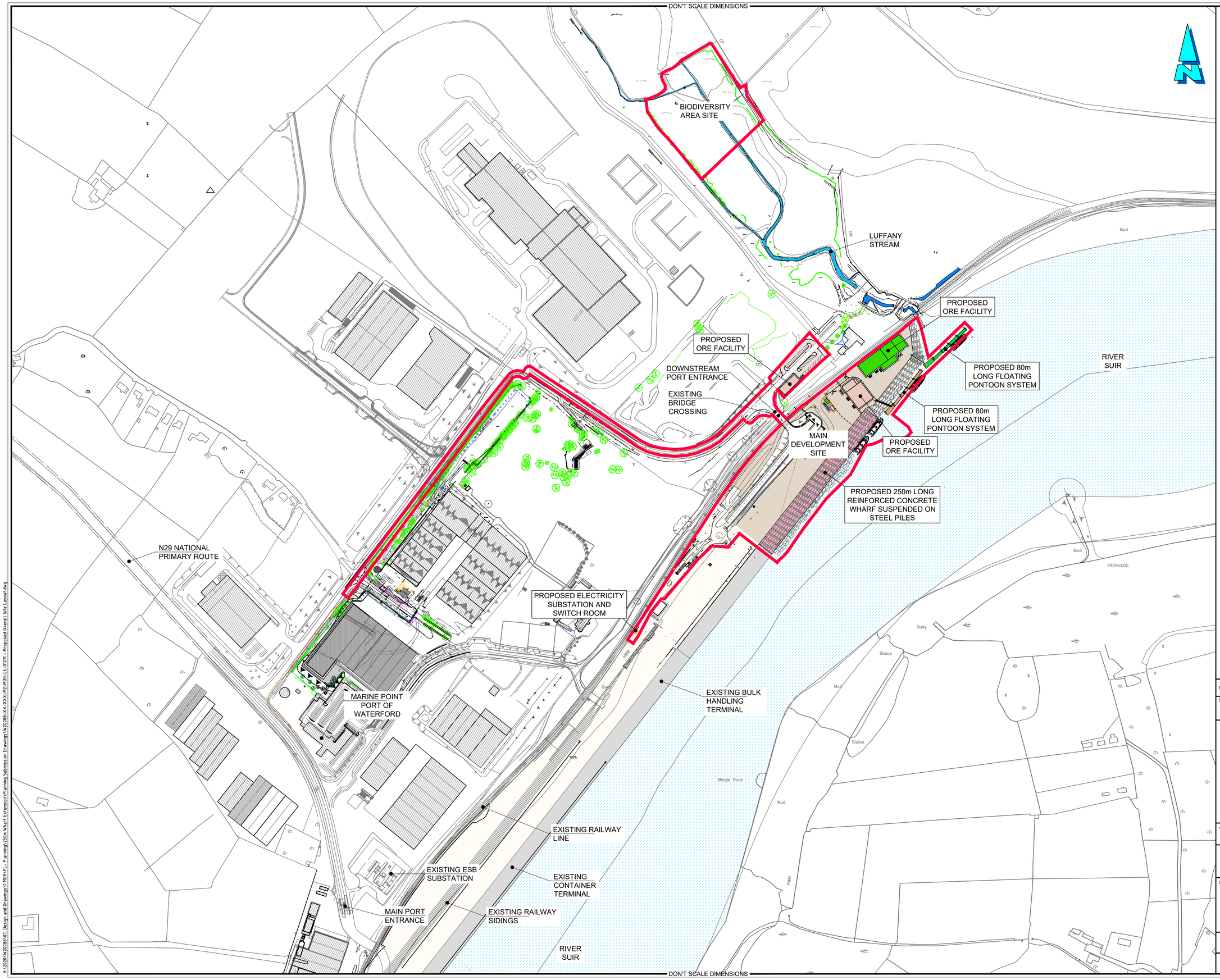
Stephen Kay,

Stephen Kay
Assistant Director of Planning

APPENDIX 3

APPENDIX 3-1

DON'T SCALE DIMENSIONS



Health and Safety:

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS, THE SPECIFICATION AND THE SAFETY AND HEALTH PLAN.

Note:

1. NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR STORED IN ANY RETRIEVAL SYSTEM OF ANY NATURE WITHOUT THE WRITTEN PERMISSION OF MALONE O'REGAN CONSULTING ENGINEERS AS COPYRIGHT HOLDER EXCEPT AS AGREED FOR USE ON THE PROJECT FOR WHICH THE DRAWING WAS ORIGINALLY ISSUED.
2. ALL DIMENSIONS IN mm UNLESS NOTED OTHERWISE.
3. ALL LEVELS ARE TO POOLBEG DATUM

LEGEND:

PROPOSED AREA OF MAIN DEVELOPMENT SITE 6.1102ha (15.099 acres)

DENOTED THUS:

PROPOSED AREA OF BIODIVERSITY AREA SITE 1.8212ha (4.50 acres)

DENOTED THUS: BIODIVERSITY AREA

TOTAL AREA OF SITE = 7.9314ha (19.599 acres)

Rev.	Description	Date	Drawn	Chkd
0	PLANNING ISSUE	05.09.2025	JD	ES

Status: P3 - ISSUED FOR PLANNING

MALONE O'REGAN CONSULTING ENGINEERS
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Client: PORT OF WATERFORD COMPANY

Job: PROPOSED OFFSHORE RENEWABLE ENERGY CAPABLE TERMINAL ON A 250m WHARF EXTENSION & ANCILLARY OPERATIONAL SUPPORT INFRASTRUCTURE

Drawing: PROPOSED OVERALL SITE LAYOUT

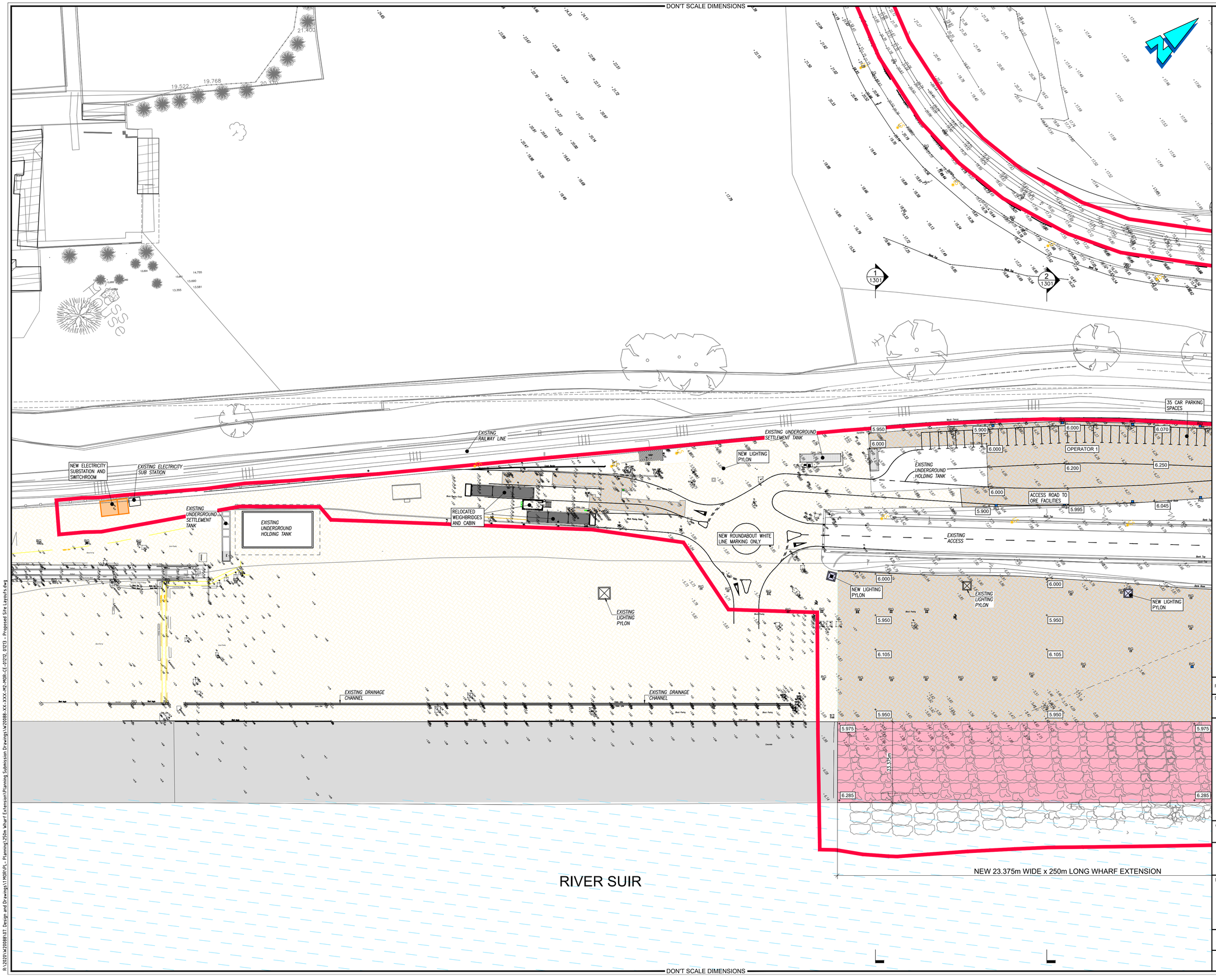
Job No	Revision	Approver	Scale	Sheet
W20088	0	ES	A1 1:2,500 A3 1:5,000	A1

Drg No: W20088-XX-XXX-DR-MOR-CE-01211

DON'T SCALE DIMENSIONS

R:\2020\w20088\07 Design and Drawings\1 MOR\PL - Planning\250m Wharf Extension\Planning Submission Drawings\W20088-XX-XXX-M2-MOR-CE-01211 - Proposed Overall Site Layout.dwg

DON'T SCALE DIMENSIONS



Health and Safety:

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS, THE SPECIFICATION AND THE SAFETY AND HEALTH PLAN.

Note:

1. NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR STORED IN ANY RETRIEVAL SYSTEM OF ANY NATURE WITHOUT THE WRITTEN PERMISSION OF MALONE O'REGAN CONSULTING ENGINEERS AS COPYRIGHT HOLDER EXCEPT AS AGREED FOR USE ON THE PROJECT FOR WHICH THE DRAWING WAS ORIGINALLY ISSUED.
2. ALL DIMENSIONS IN mm UNLESS NOTED OTHERWISE.
3. ALL LEVELS ARE TO POOLBEG DATUM

LEGEND:

PROPOSED PLANNING OUTLINE
DENOTED THUS:

EXISTING COBLOC PAVING
DENOTED THUS:

EXISTING WHARF (CONCRETE DECK)
DENOTED THUS:

NEW WHARF EXTENSION
DENOTED THUS:

WHARF CONSISTING OF CONCRETE DECK AND BEAMS WITH DRIVEN STEEL PILES

NEW COBLOC PAVING
DENOTED THUS:

COBLOC PAVING ON SAND BED ON COMPACTED CLAUSE 804 ON QUARRY RUNROCK FILL

NEW PERMEABILE PAVING
DENOTED THUS:

PERMEABLE PAVING ON BEDDING LAYER ON MODIFIED OPEN GRADED SUBBASE ON CLAUSE 804 ON PREPARED FORMATION

AREA OF ROCK ARMOUR REVETMENT
DENOTED THUS:

Rev.	Description	Date	Drawn	Chkd
0	PLANNING ISSUE	05.09.2025	JD	ES

Status: P3 - ISSUED FOR PLANNING

MALONE O'REGAN CONSULTING ENGINEERS
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GALWAY: Tel: +353 91 531 069 Email: galway@morce.ie
LONDON: Tel: +44 208 5281685 Email: london@morce.ie

Client: Cuideachtaí Phort Láirge Port of Waterford Companies
PORT OF WATERFORD COMPANY

Job: PROPOSED OFFSHORE RENEWABLE ENERGY CAPABLE TERMINAL ON A 250m WHARF EXTENSION & ANCILLARY OPERATIONAL SUPPORT INFRASTRUCTURE

Drawing: PROPOSED SITE LAYOUT SHEET 1

Job No	Revision	Approver	Scale	Sheet
W20088	0	ES	A1 1:500 A3 1:1,000	A1

Drg No: W20088-XX-XXX-DR-MOR-CE-01212

R:\2020\W20088\07. Design and Drawings\1\MOR\PL - Planning\250m Wharf Extension\Planning Submission Drawings\W20088-XX-XXX-M2-MOR-CE-01212_01213 - Proposed Site Layouts.dwg

DON'T SCALE DIMENSIONS

DON'T SCALE DIMENSIONS

PROPOSED PUMPING STATION & VALVE CHAMBER

18 CAR PARKING SPACES

OFFICE FACILITY
OPERATOR 2
F.F.L. 12.250
30500

OPERATOR 2

17 CAR PARKING SPACES

35 CAR PARKING SPACES

EXISTING DOWNSTREAM ENTRANCE TO PORT

EXISTING RAIL CROSSING

EXISTING RAILWAY LINE

ACCESS ROAD TO CORE FACILITIES

NEW PEDESTRIAN ACCESS STEPS

NEW SECURITY GATES

EXISTING ACCESS

PROPOSED PUMPING STATION & VALVE CHAMBER

FUEL 1

FUEL 2

NEW SECURITY FENCE

NEW KERB AND CRASH BARRIER TO MATCH EXISTING

PROPOSED SETTLEMENT TANK

NEW LIGHTING PYLON

PROPOSED UNDERGROUND EMERGENCY HOLDING TANK

VEHICLE FILLING LOCATION WITH DISHED CONCRETE FOR CONTAINMENT

NEW CRASH BARRIER

BELOW GROUND FUEL SUPPLY LINES

WAREHOUSE
F.F.L. 6.350

OPERATOR 1

OFFICES
F.F.L. 6.350

OPERATOR 2
WAREHOUSE & WORKSHOP
F.F.L. 6.350

NEW SECURITY FENCE

KENNEDY'S MILL

LUFFANY STREAM

LUFFANY STREAM DISCHARGE PIPES

EXISTING RAILWAY LINE

FIXED QUAY SIDE CRANE

FIXED QUAY SIDE CRANE

CTV EQUIPMENT LOADING/UNLOADING BERTH

NEW ACCESS GANGWAY

CTV LOADING/UNLOADING PONTOON (80m LONG)

NEW ACCESS GANGWAY

CTV LOADING/UNLOADING PONTOON (80m LONG)

NEW 23.375m WIDE x 250m LONG WHARF EXTENSION

RIVER SUIR

DON'T SCALE DIMENSIONS

R:\2020\W20088\07. Design and Drawings\1 MOR\PL - Planning\250m Wharf Extension\Planning Submission Drawings\W20088-XX-XXX-M2-MOR-CE-01202, 01213 - Proposed Site Layouts.dwg

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DENOTED THUS:

EXISTING COBLOC PAVING

DENOTED THUS:

EXISTING WHARF (CONCRETE DECK)

DENOTED THUS:

NEW WHARF EXTENSION

DENOTED THUS:

WHARF CONSISTING OF CONCRETE DECK AND BEAMS WITH DRIVEN STEEL PILES

NEW COBLOC PAVING

DENOTED THUS:

COBLOC PAVING ON SAND BED ON COMPACTED CLAUSE 804 ON QUARRY RUNROCK FILL

NEW PERMEABLE PAVING

DENOTED THUS:

PERMEABLE PAVING ON BEDDING LAYER ON MODIFIED OPEN GRADED SUBBASE ON CLAUSE 804 ON PREPARED FORMATION

AREA OF ROCK ARMOUR REVETMENT

DENOTED THUS:

Rev.	Description	Date	Drawn	Chkd
0	PLANNING ISSUE	05.09.2025	JD	ES

Status: P3 - ISSUED FOR PLANNING

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Client: PORT OF WATERFORD COMPANY

Job: PROPOSED OFFSHORE RENEWABLE ENERGY CAPABLE TERMINAL ON A 250m WHARF EXTENSION & ANCILLARY OPERATIONAL SUPPORT INFRASTRUCTURE

Drawing: PROPOSED SITE LAYOUT SHEET 2

Job No	Revision	Approver	Scale	Sheet
W20088	0	ES	A1 1:500 A3 1:1,000	A1

Drg No: W20088-XX-XXX-DR-MOR-CE-01213

APPENDIX 3-2

August 2025

Preliminary Rehabilitation Plan

Proposed Offshore Renewable Energy (ORE) Capable Terminal on a 250m Wharf Extension & Ancillary Operational Support Infrastructure

Calafort Phort Láirge
Port of Waterford

Port of Waterford Company

Port of Waterford, Belview, Co. Kilkenny

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Job Number: E2068

Prepared By: Amelia Keane **Signed:** _____

Checked By: Kevin O'Regan **Signed:** _____

Approved By: Kevin O'Regan **Signed:** _____

Revision Record

Issue No.	Date	Description	Remark	Prepared	Checked	Approved
01	29/08/25	Preliminary Rehabilitation Plan	Final	AK	KOR	KOR

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Preliminary Rehabilitation Plan

Proposed ORE Capable Terminal on a 250m Wharf Extension & Ancillary Operational Support Infrastructure

Port of Waterford Company

Port of Waterford, Belview, Co. Kilkenny

Contents

1 INTRODUCTION 1

2 REHABILITATION 3

2.1 Preliminary Rehabilitation Plan 3

2.2 Section 95 – Environmental Effects 3

FIGURES

Figure 1: MAC Boundary 2

TABLES

Table 1: Likely Significant Effects 4

1 INTRODUCTION

Malone O'Regan Environmental ('MOR Environmental') has been commissioned by Port of Waterford Company ('the Applicant') to prepare a preliminary Rehabilitation Plan in support of a planning application for the construction and operational phases of proposed port facilities comprising of a circa ('ca.') 250-metre ('m') wharf extension to support proposed Offshore Renewable Energy ('ORE') development and general port development, land reclamation, ancillary works and a biodiversity enhancement area ('the Proposed Development').

The Proposed Development will be located partly on land and partly in the near shore area of the coastal planning authority (Kilkenny County Council) at the Port of Waterford, Belview, Co. Kilkenny ('the Site') (ITM OS Reference: 666422; 613637).

The Proposed Development is subject to a Maritime Area Consent ('MAC') from the Maritime Area Regulatory Authority ('MARA').

MARA granted the Port of Waterford a conditional MAC on the 16th June 2025 (Ref: MAC20230001). The MAC was granted for:

> *'The construction, use, operation and maintenance of port facilities, including all associated decommissioning, demolition, rehabilitation and any other works required on foot of any development permission relating to the port facilities.'*

This MAC includes a lifespan of 60 years. At the requisite time, following the 60-year lifespan, it is anticipated that the Applicant will apply for a new MAC, and all other appropriate consents for the nature of the Proposed Development to be continued or repurposed.

The area subject to the MAC includes an area of ca. 2.37 hectares ('ha') within the River Suir, see Figure 1.

Figure 1: MAC Boundary



2 REHABILITATION

2.1 Preliminary Rehabilitation Plan

The MAC received from MARA on the 16th June 2025 outlines the requirement for rehabilitation of the consented area prior to the expiration of the MAC, in accordance with Condition 19.

However, according to the MAC, the rehabilitation works must be completed in accordance with the Rehabilitation Schedule, which will only be provided following the grant of development permission. Therefore, at this time, the Rehabilitation Schedule is not currently known.

It should be noted that according to Condition 19.4 of the MAC, "*Notwithstanding termination or revocation of this Consent pursuant to this Consent or the Act, the Holder must continue to comply with the obligations under this condition 19 and section 96 of the Act to the extent as agreed by the Grantor in all the circumstances of the case."*

Therefore, Section 96(2) of the Maritime Area Planning Act ('MAPA') 2021 states:

> *(2) Without prejudice to the generality of the obligation under subsection (1) on the holder of a MAC to rehabilitate a part of the maritime area, that obligation may be or include one or more than one of the following:*
>
> *(a) the decommissioning of infrastructure;*
>
> *(b) the removal of infrastructure;*
>
> *(c) the partial removal of infrastructure;*
>
> ***(d) the re-use of infrastructure for the same or another purpose;***
>
> *(e) the burying or encasing of infrastructure;*
>
> *(f) the removal of any deposited or waste material.*

As such, at this time, the Port of Waterford Company (the holder of the MAC) has confirmed that, in accordance with Section 96(2)(d), it is proposed to rehabilitate the maritime area by re-using the infrastructure for the same or another port-related purpose.

However, the final Rehabilitation Plan will be confirmed once the final Rehabilitation Schedule has been issued.

2.2 Section 95 – Environmental Effects

Section 95(a)(ii) of the MAPA states:

> *""rehabilitate", in relation to a part of the maritime area, means—*
>
> *(a) a treatment for the part in such a way as to either—*
>
> *(ii) restore the part to a satisfactory state to enable it to be reused for the purpose for which it was previously used (and whether or not pursuant to a MAC) or for another purpose and, consistent with such purpose, with particular regard to the seabed, water quality, wildlife, natural habitats, landscape and seascape,"*

Therefore, Table 1 outlines the potential for to likely significant effects on the seabed, water quality, wildlife, natural habitats, landscape and seascape as a result of the proposed re-use of the infrastructure for the same or another port-related purpose.

Table 1: Likely Significant Effects

Assessments	Response
Environmental Impact Assessment Report ('EIAR')	The proposed works within the maritime area are considered to be permanent in nature, but it was concluded that there will be no likely significant effects on the seabed, water quality, wildlife, natural habitats, landscape and seascape following the implementation of the recommended appropriate mitigation and monitoring measures in the EIAR.
Stage 1: Appropriate Assessment - Screening and Stage 2: Natura Impact Statement ('NIS')	The proposed works within the maritime area are considered to be permanent in nature, but it was concluded that there will be no likely significant effects on any designated habitats or species, the seabed, water quality, wildlife, natural habitats, landscape and seascape following the implementation of the recommended appropriate mitigation and monitoring measures in the NIS.
Site Specific Flood Risk Assessment	The proposed works within the maritime area are considered to be permanent in nature, but it was concluded that there will be no likely significant effects on any designated habitats or species, the seabed, water quality, wildlife, natural habitats, landscape and seascape following the implementation of the recommended appropriate mitigation and monitoring measures.
Water Framework Directive ('WFD')	The proposed works within the maritime area are considered to be permanent in nature, but it was concluded that there will be no likely significant effects on any designated habitats or species, the seabed, water quality, wildlife, natural habitats, landscape and seascape following the implementation of the recommended appropriate mitigation and monitoring measures in the WFD.

As outlined in Table 1, it can be concluded that there will be no likely significant residual effects on the seabed, water quality, wildlife, natural habitats, landscape or seascape as a result of the construction or operation of the Proposed Development following the implementation of the appropriate mitigation measures and monitoring set out in the application.

Therefore, it was concluded that there will be no likely significant effects on the seabed, water quality, wildlife, natural habitats, landscape or seascape as a result of the continued use or reuse of the infrastructure for the same or another port-related purpose.

The Final Rehabilitation Plan, including a revised assessment of potential likely significant effects on the seabed, water quality, wildlife, natural habitats, landscape or seascape will be undertaken once the final Rehabilitation Schedule has been issued by MARA following the final grant of planning.

APPENDIX 6

Appendix 6-1

August 2025

Bat Report

Proposed Offshore Renewable Energy ('ORE') Capable Terminal on a 250m Wharf Extension & Ancillary Operational Support Infrastructure

Calafort Phort Láirge
Port of Waterford

Port of Waterford Company

Port of Waterford, Belview, Co. Kilkenny

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Job Number: E2068

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Checked By: Kathryn Broderick **Signed:** K. Broderick.

Approved By: Dyfrig Hubble **Signed:** _____

Revision Record

Issue No.	Date	Description	Remark	Prepared	Checked	Approved
01	29/08/25	Bat Report	Final	SL	KB	DH

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Bat Report

Proposed ORE Capable Terminal on a 250m Wharf Extension & Ancillary Operational Support Infrastructure

Port of Waterford Company

Port of Waterford, Belview, Co. Kilkenny

Contents

1 INTRODUCTION 1
1.1 Relevant Legislation 2
1.2 Statement of Authority 2
1.3 Species Background 2
1.4 Types of Bat Roosts 3
1.5 Purpose of Survey Work 4
2 METHODOLOGY 5
2.1 Desk-Based Studies 5
2.2 Field-Based Studies 5
2.2.1 Bat Survey Guidance Documents 5
2.2.2 Daytime Bat Walkover and Identification of Bat Habitats 6
2.2.3 Preliminary Roost Assessment 7
2.2.4 Ground Level Tree Assessment 8
2.2.5 Bat Survey Area 8
2.2.6 Dusk Emergence, Dawn Re-entry and Night-time Bat Walkover ('NBW') Surveys 9
2.2.7 Static Monitoring ('SM4') 11
2.2.8 Data Analysis 12
2.3 Validation of Survey Data 13
2.4 Evaluation of the Importance of the Site for Bat Species 13
3 RESULTS 14
3.1 Desk-Based Results 14
3.2 Field-Based Results 15
3.2.1 Daytime Bat Walkover and Identification of Bat Habitats 15

3.2.2 Preliminary Roost Assessment 15
3.2.3 Ground Level Tree Assessment 16
3.2.4 Dusk Emergence, Dawn Re-Entry and NBW Survey Results 16
3.3 Overall Results 24
4 IMPACT ASSESSMENT AND MITIGATION 26
4.1 Potential Impacts on Bats 26
4.1.1 Potential Loss of Habitat / Disturbance 26
4.1.2 Potential Lighting Disturbance during the Construction and Operational Phase 27
4.2 Mitigation, Monitoring and Enhancement Measures 27
5 CONCLUSIONS 28
6 REFERENCES 29

FIGURES

Figure 1-1: Site Location 1
Figure 2-1: Bat Survey Area 9
Figure 2-2: Bat Survey Vantage Points 10
Figure 2-3: Bat Survey Transects 10
Figure 2-4: SM4 Locations 12
Figure 3-1: Gorteens Old Mill Building March 2021 15
Figure 3-2: Gorteens Old Mill Building November 2022 16
Figure 3-3: Bat Activity within the Bat Survey Area 20
Figure 3-4: Bar Chart of SM4-1 Results (Belview Port) 23
Figure 3-5: Bar Chart of SM4-2 Results (Gorteens Old Mill Building) 24

TABLES

Table 1-1: Status of Irish Bat Species [2] 3
Table 1-2: Bat roost types (definitions written by the Natural England Earned Recognition Project) [5] 4
Table 2-1: 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 [5]. 6
Table 2-2: Bat Survey Metadata 13
Table 3-1: Habitat Suitability Index 14
Table 3-2: Results from SM4 -1 (Belview Port) 22
Table 3-3: Results from SM4 – 2 (Gorteens Old Mill Building) 23

1 INTRODUCTION

This Bat Report has been prepared by Malone O'Regan Environmental ('MOR Environmental') on behalf of Port of Waterford Company ('the Applicant'), to present the findings of bat surveys undertaken in respect of the construction and operational phases of proposed port facilities comprising of a circa ('ca.') 250-metre ('m') wharf extension to support proposed Offshore Renewable Energy ('ORE') development and general port development, land reclamation, ancillary works and a biodiversity enhancement area ('the Proposed Development').

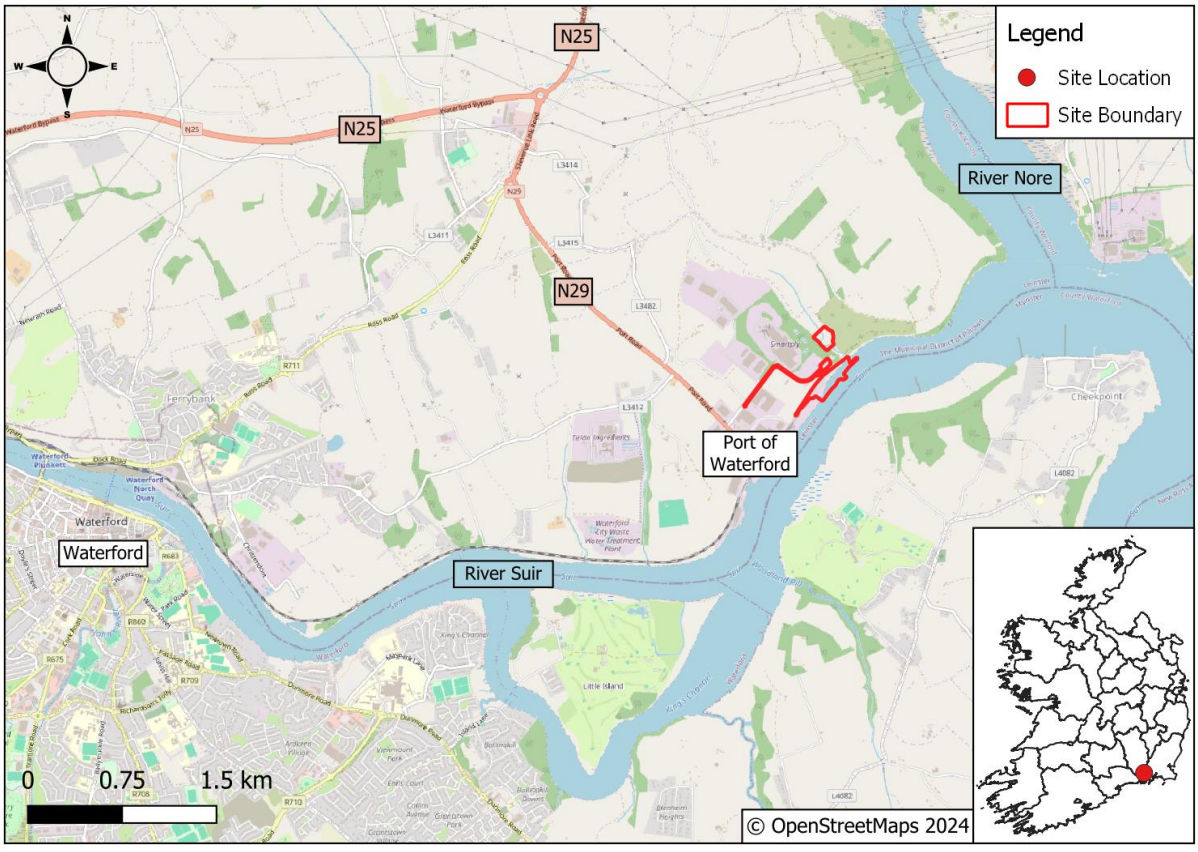
The Proposed Development will be located partly on land and partly in the near-shore area of the coastal planning authority (Kilkenny County Council) at the Port of Waterford, Belview, Co. Kilkenny ('the Site') (ITM OS Reference: 666422; 613637).

The Site has a gross site area of ca. 8 hectares ('ha') and is made up of the following sections:

- ca. 4.9ha of development within the existing Port of Waterford landownership;
- ca. 1.3ha of reclaimed area within the Lower Suir Estuary using reclaimed materials and quarried rock; and,
- ca. 1.8ha of a biodiversity enhancement area located to the northwest of the quay development.

Figure 1-1 shows the location of the Site, located partly within the townland of Gorteens, Co. Kilkenny, ca. 5.6km northeast of Waterford City.

Figure 1-1: Site Location



This Bat Report is an appendix to Chapter 6 – Biodiversity of the Environmental Impact Assessment Report ('EIAR') prepared by MOR Environmental. This bat survey report should be read in conjunction with Chapter 6 of the EIAR.

1.1 Relevant Legislation

All Irish bat species are protected by law under the Wildlife Act 1976 and its subsequent amendments. They are afforded full protection under this act, which makes it a criminal offence for anyone without a licence to:

- Kill, injure or handle a bat;
- Possess a bat (whether alive or dead);
- Disturb a roosting bat; and,
- Damage, destroy or obstruct access to any place used by bats for shelter, whether they are present or not.

In addition to domestic legislation, bats are also protected under the EU Habitats Directive (92/43/EEC). All Irish bats are listed in Annex IV of the Habitats Directive, and the lesser horseshoe bat is further listed under Annex II, which make it an offence to:

- Deliberately capture, injure or kill any bat; or,
- Deliberately disturb a bat, in particular any disturbance which is likely;
    (a) To impair their ability:
        (i) To survive, to breed or reproduce, or to rear or nurture their young; or,
        (ii) To hibernate or migrate.
    (b) To affect significantly the local distribution or abundance of the bat species; or,
- Damage or destroy a breeding site or resting place of a bat.

Therefore, the destruction, alteration or evacuation of a known bat roost is a notifiable action under current legislation, and a derogation license must be obtained from the National Parks and Wildlife Service ('NPWS') before works can commence.

Furthermore, it should also be noted that any works interfering with bats and especially their roosts, including, for instance, the installation of lighting in the vicinity of the latter, may only be carried out under a license to derogate from Regulation 23 of the Habitats Regulations 1997 (which transposed the EU Habitats Directive into Irish law) issued by NPWS.

1.2 Statement of Authority

This report was reviewed and approved by Mr. Dyfrig Hubble, Associate Director – Ecologist. Dyfrig has a B.Sc. (Hons) in Tropical Environmental Science and an M.Sc. in Environmental Forestry. Dyfrig is a full member of the Chartered Institute of Ecology and Environmental Management ('CIEEM'). Dyfrig has over 18 years' experience working in the ecological consultancy sector, including habitat appraisals and specialist species-specific surveys. Dyfrig has extensive experience in undertaking a variety of bat surveys, including dawn / dusk surveys, transects, static monitoring, harp trapping and Lesser Horseshoe roost counts. Dyfrig has also worked on numerous projects that have required supervision of building demolition and tree removal works under licence. These projects have included work both in the UK and Ireland.

1.3 Species Background

Bats in Ireland feed exclusively on insects, and in the summer months (May – September), they generally emerge from their roosts around sunset to feed. Bats are known to use a number of different foraging sites in the same night and move between them to locate areas

of high insect concentrations. They are also known to exhibit site loyalty and will return to the same foraging sites night after night [1].

There are eleven recorded bat species in Ireland, nine of which are considered resident and two which are considered vagrants (Please see Table 1-1 below).

Table 1-1: Status of Irish Bat Species [2]

Bat Species	*Latin Name*	Irish status	European Status
Resident Bat Species			
Brown Long-eared Bat	*Plecotus auritus*	Least Concern	Least Concern
Common Pipistrelle	*Pipistrellus pipistrellus*	Least Concern	Least Concern
Daubenton's Bat	*Myotis daubentonii*	Least Concern	Least Concern
Leisler's Bat	*Nyctalus leisleri*	Least Concern	Least Concern
Lesser Horseshoe Bat	*Rhinolophus hipposideros*	Least Concern	Near Threatened
Nathusius' Pipistrelle	*Pipistrellus nathusii*	Least Concern	Least Concern
Natterer's Bat	*Myotis nattereri*	Least Concern	Least Concern
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Least Concern	Least Concern
Whiskered Bat	*Myotis mystacinus*	Least Concern	Least Concern
Vagrants			
Brandt's Bat	*Myotis brandtii*	Data Deficient	Least Concern
Greater Horseshoe Bat	*Rhinolophus ferrumequinum*	Data Deficient	Near Threatened

1.4 Types of Bat Roosts

Bats were originally cave and tree-dwelling animals, but many now use buildings to roost within. Buildings are highly important as roosting sites for all Irish bat species, as they use buildings for all roost types. Most significant in terms of roosts in buildings are maternity roosts, but cellars and attics can serve as hibernation sites for bats. Roosts within buildings can far exceed the numbers encountered in trees, bridges, caves or cliffs and roosts of over 1,000 bats have been recorded in buildings [3].

Bats are social animals, and most species congregate in large colonies during the late spring / summer. These colonies consist mostly of females, with some juvenile males from the previous year. Male bats normally roost individually or in small groups, meeting up with the females in the late autumn, when it is time to mate. In summer, bats seek warm, dry buildings in which they can give birth and suckle their young. In winter, they seek out places with a constant low temperature and high humidity where they can become torpid and hibernate during adverse weather conditions. However, bats do not hibernate continuously during winter and will awake and hunt during mild nights when there are insects available, and it is energetically advantageous to forage [4].

One purpose of daytime tree or building inspections is to determine the potential of bat roosts within a survey area. Due to the transient nature of bats and their seasonal life cycle, there are a number of different types 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.

Table 1-2 below defines the various types of bat roosts [5]

Table 1-2: Bat roost types (definitions written by the Natural England Earned Recognition Project) [5]

Roost Type	Natural England Definition
Day Roost	A place where individual bats or small groups, rest or shelter in the day during the summer.
Night Roost	A place where bats rest or shelter in the night but are not found in the day. May be used by a single individual on occasion, or it could be used regularly by the whole colony..
Feeding Roost	A place where individual bats, or few individuals, rest or feed for short periods during the night but are not present by day.
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.
Maternity Site	A place where female bats give birth and raise their young to independence. In some species males may also be present in the maternity roost.
Hibernation Site	A place where bats may be found individually or together during winter. They have a constant cool temperature and high humidity.
Satellite Roost	An alternative roost found in close proximity to the main nursery colony used by a few individuals to small groups of breeding females throughout the breeding season.

1.5 Purpose of Survey Work

The implication of these legislative policies is that the Proposed Development will need to take account of the potential effects on bats. Survey work was therefore deemed necessary to establish whether the species are currently present in areas where suitable habitat exists and in areas where bats have previously been recorded. Survey work also enabled appropriate mitigation measures to be incorporated into the design of the project and to ensure that there will be no adverse effects on the conservation status of the species.

The Site is comprised of Belview Port, which is located partly on land and partly in the Lower Suir Estuary within the industrial landscape of the Port of Waterford, Belview, Co. Kilkenny. Additionally, the derelict Gorteens Old Mill Building is located ca. 20m to the north of the wharf extension.

Survey work was required following desktop assessments and site visits, which identified suitable habitats for bat roosting, foraging, and commuting within the Site. In addition, it was considered necessary to undertake emergence surveys at the Gorteens Old Mill building and activity surveys at Belview Port.

2 METHODOLOGY

The methodologies used to establish the presence / potential presence of bats are summarised below.

2.1 Desk-Based Studies

A desk-based study was undertaken to identify records of bats within the survey area. The following sources of information were reviewed:

- Aerial mapping was reviewed to identify any habitats and features likely to be used by bats. Maps and images of the Site and general landscape were examined for suitable foraging or commuting habitats, including woodlands and forestry, hedgerows, treelines, and watercourses;
- The National Parks and Wildlife Service ('NPWS') website was consulted to obtain the most up-to-date details on conservation objectives for the European sites relevant to this assessment [6];
- The National Biodiversity Data Centre ('NBDC') website was consulted with regard to bat species distributions and bat habitat suitability index [7]; and,
- The National Bat Database of Ireland dataset on the NBDC website was consulted to investigate the nearest known roosts within the vicinity of the Site [8].

2.2 Field-Based Studies

The survey design was informed by previous experience and the following publications:

- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* [3]*;*
- *A Conservation Plan for Irish Vesper Bats Irish Wildlife Manual No. 20* [9]*;*
- *UK Bat Mitigation Guidelines: A guide to impact assessment, mitigation and compensation for developments affecting bats* [10]*;*
- *Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25* [1] a publication by the NPWS*;*
- *Bat Mitigation Guidelines for Ireland – V2. Irish Wildlife Manuals, No. 134* [11] a publication by the NPWS*;*
- *Bat Surveys for Professional Ecologists - Good Practice Guidelines (3rd ed.). London:* The Bat Conservation Trust [4]*; and,*
- *Bat Surveys for Professional Ecologists - Good Practice Guidelines (4th ed.). London:* The Bat Conservation Trust [5]*.*

2.2.1 Bat Survey Guidance Documents

The 2021-2023 bat assessments and surveys utilised the methodology outlined in '*Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd ed)* [4], which was the most up-to-date guidance at the time. However, in October 2023, a new edition of this guidance was released, '*Bat Surveys for Professional Ecologists: Good Practice Guidelines* [5].

Therefore, a further supplementary bat walkover undertaken in July 2024 assessed the Site using the methodology outlined in the *'Bat Surveys for Professional Ecologists: Good Practice Guidelines – 4th Edition'* [5].

It should be noted that the guidance on activity surveys did not significantly differ between the 3rd and 4th guidance editions. Additionally, as the 4th edition of the Bat Conservation Trust

states that night vision aids should be used during emergence surveys, it would not be considered that undertaking the bat surveys in 2023 and following the most up-to-date guidance at the time presents a limitation to the surveys undertaken.

2.2.2 Daytime Bat Walkover and Identification of Bat Habitats

The Gorteens Old Mill Building (ca. 20m north of the wharf extension) was assessed during a ground-based daytime bat walkover survey on 30th March 2021. Updated assessments were also undertaken on 29th November 2022 and 10th July 2024.

During these walkovers, Belview Port was also assessed for the potential to support bat foraging and commuting habitats. Potential bat habitats and flight paths were considered in relation to the wider landscape to determine connectivity for local bat populations by examining aerial mapping. During the 2024 walkover, the most up-to-date guidance was followed - '*Bat Surveys for professional Ecologists: Good Practice Guidelines'* [5].

Table 2-1: 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 [5].

Potential Suitability	Description of Roosting habitats in structures	Description of Potential flight-paths and foraging habitats
None	No habitat features on site likely to be used by any roosting bats at any time of the year (i.e. a complete absence of crevice/suitable shelter at all ground/underground levels).	No habitat features on site likely to be used by any commuting or forging bats at any time of the year (i.e. no habitats that provide continuous lines of shade / protection for flight-lines or generate / shelter insect populations available to foraging bats).
Negligible[1]	No obvious habitat features on site likely to be used by roosting bats; however, a small element of uncertainty remains as bats can use small and apparently unsuitable features on occasion.	No obvious habitat features on site likely to be used as flight-paths or by foraging bats; however, a small element of uncertainty remains in order to account for non-standard bat behaviour.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically at any time of the year. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions[2] 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 and not a classic cool / stable hibernation site but could be used by individual hibernating bats[3]).	Habitat that could be used by small numbers of bats as flight-paths such as a gappy hedgerow or unvegetated stream, but isolated, i.e., not very well connected to the surrounding landscape by another 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 with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by bats for flight-paths such as

[1] Negligible is defined as 'so small or unimportant as to be not worth considering, insignificant'. This category may be used where there are places that a bat could roost or forage (due to one attribute) but it is unlikely that they actually would (due to another attribute).

[2] For example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.

[3] 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 ([16] and [17]).Common pipistrelle swarming has been observed in the UK ([18] and [19]) and winter hibernation of numbers of this species has been detected at Seaton Delaval Hall in Northumberland [20]. 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 prominent buildings in the landscape, urban or otherwise.

Potential Suitability	Description of Roosting habitats in structures	Description of Potential flight-paths and foraging habitats
	roost of high conservation status (with respect to roost type only, such as maternity and hibernation – the categorisation described in this table is made irrespective of species conservation status, which is established after presence is confirmed).	river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape, which 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.
High	A structure 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 and surrounding habitat. These structures have the potential to support high conservation status roost, e.g. maternity or classic cool / stable hibernation site.	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, which 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.

2.2.3 Preliminary Roost Assessment

A preliminary roost assessment ('PRA') of the Gorteens Old Mill Building was undertaken by two MOR Environmental Ecologists on 30th March 2021. Updated assessments were also undertaken on 29th November 2022 and 10th July 2024.

As part of the walkovers, the building was assessed for the presence of features that could be utilised by roosting bats, using a powerful focused-beam light source, close-focusing binoculars and an endoscope. The inspections aimed to assess the Gorteens Old Mill Building for the presence of features suitable for roosting bats. These features included:

- Windowsills;
- Window panes;
- Lifted rendering;
- Hanging tiles;
- Weatherboarding eaves;
- Soffit boxes;
- Fascias;
- Lead flashing;
- Gaps under felt; and,
- Gaps in brickwork or stonework.

Signs of roosting bats searched for included:

- Evidence of bat droppings / urine splashes;
- Bat specimens (live or dead);
- Evidence of feeding remains, (insect wings on the floor); and,
- Evidence of fur-oil staining.

2.2.4 Ground Level Tree Assessment

During walkovers of the Site completed on 30th March 2021, 29th November 2022 and 10th July 2024, all trees surrounding the Gorteens Mill Building were assessed for the presence of features that could be utilised by roosting bats, using close-focusing binoculars and a powerful focused-beam light source. The following criteria were used:

- Presence of natural cavities, splits, cracks, loose bark and rot holes in the trunk or boughs of the tree;
- Presence of dense and woody ivy (*Hedera helix*) growth that could be used by bats for roosting;
- Evidence of bat droppings, which may also be seen as a black streak beneath holes, cracks, branches, etc;
- Presence of smooth edges with dark marks and urine stains at potential entrances to roosts;
- Adjoining habitat which are likely to be important to bats, including the river corridor, and hedge / treelines within the survey area that offer a variety of potential foraging, roosting and commuting opportunities for bats; and,
- Adjoining potential roosts / known roosts identified. This raises the likelihood of a tree being of benefit, as bats may move roosts if the roost becomes too hot or cold during roosting and a nearby alternative roost is highly desirable.

2.2.5 Bat Survey Area

Following the daytime bat walkover, preliminary roost assessment and ground-level tree assessment, it was deemed necessary to undertake bat emergence and nighttime walkover surveys at the Gorteens Old Mill Building and within Belview Port.

The areas surveyed at the Gorteens Old Mill Building and within Belview Port will henceforth be referred to as ‘the bat survey area’. The bat survey area is shown in Figure 2-1 below.

Figure 2-1: Bat Survey Area



2.2.6 Dusk Emergence, Dawn Re-entry and Night-time Bat Walkover ('NBW') Surveys

Three bat surveys took place within the Bat Survey Area:

- Two dusk emergence and NBW surveys on 31st May and 29th June 2023; and,
- One dawn re-entry and NBW surveys on 27th July 2023.

The dusk emergence and NBW surveys commenced 15 minutes before sunset and ended two hours after sunset, therefore encompassing the typical emergence times of Irish bat species. The dawn re-entry and NBW survey commenced two hours before sunrise and ended 15 minutes after sunrise.

The emergence and re-entry surveys took place at the Gorteens Old Mill Building. Three surveyors were positioned at three separate pre-determined Vantage Points ('VPs') - VP1, VP2 and VP3. The VPs were designed to survey this building for bat emergence and / or the presence of a bat roost.

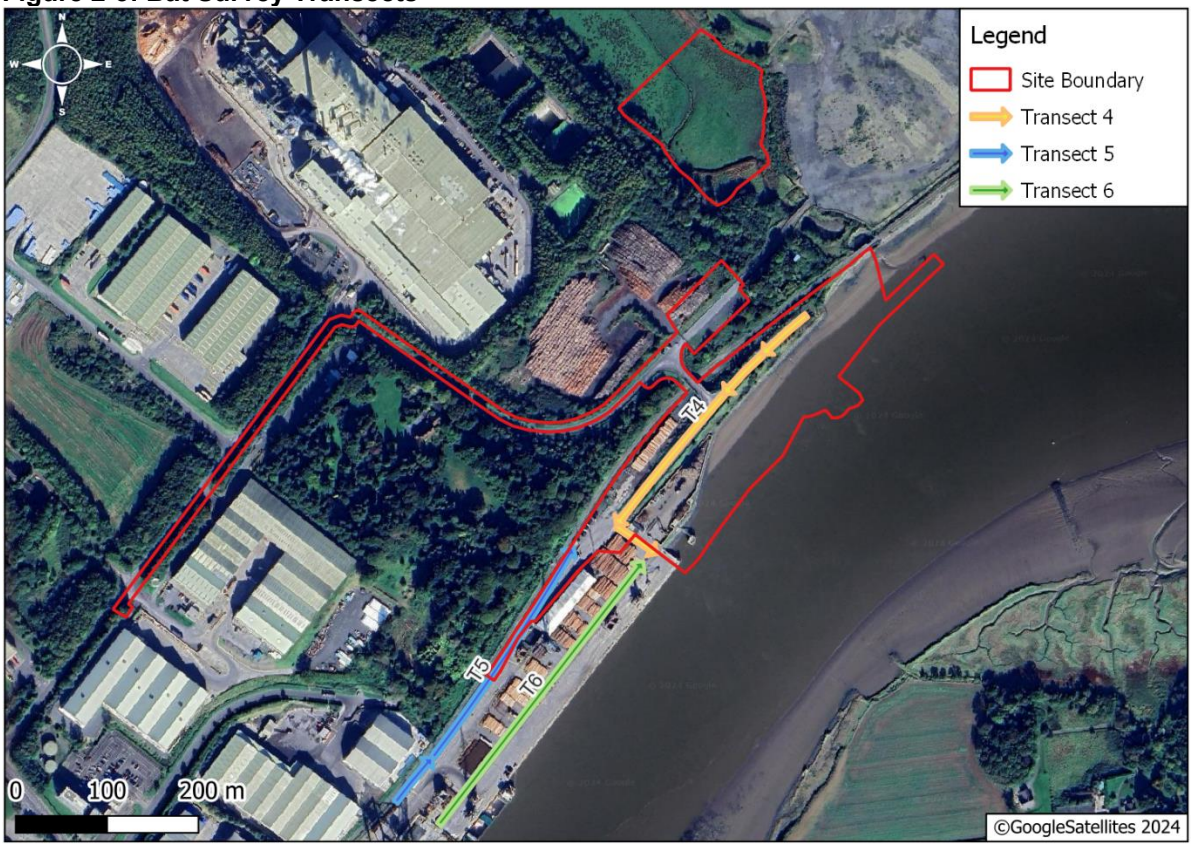
The NBW portion of the survey involved the three surveyors walking predetermined transects (T4, T5 and T6). These transects were along the Belview Quay and designed to incorporate all linear features and other areas of Belview Port for bat activity and determine which areas onsite, if any, were important flight paths and commuting habitat for bats. The transect aimed to capture bat activity levels within the wider survey area and to determine what areas within the Site and the vicinity of the Site are important habitats for bats.

Figure 2-2 below illustrates the VPs at the Gorteens Old Mill Building, and Figure 2-3 below illustrates the transects at Belview Port.

Figure 2-2: Bat Survey Vantage Points



Figure 2-3: Bat Survey Transects



During both the emergence VP, re-entry VP and NBW portions of the survey, the surveyors used an Echo Meter Touch2 Pro to listen for bat calls. Bat calls were recorded using this Echo Meter Touch2 Pro and stored on the EchoMeter App.

Additionally, for one survey, a frequency division bat detector (Batbox Duet) was also used, and bat calls were recorded digitally using Edirol Roland R-05 recorder. All bat calls were stored for analysis after the surveys.

In summary, a combination of visual observation and listening to ultrasonic bat calls was used during the emergence and NBW.

2.2.7 Static Monitoring ('SM4')

Two passive bat detectors, Wildlife Acoustics Song Meter 4 (SM4s), were deployed within the Site, one adjacent to the Gorteens Old Mill Building and one within Belview Port. Figure 2-4 below shows the locations where the SM4s were placed within the Site. The SM4s were equipped with ultrasonic microphones and were left in specific locations for a specified period of time.

- SM4-1 was placed within Belview Port from 16th August – 29th August 2023 (14 nights); and,
- SM4-2 was placed near the Gorteens Old Mill Building from 12th July – 25th July 2023 (14 nights).

The SM4s were used as a bat activity data logger, as there was no surveyor present. Bats which passed near enough to SM4 unit were recorded, and their calls were stored for analysis post monitoring period. This resulted in a far greater sampling effort over a shorter period of time.

The SM4s and the ultrasonic microphones were positioned in open spaces and locked in secure boxes so there would be no interference during the monitoring period. The SM4 bat loggers used real-time recording as a technique to record bat echolocation calls, and using specific software, the bat calls were identified. It was these sonograms of the bat calls (2-D sound graphs) that were digitally stored in the SD cards within the SM4s that were then downloaded for analysis.

These results were depicted in a table and graph detailing the bat activity for each species on a given date. The bat activity was calculated as bat passes per hour (passes / hours of recording). It is not possible through static detector monitoring to differentiate between individual bats in analysis, so each bat pass does not necessarily indicate a new individual but is used as a metric to infer bat activity levels. For example, some species of bats, such as *Pipistrellus* species, will continuously fly around a habitat. Therefore, it is likely that a series of bat passes within a short timeframe could be the same pipistrelle bat. However, other bat species, such as Leisler's bats, tend to travel through an area quickly and therefore, an individual bat pass is more indicative of the actual number of individual bats.

The total number of bat passes recorded per night, divided by the number of hours of recording, provides a figure for this analysis. The bat activity levels were determined as follows:

- None = 0 passes;
- Low = 1 - <10 passes per hour;
- Moderate = >10 - < 50 passes per hour; and,
- High = > 50 passes per hour.

All sound file data downloaded from the SM4s was imported and analysed using Kaleidoscope Pro acoustic analysis Software. The recordings were displayed as sonograms (2-D sound graphs) for analysis by suitably trained MOR Environmental analysts. The 'auto-ID' function was used to batch assign the top auto-ID species for each sound file. This approach allowed for the identification of bats to genus level for *Myotis* species, and to species level for other bats found in Ireland. Separation of *Myotis* species is complicated by the high degree of overlap between call characteristics. This software can also automatically sort sound files that contain only noise ('non-bat') from sound files that contain bat passes.

Following the batch analysis, all non-pipistrellus calls (excluding Nathusius' pipistrelle) and no ID calls were manually checked by a capable bat acoustic analyst. Auto-ID calls from common pipistrelle and soprano pipistrelle were not manually checked, as it is accepted that, due to the lack of complexity within these species' calls, the auto-ID function is sufficient.

Figure 2-4: SM4 Locations



2.2.8 Data Analysis

The bat recordings taken during the manual surveys (emergence, re-entry and NBW) were analysed using the software KaleidoscopePro. A combination of the visual observations taken during the survey and the number of bat passes [4] identified on the recordings were used to determine bat activity levels within the area.

All non-noise recordings taken on the surveys were manually checked by a capable bat acoustic analyst.

[4] It is important to acknowledge that bat calls provide a measure of bat activity rather than the number of individuals in a population. In practice, bat activity (as, for example, represented by 100 recordings) could be from 100 bats passing the detector or one bat passing 100 times [5].

2.3 Validation of Survey Data

Bat surveys are a snapshot of the bat activity within an area at the time of surveying. It is therefore important that bat surveys are comprised of a number of surveys designed to provide as much information on the species and levels of bats using an area. Therefore, a combination of surveys was used to determine the importance of the survey area on local bat populations.

All survey work was conducted in accordance with current best practice guidelines, which dictate that bat surveys should be undertaken when there is no rain or wind and the temperature is above 10°C.

Table 2-2: Bat Survey Metadata

Date	Survey Type	Sunset / Sunrise	Survey Times (Start-End)	Weather	Temperature (°C) Start - End
31/05/2023	Dusk	21:40	21:25-23:40	Dry, light breeze	13°C - 11°C
29/06/2023	Dusk	21:53	21:25-23:53	Dry, no breeze	16°C - 15°C
27/07/2023	Dawn	05:42	03:42-05:57	Light drizzle at start of survey, gentle breeze	16°C - 15°C

According to CIEEM Advice Note on the Lifespan of Ecological Reports and Surveys, survey data that is 12-18 months old can still remain valid following an updated survey by a professional ecologist and updated desk-based assessment to confirm that the Site has not experienced significant change and the local distribution of species in the wider area around the Site has not changed [12].

Following the updated survey undertaken on 10th July 2024 as outlined in Section 2.2.2, it was concluded that onsite habitats and the habitats in the wider area had not changed since the initial daytime bat walkover survey and therefore the results of the 2023 bat surveys remain valid.

2.4 Evaluation of the Importance of the Site for Bat Species

The value of the importance of the Site for bat species was evaluated using the ecological evaluation guidance presented in the Transport Infrastructure Ireland ('TII'), formally known as National Roads Authority ('NRA'), guidance on assessment of ecological impacts of National Road Schemes [13]. This guidance provides ratings for resources based primarily on geographic context and allows for resources at the following levels:

- International Importance;
- National Importance;
- County Importance (or vice-county in the case of plant or insect species);
- Local Importance (Higher Value); and,
- Local Importance (Lower Value).

3 RESULTS

3.1 Desk-Based Results

Four of the nine resident bat species found in Ireland have been recorded within a 2km radius of the Site within the past 10 years at the time of writing this report [7] – brown long-eared bat, common pipistrelle, soprano pipistrelle and Leisler's bat.

The NBDC records were checked on 24th June 2025. The following NBDC 2km grids have been reviewed: S61S, S61M, S61L, S61R, S61W, S61X, S6814, S6815, S6312, S6313, S6314, S6411, S6511, S6611, S6711, S6812, S6813 . Only records over the past 10 years were included in this report. The parameter of 10 years was chosen on the basis of habitat adaption and modification, and it is considered that any records over 10 years old are not representative of the current distribution of bat species populations.

The National Bat Database of Ireland showed that the nearest known roost is located in a 1km grid square, ca. 40m from the Site at its closest point. This was a soprano pipistrelle / Leisler's bat roost recorded in June 2007.

Table 3-1 provides details of the habitat suitability index for the Site [7]. The habitat suitability index identifies the geographical areas that are suitable for individual species. The index ranges from 0 to 100, with 100 being the most favourable to bats. The index presented is for all species combined, in addition to the individual species indices within the Site.

From the indices, it can be established that the study area has an overall very high habitat suitability index range of 36-58. The habitat suitability for Irish bats within the area ranges from very low to very high. Excluding the lesser horseshoe bat, which has a 'very low' habitat suitability for the Site, all of the other listed species are likely to occur within the Site and the vicinity of the Site.

Table 3-1: Habitat Suitability Index

Bat Species	Suitability Index Range	Suitability Index Level
All Bat Species	36-58	Very High
Brown Long-eared Bat (*Plecotus auritus)*	50-79	Very High
Natterer's Bat *(Myotis nattereri)*	49-75	Very High
Common Pipistrelle (*Pipistrellus pipistrellus)*	48-72	Very High
Leisler's bat *(Nyctalus leisleri)*	47-71	Very High
Whiskered Bat *(Myotis mystacinus)*	45-69	Very High
Soprano Pipistrelle *(Pipistrellus pygmaeus)*	46-64	Very High
Daubenton's Bat *(Myotis daubentonii)*	39-59	Very High
Nathusius' Pipistrelle *(Pipistrellus nathusii)*	16-29	Moderate
Lesser Horseshoe Bat (*Rhinolophus hipposideros)*	0-4	Very Low

3.2 Field-Based Results

3.2.1 Daytime Bat Walkover and Identification of Bat Habitats

The daytime bat walkover survey identified suitable bat roosting habitat within the Gorteens Old Mill Building. This structure was subject to bat emergence surveys. The walkover also confirmed that the Site presented suitable foraging and commuting habitat along Belview Port for bats.

3.2.2 Preliminary Roost Assessment

During the initial external and internal building inspection undertaken at the Gorteens Old Mill Building on 30th March 2021, it was noted that the building was derelict and exposed. However, the inspection identified multiple features suitable for roosting bats, including bat boxes installed on the building, ivy covering the building and cracks and crevices leading into the building.

Figure 3-1: Gorteens Old Mill Building March 2021



During the updated external and internal building inspection on 29th November 2022, further sections of the Gorteens Old Mill Building had since collapsed, likely due to weather events, as it was in very poor condition.

Figure 3-2: Gorteens Old Mill Building November 2022



Additionally, during the bat emergence survey undertaken on the 31st May 2023, it was noted that the Gorteens Old Mill Building had collapsed further. Therefore, it was concluded that the unstable nature of the Gorteens Old Mill Building would lower the suitability of the building for roosting bats based on reduced stable crevices and sheltered areas.

During the updated assessment in 2024, it was noted that the building and habitats remained in the same condition as during the 2023 survey season.

3.2.3 Ground Level Tree Assessment

No trees within the Site were identified as having PRFs or noted as requiring further assessment. No roosting resources exist within trees present within the Site.

3.2.4 Dusk Emergence, Dawn Re-Entry and NBW Survey Results

The levels of bat activity were identified foraging and commuting around the Gorteens Old Mill Building during the emergence surveys, which ranged between low and high. Soprano pipistrelle, common pipistrelle, Leisler's bat, brown long-eared bat and *Myotis* species were recorded. No bats were observed to be roosting within the Gorteens Old Mill Building. The bat activity recorded during the activity surveys along Belview Port also ranged between low and high levels. Common pipistrelle, Nathusius' pipistrelle, soprano pipistrelle, Leisler's bat and brown long-eared bat were recorded.

3.2.4.1 Dusk Emergence and NBW 31/05/2023

Sunset was at 21:40.

VP1 – Emergence Survey

Leisler's bat calls were recorded at VP1 at 22:01, 23:07 and 23:15, but not observed by the surveyor. The only bat observed at VP1 was a soprano pipistrelle at 22:32, seen commuting east over the trees surrounding the Gorteens Old Mill Building. This was considered to be low bat activity.

VP2 – Emergence Survey

No bats were observed at VP2, but Leisler's bat calls were recorded at 22:25, 22:48 and 23:15, a common pipistrelle was recorded at 23:20 and a soprano pipistrelle was recorded at 23:26. This was considered to be low bat activity.

VP3 – Emergence Survey

No bats were observed at VP3, but Leisler's bat calls were recorded at 21:52, 22:25, 22:47, 23:03 and 23:15. Common pipistrelle calls were recorded at 22:24 and 23:20. This was considered to be low bat activity.

T4

The first bat recorded at T4 was a common pipistrelle at 22:03 but not observed by the surveyor. The only bat observed at T4 was a Nathusius' pipistrelle at 22:07, seen commuting northeast towards the bridge at the Port.

Common pipistrelle calls were recorded at 22:03, 22:06, 22:15 and 22:31. Leisler's bat calls were recorded at 22:25, 23:06 and 23:19. A singular soprano pipistrelle call was recorded at 23:32. This was considered to be low bat activity.

T5

No bats were seen or recorded at T5.

T6

The only bat recorded at T6 was a common pipistrelle at 22:30, but it was not observed by the surveyor.

3.2.4.2 Dusk Emergence and NBW 29/06/23

Sunset was at 21:53.

VP1– Emergence Survey

The first bat recorded at VP1 was a Leisler's bat at 21:57, but it was not observed by the surveyor. The first bat seen at VP1 was a soprano pipistrelle at 22:10, foraging over the vegetation to the north of VP1. At 22:15, a bat was observed commuting east over the Gorteens Old Mill Building.

Bat calls recorded from this time recorded calls from common pipistrelle and Leisler's bat, so it was likely that the commuting bat observed was one of these species. The next bat observed at VP1 was a soprano pipistrelle commuting north over the VP. A soprano pipistrelle was also seen commuting west over the Gorteens Old Mill Building at 22:50. Constant levels of soprano pipistrelle, common pipistrelle and Leisler's bats were recorded at VP1, and the last bat recorded was at 23:51.

Leisler's bats had ca. 35 passes per hour, common pipistrelle had ca. eight passes per hour and soprano pipistrelle had ca. seven passes per hour. This was considered to be moderate bat activity.

VP2– Emergence Survey

The first bat recorded at VP2 was a Leisler's bat at 23:20, passing over the Gorteens Old Mill Building three times. Leisler's bat continued to be recorded passing over the Gorteens Old Mill Building constantly until 23:25. Common pipistrelle were also recorded passing over the building multiple times until the last pass was recorded at 23:29.

Leisler's bat had ca. six passes per hour, and common pipistrelle had ca. four passes per hour. This was considered to be moderate bat activity.

VP3– Emergence Survey

No bats were observed by the surveyor at VP3, but bat calls from Leisler's bat, common pipistrelle, soprano pipistrelle and *Myotis* species were recorded. The first bat recorded was at 22:39, and the last bat recorded was at 23:39.

Leisler's bat had ca. 13 passes per hour, common pipistrelle had ca. six passes per hour, soprano pipistrelle had ca. two passes per hour and *Myotis* species had ca. one pass per hour. This was considered to be moderate bat activity.

T4

The first bat recorded at T4 was a Leisler's at 22:26, but it was not observed by the surveyor. The first bat observed at T4 was a Leisler's bat at 22:58, seen commuting west over the Site. Leisler's bat were observed commuting in the same location at 23:01 and 23:27. A Leisler's bat was also observed commuting further east down the Port at 23:11, and back over the Lower Suir Estuary. Common pipistrelle and soprano pipistrelle were also recorded at T4, but not observed by the surveyor. The last bat recorded was at 23:53.

Leisler's bat had ca. 74 passes per hour, common pipistrelle had ca. two passes per hour and soprano pipistrelle had ca. one pass per hour. This was considered to be high bat activity.

T5

The first bat recorded and observed at T5 was a soprano pipistrelle at 21:58, seen commuting along the trees to the west of the active port. This was the only bat observed by the surveyor at T5, and there was a lull in bat activity along this transect until 23:03, when common pipistrelle and Leisler's bat were recorded along all areas of T5 until the end of the survey at 23:53.

Leisler's bat had ca. 20 passes per hour, common pipistrelle had ca. two passes per hour and soprano pipistrelle had ca. one pass per hour. This was considered to be moderate bat activity.

T6

The first bat recorded at T6 was a Leisler's bat at 22:26, but it was not observed by the surveyor. At 23:08, one Leisler's bat was observed constantly commuting back and forth over the Port along all areas of T6 until the end of the survey at 23:53.

Leisler's bat had ca. 46 passes per hour. This was considered to be high bat activity.

3.2.4.3 Dawn Re-entry and NBW 27/07/23

Sunrise was 05:42.

VP1 – Dawn Re-entry

The first bat recorded at VP1 was a Leisler's bat at 03:52, but it was not observed by the surveyor. At 04:08 a soprano pipistrelle was seen commuting west over the Gorteens Old Mill Building. Three additional soprano pipistrelle were observed commuting over the Gorteens Old Mill Building at 04:43, 04:47 and 04:53. The final bat observed and recorded at VP1 was a Leisler's bat at 05:30, seen commuting north away from the Site.

Soprano pipistrelle had ca. seven passes per hour, Leisler's bat had ca. three passes per hour and common pipistrelle had ca. one pass per hour. This was considered to be moderate bat activity.

VP2– Dawn Re-entry

The first bat recorded at VP2 was a common pipistrelle at 03:51, observed commuting over the Gorteens Old Mill Building. Common pipistrelle continued to be recorded and observed

foraging and commuting over the Gorteens Old Mill Building infrequently throughout the survey. The last bat recorded at VP2 was a common pipistrelle at 04:46.

Common pipistrelle had ca. seven passes per hour. This was considered to be low bat activity.

VP3– Dawn Re-entry

The first bat recorded at VP3 was a common pipistrelle and brown long-eared bat at 03:51. No bats were observed by the surveyor, but common pipistrelle, Leisler's bat and brown long-eared bat were recorded infrequently until 05:31.

Brown long-eared bat had ca. seven passes per hour, common pipistrelle had ca. four passes per hour and Leisler's bat had ca. two passes per hour. This was considered to be moderate bat activity.

T4

The first bat recorded at T4 was a Leisler's at 03:42, but it was not observed by the surveyor. Leisler's bat continued to be recorded consistently from 03:42 until 04:23. The first bats observed at T4 were two soprano pipistrelle at 04:53, seen commuting west over the Port towards the trees to the west. The last bat recorded was a Leisler's bat at 05:24.

Leisler's bat had ca. 30 passes per hour, soprano pipistrelle had ca. two passes per hour and brown long-eared bat had ca. one pass per hour. This was considered to be moderate bat activity.

T5

The first bat recorded at T5 was a Leisler's at 03:42, but it was not observed by the surveyor. No bats were observed by the surveyor at T5, but low levels of Leisler's bat and common pipistrelle were recorded infrequently. The last bat recorded was a Leisler's at 05:24.

Leisler's bat had ca. three passes per hour and common pipistrelle had ca. one pass per hour. This was considered to be low bat activity.

T6

The first bat recorded at T6 was a Leisler's at 03:42, but it was not observed by the surveyor. No bats were observed by the surveyor at T6, but Leisler's bat were recorded constantly until 04:21. The last bat recorded was a soprano pipistrelle at 05:49.

Leisler's bat had ca. 24 passes per hour and soprano pipistrelle had ca. one pass per hour. This was considered to be moderate bat activity.

Figure 3-3: Bat Activity within the Bat Survey Area



3.2.4.4 SM4s

Please refer to Tables 3-3 and Tables 3-4 below for the classification of the bat activity levels during the detector deployments and summaries of the results recorded on the SM4 units deployed in July / August 2023 within the bat survey area.

The total number of bat passes recorded per night, divided by the number of hours of recording, provides a figure for this analysis.

SM4-1 (Belview Port)

SM4-1 (within the Belview Port) was the only static monitor to record *'high'* levels of bat activity during the deployment period, and Leisler's bat was the only recorded species classified as high activity at this SM4.

Of the 14 nights of static monitor surveying at SM4-1, the following species were recorded:

- Leisler's bat activity was classified as *High* on eight nights, classified as *Moderate* activity levels on five nights and as *Low* activity levels on one night;
- Common pipistrelle were the next most frequently recorded species, which was classified as *Low* activity levels on ten nights and *None* activity levels on four nights;
- Soprano pipistrelle activity was classified as *Low* on eight nights and *None* on six nights;
- Brown long-eared bat activity was classified as *Low* on four nights and *None* on all other nights;
- Nathusius' pipistrelle activity was classified as *Low* on one night and *None* other nights; and,
- No *Myotis* species were recorded at SM4-1.

Leisler's bat, common pipistrelle and soprano pipistrelle were likely the most frequently recorded species at SM4-1 within the active port, as these species are the most frequently adapted Irish bat species to lighting. Additionally, the Lower Suir Estuary provides suitable foraging habitat for bats. No *Myotis* species were recorded at this SM4, and very low levels of brown long-eared bat were recorded, as these species are more averse to artificial lighting.

SM4-2 (Gorteens Old Mill Building)

Of the 14 nights of static monitor surveying at SM4-2, the following species were recorded:

- Common pipistrelle were the most frequently recorded species, with activity classified as *Moderate* activity levels on 10 nights and classified as *Low* activity levels on the remaining four nights;
- Soprano pipistrelle and Leisler's bat were the next most frequently recorded species, with activity classified as *Low* on all 14 nights;
- Brown long-eared bat and *Myotis* species were recorded with activity classified as *Low* on 13 out of 14 nights, and *None* on one night;
- Nathusius' pipistrelle were only recorded with activity classified as *Low* on one night and *None* on all other nights.

The higher levels of *Myotis* species and brown long-eared bats are expected at this SM4 due to its location closer to the Gorteens Old Mill Building and in an area of more complete darkness. While overall higher levels of bats were recorded at SM4-1, more consistent levels of bat activity and more species diversity was recorded at SM4-2.

Please see Table 3-2 below for the results from SM4-1 and Table 3-3 for the results from SM4-2.

Table 3-2: Results from SM4 -1 (Belview Port)

Static Monitor Location	Survey Period	Night	Leisler's bat	Soprano pipistrelle	Common pipistrelle	Brown long-eared bat	Myotis *spp.*	Nathusius' pipistrelle
SM4-1 - Near the scrap metals within the Port of Waterford	16th August 2023 – 29th August 2023 (14 nights total)	**1**	High	Low	Low	Low	None	None
		2	Moderate	Low	Low	None	None	None
		3	Moderate	None	Low	None	None	None
		4	Low	None	None	None	None	None
		5	High	None	None	Low	None	None
		6	Moderate	None	Low	None	None	None
		7	High	Low	Low	Low	None	None
		8	High	Low	Low	None	None	None
		9	High	Low	Low	None	None	Low
		10	High	Low	Low	None	None	None
		11	Moderate	Low	Low	None	None	None
		12	Moderate	None	None	None	None	None
		13	High	None	Low	Low	None	None
		14	High	Low	None	None	None	None

Figure 3-4: Bar Chart of SM4-1 Results (Belview Port)

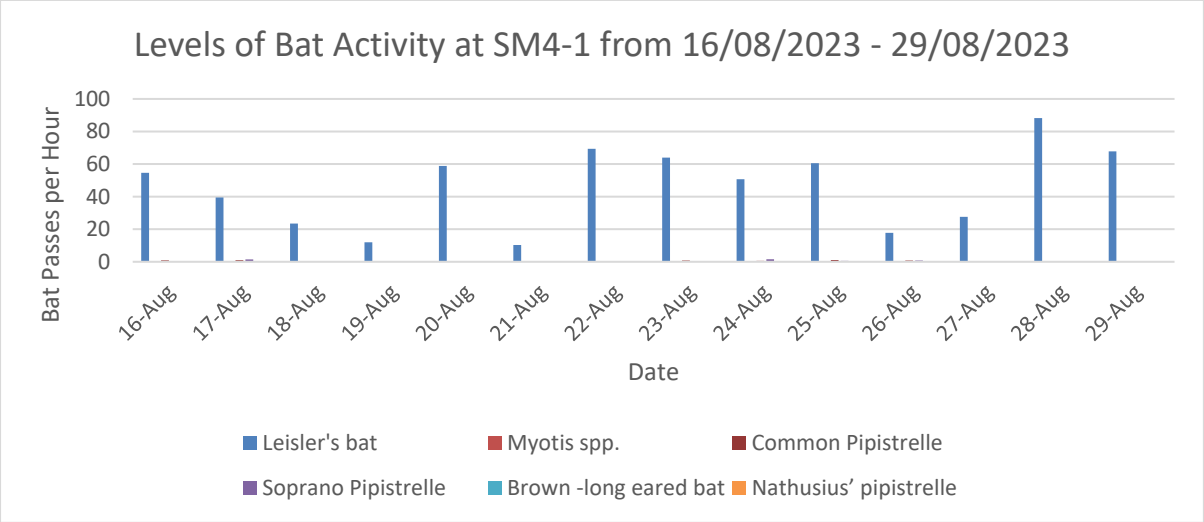
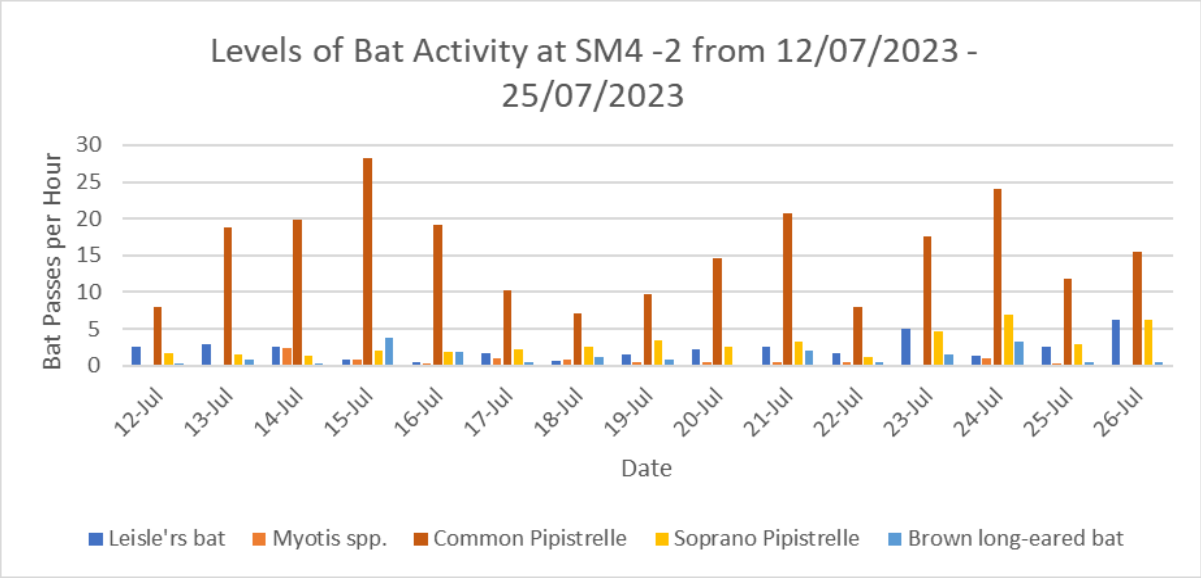


Table 3-3: Results from SM4 – 2 (Gorteens Old Mill Building)

Static Monitor Location	Survey Period	Night	Leisler's bat	Soprano pipistrelle	Common pipistrelle	Brown long-eared bat	Myotis *spp.*	Nathusius' pipistrelle
SM4-2 - Near the Gorteens Old Mill Building	12th July 2023 – 25th July 2023 (14 nights total)	**1**	Low	Low	Low	Low	None	None
		2	Low	Low	Moderate	Low	Low	None
		3	Low	Low	Moderate	Low	Low	None
		4	Low	Low	Moderate	Low	Low	None
		5	Low	Low	Moderate	Low	Low	None
		6	Low	Low	Moderate	Low	Low	None
		7	Low	Low	Low	Low	Low	None
		8	Low	Low	Low	Low	Low	None
		9	Low	Low	Moderate	None	Low	Low
		10	Low	Low	Moderate	Low	Low	None
		11	Low	Low	Low	Low	Low	None
		12	Low	Low	Moderate	Low	Low	None

Static Monitor Location	Survey Period	Night	Leisler's bat	Soprano pipistrelle	Common pipistrelle	Brown long-eared bat	Myotis *spp.*	Nathusius' pipistrelle
		13	Low	Low	Moderate	Low	Low	None
		14	Low	Low	Moderate	Low	Low	None

Figure 3-5: Bar Chart of SM4-2 Results (Gorteens Old Mill Building)



3.3 Overall Results

The following bats were recorded during the dusk emergence, dawn re-entry, NBW surveys and static monitor surveys:

- Common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bat, Nathusius' pipistrelle and *Myotis* species were recorded during the surveys;
- One singular recording from a brown long-eared bat was recorded during the activity surveys along the Belview Port, but the majority of the species recorded during the activity surveys were species more adapted to higher levels of lighting, including Leisler's bat, common pipistrelle and soprano pipistrelle;
- *Myotis* species and brown long-eared bats were recorded foraging and commuting around the Gorteens Old Mill Building more frequently than around Belview Port due to less lighting and disturbance. However, the majority of bat activity around the Gorteens Old Mill Building was from the same common bat species recorded along the Belview Port, including Leisler's bat, soprano pipistrelle and common pipistrelle;
- The static monitoring surveys recorded higher levels of bat activity within Belview Port than at the Gorteens Old Mill Building.
- No bats were observed to be roosting within the Gorteens Old Mill Building; and,
- During the dusk surveys Leisler's bat and soprano pipistrelle were recorded within 15 minutes of sunset. During the dawn survey Leisler's bat were recorded within 15 minutes of sunrise, and soprano pipistrelle were recorded seven minutes after

sunrise. This indicated that Leisler's bat and soprano pipistrelle were roosting within the vicinity of the Site.

Based on the levels of bat activity around Belview Port and the Gorteens Old Mill Building, it can be concluded that the Site was of no value to roosting bats but a high local value to both foraging and commuting bats.

4 IMPACT ASSESSMENT AND MITIGATION

The following bat species have been recorded during the dusk, dawn, NBW and static monitoring bat surveys: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bats, Nathusius' pipistrelle and *Myotis* species. Taking a precautionary approach and assuming that the *Myotis* bat calls were recorded from all three *Myotis* species in Ireland (Daubenton's bat, Natterer's bat and whiskered bat), this represents eight of the nine resident bat species found in Ireland. Lesser horseshoe bat were the only species not recorded across the bat surveys completed on-site. All bat species recorded during the bat surveys are Annex IV species under the EU Habitats Directive, and all have a favourable status in Ireland.

Bat species within the survey area have the potential to be affected by both the construction and operational phases of the Proposed Development. The impact assessment and mitigation will be undertaken in relation to the eight bat species recorded within the survey area: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bats and Nathusius' pipistrelle, Daubenton's bat, Natterer's bat and whiskered bat.

4.1 Potential Impacts on Bats

The Proposed Development will not result in the loss of any bat roosting habitat.

The Proposed Development will potentially result in the loss of bat foraging and commuting habitat as the Proposed Development will extend into Belview Port and the Lower Suir Estuary, where bats were observed and recorded foraging and commuting over.

Principal impacts of the Proposed Development, in general, on bat fauna may be summarised as follows:

- Potential loss of habitat / disturbance during Construction Phase; and,
- Potential lighting disturbance during the Construction and Operational Phase.

4.1.1 Potential Loss of Habitat / Disturbance

The surveys did not identify any bat roosts within the Site and only limited roosting opportunities were present within the Site. Bats were observed commuting and foraging through the Site during the dusk emergence, dawn re-entry and NBW survey.

The Gorteens Old Mill Building, which provides suitable bat habitat, will not be impacted by the Proposed Development. As such, bats will continue to utilise this structure and the surrounding area for foraging and commuting purposes.

Furthermore, the Site is partially located within the footprint of the operational Port of Waterford, a major working port that operates 24 hours a day, 7 days a week, year-round. Bats recorded foraging and commuting within Belview Port and over the Lower Suir Estuary, located adjacent to the Belview Port, were considered likely to be already habituated to elevated levels of noise, general disturbance and artificial lighting associated with existing port operations.

The principal potential impact relates to the ca. 1.3ha of reclamation works associated with the Proposed Development. This work has the potential to result in a loss of foraging and commuting habitat for bat species foraging over the Lower Suir Estuary. However, in order to offset the potential loss of foraging habitat, a Biodiversity Enhancement Area, ca. 1.8ha in size, has been incorporated into the design of the Proposed Development. This Biodiversity Enhancement Area will provide habitats suitable for foraging and commuting bats, please see Section 4.2.3 below.

In summary, while impacts were not predicted to be significant given the existing port context, appropriate mitigation measures will be required during both the Construction and Operational

Phases of the Proposed Development to minimise potential effects on foraging and commuting bats.

4.1.2 Potential Lighting Disturbance during the Construction and Operational Phase.

Nocturnal mammals, such as bats, are averse to excess lighting. Subsequently, effects could occur as a result of an inappropriate lighting strategy. Therefore, artificial lighting associated with the Proposed Development has the potential to affect bats by reducing the suitability of the area for commuting and foraging bats.

The degree of this impact is dependent on the sensitivity of the bat species, as some bats are more tolerant of lighting. *Pipistrellus* species and Leisler's bat will tolerate low levels of lighting, while brown long-eared bats and *Myotis* species are very sensitive to lighting and require the light levels to be below 1lux to avoid disturbance.

It should be noted that survey results indicate that the majority of bat activity recorded during the dusk, dawn NBW and static monitoring surveys within Belview Port were *Pipistrellus* species and Leisler's bat. This would be consistent with the operational nature of the Port of Waterford, which already contains extensive lighting infrastructure for safety and security purposes. As such, bats utilising the Site are likely to be habituated to a degree of artificial lighting.

Due to the fact that the Proposed Development will operate on a 24-hour basis, lighting will be required for safety and security purposes. However, the Proposed Development has been designed to include a sensitive lighting strategy that will be implemented across the entirety of the Proposed Development to minimise light spillage from the Site. The lighting plan considers both internal and external sources. This approach will ensure that the lighting installed within the Site will be sensitive for local wildlife while still providing necessary lighting for site operations.

The lighting strategy for the operational phase of the Proposed Development has been designed to minimise potential effects on nocturnal species in line with the Bat Conservation Trust ('BCT') Guidelines on '*Bats and Artificial Lighting in the UK'* [14] [15]. The lighting strategy, which has been designed as part of the Proposed Development, involves avoiding excessive lighting and the use of 2700Kelvin light temperature bulbs, as this will reduce the blue light component for bats [15]. Additionally, all lighting will be downward-facing and only directed where needed. There will be no light spillage outside of the Site boundary, so bat species within the wider area will not be impacted by onsite lighting.

An External Lighting Design Report has been prepared and submitted as part of the overall planning application, which underpins the lighting design for the Proposed Development. There will be no specific additional mitigation measures required for lighting during the Operational Phase.

4.2 Mitigation, Monitoring and Enhancement Measures

Comprehensive mitigation measures will be implemented to reduce the potential impact of the Proposed Development on local bat populations as outlined in Chapter 6 (Biodiversity). In addition, ecological clerk of works ('ECoW') monitoring will be undertaken as required, as outlined in the EIAR.

Furthermore, as outlined in Appendix 6-4 (Biodiversity Management Plan), enhancement measures will be implemented within the Biodiversity Enhancement Area that will provide foraging, commuting and potential roosting opportunities for bats.

5 CONCLUSIONS

A comprehensive range of bat surveys were undertaken as part of this assessment, which included a daytime bat walkover survey within the bat survey area, external and internal building inspections, ground-level tree assessments, dusk and dawn emergence and NBW surveys and two static monitoring periods.

No bats were identified to be roosting within the Gorteens Old Mill Building.

During the survey period, the structural condition of the Old Mill Building continued to deteriorate and was of an unstable nature. Bats were recorded foraging and commuting around the Old Mill Building. The Proposed Development will have no direct or indirect effects on the Old Mill Building.

Additionally, NBW surveys were undertaken within Belview Port to determine the levels of foraging and commuting bats. The following bat species were recorded within the bat survey area: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bats, Nathusius' pipistrelle, Daubenton's bat, Natterer's bat and whiskered bat. The lesser horseshoe bat was the only resident Irish bat species not recorded within the bat survey area.

The number of bat activity recorded within Belview Port during the dusk, dawn and static monitoring surveys ranged between low and high levels. The majority of the bat species recorded were common species in Ireland adapted to artificial lighting and noise disturbance, including Leisler's bat, common pipistrelle and soprano pipistrelle. Additionally, most bats were observed commuting over the Port towards the trees and woodland to the northwest of the Site, and towards the Lower Suir Estuary.

It was concluded that the Site was of no value for roosting bats as no roosts were identified during surveys, and suitable roosting features are largely absent. However, the Site was assessed to be of high local value for foraging and commuting bats, given the levels of bat activity recorded during dusk emergence, dawn re-entry and static detector surveys.

The principal potential impact from the Proposed Development relates to the ca. 1.3ha of reclamation works, which will extend into the estuary. These works have the potential to result in the loss of foraging habitat and to alter existing commuting routes for bats. In addition, the installation and operation of artificial lighting has the potential to create disturbance for light-sensitive species, potentially reducing the suitability of the Site and adjacent habitats for nocturnal species.

The implementation of all of the mitigation measures, including the lighting strategy and the biodiversity enhancement proposal, will ensure that the residual effects on bats will be not significant.

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APPENDIX 6-2

August 2025

Waterbird Report

Proposed Offshore Renewable Energy ('ORE') Capable Terminal on a 250m Wharf Extension & Ancillary Operational Support Infrastructure

Calafort Phort Láirge
Port of Waterford

On behalf of

Port of Waterford Company

Port of Waterford, Belview, Co. Kilkenny

MALONE O'REGAN ENVIRONMENTAL

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Job Number: E2068

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Checked By: Kevin O'Regan **Signed:** _____

Approved By: Dyfrig Hubble **Signed:** _____

Revision Record

Issue No.	Date	Description	Remark	Prepared	Checked	Approved
01	29/08/25	Waterbird Report	Final	AK	KOR	DH

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Waterbird Report

Proposed ORE Capable Terminal on a 250m Wharf Extension & Ancillary Operational Support Infrastructure

Port of Waterford Company

Port of Waterford, Belview, Co. Kilkenny

Contents

1 INTRODUCTION 1
1.1 Relevant Legislation 2
1.2 Objectives 2
1.3 Statement of Authority 2
2 METHODOLOGY 3
2.1 Desk-based Studies 3
2.2 Field-based Studies 4
2.2.1 Habitat Survey 4
2.2.2 Site Assessment and Scoping 4
2.2.3 Waterbird Vantage Point Surveys 5
2.2.4 Survey Limitations 10
2.3 Assessment Methodology 10
3 RESULTS 11
3.1 Desk Based Studies 11
3.1.1 National Biodiversity Data Centre 11
3.1.2 Birdwatch Ireland I-WeBS 13
3.2 Field-Based Studies 14
3.2.1 Habitat Assessment 14
3.2.2 Waterbird VP Survey Results 16
4 ASSESSMENT OF POTENTIAL EFFECTS AND MITIGATION ..25
4.1 Potential Effects on Waterbirds 25
4.2 Proposed Mitigation and Enhancement Measures 28
5 CONCLUSIONS 29
6 REFERENCES 30

FIGURES

Figure 1-1: Site Location 1
Figure 2-1: I-WeBS Sites and Subsites 4
Figure 2-2: Vantage Point Location and Viewshed 6
Figure 2-3: VP Survey Distance Bands 8
Figure 3-1: Habitat Map 15
Figure 3-2: Overall Count Boundary ('OCB') Results 18

TABLES

Table 2-1: I-Webs Data Request 3
Table 2-2: VP Locations (ITM) 5
Table 2-3: Survey Dates and Metadata 8
Table 3-1: NBDC Species within 2km of the Site 11
Table 3-2: Vantage Point Count Boundary ('VPCB') Results 17
Table 3-3: Peak Numbers Recorded for VPCB and OCB Surveys 19
Table 3-4: VPCB Waterbird Locations 20
Table 3-5: OCB Waterbird Locations 21
Table 3-6: Waterbirds Recorded in each Distance Band 23

1 INTRODUCTION

This waterbird survey report has been prepared by Malone O'Regan Environmental ('MOR Environmental') on behalf of Port of Waterford Company ('the Applicant') to present the findings of breeding and wintering waterbird surveys in respect of the construction and operational phases of proposed port facilities comprising of a circa ('ca.') 250-metre ('m') wharf extension to support proposed Offshore Renewable Energy ('ORE') development and general port development, land reclamation, ancillary works and a biodiversity enhancement area ('the Proposed Development').

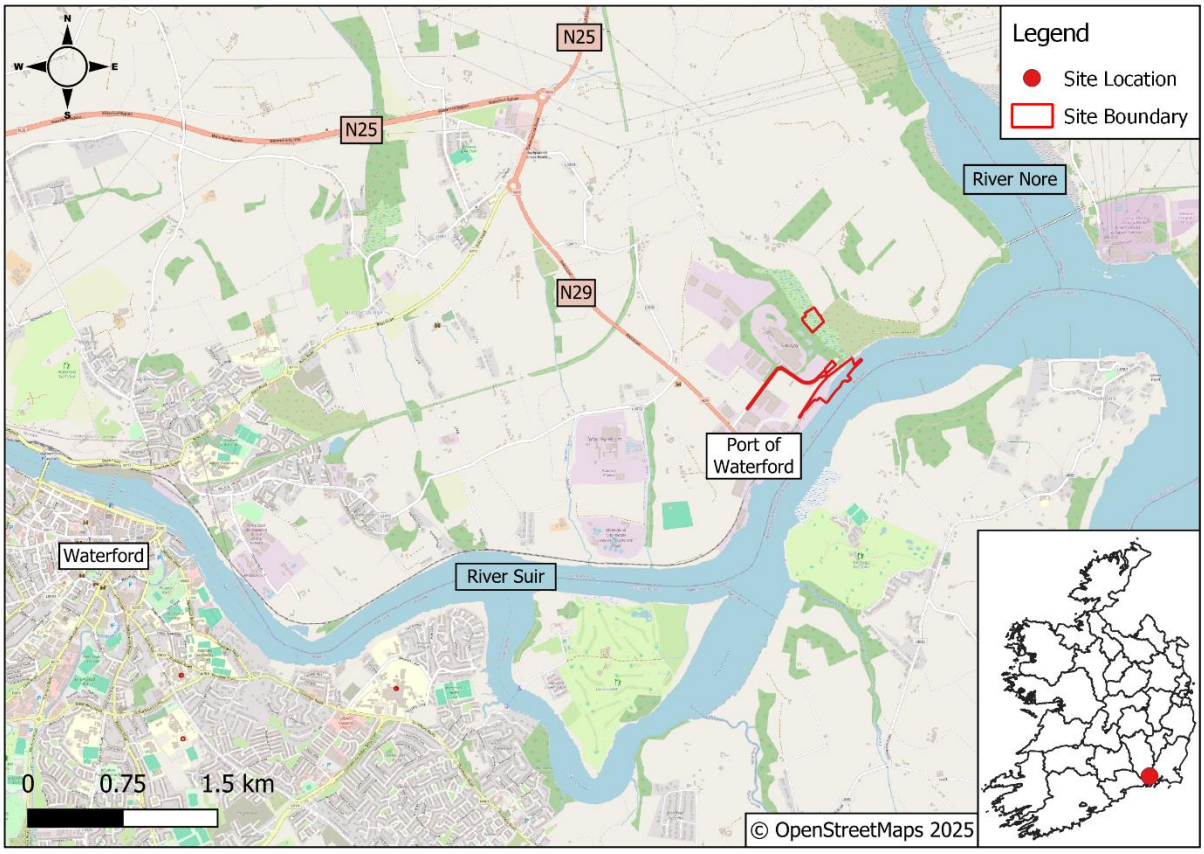
The Proposed Development will be located partly on land and partly in the near-shore area of the coastal planning authority (Kilkenny County Council) at the Port of Waterford, Belview, Co. Kilkenny ('the Site') (ITM OS Reference: 666422; 613637).

The Site has a gross site area of ca. 8 hectares ('ha') and is made up of the following sections:

- ca. 4.9ha of development within the existing Port of Waterford landownership;
- ca. 1.3ha of reclaimed area within the Lower Suir Estuary using reclaimed materials and quarried rock; and,
- ca. 1.8ha of a biodiversity enhancement area located to the northwest of the quay development.

Figure 1-1 shows the location of the Site, located partly within the townland of Gorteens, Co. Kilkenny, ca. 5.6km northeast of Waterford City.

Figure 1-1: Site Location



This Waterbird Report is an appendix to Chapter 6 – Biodiversity of the Environmental Impact Assessment Report ('EIAR') prepared by MOR Environmental. This report should be read in conjunction with Chapter 6 of the EIAR.

1.1 Relevant Legislation

All wild birds are protected by law under the Wildlife Act 1976 and subsequent amendments. All species are afforded full protection under this Act, which makes it a criminal offence for anyone without a licence to:

- Kill or injure a wild bird;
- Disturb, damage or remove a wild bird nest or eggs; and,
- Disturb any wild bird while at the nest.

In addition to domestic legislation, birds are also protected under the EU Birds Directive (2009/147/EC). The Birds Directive provides for a network of sites to protect birds at their breeding, feeding, roosting and wintering areas.

For the purposes of this report, a species was considered to be of '*conservation concern*' should it be listed on one or more of the following:

- Annex I of the EU Birds Directive;
- Part I of the Fourth Schedule of the Wildlife Act, 1976 (as amended);
- Birds of Conservation Concern in Ireland 2022-2026 ('BoCCI') red list [1]; and,
- BoCCI amber list [1].

1.2 Objectives

The Ramsar Convention has defined the term '*waterfowl*' as birds that are 'ecologically dependent on wetlands' [2] and has further defined the term 'waterbird' as being synonymous with waterfowl [2].

During the winter period, Ireland has over 50 migratory water bird species that either stop in Ireland on passage to other wintering grounds or remain in Ireland for the duration of the winter period. For the purposes of this report, the term waterbird includes species of swans, geese, ducks, divers, grebes, crakes, rails, herons, waders, gulls, terns, cormorants and kingfisher.

The objective of this assessment was to:

- Determine the suitability of the Site for overwintering and breeding waterbird species;
- Identify, if any, overwintering and breeding waterbird species are utilising the Site;
- Identify any potential roost or breeding sites for waterbird species within the Site;
- To map active nests, where present, within the Site;
- To assess all potential impacts, if any, of the Proposed Development on overwintering and/or breeding waterbird species; and,
- To provide appropriate mitigation measures, as required.

1.3 Statement of Authority

This report was approved by Mr. Dyfrig Hubble, Associate Director - Ecologist. Dyfrig is a full member of the Chartered Institute of Ecology and Environmental Management ('CIEEM'). Dyfrig has over 18 years' experience working in the ecological consultancy sector, including habitat surveys and appraisals and specialist protected species surveys, including ornithological surveys in line with Best Practice Guidelines, and prepares specialist ornithological assessments and reports.

2 METHODOLOGY

The methodologies used to establish the presence / potential presence of breeding and/or wintering waterbirds are summarised below.

2.1 Desk-based Studies

A desk-based review of information sources was completed, which included the following sources of information:

- Aerial maps of the Site and the surrounding area were reviewed;
- The National Parks and Wildlife Service ('NPWS') website was consulted to obtain the most up-to-date details on conservation objectives for the Natura 2000 sites relevant to this assessment [3];
- Bird Watch Ireland ('BWI') – The Irish Wetland Bird Survey ('I-WeBS') data was reviewed with regard to wintering waterbird population within the vicinity of the Site [4]; and,
- The National Biodiversity Data Centre ('NBDC') website was consulted with regard to species distributions within 2km of the Site [5].

2.1.1.1 Irish Wetland Bird Survey ('I-WeBS') Data

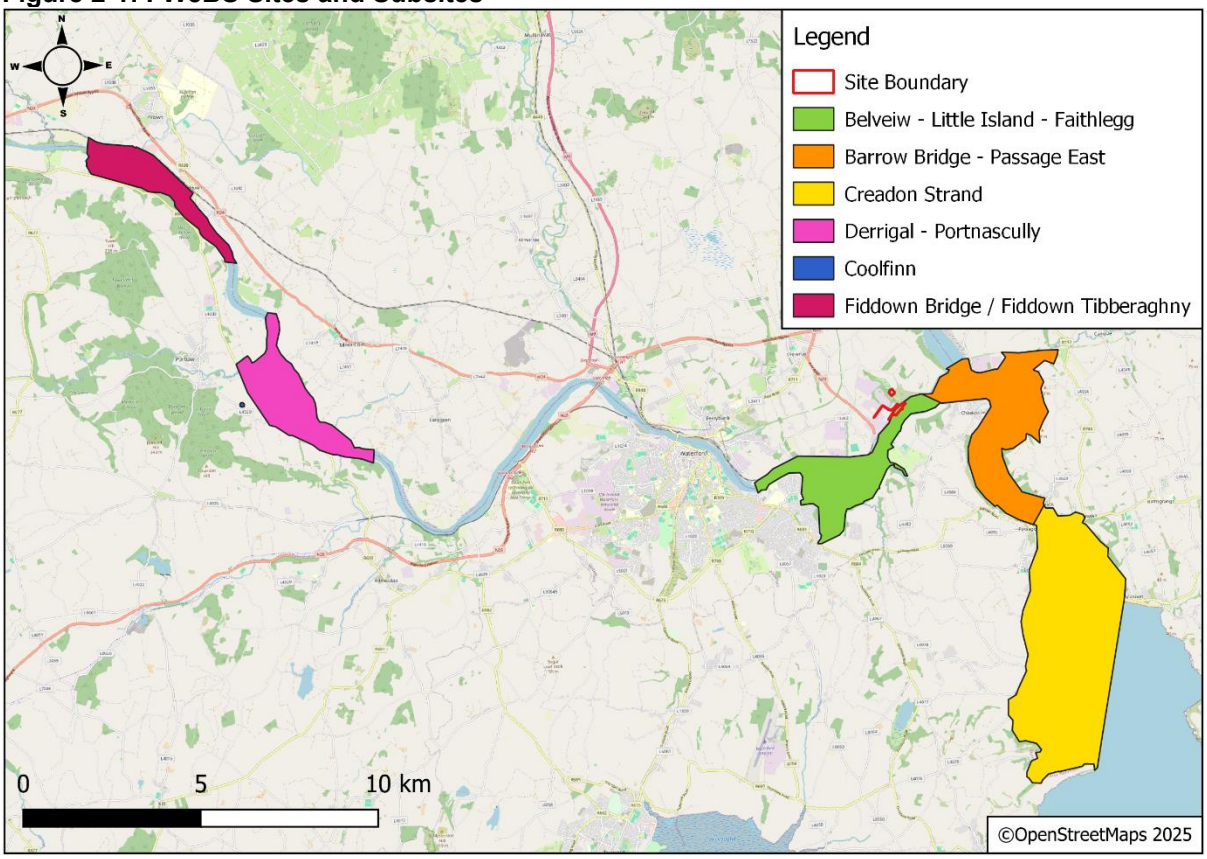
I-WeBS data was reviewed in order to understand the potential assemblages of wintering bird populations that tend to occur within the vicinity of the Site.

As part of this review, a data request was submitted to the I-WeBS on the 24th June 2025. The data request was made for all available data from the two nearest I-WeBS Sites, the River Suir Lower and Waterford Harbour, and their associated subsites. These sites, subsites and their associated I-WeBS codes are listed in Table 2-1 below. See Figure 2-1 for the location of the subsites in relation to the Site.

Table 2-1: I-Webs Data Request

Site Name	Site Code	Subsite Name	Subsite Code
River Suir Lower	0M301	Belview – Little Island – Faithlegg	0M390
		Coolfinn	0M360
		Derrigal – Portnascully	0M361
		Fiddown – Tibberaghny	0M398
Waterford Harbour	0M403	Barrow Bridge – Passage East	0M496
		Barrow Bridge – Creadan Strand	0M498

Figure 2-1: I-WeBS Sites and Subsites



2.2 Field-based Studies

2.2.1 Habitat Survey

The initial Site assessment undertaken on 15th February 2021 aimed to identify the extent and quality of habitats present on the Site and to identify any potential ecological receptors.

The habitat survey utilised Fossitt's Guide to Habitats for Ireland [6] and was conducted in line with the Heritage Council's '*Best Practice Guidance for Habitat Survey & Mapping*' [7]. This is the standard habitat classification system used in Ireland and includes both a desk-based and field-based assessment. The surveys were also undertaken utilising the Irish Ramsar Wetlands Committee's *'Irish Wetland Types- an identification guide and field survey manual'* [8].

Updated habitat surveys were undertaken on:

- 31st July 2024;
- 25th March 2025; and,
- 28th July 2025.

These surveys were undertaken by a team of suitably qualified and experienced MOR Environmental Ecologists to confirm that the extent and quality of habitats present onsite and the potential ecological receptors onsite had not changed from the previous assessments.

2.2.2 Site Assessment and Scoping

As part of the initial site assessment undertaken on 15th February 2021, the Site was assessed for its potential to provide suitable foraging, breeding and roosting habitat for waterbird

species. In addition, the Site was assessed for its potential to support assemblages of rare or notable bird species, as well as designated bird species.

A further scoping survey was undertaken by two MOR Environmental Ecologists and Dr. Tom Gittings, an expert ornithologist, on 19th March 2021. This survey aimed to identify a suitable vantage point ('VP') location for wetland bird surveys and confirm the methodology that should be followed.

2.2.3 Waterbird Vantage Point Surveys

Waterbird vantage point ('VP') surveys were undertaken at the Site to determine whether or not the Site is utilised by breeding or wintering waterbird species.

Wetland bird surveys were undertaken during 2021, 2022, 2023 and 2024 summer wetland seasons and 2021/2022, 2022/2023, 2023/2024 and 2024/2025 winter wetland seasons. Summer surveys were conducted from April to September, and the winter surveys took place from October to March.

VP Location and Viewshed

The VP location was selected on the basis that it provided the clearest and least disturbed view of the Site and surrounding area.

During the surveys, the surveyors undertook counts within the vantage point count boundary ('VPCB') and within the overall count boundary ('OCB'). The counts within the VPCB were undertaken every 15 minutes, and the OCB counts were undertaken every hour following completion of the VPCB count.

The VPCB encompassed a core area that was initially assessed as having the potential to be directly disturbed as a result of the Proposed Development. The VPCB encompassed terrestrial, supratidal, intertidal and subtidal habitats up to the middle of the river. This boundary extended from Belview Quay approximately 420m north and extended approximately 150m into the river.

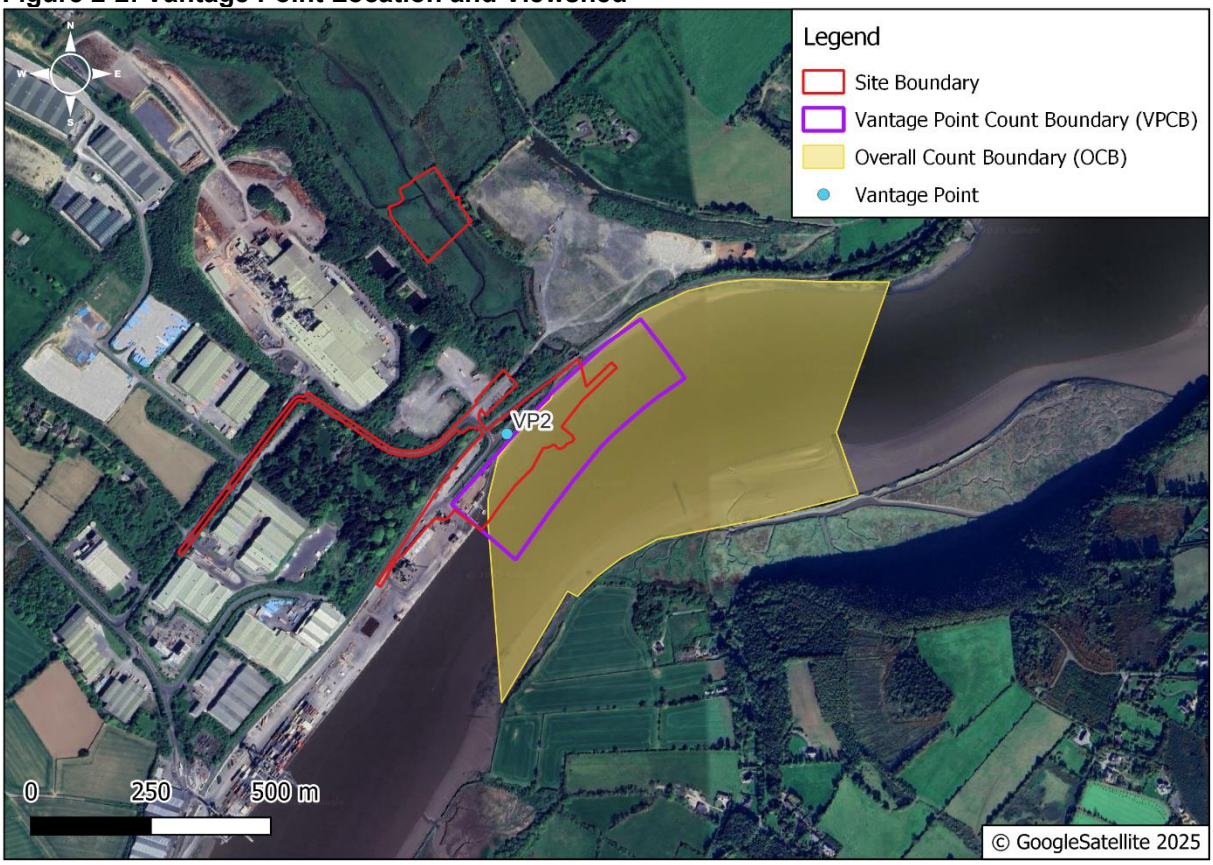
The OCB covered both the near and far shore, encompassing all areas of the shoreline that were visible to the surveyor. The OCB included the terrestrial, supratidal, intertidal and subtidal habitats. This boundary extended northeast from the VP along the viewable shoreline until the bend in the shoreline, where the mudflat was no longer visible. The boundary then extended across the river to the Waterford shoreline and went along this shoreline to encompass the third and fourth groynes. The boundary extended to a rock formation south of the VP and back across the river to the VP.

The location of the VP is presented in Table 2-2 below. The VPCB and OCB are illustrated below in Figure 2-1.

Table 2-2: VP Locations (ITM)

Latitude (X)	Longitude (Y)
666380	613631

Figure 2-2: Vantage Point Location and Viewshed



Survey Timing

The summer wetland bird surveys undertaken during the 2021, 2022 and 2023 summer seasons were conducted once a month for six hours in order to encompass one tidal cycle (including both high and low tides), where possible. The surveys were timed to coincide with the spring tide, where possible, as this tide has the largest range between high tide and low tide and results in the maximum intertidal habitat exposure.

The winter wetland bird surveys undertaken during the 2021/2022, 2022/2023 and 2023/2024 winter seasons were undertaken twice a month for six hours. The surveys were timed to coincide with either the high or low tide, as due to the short day length, the full tidal cycle could not be surveyed. In addition to this, where possible, one survey was conducted during the spring tide, and one survey was conducted during the neap tide. As discussed above, surveying the spring tide ensured that the maximum area of exposed intertidal habitat was surveyed. Surveys were also conducted during the neap tide, which is when the range between high tide and low tide is at its lowest. Therefore, the exposure of the intertidal habitat is less during the neap tide than during the spring tide.

However, in April 2024, given the large scale of the dataset previously gathered, the survey methodology was amended to utilise three-hour VP surveys once per month, timed with the spring tide where possible. As these surveys were only three hours, they encompassed either the high or low tidal cycle rather than both. Therefore, all VP surveys undertaken from April 2024 to March 2025 utilised the amended survey timings.

Methodology

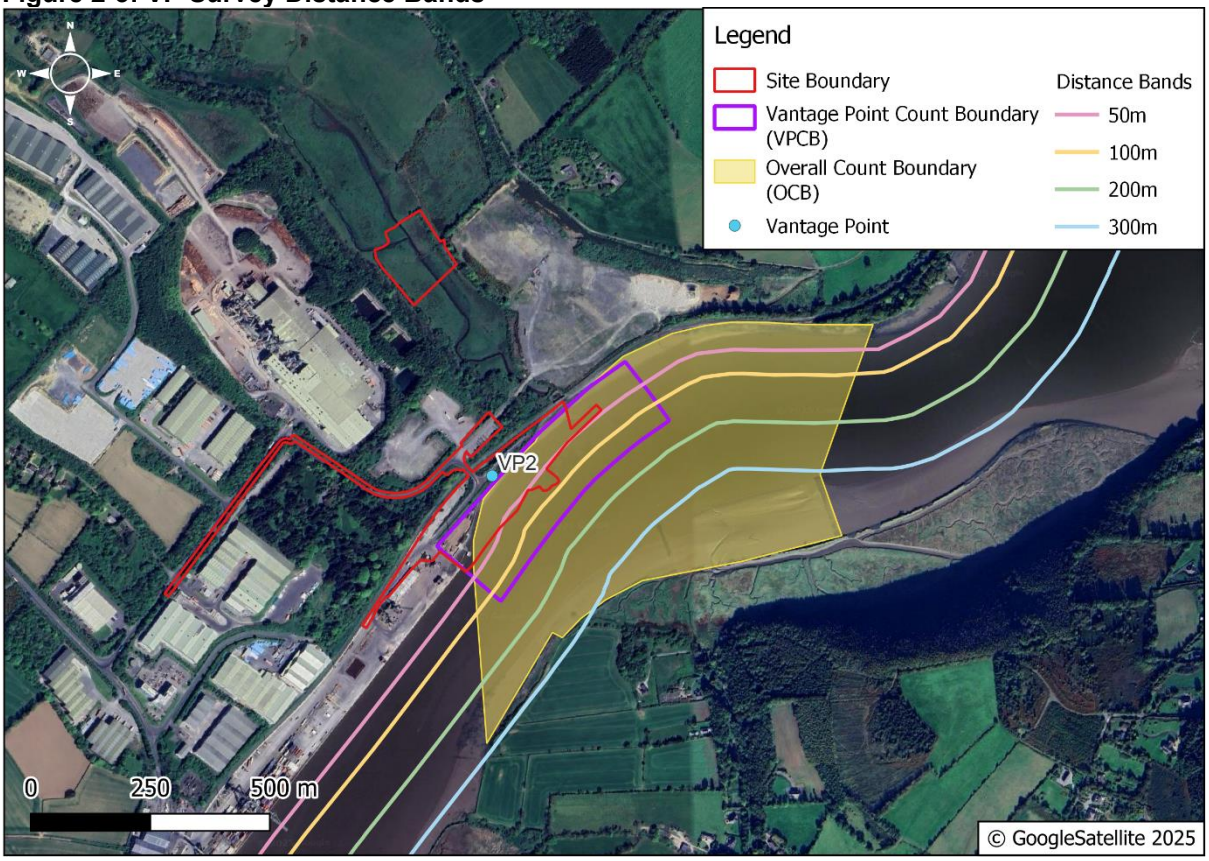
The surveyors utilised optical equipment, such as binoculars and telescopes, to ensure minimal disturbance to wetland bird species. The surveys were undertaken using an amended methodology based on the Irish Wetland Bird Survey ('I-WeBS') Core Counts methodology

[9]. This methodology employs the well-established technique of counting the numbers of waterbirds at wetland sites using the so-called 'look-see' method, whereby the observer surveys the whole of a predefined area [10].

The following information was recorded by the surveyor:

- Count Time: surveyors recorded the time of each count;
- Species were recorded using BTO codes;
- Species Behaviour was recorded using BTO codes. Surveyors also took note of any disturbance responses exhibited by waterbirds when boats or vessels moved through the Lower Suir Estuary;
- Number of birds was recorded by counting each individual of each species. The numbers were recorded on the survey proforma under each behaviour they were exhibiting;
- Distance of the birds from the shore was recorded in bands, i.e. 0-50m, 50-100m, 100-200m, 2003-300m and 300m+;
- Tidal Zone was recorded using the following NPWS categories [11]:
    - Intertidal ('INT') – classified as the area between mean low water and mean high water which includes areas uncovered by the tide and dominated by mudflats / sandy shores but also includes areas of rocky shoreline, gravel, pebbles or shingle shores;
    - Subtidal ('SUB') – classified as the area below mean low water and includes the areas covered by water during the counts. This also includes buoys and masts associated with fishing / aquaculture;
    - Supratidal ('SUP') – classified as the shore area and habitats above the high water mark that have a strong marine influence (i.e., saltmarsh and reedbeds that are associated with tidal habitats);
    - Terrestrial ('TER') – classified as the habitats above the intertidal and supratidal levels that have little to no coastal / tidal influence (i.e., coastal grassland) and man-made unnatural habitats that are linked to the land (i.e., jetties and piers); and,
    - Flying ('FLY') – birds flying over the area that are not associated or interacting with the area.

Figure 2-3: VP Survey Distance Bands



In addition, the surveyor also took note of the weather conditions throughout the surveys and the average weather conditions are provided in Table 2-3 below.

Table 2-3: Survey Dates and Metadata

Date	Start Time	End Time	Hours Surveyed	Cloud Coverage*	Rain**	Wind (Beaufort)	Visibility***	Start - End Temperature (°C)
28/04/2021	06:30	14:30	8.00	2	1	3	1	6ºC – 9ºC
25/05/2021	10:00	18:00	8.00	2 – 3	1 – 4	1 – 4	1 – 3	9ºC – 14ºC
09/06/2021	10:00	18:00	8.00	3	1 – 4	1 – 4	1 – 3	15ºC – 16ºC
26/07/2021	08:30	16:30	8.00	1 – 3	1	1 – 3	1 – 2	17ºC – 21ºC
23/08/2021	12:00	20:00	8.00	1 – 3	1	1	1	18ºC – 22ºC
20/09/2021	10:30	18:30	8.00	1 – 3	1 – 4	1 – 3	1	16ºC – 18ºC
22/10/2021	11:00	17:00	6.00	1 – 3	1	2 – 4	2	12ºC - 12ºC
10/11/2021	07:30	13:30	6.00	1 – 3	1	1	1	9ºC – 11ºC
18/11/2021	08:30	14:30	6.00	3	1 – 2	1	1	11ºC – 14ºC
02/12/2021	08:30	14:30	6.00	3	1	1 – 2	1	4ºC – 8ºC
16/12/2021	10:15	16:15	6.00	3	1	1	1 – 2	10ºC – 11ºC
17/01/2022	08:45	14:45	6.00	1	1	1 – 3	1 – 2	-2ºC – 8ºC
26/01/2022	08:30	14:30	6.00	1 – 3	1	1 – 4	1 – 3	3ºC – 10ºC
02/02/2022	10:15	16:15	6.00	3	1	1 – 2	1	10ºC – 12ºC
22/02/2022	07:45	13:45	6.00	1 – 3	1 – 2	4	1 – 2	8ºC - 8ºC

Date	Start Time	End Time	Hours Surveyed	Cloud Coverage*	Rain**	Wind (Beaufort)	Visibility***	Start - End Temperature (°C)
15/03/2022	07:30	13:30	6.00	3 – 4	1	1 – 3	1 – 3	9ºC – 13ºC
28/03/2022	13:00	19:00	6.00	1 – 2	1	2	1	12ºC – 15ºC
28/04/2022	10:00	18:00	8.00	1 – 3	1	1 – 3	1	9ºC – 12ºC
24/05/2022	07:00	15:00	8.00	1 – 3	1	1 – 3	1	9ºC – 16ºC
16/06/2022	08:00	16:00	8.00	2 – 3	1	1 – 4	1	15ºC – 19ºC
14/07/2022	12:30	20:30	8.00	1 – 3	1	1 – 3	1	16ºC – 20ºC
25/08/2022	10:00	18:00	8.00	1 – 3	1	2	1 – 3	16ºC – 18ºC
27/09/2022	07:30	15:30	8.00	3	1 – 4	1 – 3	1 – 3	`10ºC – 11ºC
10/10/2022	10:30	16:30	6.00	1	1	2 – 4	1	10ºC – 14ºC
25/10/2022	09:30	15:30	6.00	3	1 – 4	3 – 4	1 – 3	14ºC - 14ºC
18/11/2022	10:15	16:15	6.00	1 – 2	1	2 – 3	1 – 2	8ºC – 10ºC
22/11/2022	10:15	16:15	6.00	1 – 3	1	3 – 4	1 – 2	7ºC – 9ºC
06/12/2022	09:00	15:00	6.00	2 – 3	1 – 3	4 – 5	1 – 2	4ºC – 7ºC
06/01/2023	08:45	14:45	6.00	3	1 – 2	1 – 5	1	9ºC – 10ºC
18/01/2023	10:30	16:30	6.00	1	1	4 – 5	1	2ºC – 5ºC
09/02/2023	09:30	15:30	6.00	1 – 2	1	1 – 3	1	3ºC – 8ºC
24/02/2023	07:45	13:45	6.00	3	1	3 – 6	1	6ºC – 11ºC
14/03/2023	08:30	14:30	6.00	1 – 3	1 – 3	3 – 4	1	2ºC – 7ºC
30/03/2023	09:45	15:45	6.00	3	1 – 2	4 – 5	2	10ºC – 13ºC
20/04/2023	06:30	14:30	8.00	1	1	4	1 – 3	6ºC – 12ºC
25/05/2023	08:30	16:30	8.00	1	1	3	1	14ºC – 22ºC
26/06/2023	11:15	18:15	7.00	2 – 3	1 – 3	3 – 4	1	17ºC – 19ºC
19/07/2023	07:00	15:00	8.00	2 – 3	1	2 – 3	1	13ºC – 20ºC
16/08/2023	10:00	18:00	8.00	1 – 3	1	2 – 3	1	18ºC – 21ºC
29/09/2023	07:30	15:30	8.00	1 – 2	1	1 – 2	1	9ºC – 16ºC
12/10/2023	09:00	15:00	6.00	1 – 3	1	1 – 2	1	7ºC – 14ºC
08/11/2023	11:30	17:30	6.00	2 – 3	1 – 2	2 – 5	1 – 2	9ºC – 11ºC
21/12/2023	08:45	14:45	6.00	3	1 – 2	5	1 – 2	11ºC – 12ºC
10/01/2024	08:30	14:30	6.00	1	1	3	1 – 2	1ºC – 6ºC
30/01/2024	11:00	17:00	6.00	1 – 2	1	1 – 3	1 – 2	4ºC – 8ºC
16/02/2024	08:00	14:00	6.00	2	1	2	1 – 3	7ºC – 12ºC
29/03/2024	10:30	16:30	6.00	1 – 3	1 – 2	2 – 4	1	9ºC – 11ºC
26/04/2024	12:00	15:00	3.00	3	1	3	1	9ºC – 11ºC
28/05/2024	14:45	17:45	3.00	1 – 3	1 – 2	3 – 5	1	17ºC – 18ºC
28/06/2024	09:45	12:45	3.00	2 – 3	1	3 – 4	1	15ºC – 17ºC
31/07/2024	13:30	16:30	3.00	2	1	1 – 2	1	22ºC - 22ºC
23/08/2024	08:00	11:00	3.00	1	1	3 – 4	1 – 2	12ºC – 16ºC
27/09/2024	13:15	16:15	3.00	1 – 2	1 – 2	3 – 6	1	12ºC – 13ºC
17/10/2024	11:15	14:15	3.00	1 – 3	1	2 – 3	1 – 2	14ºC – 16ºC

Date	Start Time	End Time	Hours Surveyed	Cloud Coverage*	Rain**	Wind (Beaufort)	Visibility***	Start - End Temperature (°C)
26/11/2024	13:00	16:00	3.00	1 – 2	1	1	1	7ºC – 8ºC
16/12/2024	11:00	14:00	3.00	3	1	4 – 5	1	11ºC - 11ºC
23/01/2025	11:00	14:00	3.00	1 – 2	1 – 2	4	1	6ºC – 7ºC
18/02/2025	14:00	17:00	3.00	3	1	5 – 6	2	8ºC – 9ºC
26/03/2025	08:15	11:15	3.00	3	1	1 – 3	1	11ºC – 12ºC

*Cloud: 1 = 0-33%, 2 = 34-66%, 3 = 67-100%
**Rain: 1 = no rain, 2 = light showers, 3 = drizzle, 4 = persistent rain
***Visibility: 1 = good, 2 = moderate, 3 = poor

2.2.4 Survey Limitations

The surveys were scheduled to be undertaken during suitable weather conditions, i.e., no rain, little to no wind, bright conditions, etc. However, during the winter months, it was not possible to ensure dry weather windows and as such, light drizzles to slight rain were experienced during some of the surveys. However, given the large dataset gathered as part of these assessments, it would not be considered that this survey limitation effected the survey results.

2.3 Assessment Methodology

Following the completion of the surveys, the data was analysed by a suitably qualified and experienced ornithologist.

In order to determine the importance of the area for national and international populations of waterbird species, the peak count data for the species from each survey date was assessed against national and international thresholds:

- National Thresholds were assessed using the 1% All-Ireland thresholds ('AllIreland_1pc') outlined in Burke *et al*. (2018) [12]. A wetland in Ireland is considered of 'national importance' when it regularly supports 1% or more of the all-Ireland population of a particular waterbird species. The AllIreland_1pc is used as a standard measurement to identify sites that play a significant role in maintaining nationally important bird populations. Reaching or exceeding this threshold would indicate that the area provides essential habitat for the species in question and contributes meaningfully to the overall conservation of waterbirds in Ireland; and,
- International Thresholds were assessed using the 1% Flyway threshold ('Flyway_1pc') outlined in the *Report on the Conservation Status of Migratory Waterbirds in the Agreement Area: Seventh Edition* (CSR7) [13] and the international thresholds provided by the British Trust for Ornithology ('BTO') for kingfisher and shag [14]. A wetland is considered of 'international importance' when it regularly supports 1% or more of the biogeographic population (or flyway population) of a waterbird species. This Flyway_1pc is the internationally recognised criterion under the Ramsar Convention and the International Waterbird Census ('IWC') for identifying sites of global significance. Meeting or exceeding this threshold demonstrates that the wetland provides critical habitat within the migratory range of a species and plays a key role in maintaining waterbird populations on an international scale.

In addition, in order to determine the areas and habitats utilised by waterbird species within the vicinity of the Site, the overall distribution of species within the distance bands and tidal zones were also assessed.

3 RESULTS

3.1 Desk Based Studies

3.1.1 National Biodiversity Data Centre

The NBDC records of waterbird species were reviewed for data collected over the last 10 years [5]. These records were checked on the 22nd July 2025. The following 2km Grid Codes were checked: S61S, S61M, S61L, S61R, S61W and S61X. In addition, the following 1km Grid Codes were checked: S6814, S6815, S6312, S6313, S6314, S6411, S6511, S6611, S6711, S6812, S6813.

Table 3-1 provides a summary of records of bird species that occur within 2km of the Site boundary. The parameter of 10 years was chosen to allow for habitat adaptation and modification. It would be considered that any records over 10 years old would not be representative of the current distribution of species populations.

Table 3-1: NBDC Species within 2km of the Site

Common Name	***Scientific Name***	**Date of last record**	**Designation**
Bird Species			
Bar-tailed Godwit	*Limosa lapponica*	30/04/2020	Wildlife Acts 1976 / 2000 EU Birds Directive Annex I Birds of Conservation Concern Red List
Black-headed Gull	*Chroicocephalus ridibundus*	29/02/2024	Wildlife Acts 1976 / 2000 Birds of Conservation Concern Amber List
Black-tailed Godwit	*Limosa limosa*	29/02/2024	Wildlife Acts 1976 / 2000 Birds of Conservation Concern Red List
Common Snipe	*Gallinago gallinago*	04/02/2019	Wildlife Acts 1976 / 2000 EU Birds Directive Annex II and III Birds of Conservation Concern Red List
Common Tern	*Sterna Hirundo*	30/04/2020	Wildlife Acts 1976 / 2000 EU Birds Directive Annex I Birds of Conservation Concern Amber List
Cormorant	*Phalacrocorax carbo*	29/02/2024	Wildlife Acts 1976 / 2000 Birds of Conservation Concern Amber List
Curlew	*Numenius arquata*	29/02/2024	Wildlife Acts 1976 / 2000 EU Birds Directive Annex II Birds of Conservation Concern Red List

Common Name	***Scientific Name***	**Date of last record**	**Designation**
Dunlin	*Calidris alpina*	29/02/2024	Wildlife Acts 1976 / 2000 EU Birds Directive Annex I Birds of Conservation Concern Red List
Grey Heron	*Ardea cinerea*	29/02/2024	Wildlife Acts 1976 / 2000
Herring Gull	*Larus argentatus*	29/02/2024	Wildlife Acts 1976 / 2000 Birds of Conservation Concern Amber List
Kingfisher	*Alcedo atthis*	30/04/2020	Wildlife Acts 1976 / 2000 EU Birds Directive Annex I Birds of Conservation Concern Amber List
Lapwing	*Vanellus vanellus*	03/10/2020	Wildlife Acts 1976 / 2000 EU Birds Directive Annex II Birds of Conservation Concern Red List
Little Egret	*Egretta garzetta*	29/02/2024	Wildlife Acts 1976 / 2000 EU Birds Directive Annex I
Mallard	*Anas platyrhynchos*	30/04/2020	Wildlife Acts 1976 / 2000 EU Birds Directive Annex II and III Birds of Conservation Concern Amber List
Mute Swan	*Cygnus olor*	30/04/2020	Wildlife Acts 1976 / 2000 Birds of Conservation Concern Amber List
Oystercatcher	*Haematopus ostralegus*	29/02/2024	Wildlife Acts 1976 / 2000 Birds of Conservation Concern Red List
Redshank	*Tringa tetanus*	29/02/2024	Wildlife Acts 1976 / 2000 Birds of Conservation Concern Red List
Shelduck	*Tadorna tadorna*	29/02/2024	Wildlife Acts 1976 / 2000 Birds of Conservation Concern Amber List
Whooper Swan	*Cygnus cygnus*	04/02/2019	Wildlife Acts 1976 / 2000 EU Birds Directive Annex I Birds of Conservation Concern Amber List

3.1.2 Birdwatch Ireland I-WeBS

The Site is not located within or adjacent to any Special Protection Area ('SPA'); however, the Site is located within the Lower Suir Estuary. The Lower Suir Estuary forms part of the '*River Suir Lower'* I-WeBS site. I-WeBS records were reviewed in order to gain an understanding of the potential assemblage of bird populations that may utilise the areas within the vicinity of the Site. This data included a number of subsites within the River Suir Lower site and the Waterford Harbour site (refer to Table 6-1).

The data received from BirdWatch Ireland covers the period from 2012/2013 winter season to 2023/2024 winter season. A total of 43 species have been recorded during the 12-year period. However, during the 2023/2024 winter season, a total of 26 species were recorded, which included black-headed gull, bar-tailed godwit, black-tailed godwit, common gull, cormorant, curlew, dunlin, great black-backed gull, great crested grebe, great northern diver, greenshank, grey heron, golden plover, herring gull, knot, lesser black-backed gull, light-bellied brent goose, little egret, mallard, oystercatcher, redshank, shag, shelduck, teal, turnstone and wigeon.

It should be noted that no data was received for River Suir Lower sites for the 2023/2024 winter season.

None of the species recorded in the last 10-years were recorded in numbers that would be considered of international importance. However, several species were recorded in numbers that would be considered to be of national importance, including:

- Bar-tailed godwit were recorded at numbers of national importance during the 2013/2014 season in the Waterford Harbour at Passage East - Creadan Head;
- Great crested grebe were recorded at numbers of national importance during the 2013/2014 season in the Waterford Harbour at Passage East - Creadan Head;
- Teal were recorded at numbers of national importance during the 2013/2014 & 2014/2015 seasons in the River Suir at Fiddown – Tibberaghny;
- Little egret were recorded at numbers of national importance at Barrow Bridge – Passage East during the 2023/2024 season;
- Greenshank were recorded at numbers of national importance at Passage East – Creaden Head during the 2023/2024 season;
- Greenshank were recorded at numbers of national importance at Barrow Bridge – Passage East during the 2023/2024 season;
- Sanderling were recorded at numbers of national importance at Passage East – Creaden Head during the 2023/2024 season;
- Ringed plover were recorded at numbers of national importance at Passage East – Creaden Head during the 2023/2024 season; and,
- Black-tailed godwit were recorded at numbers of national importance at Barrow Bridge – Passage East during the 2023/2024 season.

It should be noted that these subsites are not located within the immediate vicinity of the Site; the nearest records to the Site would be from the Passage East area, which is located ca. 3.5km southeast of the Site. Therefore, these populations of bird species are not located within close proximity to the Site. Furthermore, it should be noted that none of these species identified are considered to exclusively occur within this area.

3.2 Field-Based Studies

3.2.1 Habitat Assessment

The habitats identified within and bordering the Site during the surveys were as follows:

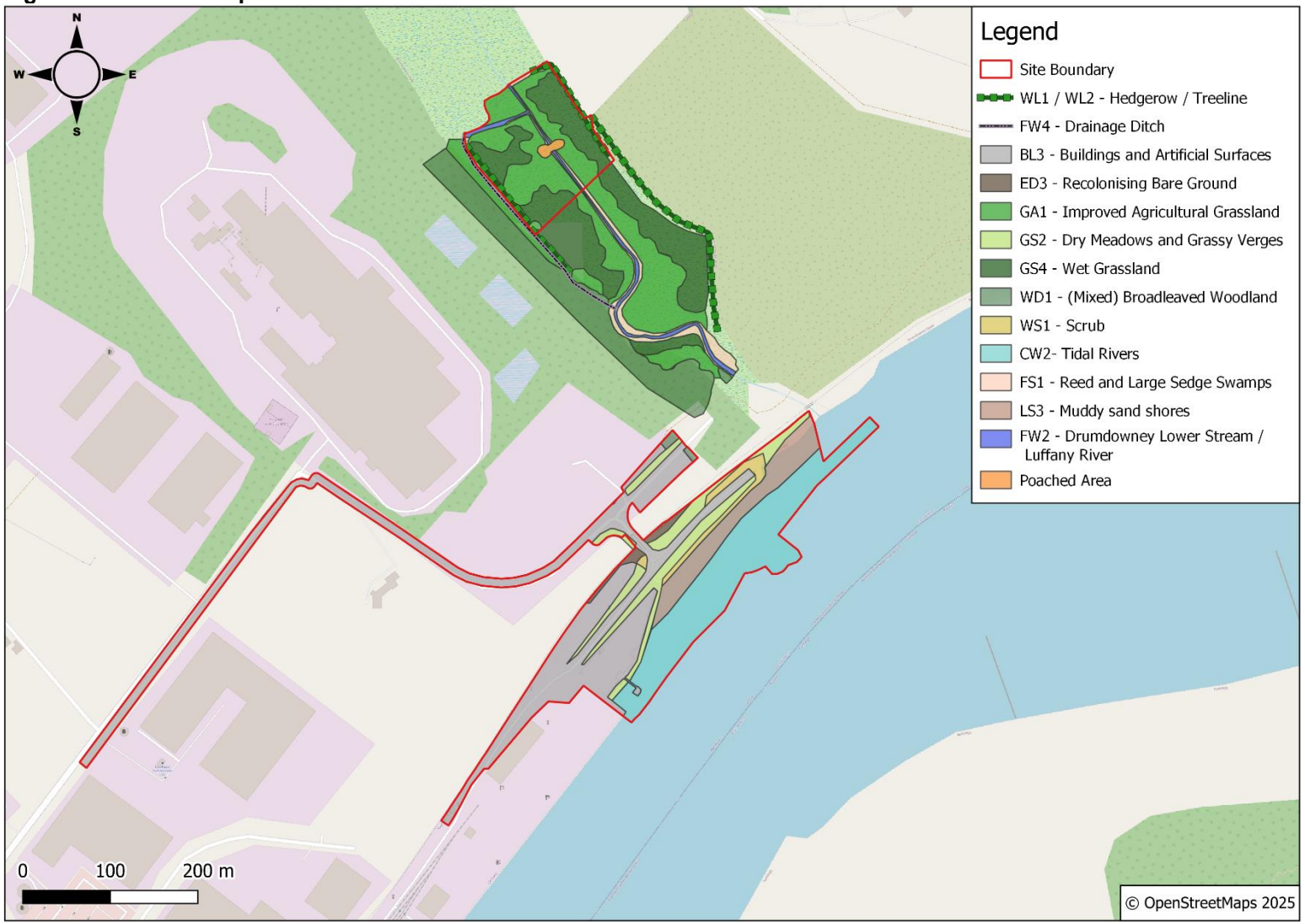
Proposed Development Site

- Buildings and Artificial Surfaces (BL3);
- Dry Meadows and Grassy Verges (GS2);
- Scrub (WS1);
- Mixed Broadleaved Woodland (WD1);
- Recolonising Bare Ground (ED3);
- Muddy Sand Shores (LS3);
- Sea walls, Piers and Jetties (CC1); and,
- Tidal Rivers (CW2).

Biodiversity Enhancement Area

- Improved Agricultural Grassland (GA1) / Wet Grassland (GS4);
- Reed and Large Sedge Swamps (FS1);
- Drainage Ditch (FW4);
- Hedgerows and Treelines (WD1/WD2);
- Mixed Broadleaf Woodland (WD1); and,
- Drumdowney Lower Stream / Luffany River (FW2).

Figure 3-1: Habitat Map



3.2.2 Waterbird VP Survey Results

A total of 62 species were recorded during the waterbird surveys. The VPCB surveys recorded a total of 35 waterbird species, and the OCB surveys recorded a total of 38 waterbird species.

Of the species, the following waterbird species were recorded:

- Six Green-listed BoCCI, non-Annex I species – great black-backed gull, greenshank, grey heron, little grebe, sanderling, and whimbrel;
- 19 Amber-listed BoCCI, non-Annex I species were recorded – black-headed gull, common gull, common sandpiper, cormorant, gannet, great crested grebe, guillemot, herring gull, lesser black-backed gull, light-bellied brent goose, mallard, mute swan, ruff, shag, shelduck, teal, turnstone, tufted duck, wigeon;
- Eight Red-listed BoCCI, non-Annex I species were recorded – black-tailed godwit, curlew, dunlin, knot, oystercatcher, purple sandpiper, redshank, snipe;
- One Green-listed BoCCI Annex I species was recorded – little egret;
- Three Amber BoCCI Annex I species were recorded –kingfisher, mediterranean gull, and sandwich tern;
- One Red-listed BoCCI Annex I species were recorded – bar-tailed godwit;
- One Non-BoCCI Listed and Annex I species was recorded – spoonbill; and,
- One Non-BoCCI Listed was recorded – juvenile gull.

Table 3-2 and Table 3-3 provide a record of the maximum counts of each bird species recorded during the 2021-2025 bird surveys.

It should be noted that a total of 22 non-waterbird species were also recorded during the surveys, which included:

- 19 Green-listed BoCCI non-Annex I species - blackbird, blue tit, buzzard, chaffinch, coal tit, feral pigeon, goldfinch, hooded crow, jackdaw, magpie, pheasant, pied wagtail, reed bunting, robin, rock pipit, rook, sparrowhawk, whitethroat, wood pigeon;
- Two Amber-listed BoCCI, non-Annex I species were recorded – barn swallow; wheatear; and,
- One Non-BoCCI Listed and non-Annex I species – carrion crow.

However, these non-target species were not considered to be reliant on the Lower Suir Estuary and surrounding habitats and therefore were not considered further in this assessment.

It should be noted that none of the species were recorded in numbers considered to be of national (‘AllIreland_1pc’) [12] or international (‘Flyway_1pc’) importance [13, 14], as shown in Tables 3-1 and 3-2.

Table 3-2: Vantage Point Count Boundary ('VPCB') Results

| BoCCI Status | Species | AllIreland_1pc National Threshold | Flyway_1pc International Threshold | Peak Count | 28/04/2021 | 25/05/2021 | 09/06/2021 | 26/07/2021 | 23/08/2021 | 20/09/2021 | 22/10/2021 | 10/11/2021 | 18/11/2021 | 02/12/2021 | 16/12/2021 | 17/01/2022 | 26/01/2022 | 02/02/2022 | 22/02/2022 | 15/03/2022 | 28/03/2022 | 28/04/2022 | 24/05/2022 | 16/06/2022 | 14/07/2022 | 25/08/2022 | 27/09/2022 | 10/10/2022 | 25/10/2022 | 18/11/2022 | 22/11/2022 | 06/12/2022 | 06/01/2023 | 18/01/2023 | 09/02/2023 | 24/02/2023 | 14/03/2023 | 30/03/2023 | 20/04/2023 | 25/05/2023 | 26/06/2023 | 19/07/2023 | 16/08/2023 | 29/09/2023 | 12/10/2023 | 08/11/2023 | 21/12/2023 | 10/01/2024 | 30/01/2024 | 16/02/2024 | 29/03/2024 | 26/04/2024 | 28/05/2024 | 28/06/2024 | 31/07/2024 | 23/08/2024 | 27/09/2024 | 17/10/2024 | 26/11/2024 | 16/12/2024 | 23/01/2025 | 18/02/2025 | 26/03/2025 |
|---|---|---

Figure 3-2: Overall Count Boundary ('OCB') Results

BoCCI Status	Species	AllIreland_1pc National Threshold	Flyway_1pc International Threshold	Peak Count	28/04/2021	25/05/2021	09/06/2021	26/07/2021	23/08/2021	20/09/2021	22/10/2021	10/11/2021	18/11/2021	02/12/2021	16/12/2021	17/01/2022	26/01/2022	02/02/2022	22/02/2022	15/03/2022	28/03/2022	28/04/2022	24/05/2022	16/06/2022	14/07/2022	25/08/2022	27/09/2022	10/10/2022	25/10/2022	18/11/2022	22/11/2022	06/12/2022	06/01/2023	18/01/2023	09/02/2023	24/02/2023	14/03/2023	30/03/2023	20/04/2023	25/05/2023	26/06/2023	19/07/2023	16/08/2023	29/09/2023	12/10/2023	08/11/2023	21/12/2023	10/01/2024	30/01/2024	16/02/2024	29/03/2024	26/04/2024	28/06/2024	31/07/2024	23/08/2024	27/09/2024	17/10/2024	26/11/2024	16/12/2024	23/01/2025	18/02/2025	26/03/2025
Green	Great Black-Backed Gull		3,600	79	2	7	1	2	7	2	13	5	47	5	79	4	1	5	6	9	12	4		1	4	3	4	7	2	3	2	11	5	6	33	35	4	4		2	3	25	3	8			2	14	2		2	3	2			1	9	25		1	6	12
	Greenshank	20	3,300	4				2								1		1			1							2	1			2				2																								4	1	
	Grey Heron	25	5,000	6		2	2	2	4	1	1	2	1	2	1			1		1		1	2	1	1	1	3	2	1	1	1	3	2					1		1	2	2	2	1	2			6	1		1	1		1				1		2	
	Little Egret	20	1,100	25		1	4		7	2	1	1	1		3		1	1		1	3	3	1	2	12	5	3	1	2	1	1	1				2	2	1		1	5	25	9	2	2	2			1	1	1		1	10	2		1					1
	Little Grebe	20	4,700	3		3																																																										
	Sanderling	85	2,000	5																														5																													
	Whimbrel		6,700	5																		2						1	1	1										1			5																	2				
Amber	Black-headed Gull		3,100	272	1	2		38	17	27	36	47	95	26	37	27	42	131	67	7	1	3		5	24	37	43	44	27	41	19	91	105	272	50	10	118	5		20	50	40	25	40	14	82	60	57	110	30	8	6	20	55	3	59	58	21	20	27	82	25
	Brent Goose	350	400	9										1																		9																																
	Common Gull		16,400	115			6		5	2	5		14	8		33	18	4						2					4		2	1		1	115	5	2			15	50	25	20																	2			
	Common Sandpiper		12,000	20				4								1		1								20					1			15		1					15	6																				
	Cormorant	110	1,200	33			4	1			2	4	2	8	2	2	6	15	6	11	4	3	1	5	11	3	2	5	2	3		19	7	3	2	6	33	12	16	2	5	12	3	8	4	1	10	3	1	9	5	2	1	1	2	3	1	5	1	5	3	4
	Gannet		25,000	2																																								2																				
	Great Crested Grebe	30	6,300	22																								22																																
	Herring Gull		10,200	45	10	4	3	4			1	6	24	3	26	4	2	3	2	33	13	7	1	4	8	5	13	17	11	2	3	18	16	23	35	1	7	6	15	5			15	9	15	4	11	20	15	8	21	3	1	3	2			5	6	1	13	45
	Kingfisher		2,000	1																										1																																
	Lesser Black-Backed Gull		5,500	175		14	2		2	2	65		2	175	115	77	1	27	18	3	13	1		5	3			5	9	1		49	6	53	80	15	7	4	5	5	15	15	5	1	12		6	13	2	5	2	7		2					47	4	7	
	Mallard	280	53,000	78			2				1		16	33	7	58	22	28		3	2	4	3	2			3	3	2			78	4	2	15	12	19				20		15					6			1				5			40		2	1
	Mediterranean Gull		2,400	2															2																																												
	Mute Swan	90	100	11		2	1	0	1	3	2		6	2	2		4	2		2		3	1	2	5	3	2	2	2			2	4		1		11			2	1	2	2	2	2		4	4	2	4	2	3		2			2	4				2
	Sandwich Tern		1,700	12																		12										3																										4						
	Shag		2,000	2		1																										2				2	1																								
	Shelduck	100	2,500	9		4	2	1														4	1	9													2			2											2	1	5	2							6
	Teal	360	5,000	34										8	28		8	26			11									24				12				4																						6			34		34
	Tufted Duck	270	8,900	2																2																																											
	Turnstone	95	1,100	38						25			1		8																2		38																								2					
	Wigeon	560	14,000	34								34						5										4					5																4								4	22	3			
Red	Bar-tailed Godwit	170	1,500	112						34	2					12													37																																112					
	Black-tailed Godwit	200	1,100	140	8					15	93		2	5				1				14		31	3	3	11	16	23	4	2		2		2	44	25	23	20	1			10	3	140	5				3		27						10		111		25
	Curlew	350	7,600	37	2		2	4		2	2	4	3	3	7	3	2	4	1	1		2	3		2	2	3	2		1	3	3	5	1	37	1	1	1			3	30	30	2	4	2	1	12	5	1	1	4		25	1	1	3	1	1	8	3	
	Dunlin	460	13,300	17												1				2															17																														
	Knot	160	5,300	6										2			1											6			2																																
	Oystercatcher	610	8,200	19				1	2		2	1	1		1	2	8	4							1	4			4	1	1	2	19	1	19	3				2							1	1		6					1				1		
	Purple Sandpiper	20	710	1					1																																																							
	Redshank	240	2,400	52							6		5			2	13	3	10					1			52	4		21		5	9	1	14		6								7	12		7	10	10					10		1	2	16	12	
	Snipe		20,000	9																						9																																				
Unknown	Juvenile Gull			25			3				7			21		18	1						1							3	12		3	25	1	5	2	6	5		2	15						2									2			
	Spoonbill		440	2																																																								2	2	2

Based on the counts provided in Tables 3-1 and 3-2, it can be concluded that a higher number of waterbirds were recorded within the OCB area compared to the VPCB area.

In addition, when reviewing the peak numbers recorded, on average, higher numbers of birds were recorded during the OCB surveys compared to the VPCB surveys, please see Table 3-3 below. Approximately 73% of the waterbird species recorded during the surveys were recorded at higher peak counts within the OCB surveys compared to the VPCB surveys.

Table 3-3: Peak Numbers Recorded for VPCB and OCB Surveys

BoCCI Status	Species	VPCB Peak Count	OCB Peak Count
Green	Great Black-Backed Gull	28	79
	Greenshank	4	4
	Grey Heron	7	6
	Little Egret	3	25
	Little Grebe	3	3
	Sanderling	4	5
	Whimbrel	1	5
Amber	Black-Headed Gull	210	272
	Brent Goose	0	9
	Common Gull	10	115
	Common Sandpiper	17	20
	Cormorant	26	33
	Gannet	1	2
	Great Crested Grebe	1	22
	Guillemot	5	0
	Herring Gull	35	45
	Kingfisher	1	1
	Lesser Black-Backed Gull	93	175
	Mallard	63	78
	Mediterranean Gull	2	2
	Mute Swan	6	11
	Ruff	3	0
	Sandwich Tern	2	12
	Shag	4	2
	Shelduck	5	9
	Teal	35	34
	Tufted Duck	0	2
	Turnstone	3	38
	Wigeon	0	34
Red	Bar-Tailed Godwit	2	112
	Black-tailed Godwit	19	140
	Curlew	49	37
	Dunlin	3	17
	Knot	9	6
	Oystercatcher	2	19

BoCCI Status	Species	VPCB Peak Count	OCB Peak Count
	Purple Sandpiper	0	1
	Redshank	12	52
	Snipe	1	9
Unknown	Juvenile Gull	10	25
	Spoonbill	0	2

In addition, as part of the assessment, the location utilisation of the bird species was also reviewed. Table 3-4 outlines the locations where waterbirds were recorded within the VPCB. As shown in the table, the subtidal habitat was the location where the highest amount of species was recorded at 43%, followed by the intertidal habitat at 30%. During the surveys, birds were recorded utilising the mudflats and subtidal areas along the Lower Suir Estuary for foraging and roosting purposes. However, no potentially suitable breeding habitat was noted within the Site boundary as the mudflats were covered by water at high tide.

The surveys also recorded birds foraging and occasionally roosting on the Lower Suir Estuary. In addition, birds were regularly noted flying over the area, commuting up and downstream of the Lower Suir Estuary. It was noted that mute swan, in particular, were regularly commuting under the existing open wharf at Belview Port.

Table 3-4: VPCB Waterbird Locations

BoCCI Status	Species	INT	SUB	SUP	TER	FLY
Green	Great Black-Backed Gull	34%	54%	1%	7%	3%
	Greenshank	71%	2%	18%	7%	2%
	Grey Heron	41%	15%	30%	14%	0%
	Little Egret	59%	17%	22%	0%	2%
	Little Grebe	100%	0%	0%	0%	0%
	Sanderling	0%	100%	0%	0%	0%
	Whimbrel	50%	50%	0	0	0
Amber	Black-Headed Gull	25%	50%	5%	20%	1%
	Common Gull	15%	41%	15%	29%	0%
	Common Sandpiper	95%	2%	2%	0%	1%
	Cormorant	61%	26%	7%	6%	0%
	Gannet	0%	100%	0%	0%	0%
	Great Crested Grebe	0%	100%	0%	0%	0%
	Guillemot	0%	0%	0%	100%	0%
	Herring Gull	25%	53%	13%	6%	3%
	Kingfisher	50%	0%	50%	0%	0%
	Lesser Black-Backed Gull	34%	37%	26%	1%	2%
	Mallard	16%	43%	39%	1%	1%
	Mediterranean Gull	86%	14%	0%	0%	0%
	Mute Swan	29%	61%	6%	2%	2%
	Ruff	100%	0%	0%	0%	0%
	Sandwich Tern	0%	83%	0%	17%	0%
	Shag	7%	93%	0%	0%	0%
	Shelduck	72%	28%	0%	0%	0%

BoCCI Status	Species	INT	SUB	SUP	TER	FLY
	Teal	23%	77%	0%	0%	0%
	Turnstone	80%	0%	20%	0%	0%
Red	Bar-Tailed Godwit	33%	67%	0%	0%	0%
	Black-tailed Godwit	84%	1%	14%	1%	1%
	Curlew	93%	2%	6%	0%	0%
	Dunlin	71%	29%	0%	0%	0%
	Knot	80%	0%	20%	0%	0%
	Oystercatcher	86%	14%	0%	0%	0%
	Redshank	65%	9%	11%	15%	1%
	Snipe	0%	100%	0%	0	0%
Unknown	Juvenile Gull	20%	40%	39%	0%	1%
Total		**30%**	**43%**	**15%**	**10%**	**1%**

Table 3-5 outlines the location utilisation of the waterbird species within the OCB. As shown in the table, the intertidal habitat was the location where the majority of species were recorded at 59%, followed by the subtidal habitat at 24%. It was noted that there were larger mudflats along the Waterford-side of the Lower Suir Estuary, and higher numbers of birds were regularly observed roosting and foraging in this area.

Table 3-5: OCB Waterbird Locations

BoCCI Status	Species	INT	SUB	SUP	TER	FLY
Green	Great Black-Backed Gull	64%	28%	5%	3%	0%
	Greenshank	93%	4%	4%	0%	0%
	Grey Heron	61%	9%	20%	11%	0%
	Little Egret	75%	6%	13%	6%	0%
	Little Grebe	100%	0%	0%	0%	0%
	Sanderling	0%	100%	0%	0%	0%
	Whimbrel	75%	19%	3%	3%	0%
Amber	Black-headed Gull	58%	29%	7%	6%	1%
	Brent Goose	10%	0%	90%	0%	0%
	Common Gull	74%	13%	12%	1%	0%
	Common Sandpiper	94%	6%	1%	0%	0%
	Cormorant	37%	34%	12%	15%	1%
	Gannet	0%	100%	0%	0%	0%
	Great Crested Grebe	100%	0%	0%	0%	0%
	Herring Gull	64%	23%	9%	4%	1%
	Kingfisher	0%	0%	100%	0%	0%
	Lesser Black-Backed Gull	45%	25%	30%	1%	0%
	Mallard	24%	41%	33%	1%	0%
	Mediterranean Gull	0%	100%	0%	0%	0%
	Mute Swan	33%	54%	11%	2%	0%
	Sandwich Tern	17%	44%	1%	37%	0%
	Shag	33%	50%	0%	17%	0%

BoCCI Status	Species	INT	SUB	SUP	TER	FLY
	Shelduck	66%	22%	3%	10%	0%
	Teal	70%	24%	6%	0%	0%
	Tufted Duck	100%	0%	0%	0%	0%
	Turnstone	71%	21%	9%	0%	0%
	Wigeon	63%	34%	3%	0%	0%
Red	Bar-tailed Godwit	98%	0%	2%	0%	0%
	Black-tailed Godwit	78%	9%	12%	0%	0%
	Curlew	85%	7%	7%	1%	0%
	Dunlin	97%	0%	3%	0%	0%
	Knot	87%	3%	10%	0%	0%
	Oystercatcher	83%	6%	11%	0%	0%
	Purple Sandpiper	25%	75%	0%	0%	0%
	Redshank	72%	8%	11%	9%	0%
	Snipe	64%	36%	0%	0%	0%
Unknown	Juvenile Gull	47%	18%	34%	0%	0%
	Spoonbill	50%	50%	0%	0%	0%
Total		**59%**	**24%**	**12%**	**0%**	**4%**

As outlined in Table 3-6 below, during the surveys, the majority of the waterbirds recorded within the VPCB (66%) were located within 0-50m from the Kilkenny-side of the shore. Whereas the majority of the waterbirds recorded within the OCB were recorded over 300m from the Kilkenny-side of the shore at 81%. These birds were located along the Waterford-side of the Lower Suir Estuary. This is consistent with the findings that the majority of birds recorded in the wider area were located within the intertidal habitats along the Waterford-side of the Lower Suir Estuary. It was also noted that the marsh areas adjacent to Cheekpoint have the potential to provide possible breeding habitat for waterbird species and may provide coverage for more cryptic waterbird species.

It should also be noted that during the surveys, ship and boat movements along the Lower Suir Estuary were regularly observed, and no discernible disturbance response was exhibited by bird species within the area. When boats moved within the vicinity of a bird, birds were noted moving away before very quickly returning to roosting / foraging behaviours.

Table 3-6: Waterbirds Recorded in each Distance Band

BoCCI Status	Species	VPCB 0-50	VPCB 50-100	VPCB 100-200	VPCB 200-300	VPCB 300+	OCB 0-50	OCB 50-100	OCB 100-200	OCB 200-300	OCB 300+
Green	Great Black-Backed Gull	51%	38%	11%	0%	0%	1%	2%	1%	3%	92%
	Greenshank	98%	2%	0%	0%	0%	0%	25%	0%	0%	75%
	Grey Heron	91%	5%	3%	0%	0%	14%	8%	1%	9%	68%
	Little Egret	92%	3%	5%	0%	0%	3%	0%	0%	19%	77%
	Little Grebe	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Sanderling	0%	100%	0%	0%	0%	0%	19%	38%	31%	13%
	Whimbrel	50%	0%	50%	0%	0%	0%	9%	0%	6%	84%
Amber	Black-Headed Gull	56%	29%	15%	0%	0%	5%	4%	5%	10%	77%
	Brent Goose	0%	0%	0%	0%	0%	0%	10%	0%	0%	90%
	Common Gull	60%	20%	20%	0%	0%	0%	1%	2%	10%	86%
	Common Sandpiper	99%	1%	0%	0%	0%	1%	3%	0%	1%	97%
	Cormorant	63%	19%	18%	0%	0%	0%	2%	0%	6%	91%
	Gannet	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%
	Great Crested Grebe	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Guillemot	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Herring Gull	42%	24%	34%	0%	0%	2%	2%	1%	6%	89%
	Kingfisher	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%
	Lesser Black-Backed Gull	58%	32%	9%	0%	0%	0%	7%	4%	6%	84%
	Mallard	85%	15%	0%	0%	0%	2%	42%	5%	2%	50%
	Mediterranean Gull	100%	0%	0%	0%	0%	0%	100%	0%	0%	0%
	Mute Swan	79%	19%	2%	0%	0%	22%	14%	2%	12%	50%
	Ruff	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Sandwich Tern	33%	33%	33%	0%	0%	1%	3%	0%	24%	72%
	Shag	7%	93%	0%	0%	0%	0%	0%	50%	0%	50%

BoCCI Status	Species	VPCB 0-50	VPCB 50-100	VPCB 100-200	VPCB 200-300	VPCB 300+	OCB 0-50	OCB 50-100	OCB 100-200	OCB 200-300	OCB 300+
	Shelduck	83%	17%	0%	0%	0%	0%	0%	4%	14%	82%
	Teal	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Tufted Duck	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Turnstone	100%	0%	0%	0%	0%	1%	1%	0%	0%	98%
	Wigeon	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Red	Bar-Tailed Godwit	33%	0%	67%	0%	0%	0%	0%	0%	7%	93%
	Black-tailed Godwit	100%	0%	0%	0%	0%	2%	1%	0%	15%	82%
	Curlew	98%	2%	0%	0%	0%	2%	3%	0%	9%	86%
	Dunlin	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Knot	95%	5%	0%	0%	0%	13%	17%	0%	0%	70%
	Oystercatcher	86%	14%	0%	0%	0%	0%	0%	0%	10%	89%
	Purple Sandpiper	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Redshank	100%	0%	0%	0%	0%	7%	7%	0%	0%	86%
	Snipe	100%	0%	0%	0%	0%	0%	0%	0%	36%	64%
Unknown	Juvenile Gull	55%	37%	8%	0%	0%	1%	8%	4%	1%	86%
	Spoonbill	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Total		**66%**	**24%**	**10%**	**0%**	**0%**	**3%**	**5%**	**3%**	**8%**	**81%**

4 ASSESSMENT OF POTENTIAL EFFECTS AND MITIGATION

4.1 Potential Effects on Waterbirds

The Site is located within the existing Belview Port and extends partially into the Lower Suir Estuary. During the surveys, 62 waterbird species were recorded onsite and within the wider area. None of the species were recorded in numbers considered to be of national or international importance. However, it was noted that higher numbers of waterbirds were recorded within the OCB area compared to the VPCB area.

The intertidal and tidal river habitat located onsite and within the wider area provided suitable foraging and roosting habitat for waterbird species. During the surveys, it was noted that the mudflats within the Site and its immediate vicinity (the Kilkenny-side of the Lower Suir Estuary) were subject to significant tidal movements and were covered by water at high tide. These shores were considered narrower than the larger mudflats recorded along the Waterford-side of the Lower Suir Estuary, which retained areas of exposed shores throughout the tidal cycle.

It was noted that there was no suitable breeding habitat within the Site and the immediate vicinity of the Site. The Site comprised primarily of the existing Belview Port, which did not contain any suitable breeding habitat for birds. In addition, no potentially suitable breeding habitat was noted along the mudflats within the Site boundary, as these areas were covered by water at high tide. No birds were noted nesting within the Site, and no birds were recorded exclusively utilising the habitats within the Site boundary.

However, the marsh habitat, located near Cheekpoint on the Waterford-side of the Lower Suir Estuary, was considered to provide potential breeding habitat for waterbird species and coverage for more cryptic bird species.

Demolition and Construction Effects

The Proposed Development will involve demolition works, capital dredging and construction of the wharf that will include land reclamation with infilling of 160,000 tonnes of imported engineering fill materials, piling works, installation of wharf infrastructure and construction of the ORE Operator Facilities. These different phases of works are considered to have the potential to result in effects on waterbirds, as described below:

Demolition Works

The Proposed Development will involve demolition works to the existing dolphin, partial demolition works to the downstream ramp and demolition works to the end of the existing wharf. During the surveys, no birds were recorded nesting or breeding on the dolphin; as such, it was not considered that the demolition of the dolphin will result in any loss of breeding habitat. Similarly, no birds were recorded nesting or breeding on the downstream ramp at the Belview Port or the existing wharf.

Capital Dredging

The Proposed Development will also involve a small area of capital dredging within the immediate vicinity of the existing Belview Port. Disturbances as a result of dredging can result in the flushing of bird species from an area or the avoidance of an area by bird species.

Flushing distance for bird species can vary by both species and flock size [15]. Species such as cormorant, divers, grebes and sea ducks (eiders, scoters and long-tailed ducks) are considered to be highly sensitive species to direct disturbances that may occur from dredging works [15, 16]. Disturbance / displacement from an area is considered to effectively be a temporary habitat loss for these species. However, it has been shown that boats can approach within 100m of sensitive species before a response (‘flight’) is triggered [15, 16, 17]. Generally,

it is considered that gulls, terns and gannets have a low sensitivity to disturbance effects that may occur as a result of dredging works [15].

Therefore, given the predicted short duration of the capital dredging works and the fact that birds are highly mobile and will move to more suitable habitats in the wider area, it was considered that the capital dredging works will not result in any impacts to waterbirds.

Wharf Construction

During the Construction Phase, the works will also involve in-river and land-side works, including piling works, infilling of rock, construction of the wharf structure and the construction of the ORE Facilities, which include buildings, 90,000L fuel tanks and the installation of a pontoon for each ORE Operator.

In addition, the Proposed Development will involve the reclamation of ca. 1.3ha. However, as there was no suitable breeding habitat located along the sandy shores / mudflats within the Site or in the vicinity of the Site, it was considered that the reclamation works will not result in a loss of potential breeding habitat for waterbird species.

The works have the potential to result in dust-related impacts from demolition and construction activities. According to the Institute of Air Quality Management ('IAQM') Guidelines, the adverse effects of dust on ecological receptors are generally confined to a 50-meter radius of the construction site [18]. A detailed dust risk assessment has been undertaken as part of the Environmental Impact Assessment Report ('EIAR'), with consideration given to dust-generating activities such as on-site demolition works, earthworks, construction operations, and track-out from HGV movements. Dust effects have the potential to result in the loss of foraging habitat and prey availability for waterbird species. Therefore, appropriate mitigation measures will be implemented during the demolition and construction phase to ensure no impacts from dust occur to waterbird species within the vicinity of the Site and the wider area.

As part of the Proposed Development, in-river works will be required throughout the construction phase. In addition, the proposed works on the wharf extension will also require the use of concrete and machinery. Therefore, during the works, should potential water quality impairment occur, this could result in direct impacts to waterbirds as well as a bottom-up trophic cascade wherein the abundance and distribution of prey species or foraging habitat for waterbird species is altered, conferring a negative impact upon the waterbirds, which are at higher trophic levels. A bottom-up trophic cascade would affect the functioning of ecosystem processes. Therefore, the appropriate mitigation measures will be implemented in order to ensure no significant water quality impairment effects will occur.

Although it would be considered that the waterbirds located within the area are likely habituated to ongoing port-related activities and anthropogenic disturbances, the construction phase will result in new noise emissions. Potential noise sources will include the demolition works, piling works, infilling works and general construction works required. Studies have shown that different types of disturbance stimuli are characterised by different avifaunal reactions but in general, a distance of 300m can be used to represent the maximum likely disturbance distance for waterfowl [19]. As shown in Section 3, suitable foraging and roosting habitat for waterbirds has been identified within 300m of the Site. As such, a detailed noise impact assessment was undertaken as part of the EIAR (Chapter 11). This noise impact assessment concluded that waterbirds may be disturbed by the works; however, given the abundance of suitable habitat within the wider area, it was considered likely that these birds will move away to alternative suitable areas during construction. Furthermore, in order to ensure noise effects will be minimised as much as practicable, appropriate mitigation measures will be implemented during the Construction Phase.

Overall, following the implementation of the mitigation measures, it was considered that there will be no significant and long-term effects to waterbirds as a result of the Proposed Development.

Operational Phase Effects

Although the reclamation of intertidal habitat has the potential to result in a loss of foraging habitat for waterbird species, the Waterford-side of the Lower Suir Estuary has been observed as having higher foraging activity, and this area will not be directly impacted by the Proposed Development. Furthermore, it should be noted that although the reclamation will result in a loss of sandy shores and benthic habitat, the Proposed Development has been designed to incorporate an 'open quay' design, which will allow for an influx of water to move under the wharf and allow the movement of waterbird species in and out of this area so that they can still utilise the habitats under the wharf for commuting and foraging purposes. In addition, a Biodiversity Enhancement Area, ca. 1.8ha in size, has been incorporated into the design of the Proposed Development to provide suitable foraging and roosting / resting areas for local biodiversity, including waterbirds. In addition, no works will take place outside of the Site boundary, and as such, no direct effects will occur to any intertidal habitats within the wider area.

It is noted that during the Operational Phase of the Proposed Development, stormwater will discharge into the Lower Suir Estuary, and each of the ORE Operator Facilities will have a 90,000L fuel tank, located within appropriate bunds, located on the new wharf extension. Therefore, appropriate water mitigation measures have been incorporated into the design of the Proposed Development, including a settling tank, hydrocarbon bypass interceptor, sampling equipment, continuous pH and conductivity probes and an emergency holding tank. However, in addition to these design measures, mitigation measures will also be implemented to ensure no impacts occur as a result of water quality impairment.

During the Operational Phase, the Proposed Development will have two operational ORE Operator Facilities and an area for port-related activities. It is anticipated that the noise emissions generated from the Proposed Development will be similar to those associated with the existing Belview Port, which, as stated above, the waterbirds are habituated to. Waterbirds will not be significantly impacted by noise during the Operational Phase; however, mitigation measures will be implemented during the Operational Phase to ensure no significant effects occur.

In addition, during the Operational Phase, there will be two fixed cranes for each ORE Operator facility and one harbour mobile crane that will be used for port-related activities as part of the Proposed Development. The fixed cranes will have a maximum height of 6m and will be of a comparable height to the existing port infrastructure, which birds are accustomed to avoiding. The harbour mobile crane will have a maximum lifting height of ca. 48m, but will only be in use intermittently and operate with slow and highly visible movement. As such, birds will readily detect and avoid them. Therefore, the potential for collision risk to birds during the operational phase was considered negligible.

Furthermore, during the surveys, it was noted that ship and boat movements along the Lower Suir Estuary have no discernible disturbance effects on waterbird species within the area. When boats moved within the vicinity of a bird, birds were noted moving away before very quickly returning to roosting / foraging behaviours. Therefore, it is considered that the boat / vessel movements associated with the Proposed Development will be similar in nature to the ongoing port-related activities and will not result in effects to waterbirds.

Overall, it was considered that there will be no significant effects to waterbirds within the area during the Operational Phase.

4.2 Proposed Mitigation and Enhancement Measures

Comprehensive mitigation measures will be implemented to reduce the potential impact of the Proposed Development on local waterbird populations as outlined in Chapter 6 (Biodiversity), Chapter 7 (Land and Soils), Chapter 8 (Water), Chapter 9 (Air Quality) and Chapter 11 (Terrestrial Noise and Vibration).

In addition, ecological clerk of works ('ECoW') monitoring will be undertaken as required, as outlined in the EIAR.

Furthermore, as outlined in Appendix 6-4 (Biodiversity Management Plan), enhancement measures will be implemented within the Biodiversity Enhancement Area that will provide foraging, commuting and potential roosting opportunities for local waterbirds.

5 CONCLUSIONS

During the bird surveys undertaken at Belview Port, a total of 40 waterbird species were identified utilising the Lower Suir Estuary and surrounding habitats. None of these species were recorded in numbers of national or international importance during either the breeding or wintering seasons.

Of the waterbird species that were recorded:

- Six Green-listed BoCCI non-Annex I species – great black-backed gull, greenshank, grey heron, little grebe, sanderling, and whimbrel;
- 19 Amber-listed BoCCI, non-Annex I species were recorded – black-headed gull, common gull, common sandpiper, cormorant, gannet, great crested grebe, guillemot, herring gull, lesser black-backed gull, light-bellied brent goose, mallard, mute swan, ruff, shag, shelduck, teal, turnstone, tufted duck, wigeon;
- Eight Red-listed BoCCI, non-Annex I species were recorded – black-tailed godwit, curlew, dunlin, knot, oystercatcher, purple sandpiper, redshank, snipe;
- One Green BoCCI Annex I species was recorded – little egret;
- Three Amber BoCCI Annex I species were recorded –kingfisher, mediterranean gull, and sandwich tern;
- One Red BoCCI Annex I species were recorded – bar-tailed godwit;
- One Non-BoCCI Listed and Annex I species was recorded – spoonbill; and,
- One Non-BoCCI Listed was recorded – juvenile gull.

Overall, it was concluded during the surveys that the onsite habitats and habitats within the immediate vicinity of the Site are not sites of importance for any waterbird species. Waterbirds were observed foraging and roosting along the intertidal habitats of the Lower Suir Estuary; however, no species were exclusively utilising these habitats. Waterbirds were observed moving throughout the wider area.

Therefore, it was concluded that the Proposed Development will have a permanent slight negative impact on birds at a local level due to habitat loss / alteration (ca. 1.3ha) and will result in a temporary slight negative impact on waterbirds due to disturbances associated with the construction and operational phase of the Proposed Development. However, there will be a Biodiversity Enhancement Area (ca. 1.8ha), which will offer additional foraging and breeding ground for bird species. Furthermore, since birds are highly mobile species, it was considered that any birds that may be displaced would relocate to other suitable habitats within the vicinity of the Site.

In addition, the Operational Phase of the Proposed Development will be similar to those associated with the existing Belview Port. As such, it would be considered that waterbirds within the vicinity of the Belview Port are already habituated to the ongoing port-related activities and anthropogenic disturbances and, as such, will not be impacted during the Operational Phase.

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APPENDIX 6-3

Port of Waterford

Benthic Survey of Belview Port

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AQUAFACT

Table of Contents

1. Introduction 3

2. Materials & Methods 3

2.1. Sampling Procedure 3
2.2. Sample Processing 6
2.3. Data Analysis 7
2.3.1. Univariate Indices 7
2.3.2. Multivariate Analysis 8

3. Results 11

3.1. Fauna 11
3.1.1. Univariate Analysis 11
3.1.2. Multivariate Analysis 14
3.2. Sediment 18

4. Discussion 22

5. References 23

List of Figures

Figure 1.1: Location of study area. 3

Figure 2.1: Location of the grab stations sampled on the 1st of June 2021 5

Figure 3.1: Subtidal community diversity indices. Diversity is expressed in Effective Number of Species (ENS) and Shannon-Wiener Diversity. 13

Figure 3.2: Dendrogram produced from Cluster analysis. 16

Figure 3.3: MDS plot. 16

Figure 3.4: River Barrow and River Nore conservation objectives marine community types (NPWS, 2011). 17

Figure 3.5: Sediment type at each stations according to Folk (1954). 18

Figure 3.6: Sediment fractions of stations W1-5. 19

Figure 3.7: Sediment fractions of B1-4. 19

Figure 3.8: Sediment fractions of Q1-4. 20

List of Tables

Table 2.1: Station coordinates and depths at the grab stations. 5

Table 2.2: The classification of sediment particle size ranges into size classes (adapted from Buchanan, 1984). 6

Table 3.1: Univariate measures of community structure. 12

Table 3.2: Sediment characteristics of the benthic faunal stations sampled. LOI refers to the % organic carbon loss on ignition. 21

List of Appendices

Appendix 1 Sediment Analysis Methodology

Appendix 2 Species List

1. Introduction

AQUAFACT International Services Ltd. was commissioned by the Client Port of Waterford to carry out a benthic survey at the location of Proposed Development at Belview Port. Three separate areas were sampled. One at the site of the Proposed Development, one upstream of the proposed the Site and one downstream of the site as shown below in Figure 1.1.



Figure 1.1: Location of study area.

2. Materials & Methods

2.1. Sampling Procedure

To carry out the subtidal benthic assessment of Belview Port, AQUAFACT sampled a total of 13 stations. Sampling took place on the 1st June 2021 from the Keltoi Warrior. Sea state was

calm with a light (5kt) southerly breeze. Figure 2.1 shows the location of the grab stations sampled on the 1st of June and Table 2.1 shows the station coordinates and depths.

AQUAFACT has in-house standard operational procedures for benthic intertidal sampling and these were followed for this project. Additionally, the NMBAQC report "Guidelines for processing marine macrobenthic invertebrate samples: a processing requirements protocols" (Worsfold and Hall, 2010) was adhered to.

A 0.025m^2 van Veen grab was used to sample the grab sites. On arrival at each sampling station, the vessel location was recorded using DGPS (latitude/longitude). Additional information such as date, time, site name, sample code and depth were recorded in a data sheet.

Three grab samples were taken at each of the thirteen stations for faunal analysis and a fourth sample was collected for sediment grain size and organic carbon analysis. The grab deployment and recovery rates did not exceed 1 metre/sec. This was to ensure minimal interference with the sediment surface as the grab descended. Upon retrieval of the grab a description of the sediment type was noted in the sample data sheet. Notes were also made on colour, texture, smell and presence of animals.

The grab sampler was cleaned between stations to prevent cross contamination.

The samples collected for faunal analysis were carefully and gently sieved on a 1mm mesh sieve as a sediment water suspension for the retention of fauna. Great care was taken during the sieving process in order to minimise damage to taxa such as spionids, scale worms, phyllodocids and amphipods. The sample residue was carefully flushed into a pre-labelled (internally and externally) container from below. Each label contained the sample code and date. The samples were stained with Eosin-briebrich scarlet and fixed in 4% w/v buffered formaldehyde solution upon returning to the laboratory. These samples were ultimately preserved in 70% alcohol prior to processing.



Figure 2.1: Location of the grab stations sampled on the 1st June 2021.

Table 2.1: Station coordinates and depths at the grab stations.

Station	Latitude	Longitude	Depth (m)
W 1	52.2756342	-7.0087152	6
W 2	52.2758877	-7.0073548	7
W 3	52.2763827	-7.0048165	7
W 4	52.2770475	-7.0016356	6
W 5	52.2773569	-7.0036584	6
B 1	52.2695155	-7.0272737	15
B 2	52.2701497	-7.0269006	8
B 3	52.2706634	-7.0261855	7
B 4	52.271342	-7.0252424	4
Q 1	52.2612827	-7.0368706	11
Q 2	52.2617901	-7.0369225	9
Q 3	52.2621644	-7.0365701	7
Q 4	52.2628558	-7.0361866	5

2.2. Sample Processing

All faunal samples were placed in an illuminated shallow white tray and sorted first by eye to remove large specimens and then sorted under a stereo microscope (x 10 magnification). Following the removal of larger specimens, the samples were placed into Petri dishes, approximately one half teaspoon at a time and sorted using a binocular microscope at x25 magnification.

The fauna was sorted into four main groups: Polychaeta, Mollusca, Crustacea and others. The 'others' group consisted of echinoderms, nematodes, nemerteans, cnidarians and other lesser phyla. The fauna were maintained in stabilised 70% industrial methylated spirit (IMS) following retrieval and identified to species level where practical using a binocular microscope, a compound microscope and all relevant taxonomic keys. After identification and enumeration, specimens were separated and stored to species level.

The sediment granulometric analysis was carried out by AQUAFACT using the traditional granulometric approach. Traditional analysis involved the dry sieving of approximately 100g of sediment using a series of Wentworth graded sieves. The process involved the separation of the sediment fractions by passing them through a series of sieves. Each sieve retained a fraction of the sediment, which were later weighed, and a percentage of the total was calculated. Table 2.2 shows the classification of sediment particle size ranges into size classes. Sieves, which corresponded to the range of particle sizes, were used in the analysis. Appendix 1 provides the detailed granulometric methodology.

Table 2.2: The classification of sediment particle size ranges into size classes (adapted from Buchanan, 1984).

Range of Particle Size	Classification	Phi Unit
<63µm	Silt/Clay	>4 Ø
63-125 µm	Very Fine Sand	4 Ø, 3.5 Ø
125-250 µm	Fine Sand	3 Ø, 2.5 Ø
250-500 µm	Medium Sand	2 Ø, 1.5 Ø
500-1000 µm	Coarse Sand	1 Ø, 1.5 Ø
1000-2000 µm (1 – 2mm)	Very Coarse Sand	0 Ø, -0.5 Ø
2000 – 4000 µm (2 – 4mm)	Very Fine Gravel	-1 Ø, -1.5 Ø
4000 -8000 µm (4 – 8mm)	Fine Gravel	-2 Ø, -2.5 Ø
8 -64 mm	Medium, Coarse & Very Coarse Gravel	-3 Ø to -5.5 Ø
64 – 256 mm	Cobble	-6 Ø to -7.5 Ø
>256 mm	Boulder	< -8 Ø

The additional sediment samples collected from the faunal stations had their organic carbon analysis performed by ALS Laboratories in Loughrea using the Loss on Ignition method. Appendix 1 provides the methodology.

2.3. Data Analysis

Uni- and multi-variate statistical analyses of the faunal data were undertaken using PRIMER v.6 (Plymouth Routines in Ecological Research).

2.3.1. Univariate Indices

Using PRIMER the faunal data were used to produce a range of univariate indices. Univariate indices are designed to condense species data in a sample into a single coefficient that provides quantitative estimates of biological variability (Heip *et al*., 1998; Clarke and Warwick, 2001). Univariate indices can be categorised as primary or derived indices.

Primary biological indices used in the current study include:

number of taxa (S) in the samples and

number of individuals (N) in the samples.

Derived biological indices, which are calculated based on the relative abundance of species in samples, used in the study include:

- Margalef's species richness index (d) (Margalef, 1958),

$$D = \frac{S - 1}{\log_2 N}$$

where: N is the number of individuals and S is the number of species

Margalef's species richness is a measure of the total number of species present for a given number of individuals.

- Pielou's Evenness index (J) (Pielou, 1977)

$$J = \frac{H'(observed)}{H'_{max}}$$

where: H'_{max} is the maximum possible diversity, which could be achieved if all species were equally abundant (= $\log_2 S$)

Pielou's evenness is a measure of how evenly the individuals are distributed among different species.

- Shannon-Wiener diversity index (H') (Pielou, 1977)

$$H' = -\sum_{i=1}^{S} p_i (\log_2 p_i)$$

where: p_l is the proportion of the total count accounted for by the ith taxa

Shannon-Wiener diversity index takes both species abundance and species richness into account quantify diversity (Shannon & Wiener, 1949).

- The Shannon-Wiener based Effective Number of Species (ENS) (Hill, 1973; Jost, 2006)

$$H = \exp(H')$$

where H' is the Shannon-Wiener diversity index.

The Shannon-Wiener index diversity index is converted to ENS to reflect 'true diversities' (Hill, 1973, Jost, 2006) that can then be compared across communities (MacArthur, 1965; Jost, 2006). The ENS is equivalent to the number of equally abundant species that would be needed in each sample to give the same value of a diversity index, *i.e.* Shannon-Wiener Diversity index. The ENS behaves as one would intuitively expect when diversity is doubled or halved, while other standard indices of diversity do not (Jost, 2006). If the ENS of one community is twice that of another then it can be said that the community is twice as diverse as the other.

2.3.2. Multivariate Analysis

The PRIMER programme (Clarke & Warwick, 2001) was used to carry out multivariate analyses on the station-by-station faunal data. All species abundance data from the grab surveys were fourth root transformed and used to prepare a Bray-Curtis similarity matrix in PRIMER. The fourth root transformation allows some of the less abundant species to play a part in the

similarity calculation. Various ordination and clustering techniques can then be applied to the similarity matrix to determine the relationship between the samples.

Multidimensional scaling (MDS) is a technique that ordinates samples as points in 2D or 3D space based on similarity in species distribution data. MDS performed on the Bray-Curtis similarity matrix produce ordination maps whereby the placement of samples reflects the similarity of their biological communities, rather than their simple geographical location (Clarke & Warwick, 2001).

An indication of how well the similarity matrix is represented by the ordination is given by stress values calculated by comparing the interpoint distances in the similarity matrix with the corresponding interpoint distances on the ordinations. Perfect or near perfect matches are rare in field data, especially in the absence of a single overriding forcing factor such as an organic enrichment gradient. Stress values increase, not only with the reducing dimensionality (lack of clear forcing structure), but also with increasing quantity of data (it is a sum of the squares type regression coefficient). Clarke & Warwick (2001) have provided a classification of the reliability of MDS plots based on stress values, having compiled simulation studies of stress value behaviour and archived empirical data. This classification generally holds well for ordinations of the type used in this study. Their classification is given below:

- Stress value < 0.05: Excellent representation of the data with no prospect of misinterpretation.
- Stress value < 0.10: Good representation, no real prospect of misinterpretation of overall structure, but very fine detail may be misleading in compact subgroups.
- Stress value < 0.20: This provides a useful picture, but detail may be misinterpreted particularly nearing 0.20.
- Stress value 0.20 to 0.30: This should be viewed with scepticism, particularly in the upper part of the range, and discarded for a small to moderate number of points such as < 50.
- Stress values > 0.30: The data points are close to being randomly distributed in the ordination and not representative of the underlying similarity matrix.

Each stress value must be interpreted both in terms of its absolute value and the number of data points. In the case of this study, the moderate number of data points indicates that the

stress value can be interpreted more or less directly. While the above classification is arbitrary, it does provide a framework that has proved effective in this type of analysis.

Hierarchical Agglomerative Clustering (HAC) is used to cluster samples based on between-sample similarities into groups in dendrograms. Similarity Profiling (SIMPROF) is used to test if differences between HAC derived similarity-based clusters are significant. Similarity Percentages (SIMPER) analysis can be used to determine the characterising species of each cluster of stations identified either arbitrarily (by eye) from HAC dendrograms or statistically using SIMPROF testing (Clarke and Warwick, 2001; Clarke and Gorley, 2006; Anderson *et al*., 2008).

The species, which are responsible for the grouping of samples in CLUSTER analyses, were identified using the PRIMER programme SIMPER (Clarke & Warwick, 1994). This programme determined the percentage contribution of each species to the dissimilarity/similarity within and between each sample group.

3. Results

3.1. Fauna

The taxonomic identification of the benthic infauna across all 13 subtidal stations sampled in the vicinity of Belview Port yielded a total count of 51 taxa ascribed to 6 phyla and comprising 1,528 individuals. Of the 51 taxa identified, 35 were identified to species level. The remaining 16 could not be identified to species level due to the fact that they were juveniles, damaged or indeterminate. The full faunal abundance species list can be seen in Appendix 2.

Of the 51 taxa recorded, 22 were annelids (segmented worms), 15 were arthropods (crabs, shrimps, insects *etc*.), 11 were molluscs (mussels, cockles, snails etc.), 1 was an echinoderm (brittlestar), 1 was a nemertean (ribbon worm) and 1 was a nematode (round worm).

3.1.1. Univariate Analysis

In order to carry out the univariate analyses all replicate data were combined to give a total for each station prior to statistical analysis. Univariate statistical analyses were carried out on the station-by-station faunal data. The following parameters were calculated and can be seen in Table 3.1; species numbers, number of individuals, richness, evenness, Shannon-Wiener diversity, and Effective Species Number (ENS). Species numbers ranged from 5 (Q3) to 22 (Q3). Number of individuals ranged from 23 (Q3) to 336 (W2). Richness ranged from 1.28 (Q3) to 4.23 (Q1). Evenness ranged from 0.42 (W2) to 0.85 (W5). Shannon-Wiener diversity ranged from 0.7 (Q3) to 2.23 (Q1). Effective number of species ranged from 2.02 (Q3) to 9.34 (Q1) indicating that station Q1 is over 4.6 times more diverse than Q3. Figure 3.1 shows these community indices in graphical form.

Table 3.1: Univariate measures of community structure.

Station	No. Taxa	No. Individuals	Richness	Evenness	Shannon-Wiener Diversity	Effective Number of Species
	S	N	d	J'	H'(loge)	EXP(H')
W1	13	244	2.18	0.57	1.45	4.28
W2	18	336	2.92	0.42	1.22	3.38
W3	11	43	2.66	0.74	1.77	5.86
W4	13	88	2.68	0.81	2.09	8.07
W5	13	56	2.98	0.85	2.17	8.77
B1	6	26	1.53	0.80	1.43	4.17
B2	13	103	2.59	0.65	1.66	5.24
B3	19	213	3.36	0.66	1.95	7.04
B4	11	55	2.50	0.59	1.41	4.10
Q1	20	89	4.23	0.75	2.23	9.34
Q2	13	54	3.01	0.75	1.93	6.92
Q3	5	23	1.28	0.44	0.70	2.02
Q4	22	198	3.97	0.49	1.50	4.49

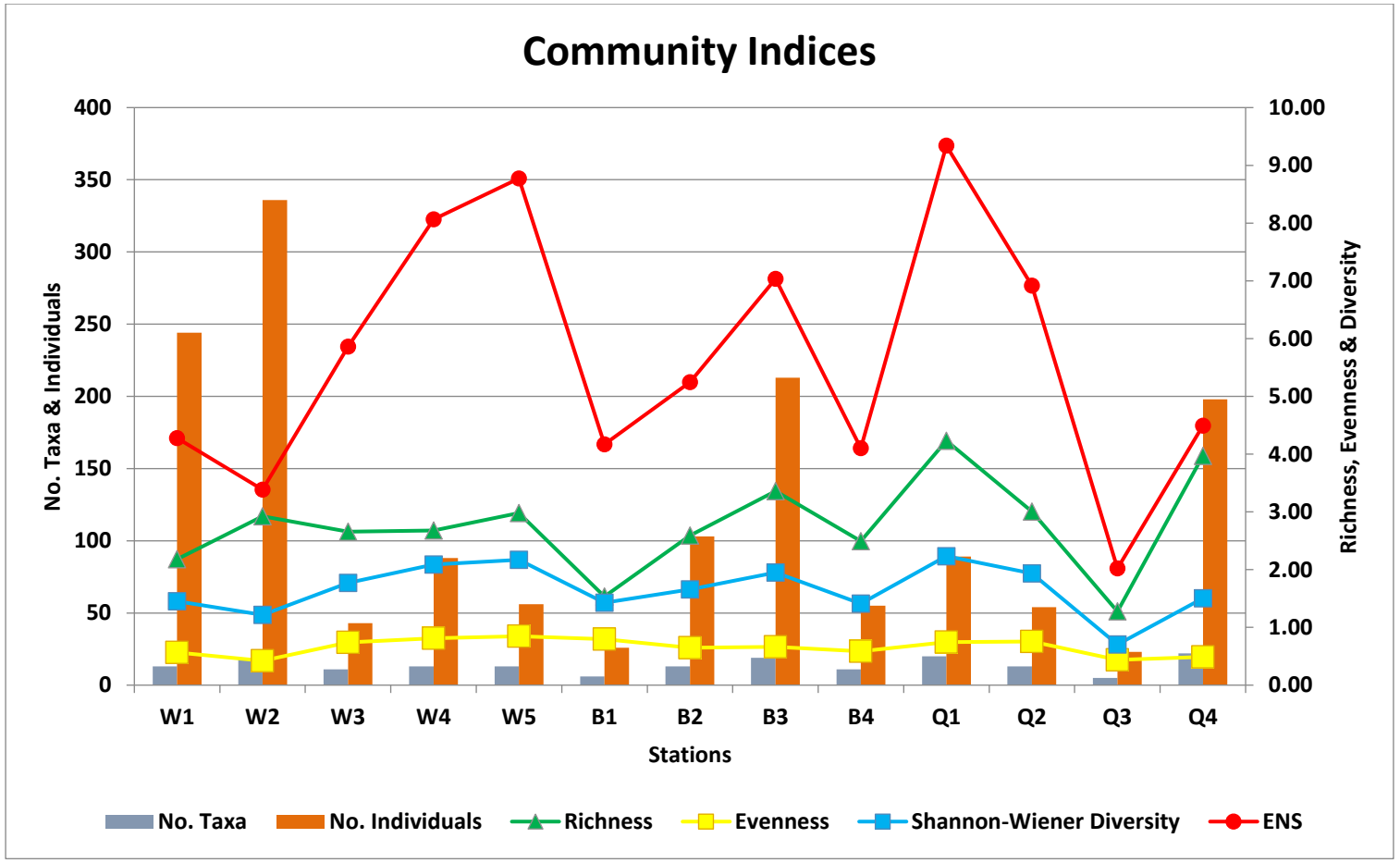


Figure 3.1: Subtidal community diversity indices. Diversity is expressed in Effective Number of Species (ENS) and Shannon-Wiener Diversity.

3.1.2. Multivariate Analysis

The same data set used above for the univariate analyses was also used for the multivariate analyses. The dendrogram and the MDS plot can be seen in Figures 3.2 and 3.3, respectively. SIMPROF analysis revealed 3 statistically significant groupings between the 13 stations (the samples connected by red lines cannot be significantly differentiated). The stress level on the MDS plot indicates that this provides a useful picture representation of the data but very fine detail may be misleading in compact subgroups.

A clear divide (25.01% similarity) can be seen between **Group a** and all other groups. A similarly clear divide (30.57% similarity) can be seen between **Group b** and **Group c**.

Group a consisted of station Q3. This group separated from all other groups at a 74.99% dissimilarity level. Group a contained 5 taxa comprising 23 individuals. 4 taxa were present twice or less. SIMPER analysis could not be carried out on this group as it only contained one station. One species accounted for over 82% of the faunal abundance: the amphipod *Corophium volutator* (19 individuals, 82.6% abundance). *C. volutator* is tolerant of disturbance, occurring under normal conditions, but their populations are stimulated by organic enrichment. This station had the lowest number of taxa, lowest number of individuals, lowest richness and lowest diversity.

Group b consisted of station Q4. This group separated from Group c at a 69.43% dissimilarity level. Group b contained 22 taxa comprising 198 individuals. Of the 22 taxa, 17 were present twice or less. Four taxa accounted for almost 89% of the faunal abundance: Nematoda (118 individuals, 59.6% abundance), the oligochaete *Tubificoides benedii* (34 individuals, 17.17% abundance), the gastropod *Peringia ulvae* (13 individuals, 6.57% abundance), and the amphipod *Corophium volutator* (11 individuals, 5.56% abundance). SIMPER analysis could not be carried out on this group as it only contained one station. Nematoda, *Corophium volutator* and *Peringia ulvae* are tolerant of disturbance, occurring under normal conditions, but their populations are stimulated by organic enrichment. *Tubificoides benedii* is a first order opportunistic species which proliferates in reduced sediments with high organic content. Q4 had the highest number of taxa and the highest richness.

Group c consisted of stations W1-W5, B1-B4, Q1 and Q2. This group separated from Group b at a 69.43% dissimilarity level. This group had a within-group similarity level of 51.83%. Group c contained 39 taxa comprising 1,307 individuals. Of the 39 taxa, 17 were present twice or less. Six taxa accounted for over 79% of the faunal abundance: the amphipod *Corophium volutator* (440 individuals, 33.66% abundance), Nematoda (97 individuals, 7.42% abundance), and the polychaetes *Tharyx killariensis* (245 individuals, 18.75% abundance), *Pygospio elegans* (83 individuals, 6.35% abundance) and *Streblospio shrubsolii* (55 individuals, 4.21% abundance). SIMPER analysis further revealed *Tubificoides benedii* and the bivalve *Macoma balthica* as characterising species of this group. *Macoma balthica, Corophium volutator*, Nematoda, *Streblospio shrubsolii* and *Pygospio elegans* are tolerant of disturbance, occurring under normal conditions, but their populations are stimulated by organic enrichment. *Tubificoides benedii* is a first order opportunistic species that proliferates in reduced sediments with high organic content. *Tharyx killariensis* is a second order opportunistic species that is present in slight to pronounced unbalanced conditions.

All of the groups can be seen as belonging to the JNCC biotope SS.SMu.SMuVS.PolCvol *Polydora ciliata* and *Corophium volutator* in variable salinity infralittoral firm mud or clay (EUNIS code A5.321). SS.SMu.SMuVS.PolCvol is a sublittoral biotope occurring in sheltered, very sheltered and extremely sheltered areas with weak tidal streams (Connor *et al.,* 2004). The biotope occurs in variable salinity and exclusively in clay and very firm mud, and is characterized by a turf of the polychaete *Polydora* along with the amphipod *Corophium volutator.* The resilience and resistance of the biotope to impacts is considered high (De-Bastos & Hill, 2016).

Additionally, these stations can be classified as belonging to one of the four common benthic community habitat types occurring in the River Barrow and River Nore SAC (Figure 4.4) (NPWS, 2011) namely the habitat 'Muddy estuarine community complex'. This community is present intertidally and subtidally from Cheek Point and Great Island northward to New Ross. The substrate of this community complex is predominantly of fine material. The distinguishing species for this group are the bivalve *Scrobicularia plana* and *Macoma balthica,* the amphipod *Corophium volutator,* the polychaete *Streblospio shrubsolii,* and the oligochaetes *Tubificoides pseudogaster* and *Tubificoides benedii.* These species are indicative of variable salinity community (NPWS, 2011).

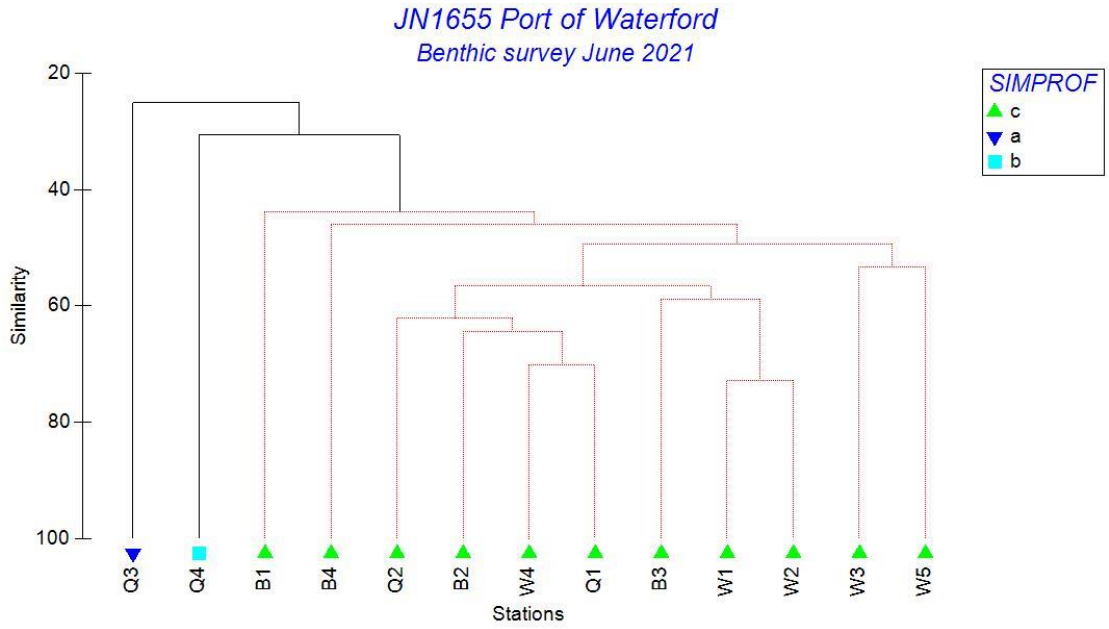


Figure 3.2: Dendrogram produced from Cluster analysis.

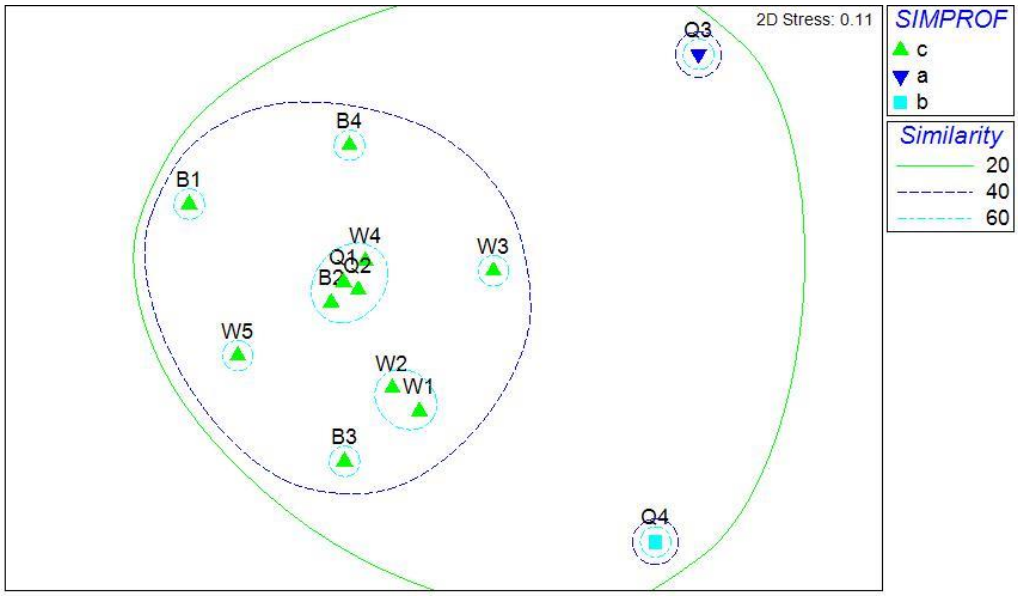


Figure 3.3: MDS plot.

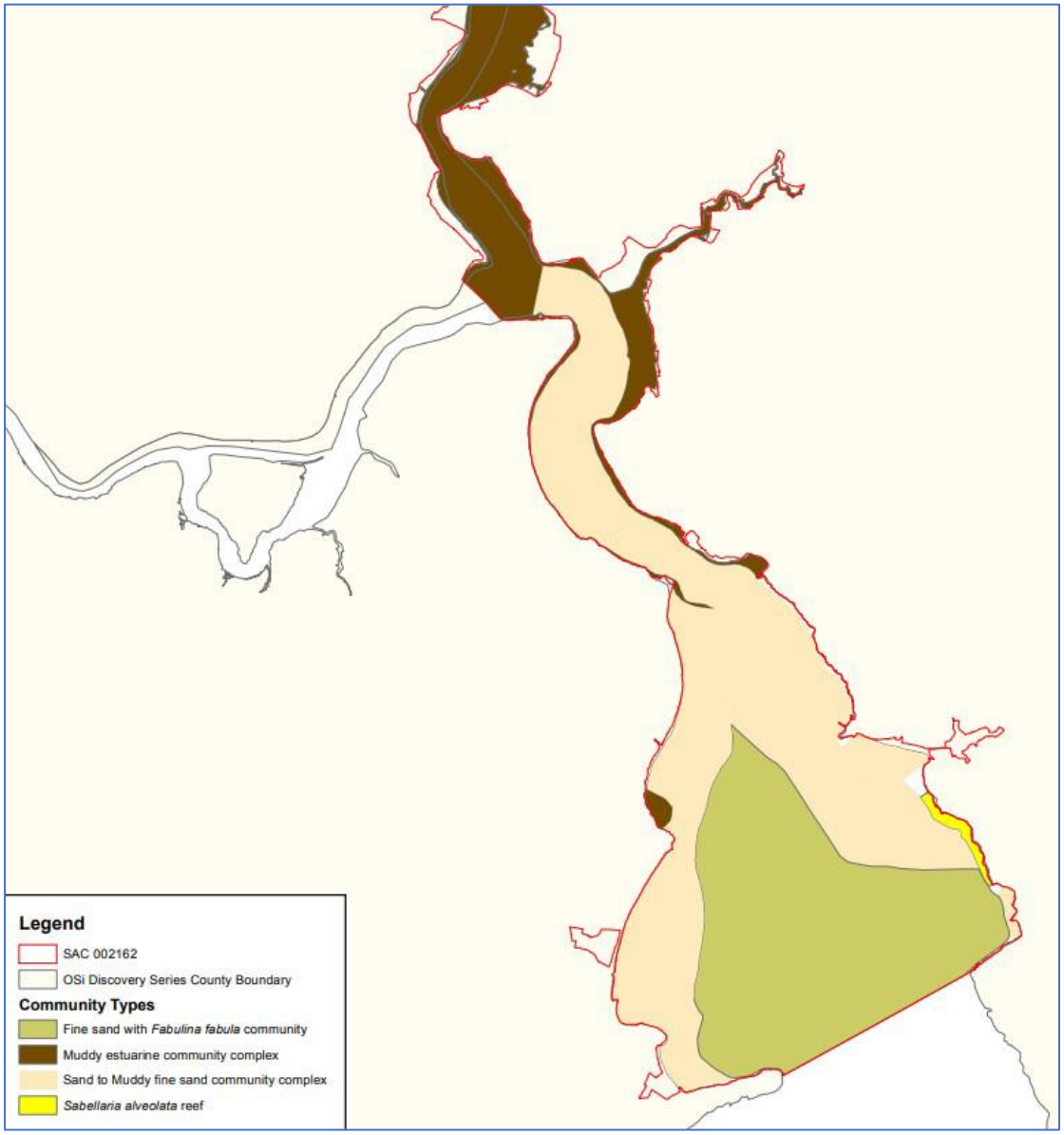


Figure 3.4: River Barrow and River Nore conservation objectives marine community types (NPWS, 2011).

3.2. Sediment

Table 3.2 shows the sediment characteristics of the subtidal and intertidal stations surveyed including the granulometry and the percentage organic carbon.

The sediment sampled within the study area was classified as slightly gravelly muddy sand, and muddy sand according to Folk (1954). No medium gravel-boulders were recorded. Highest levels of fine gravel were observed at Q1 (0.8%). Highest levels of very fine gravel, very coarse sand, coarse sand, medium sand and fine sand were found at B1 (1.3%, 4.8%, 7.8%, 8.6% and 8.9% respectively). Highest levels of very fine sand were found at W3 (75.2%) and highest levels of silt-clay were found at Q4 (36.7%). Figure 3.5 illustrates the sediment type according to Folk (1954). Figure 3.6, 3.7 and 3.8 illustrate the sediment fractions of stations W1-5, B1-4 and Q1-4 respectively. Organic matter values ranged from 4.88% (B4) to 8.04% (B1).

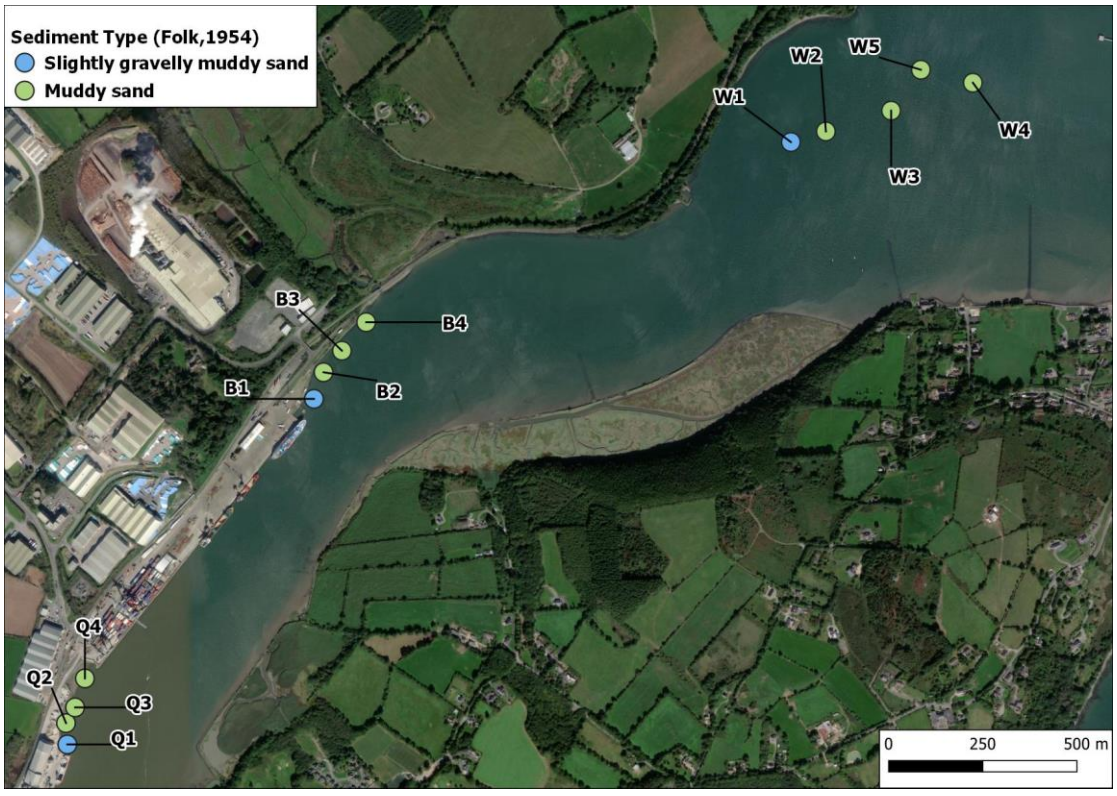


Figure 3.5: Sediment type at each stations according to Folk (1954).

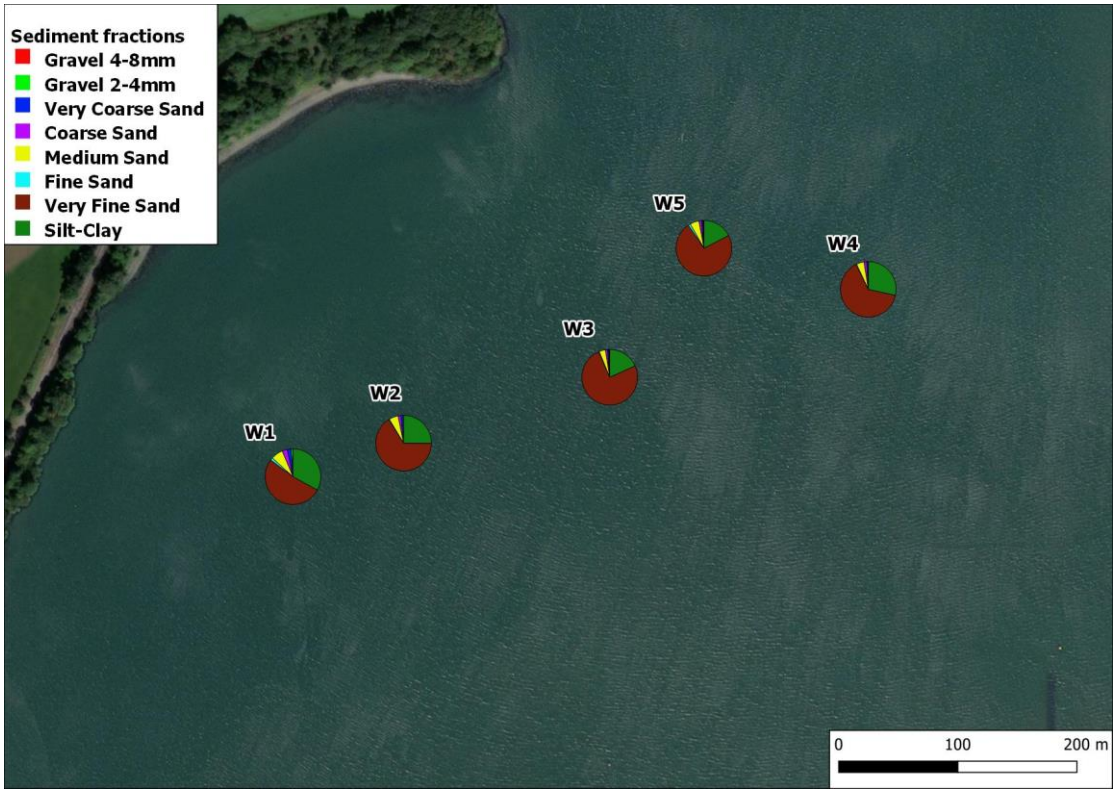


Figure 3.6: Sediment fractions of stations W1-5.

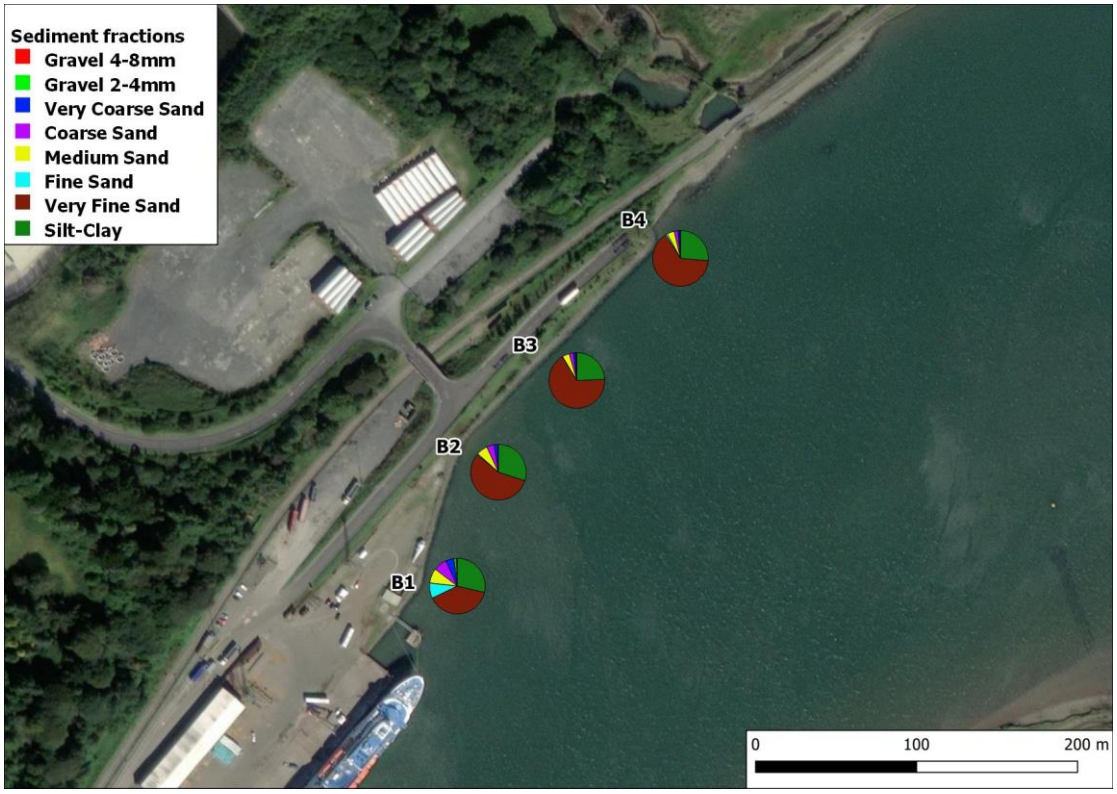


Figure 3.7: Sediment fractions of B1-4.

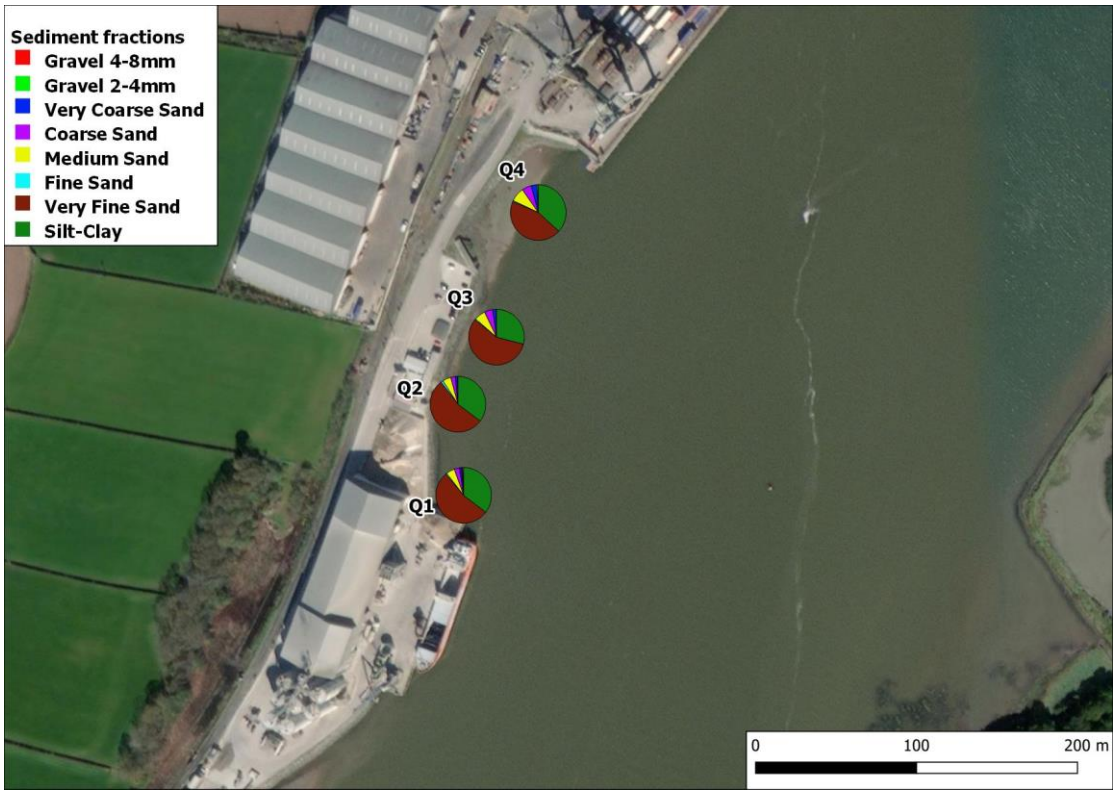


Figure 3.8: Sediment fractions of Q1-4.

Table 3.2: Sediment characteristics of the benthic faunal stations sampled. LOI refers to the % organic carbon loss on ignition.

Station	>8mm	Fine Gravel (4-8mm)	Very Fine Gravel (2-4mm)	Very Coarse Sand (1-2mm)	Coarse Sand (0.5-1mm)	Medium Sand (0.25-0.5mm)	Fine Sand (125-250mm)	Very Fine Sand (62.5-125mm)	Silt-Clay (<63mm)	Folk (1954)	LOI
W1	0	0	1	2.3	3	7	1.5	52.2	33	Slightly Gravelly Muddy Sand	6.18
W2	0	0	0.3	1.3	1.6	5.4	0.5	65.8	25.1	Muddy Sand	5.77
W3	0	0.4	0.2	0.7	1.2	3.7	0.4	75.2	18.2	Muddy Sand	6.62
W4	0	0.3	0.3	0.8	1.5	5.3	1.3	73.1	17.4	Muddy Sand	6.43
W5	0	0.1	0	0.8	1.6	4.5	0.3	64.2	28.4	Muddy Sand	5.77
B1	0	0.7	1.3	4.8	7.8	8.6	8.9	39.2	28.6	Slightly Gravelly Muddy Sand	8.04
B2	0	0	0.4	2.1	4.4	6.5	0.6	56.1	29.9	Muddy Sand	6.36
B3	0	0.5	0.2	1.3	2.4	4.2	0.3	66.8	24.4	Muddy Sand	4.93
B4	0	0.4	0.1	1	2.2	4.3	1	64.8	26.4	Muddy Sand	4.88
Q1	0	0.8	0.4	1.3	3	5	0.6	53.5	35.4	Slightly Gravelly Muddy Sand	5.62
Q2	0	0	0.3	1.3	2.6	4.9	1.3	54.2	35.2	Muddy Sand	5.47
Q3	0	0	0.3	2	4.8	6.5	0.6	56.7	29	Muddy Sand	7.32
Q4	0	0.1	0.7	3.3	5.6	8.3	0.6	44.7	36.7	Muddy Sand	7.22

4. Discussion

Estuarine communities in the Suir estuary were generally characterised by low numbers of species and individuals. Analysis of the benthic communities present at the 13 stations reveal that all stations can be classified as belonging to one of the four common benthic community habitat types occurring in the River Barrow and River Nore SAC namely the habitat 'Muddy estuarine community complex'. This community is present intertidally and subtidally from Cheek Point and Great Island northward to New Ross and extends up the Suir estuary. The substrate of this community complex is predominantly of fine material. The distinguishing species for this group are the bivalve *Scrobicularia plana* and *Macoma balthica,* the amphipod *Corophium volutator,* the polychaete *Streblospio shrubsolii* and the oligochaetes *Tubificoides pseudogaster* and *Tubificoides benedii.* These species are indicative of variable salinity community (NPWS, 2011).

The 13 stations can be classified as belonging to the JNCC biotope SS.SMu.SMuVS.PolCvol *Polydora ciliata* and *Corophium volutator* in variable salinity infralittoral firm mud or clay (EUNIS code A5.321). SS.SMu.SMuVS.PolCvol is a sublittoral biotope occurring in sheltered, very sheltered and extremely sheltered areas with weak tidal streams (Connor *et al.,* 2004). The biotope occurs in variable salinity and exclusively in clay, very firm mud and muddy sand and is characterized by a turf of the polychaete *Polydora* along with the amphipod *Corophium volutator.* The often-abundant *Corophium volutator* forms an important food source for several species of birds and mobile predators such as fish and crabs. Because of their high numbers, the tube contracted by *Corophium* and *Polydora* are thought to stabilize the intertidal sediments in which they reside. Removal of these characterising species would result in the biotope being lost or re-classified. However, both species are known to have long reproductive seasons and short life spans and where perturbation removes a portion if the populations or even causes local extinction resilience is likely to be high for as long as recruitment from neighbouring areas and/or adult migration is possible (De-Bastos & Hill, 2016). Within the Suir estuary and adjacent Barrow and Nore estuaries this biotope is extensive.

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Appendix 1
Sediment Analysis Methodology

Sediment Analysis

AQUAFACT will carry out the granulometric analysis using the traditional granulometric technique. We have all of the necessary equipment required *e.g.* Wentworth graded sieves, Easysize and GRADISTAT computer software, hydrogen peroxide, sodium hexametaphosphate, drying oven, beakers, mixers, electronic scales. We have carried out sediment analysis for all subtidal sampling programmes that we have been involved in.

AQUAFACT will employ the following methodology for the granulometric analysis:

1. Approximately 100g of dried sediment (previously washed in distilled water and dried) is weighed out and placed in a labelled 1L glass beaker to which 100ml of a 6 percent hydrogen peroxide solution is then added. This is allowed to stand overnight in a fume hood.
2. The beaker is placed on a hot plate and heated gently. Small quantities of hydrogen peroxide are added to the beaker until there is no further reaction. This peroxide treatment removes any organic material from the sediment which can interfere with grain size determination.
3. The beaker is then emptied of sediment and rinsed into a 63µm sieve. This is then washed with distilled water to remove any residual hydrogen peroxide. The sample retained on the sieve is then carefully washed back into the glass beaker up to a volume of approximately 250ml of distilled water.
4. 10ml of sodium hexametaphosphate solution is added to the beaker and this solution is stirred for ten minutes and then allowed to stand overnight. This treatment helps to dissociate the clay particles from one another.
5. The beaker with the sediment and sodium hexametaphosphate solution is washed and rinsed into a 63µm sieve. The retained sampled is carefully washed from the sieve into a labelled aluminium tray and placed in an oven for drying at 100ºC for 24 hours.
6. The dried sediment should then be passed through a Wentworth series of analytical sieves (>8,000 to 63µm; single phi units). The weight of material retained in each sieve is weighed and recorded. The material passing through the 63µm sieve is also weighed and the value added to the value measured in Point 5 above.
7. The total silt/clay fraction is determined by subtracting all weighed fractions from the initial starting weight of sediment as the less than 63µm fraction was lost during the various washing stages.

8. The reporting of sediment samples will be as percentages within the following range of particle sizes:
    - PSA % <63
    - PSA % 63<125
    - PSA % 125<250
    - PSA % 250<500
    - PSA % 500<1000
    - PSA % 1000<2000
    - PSA % 2000<4000
    - PSA % 4000<8000
    - PSA % ≥8000

The grain size data will be used to determine Folk (1954) classification, which is standard in all AQUAFACT's reports.

The organic matter (Loss on Ignition) will be carried out by ALS Labs in Loughrea using the following methodology:

1. The collected sediments are transferred to aluminium trays, homogenised by hand and dried in an oven at 100º C for 24 hours.
2. A sample of dried sediment is placed in a mortar and pestle and ground down to a fine powder.
3. 1g of this ground sediment is weighed into a pre-weighed crucible and placed in a muffle furnace at 450ºC for a period of 6 hours.
4. The sediment samples are then allowed to cool in a dessicator for 1 hour before being weighed again.
5. The organic content of the sample is determined by expressing as a percentage the weight of the sediment after ignition over the initial weight of the sediment.

Appendix 2
Species List

JN1655 Port of Waterford Benthic Survey														
Station	**AphiaID**	**W1**	**W2**	**W3**	**W4**	**W5**	**B1**	**B2**	**B3**	**B4**	**Q1**	**Q2**	**Q3**	**Q4**
NEMATODA	799	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda	799	4	4	0	1	0	2	5	55	0	1	25	0	118
NEMERTEA	152391	0	0	0	0	0	0	0	0	0	0	0	0	0
Nemertea (indet)	152391	0	1	0	0	0	0	0	0	0	1	0	0	0
ANNELIDA	882	0	0	0	0	0	0	0	0	0	0	0	0	0
POLYCHAETA	883	0	0	0	0	0	0	0	0	0	0	0	0	0
PHYLLODOCIDA	892	0	0	0	0	0	0	0	0	0	0	0	0	0
Polynoidae	939	0	0	0	0	0	0	0	0	0	0	0	0	0
Pholoidae	941	0	0	0	0	0	0	0	0	0	0	0	0	0
Pholoe inornata	130601	0	1	0	0	0	0	0	0	0	0	0	0	0
Pholoe baltica (sensu Petersen)	130599	0	0	0	0	0	0	0	0	0	0	0	0	1
Nephtyidae	956	0	0	0	0	0	0	0	0	0	0	0	0	0
Nephtys sp. (juv)	129370	0	0	0	0	1	0	0	0	1	0	0	0	0
Nephtys hombergii	130359	0	2	4	4	10	7	2	0	2	1	0	0	0
ORBINIIDA	884	0	0	0	0	0	0	0	0	0	0	0	0	0
Orbiniidae	902	0	0	0	0	0	0	0	0	0	0	0	0	0
Scoloplos armiger	130537	0	0	0	0	0	0	0	0	0	0	0	0	1
SPIONIDA	889	0	0	0	0	0	0	0	0	0	0	0	0	0
Spionidae	913	0	0	0	0	0	0	0	0	0	0	0	0	0
Spionidae (damaged)	913	0	0	0	0	0	0	1	0	0	0	0	0	0
Polydora sp. (damaged)	129619	3	1	0	0	0	0	0	0	0	0	0	0	0
Polydora cornuta	131143	0	2	0	0	0	0	0	0	0	0	0	0	0
Pygospio elegans	131170	9	29	2	0	13	0	5	14	0	11	0	0	1
Streblospio shrubsolii	131193	0	1	0	2	0	2	10	25	6	5	4	0	0

JN1655 Port of Waterford Benthic Survey														
Station	**AphiaID**	**W1**	**W2**	**W3**	**W4**	**W5**	**B1**	**B2**	**B3**	**B4**	**Q1**	**Q2**	**Q3**	**Q4**
CAPITELLIDA	890	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitellidae	921	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitella sp. complex	129211	0	0	0	1	0	0	3	0	0	7	0	1	0
Arenicolidae	922	0	0	0	0	0	0	0	0	0	0	0	0	0
Arenicola marina	129868	0	0	0	0	0	0	0	0	1	1	1	0	0
Maldanidae	923	0	0	0	0	0	0	0	0	0	0	0	0	0
Euclymene oerstedii	157376	0	0	0	0	0	0	0	1	0	0	0	0	0
OPHELIIDA	891	0	0	0	0	0	0	0	0	0	0	0	0	0
Opheliidae	924	0	0	0	0	0	0	0	0	0	0	0	0	0
Polyophthalmus pictus	130510	0	0	0	0	0	0	0	1	0	0	0	0	0
TEREBELLIDA	900	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirratulidae	919	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirratulidae (partial/damaged)	919	10	0	0	1	0	0	0	4	0	1	0	0	0
Tharyx killariensis	152269	38	32	2	10	7	0	57	74	0	22	3	1	0
SABELLIDA	901	0	0	0	0	0	0	0	0	0	0	0	0	0
Sabellidae	985	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabricia stellaris	130913	0	0	0	0	0	0	0	0	0	1	0	0	0
OLIGOCHAETA	2036	0	0	0	0	0	0	0	0	0	0	0	0	0
HAPLOTAXIDA	2118	0	0	0	0	0	0	0	0	0	0	0	0	0
Naididae	2039	0	0	0	0	0	0	0	0	0	0	0	0	0
Baltidrilus costatus	743898	0	0	0	0	0	0	0	0	0	0	0	1	1
Tubificoides sp. (damaged)	137393	2	3	0	26	1	1	1	1	0	1	1	0	0
Tubificoides diazi	137574	0	0	0	0	5	0	0	0	0	0	0	0	0
Tubificoides pseudogaster aggregate	137582	2	0	2	13	0	0	0	0	0	1	1	0	0

JN1655 Port of Waterford Benthic Survey														
Station	**AphiaID**	**W1**	**W2**	**W3**	**W4**	**W5**	**B1**	**B2**	**B3**	**B4**	**Q1**	**Q2**	**Q3**	**Q4**
Tubificoides benedii	137571	19	6	1	12	6	12	11	16	6	24	5	0	34
ARTHROPODA	1065	0	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	1066	0	0	0	0	0	0	0	0	0	0	0	0	0
AMPHIPODA	1135	0	0	0	0	0	0	0	0	0	0	0	0	0
Phoxocephalidae	101403	0	0	0	0	0	0	0	0	0	0	0	0	0
Metaphoxus simplex	102983	0	0	0	0	0	0	0	2	0	0	0	0	0
Gammaridae	101383	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus sp. (damaged)	101537	0	0	0	0	0	0	0	0	0	0	0	0	1
Gammarus locusta	102281	0	0	0	0	0	0	0	5	0	0	0	0	1
Melitidae	101397	0	0	0	0	0	0	0	0	0	0	0	0	0
Melitidae (damaged)	101397	0	0	0	0	0	0	0	0	1	0	0	0	0
Isaeidae	101388	0	0	0	0	0	0	0	0	0	0	0	0	0
Microprotopus maculatus	102380	0	0	0	0	0	0	0	0	0	0	1	0	1
Aoridae	101368	0	0	0	0	0	0	0	0	0	0	0	0	0
Microdeutopus sp. (damaged)	101471	0	0	0	0	0	0	0	0	0	0	0	0	4
Microdeutopus gryllotalpa	102048	0	0	0	0	0	0	0	0	0	0	0	0	1
Corophiidae	101376	0	0	0	0	0	0	0	0	0	0	0	0	0
Monocorophium insidiosum	148592	0	0	0	0	0	0	0	1	0	0	0	0	0
Corophium volutator	102101	145	235	3	10	0	0	2	2	34	4	5	19	11
Caprellidae	101361	0	0	0	0	0	0	0	0	0	0	0	0	0
Caprella acanthifera	101822	0	0	0	0	0	0	0	0	0	0	0	0	1
ISOPODA	1131	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthuridae	118244	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyathura carinata	118474	0	0	0	0	0	0	0	0	0	1	0	0	0

JN1655 Port of Waterford Benthic Survey														
Station	**AphiaID**	**W1**	**W2**	**W3**	**W4**	**W5**	**B1**	**B2**	**B3**	**B4**	**Q1**	**Q2**	**Q3**	**Q4**
Janiridae	118258	0	0	0	0	0	0	0	0	0	0	0	0	0
*Jaer*a sp. (damaged)	118364	0	0	0	0	0	0	0	0	0	1	0	0	0
Idoteidae	118283	0	0	0	0	0	0	0	0	0	0	0	0	0
Idotea chelipes	119042	0	0	0	0	0	0	0	1	0	0	0	0	0
DECAPODA	1130	0	0	0	0	0	0	0	0	0	0	0	0	0
Caridea	106674	0	0	0	0	0	0	0	0	0	0	0	0	0
Crangonidae	106782	0	0	0	0	0	0	0	0	0	0	0	0	0
Crangon crangon	107552	0	1	0	0	1	0	0	1	0	0	0	0	0
INSECTA	1307	0	0	0	0	0	0	0	0	0	0	0	0	0
Elmidae larvae	?	0	0	0	0	1	0	0	0	0	0	0	0	0
MOLLUSCA	51	0	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	101	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerithiidae	128	0	0	0	0	0	0	0	0	0	0	0	0	0
Bittium reticulatum	139054	0	0	0	0	0	0	0	0	0	0	0	0	1
Rissoidae	123	0	0	0	0	0	0	0	0	0	0	0	0	0
Rissoa parva	141365	0	0	1	0	0	0	0	0	0	0	0	0	1
Hydrobiidae	120	0	0	0	0	0	0	0	0	0	0	0	0	0
Peringia ulvae	151628	7	11	22	1	2	0	0	3	1	1	2	1	13
Iravadiidae	122	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramidellidae	162	0	0	0	0	0	0	0	0	0	0	0	0	0
Turbonilla lactea	141072	0	0	0	0	0	0	0	0	0	0	0	0	2
BIVALVIA	105	0	0	0	0	0	0	0	0	0	0	0	0	0
MYTILIDA	210	0	0	0	0	0	0	0	0	0	0	0	0	0
Mytilidae	211	0	0	0	0	0	0	0	0	0	0	0	0	0

JN1655 Port of Waterford Benthic Survey														
Station	**AphiaID**	**W1**	**W2**	**W3**	**W4**	**W5**	**B1**	**B2**	**B3**	**B4**	**Q1**	**Q2**	**Q3**	**Q4**
Mytilidae (juv)	211	0	1	1	2	1	0	0	3	1	1	0	0	1
CARDIIDA	869602	0	0	0	0	0	0	0	0	0	0	0	0	0
Cardiidae	229	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastoderma edule	138998	2	2	2	0	0	0	0	0	0	0	0	0	0
Tellinidae	235	0	0	0	0	0	0	0	0	0	0	0	0	0
Macomangulus tenuis	878470	0	0	0	0	0	0	0	0	0	0	0	0	1
Macoma balthica	141579	1	3	3	5	7	2	2	2	1	2	2	0	0
Semelidae	1781	0	0	0	0	0	0	0	0	0	0	0	0	0
Semelidae (juv)	1781	2	1	0	0	1	0	1	2	0	0	2	0	1
Scrobicularia plana	141424	0	0	0	0	0	0	3	0	1	2	2	0	0
MYIDA	245	0	0	0	0	0	0	0	0	0	0	0	0	0
Corbulidae	248	0	0	0	0	0	0	0	0	0	0	0	0	0
Varicorbula gibba	378492	0	0	0	0	0	0	0	0	0	0	0	0	1
ECHINODERMATA	1806	0	0	0	0	0	0	0	0	0	0	0	0	0
OPHIUROIDEA	123084	0	0	0	0	0	0	0	0	0	0	0	0	0
OPHIURIDA	123117	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphiuridae	123206	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphiuridae (juv)	123206	0	0	0	0	0	0	0	0	0	0	0	0	1

APPENDIX 6-4

August 2025

Biodiversity Management Plan

Proposed ORE Capable Terminal on a 250m Quay Extension & Ancillary Operational Support Infrastructure

Calafort Phort Láirge
Port of Waterford

On behalf of

Port of Waterford

Port of Waterford, Belview, Co. Kilkenny

MALONE O'REGAN ENVIRONMENTAL

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Title: Biodiversity Management Plan, Proposed ORE Capable Terminal on a 250m Quay Extension & Ancillary Operational Support Infrastructure, Port of Waterford, Port of Waterford, Belview, Co. Kilkenny

Job Number: E2068

Prepared By: Amelia Keane **Signed:** _____

Checked By: Kevin O'Regan **Signed:** _____

Approved By: Dyfrig Hubble **Signed:** _____

Revision Record

Issue No.	Date	Description	Remark	Prepared	Checked	Approved
01	29/08/25	Biodiversity Management Plan	Final	AK	KOR	DH

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Biodiversity Management Plan

Proposed ORE Capable Terminal on a 250m Quay Extension & Ancillary Operational Support Infrastructure

Port of Waterford

Port of Waterford, Belview, Co. Kilkenny

Contents

1 INTRODUCTION 1
1.1 Purpose of the BMP 2
1.2 Site Selection 2
1.3 Site Context 3
1.4 Watercourses within the Vicinity of the Biodiversity Enhancement Area 4
1.5 Statement of Authority 5
2 LEGISLATION POLICY CONTEXT GUIDANCE 6
2.1 National Planning Context 6
2.1.1 Project Ireland 2040, National Planning Framework 6
2.2 Ireland National Biodiversity Action Plan 2023-2030 7
2.3 All-Ireland Pollinator Plan 2021-2025 8
2.4 Local Planning Context 8
3 RECEIVING ENVIRONMENT 15
3.1 Methodology 15
3.1.1 Desk Study 15
3.1.2 Habitat Survey 15
3.2 Results 16
3.2.1 Designated Sites 16
3.2.2 Existing Baseline Environment 16
4 BIODIVERSITY ENHANCEMENT MEASURES 20
4.1 Protection Measures for the Protection of Flora and Fauna 20
4.2 Overview of Enhancement Measures 20
4.3 Protection of Habitat Linkages and Ecological Corridors 20
4.3.1 Stock Proof Fencing 21
4.4 Habitats 22

4.4.1 Riparian Woodland / Treeline Enhancement 22
4.4.2 Pond Complex Creation 23
4.4.3 Natural Regeneration of Wet Grassland 23
4.4.4 Natural Regeneration of Reed and Large Sedge Swamp 23
4.5 Fauna 23
4.5.1 Otter Holts 24
4.5.2 Sand Martin Nest Hotel 24
4.5.3 Kingfish Artificial Nesting Bank 25
4.5.4 Bat Boxes 25
4.5.5 Hibernaculum and Habitat Piles 25
4.5.6 Deadwood Habitats 26
5 IMPLEMENTATION STRATEGIES AND AFTERCARE 29
5.1.1 Ecological Monitoring During Implementation 29
5.1.2 Ecological Monitoring Post-Implementation 29
5.2 Riparian Woodland / Treeline Enhancement 29
5.3 Fauna Enhancement Measures 29
6 CONCLUSION 31
7 REFERENCES 32

FIGURES

Figure 1-1: Site Location 1
Figure 1-2: Site Context 4
Figure 1-3: Watercourses within the Vicinity 5
Figure 3-1: Site location within the Lower River Suir SAC 16
Figure 3-2: Baseline Habitats 19
Figure 4-1: Post and Rail Fencing Example 21
Figure 4-2: Otter Holt Construction 24
Figure 4-3: Sand Martin Hotel Examples 24
Figure 4-4: Example of Artificial Kingfisher Nesting Bank 25
Figure 4-5: Suitable Bat Roost Boxes 25
Figure 4-6: Typical Hibernaculum and Cross Section 26
Figure 4-7: Habitat Piles 26
Figure 4-8: Indicative Biodiversity Enhancement Plan 28

TABLES

Table 5-1: Native Tree and Understorey Species Planting 22

ATTACHMENTS

Attachment A: Biodiversity Enhancement Plan

1 INTRODUCTION

Malone O'Regan Environmental ('MOR Environmental') has been commissioned by Port of Waterford Company ('the Applicant') to prepare a Biodiversity Management Plan ('BMP') in respect of the construction and operational phases of proposed port facilities comprising of a circa ('ca.') 250-metre ('m') wharf extension to support proposed Offshore Renewable Energy ('ORE') development and general port development, land reclamation, ancillary works and a biodiversity enhancement area ('the Proposed Development').

The Proposed Development will be located partly on land and partly in the near-shore area of the coastal planning authority (Kilkenny County Council) at the Port of Waterford, Belview, Co. Kilkenny ('the Site') (ITM OS Reference: 666422; 613637).

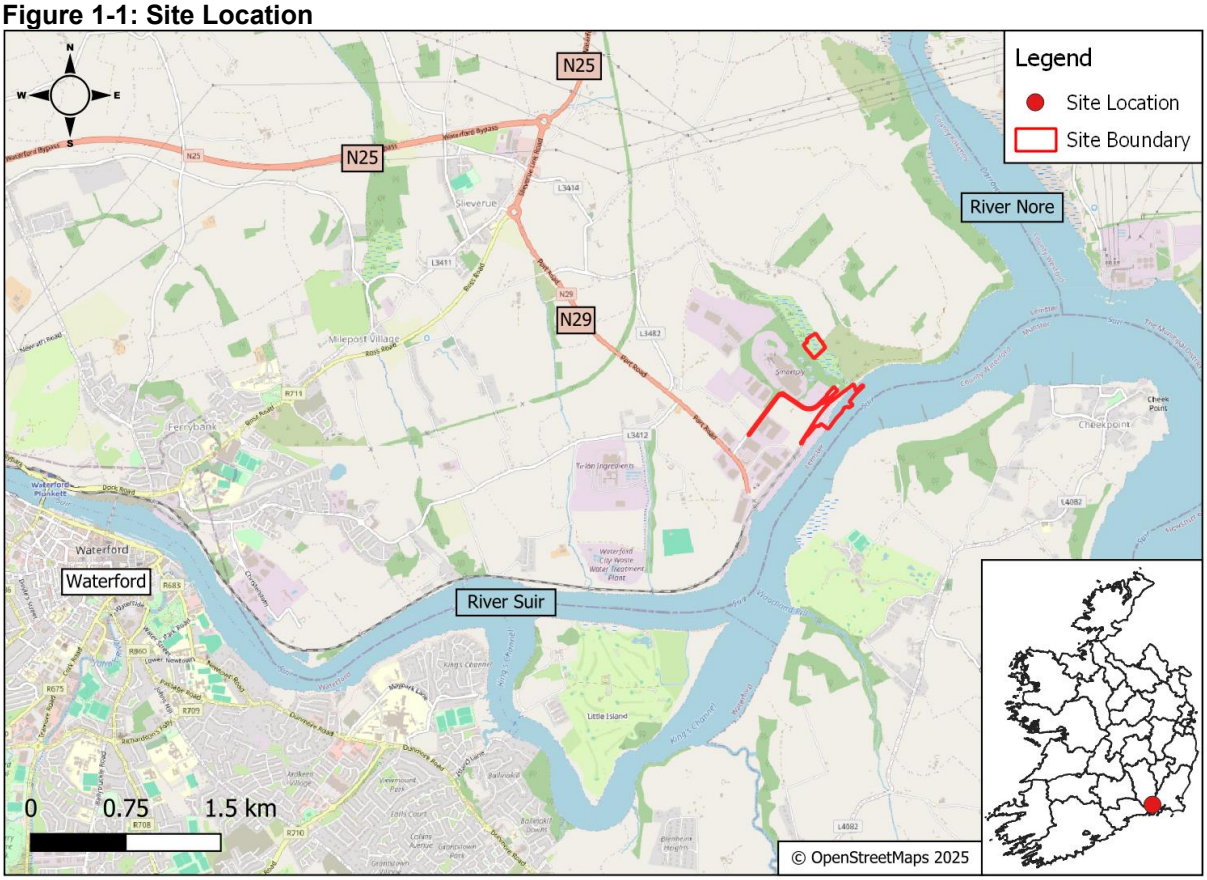
The Site has a gross site area of ca. 8 hectares ('ha') and is made up of the following sections:

- ca. 4.9ha of development within the existing Port of Waterford landownership;
- ca. 1.3ha of reclaimed area within the Lower Suir Estuary using reclaimed materials and quarried rock; and,
- ca. 1.8ha of a Biodiversity Enhancement Area located to the northwest of the quay development.

Figure 1-1 shows the location of the Site, located partly within the townland of Gorteens, Co. Kilkenny, ca. 5.6km northeast of Waterford City.

This BMP is an appendix to Chapter 6 – Biodiversity of the Environmental Impact Assessment Report ('EIAR') prepared by MOR Environmental. This report should be read in conjunction with Chapter 6 of the EIAR.

Figure 1-1: Site Location



1.1 Purpose of the BMP

The Proposed Development will require the reclamation of ca. 1.3ha of the Lower Suir Estuary, which forms part of the Lower River Suir SAC. The primary habitats to be reclaimed during these works will be a small area of muddy sand shores (LS3) and tidal river (CW2) that includes the benthic community habitat 'muddy estuarine community complex,' which makes up part of the Annex I habitat - estuaries. It should be noted that estuarine habitat does not constitute a qualifying feature of the Lower River Suir SAC. Regardless, this Biodiversity Enhancement Area, ca. 1.8ha in size, was specifically acquired by the Applicant in order to offset the loss of this habitat as part of the Proposed Development.

In order to determine the suitable options for the biodiversity enhancement measures, a consultation meeting was held with the National Parks and Wildlife Service ('NPWS') as outlined in Section 1.10 of the EIAR. During the meeting, it was concluded that in the event that like-for-like habitat replacement was not feasible, a package of measures should be presented to offset the proposed habitat loss.

Estuarine systems are highly complex, dynamic environments that are shaped by tidal exchange, salinity gradients, and continuous sediment transport processes. Therefore, the physical, chemical, and biological interactions that sustain estuarine habitats are extremely difficult to replicate or recreate through habitat creation measures, particularly outside the active estuarine zone. Therefore, it was concluded that a like-for-like offset would not be possible and instead, the proposed Biodiversity Enhancement Area will provide a robust offset through the comprehensive suite of measures outlined below.

The primary objective of the Biodiversity Enhancement Area will be to provide suitable foraging, commuting and roosting habitat for the species currently utilising this section of the muddy sand shores and tidal river, particularly otter (designated for the Lower River Suir SAC) and waterbirds. The measures will also provide enhanced opportunities for local wildlife.

Therefore, this BMP has been based on baseline ecological data to assess the overall quality of the Biodiversity Enhancement Area in order to inform the most appropriate enhancement measures, which will maximise the value of the natural features onsite and enhance local biodiversity.

1.2 Site Selection

During the design phase of the Proposed Development, the Applicant and Design Team worked to identify a suitable location for the Biodiversity Enhancement Area. The key criteria for the selection process included:

- Proximity to the Proposed Development: It was considered that the closer the Biodiversity Enhancement Area could be located to the Proposed Development footprint, the greater its value as an effective offset for local biodiversity will be, as a nearby location ensures that species potentially affected by habitat loss will be able to continue to utilise the enhancement area for foraging, roosting, and commuting;
- Habitat Connectivity: It was considered that the Biodiversity Enhancement Area should be functionally linked to the Lower Suir Estuary, in some way, in order to provide connectivity for species such as otter and maximise the function of the Biodiversity Enhancement Area as part of the wider ecological network;
- Feasibility of Management and Protection: It was considered that the Biodiversity Enhancement Area needed to be an area that could be accessed by the Applicant for the implementation and long-term management of biodiversity enhancement measures; and,

- Available for Acquisition: The selected had to be available so the Applicant could acquire them, subject to obtaining planning consent.

On the basis of these criteria, the Applicant and Design Team identified several potential locations throughout the Lower Suir Estuary and the wider Waterford Estuary. Surveys were undertaken by MOR Environmental Ecologists, via boat and landside assessments, of eight potential locations between 2021 and 2024.

The Biodiversity Enhancement Area decided upon was selected on the basis that it represented the most suitable and deliverable option given the fact that it is located within the immediate vicinity of the Site, the area is linked to the Lower River Suir SAC via the Luffany Stream, it is accessible for the implementation and monitoring of the biodiversity enhancement measures and the Applicant could acquire it.

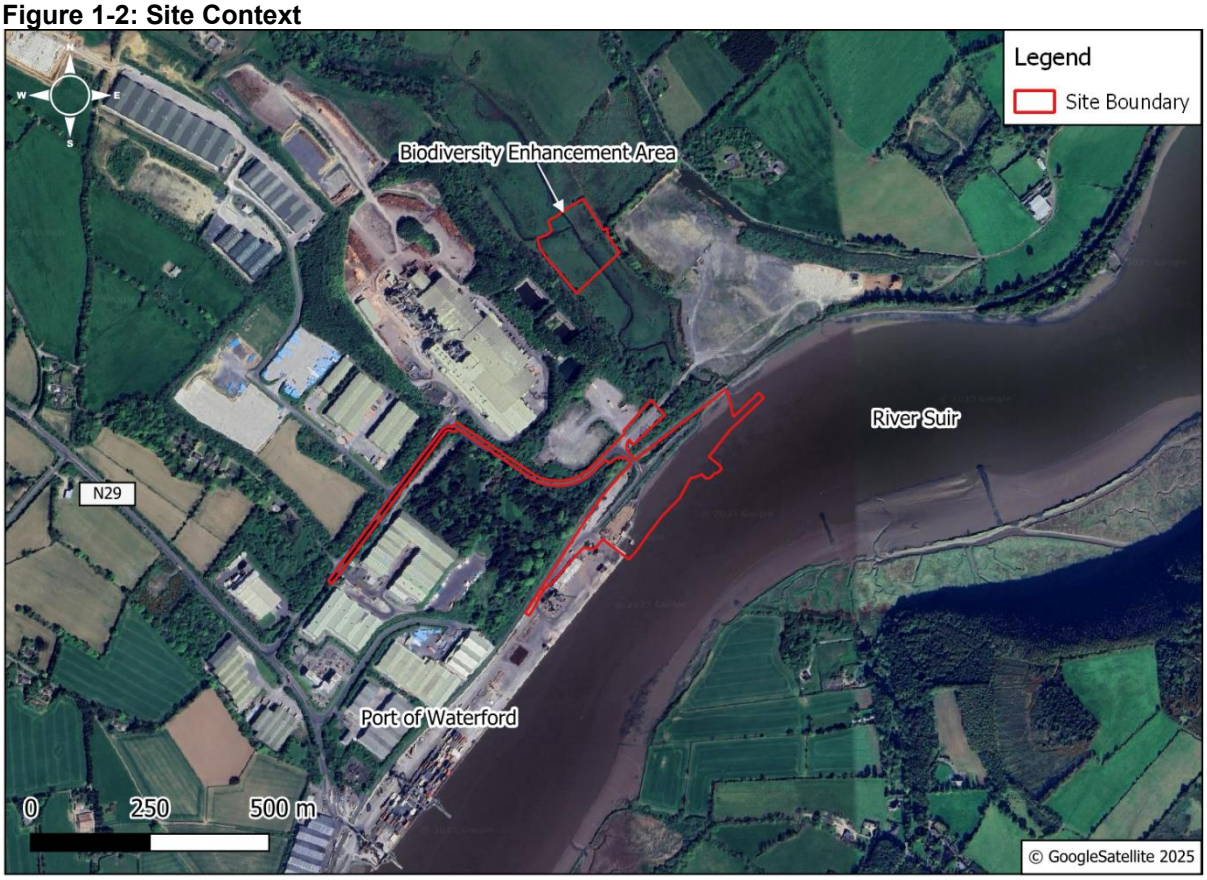
This BMP will ensure the enhancement and protection of this land and will provide a positive long-term ecological function and resilience to the ecological network of the wider area and the Lower River Suir SAC. As such, this was considered to be a suitable robust offset for the reclaimed area.

1.3 Site Context

The overall Site covers an area of ca. 8ha and is located partly on land and partly in the Lower Suir Estuary within the industrial landscape of the Port of Waterford, Belview, Co. Kilkenny (see Figure 1-2). The Site boundary also includes the proposed Biodiversity Enhancement Area located north of the proposed quay extension.

The Biodiversity Enhancement Area is currently comprised of agricultural grassland utilised for grazing cattle, which has resulted in poached areas with stagnant water. The cattle that regularly entered this area were from the adjacent fields, and access was possible due to the lack of fencing and dense hedgerows within this area. The fields were noted as also having small areas of wet grassland that were limited in size due to overgrazing and poaching.

Figure 1-2: Site Context



The Biodiversity Enhancement Area is located within an area zoned as 'Water Compatible Development' ('WCD') within the Ferrybank-Belview Local Area Plan ('LAP') (2017) [1] and also within the recently published Ferrybank-Belview Framework Plan (Draft) [2]. The objective of WCD is '*To allow for water compatible development, passive open space and biodiversity conservation*.'

Furthermore, according to the Ferrybank-Belview LAP (2017), the Biodiversity Enhancement Area is bordered to the west by Riparian Woodland (WN5) and to the east by Mixed Broadleaved Woodland (WD1). In addition, an area, Reed Swamp (FS1), is mapped to the south of the area.

1.4 Watercourses within the Vicinity of the Biodiversity Enhancement Area

There are three hydrological features of note within the immediate vicinity of the Biodiversity Enhancement Area: the Drumdowney Lower Stream, the Luffany River and the Lower Suir Estuary.

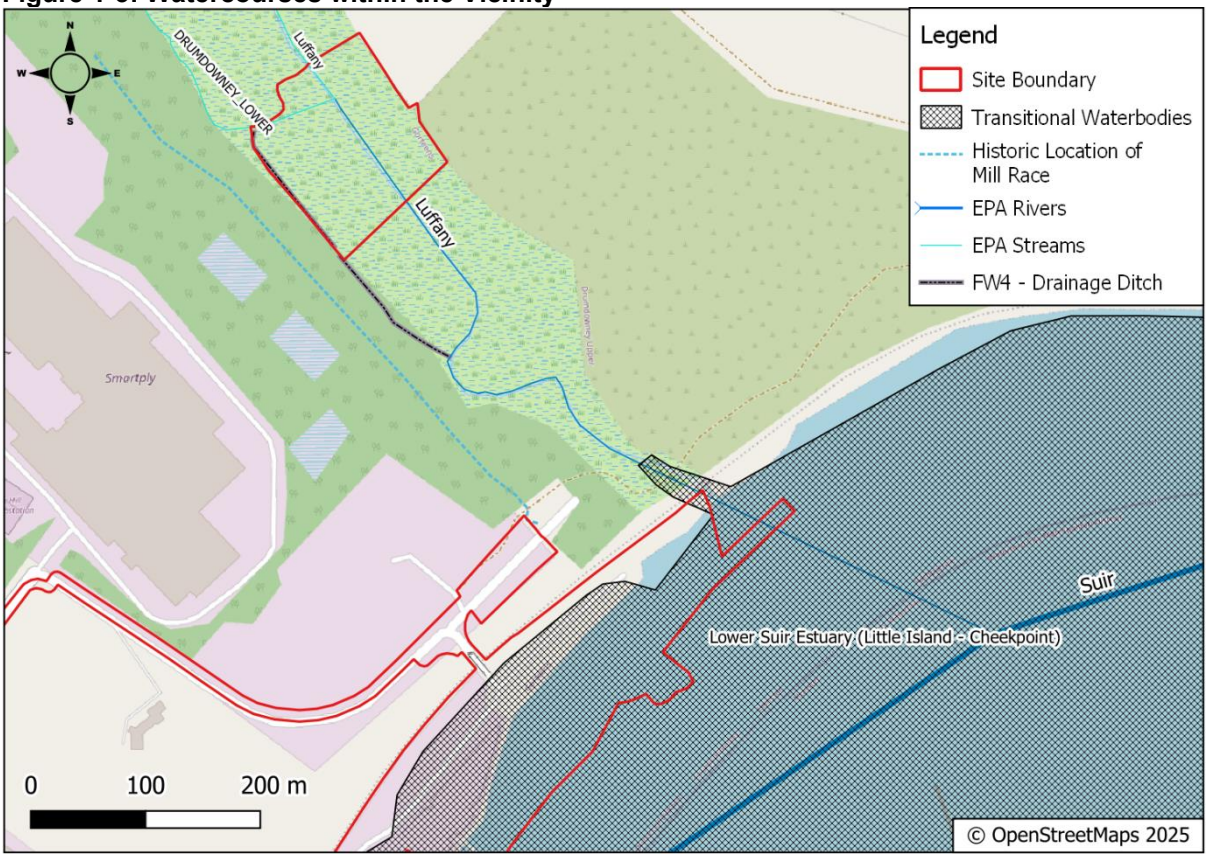
- The Drumdowney Lower Stream is located along the northern perimeter of the Biodiversity Enhancement Area and flows into the Luffany River;
- The Luffany River bisects the Biodiversity Enhancement Area and flows in a southerly direction towards the Lower Suir Estuary; and,
- The Lower Suir Estuary transitional waterbody is located ca. 360m to the south of the Biodiversity Enhancement Area and is part of the Lower River Suir SAC. The Lower Suir Estuary flows in a north easterly direction for ca. 1km before converging with the River Barrow, which is part of the River Barrow and River Nore SAC.

According to the WFD 2016-2021 monitoring events, the most up-to-date data at the time of writing this report, the water quality within both the Luffany River and the Drumdowney Lower Steam is '*moderate*' and the risk to these watercourses is '*under review*' [3]. The water quality within the Lower Suir Estuary (Little Island – Cheekpoint) transitional waterbody, according to EPA Maps, is '*moderate',* and this watercourse is considered '*at risk*' [3].

In addition to the above-mentioned watercourses, the Mill Race Stream is historically known to be located ca. 30m to the west of the Biodiversity Enhancement Area. However, this watercourse is not listed on EPA Maps, and there is no data available on the exact location or length of the Mill Race. Based on Historic OSI 25-inch Maps, the Mill Race flowed in a southerly direction to a 'mill pond' at the Gorteens Old Mill Building and to a sluice that discharged into the Lower Suir Estuary. It appears that the mill pond has since been infilled. Details on the exact location of the Mill Race Stream are not available.

Furthermore, surveys of the Biodiversity Enhancement Area have noted a drainage ditch along the western perimeter of the area that connects the Drumdowney Lower Stream to the Luffany River (see Figure 2-2 below). However, a review of the OPW Flood Maps shows that the drainage ditch is not part of the Arterial Drainage Scheme or Drainage Districts [4].

Figure 1-3: Watercourses within the Vicinity



1.5 Statement of Authority

This report was approved by Mr. Dyfrig Hubble, Associate Director - Ecologist. Dyfrig is a full member of Chartered Institute of Ecology and Environmental Planning ('CIEEM') and has over 18 years' experience working in the ecological consultancy sector. As part of his role, Dyfrig regularly undertakes habitat surveys and appraisals, and specialist protected species surveys in support of Appropriate Assessments and Ecological Appraisals.

2 LEGISLATION POLICY CONTEXT GUIDANCE

Biodiversity loss in Ireland has accelerated in recent decades predominantly due to human-induced activities, resulting in increased damage to habitats, loss of species, reduced abundance of wildlife and degradation of our surrounding environment.

2.1 National Planning Context

2.1.1 Project Ireland 2040, National Planning Framework

Project Ireland 2040 was launched by the Government in February 2018 [5] and incorporates two policy documents - the National Planning Framework ('NPF') [5] and the National Development Plan('NDP') [6]

Following a decision of the Government in June 2023, the preparation of a revised NPF [6] commenced to take account of changes that have occurred since it was published (in 2018) and to build on the existing framework. Public consultation took place from 10th July 2024 to 12th September 2024, following which the Government agreed to progress and publish a draft schedule of amendments to the First Revision to the NPF in November 2024. On 8th April 2025, the Government approved the revised NPF following the conclusion of environmental assessments, which included a Strategic Environmental Assessment ('SEA'), NIS and Appropriate Assessment Determination and a Strategic Flood Risk Assessment ('SFRA'). Both houses of the Oireachtas, the Seanad and the Dáil, approved this document as of 30th April 2025. The revised NPF is a direct replacement of the NPF and is detailed further below.

Revised National Planning Framework (April 2025)

Objectives under the '*Strategic Planning for Biodiversity'* section of this draft framework include the following:

National Policy Objective 84:

> *'In line with the National Biodiversity Action Plan and European Union Nature Restoration Law, and best available scientific information, regional and local planning authorities shall support the preparation and implementation of the National Restoration Plan.'*

National Policy Objective 85:

'In line with the National Biodiversity Action Plan; the conservation, enhancement, mitigation and restoration of biodiversity is to be supported by:

- *Integrating policies and objectives for the protection and restoration of biodiversity, including the principles of the mitigation hierarchy of - avoid, minimise, restore and offset - of potential biodiversity impacts, in statutory land-use plan.*
- *Retention of existing habitats which are currently important for maintaining biodiversity (at local/regional/national/international levels), in the first instance, is preferable to replacement/restoration of habitats, in the interests of ensuring continuity of habitat provision and reduction of associated risks and costs.'*

National Policy Objective 86:

> *'In line with the objectives of the National Biodiversity Action Plan, planning authorities should seek to address no net loss of biodiversity within their plan making functions.'*

National Policy Objective 87:

> *'Enhance the conservation status and improve the management of protected areas and protected species by:*

- *Implementing relevant EU Directives to protect Ireland's environment and wildlife and support the objectives of the National Biodiversity Action Plan;*
- *Developing and utilising licensing and consent systems to facilitate sustainable activities within Natura 2000 sites;*
- *Continued research, survey programmes and monitoring of habitats and species.'*

The National Development Plan (2021-2030) ('NDP')

The NPF and the NDP will continue to align and form a single vision for Ireland under Project Ireland 2040. The NDP also lists the following items as strategic investment priorities in relation to National Heritage and biodiversity:

- *'Implementation of the current and future National Biodiversity Action Plan, delivery of National Parks and Wildlife Service Farm Plans and LIFE projects, enhanced wildlife crime investigation capacity and identification and delivery conservation measures at designated sites as identified in the Prioritised Action Framework for Ireland (2021-2027).'*
- *'Investment in nature and biodiversity, to improve the quality of natural habitats and support native plants and animals, including those under threat, and to bolster broader societal wellness and sustainability goals.'*
- *'Future-proofing obligations under the Biodiversity Strategy 2030, including potential national designations and the preparation and delivery of a National Restoration Plan.'*

2.2 Ireland National Biodiversity Action Plan 2023-2030

The 4th National Biodiversity Action Plan ('NBAP') was published in January 2024, having been in development since 2021. The NBAP sets out a number of strategic objectives that lay out a clear framework for Ireland's approach to biodiversity and demonstrate Ireland's commitment to protecting biodiversity and halting decline [7].

The NBAP was reviewed as part of this report, and the following were considered relevant to the Proposed Development.

Objective 2 of the NBAP aims to:

> *'Meet urgent conservation and restoration needs.'*

One targeted outcome is listed under this objective and is considered relevant to the Proposed Development. This outcome is as follows:

Outcome 2A:

> '*The protection of existing designated areas and species is strengthened, and conservation and restoration within the existing protected area network are enhanced.'*

Outcome 2D:

> *Biodiversity and ecosystem services in the marine and freshwater environment are conserved and restored*

Objective 3 of the NBAP aims to:

> '*Secure Nature's Contribution to People'*

One targeted outcome is listed under this objective and is considered relevant to the Proposed Development. This outcome is as follows:

Outcome 3B:

> *'The role of biodiversity in supporting wellbeing, livelihoods, enterprise and employment is recognised and enhanced.'*

Outcome 3C:

> '*Planning and development will facilitate and secure biodiversity's contributions to people.*'

2.3 All-Ireland Pollinator Plan 2021-2025

Irish pollinators are in decline, and in response, Ireland joined a small number of countries in Europe that have developed a strategy to address pollinator decline and protect pollination services.

The All-Ireland Pollination Plan [8] It was developed by a fifteen-member All-Ireland steering group with the aim of building a foundation to bring about a landscape where pollinators can flourish, reverse pollinator losses, help restore populations to healthy levels and make Ireland pollinator-friendly.

The Plan identifies targets that can be incorporated into agri-environment schemes and actions that can be undertaken voluntarily by landowners in order to make private / farm land more pollinator-friendly, including:

- Maintenance of good quality hedgerows;
- Plant pollinator-friendly trees and shrubs;
- Provide nesting habitats; and,
- No use of pesticides.

The BMP recommends enhancements that will support the targets and actions set out by Ireland's Pollination Plan, including the creation of wildflower habitats.

2.4 Local Planning Context

2.4.1.1 Kilkenny City County Development Plan 2021-2027

The KCCDP 2021-2027 [9] contains a number of policies and objectives that relate directly to the protection of biodiversity and natural heritage in the context of proposed developments. The policies and objectives of the KCCDP with regard to the natural environment that are relevant to the Proposed Development are as follows [9]:

Objective 1A:

> '*To implement the provisions of Articles 6(3) and 6(4) of the EU Habitats Directive and ensure that that any plan or project within the functional area of the Planning Authority is subject to appropriate assessment in accordance with the Guidance Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities, 20091 or any subsequent version, and is assessed in accordance with Article 6 of the Habitats Directive in order to avoid adverse impacts on the integrity and conservation'*

Section 9.1:

> *'The Council will support the implementation of the National Heritage Plan and National Biodiversity Action Plan. The Council will prepare and implement, in partnership with the Kilkenny Heritage Forum and all relevant stakeholders, a*

County Heritage Plan and County Biodiversity Action Plan. The Council will also support the implementation of key legislation and national and local policies, programmes and plans which identify, protect and promote Kilkenny's heritage.

It is the aim of the Council to develop and support programmes which encourage active participation in identifying, recording, protecting, communicating and enjoying Kilkenny's heritage.'

Section 9.2.1. Protected habitats and species designated for nature conservation

Section 9.2.1.1. European Sites (Natura 2000)

'The EU Habitats Directive (92/43/EEC) and EU Birds Directive (2009/147/EC) provide for the conservation and protection of breeding and resting sites for rare and threatened species, and rare habitat types in a European context considered to be most in need of conservation. Such sites form part of an EU network of ecologically important and protected sites known as Natura 2000 sites and comprise:

- ***Special Areas of Conservation ('SACs')** – these sites are selected for the conservation and protection of plant and animal species (other than birds) and habitats listed in Annex I and Annex II of the EU Habitats Directive (92/43/EEC) respectively.*
- ***Special Protection Areas ('SPAs')** – these sites are selected for the conservation and protection of birds and their habitats designated under the EU Birds Directive 2009 (2009/147/EC) (first adopted in 1979) and transposed into Irish law by the Conservation of Wild Birds Regulations (SI 291 of 1985). There are 8 Natura 2000 sites within the County.'*

Natural Heritage Area (Section 9.2.1.2)

'Natural Heritage Areas ('NHAs') and proposed Natural Heritage Areas ('pNHAs') are designated under the Wildlife (Amendment) Act 2000 and encompass nationally important semi-natural and natural habitats, landforms and geomorphological features. There are 34 Natural Heritage Areas in the county.'

Statutory Nature Reserve (Section 9.2.1.3)

'A Nature Reserve is an area of importance to wildlife which is protected under Ministerial order. Most are owned by the State. There are 4 Statutory Nature Reserves in the county.'

Wildfowl Sanctuary (Section 9.2.1.4)

'Wildfowl Sanctuaries are areas that have been excluded from the 'Open Season Order' so that game birds can rest and feed undisturbed. Shooting of game birds is not allowed in these sanctuaries.'

Protected Plant and Animal Species (Section 9.2.1.5)

'Certain plant, animal and bird species are protected by law. These includes plant species listed in the Flora (Protection) Order 2015 (S.I. No. 356 of 2015) (or other such Orders) and animals and birds listed in the Wildlife Act, 1976 and subsequent statutory instruments, those listed in Annex IV of the Habitats Directive (92/43/EEC), and those listed in Annex I of the Birds Directive.

The Planning Authority will consult with the National Parks and Wildlife Service (a) in respect of any proposed development where there is a possibility that such development may have an impact on a protected area of international or national

importance, and (b) take account of any licensing requirements, when undertaking, or approving development which is likely to affect plant, animal or bird species protected by national or European legislation.

The Council will protect and, where possible, enhance the natural heritage sites designated under EU legislation and national legislation (Habitats Directive, Birds Directive, European Communities (Birds Chapter 9 Heritage, Culture and the Arts Kilkenny City and County Development Plan Volume 1 128 and Natural Habitats) Regulations 2011 and Wildlife Acts). This protection will extend to any additions or alterations to sites that may arise during the lifetime of this plan. The Council will also protect and, where possible, enhance the plant and animal species and their habitats that have been identified under European legislation (Habitats and Birds Directive) and protected under national Legislation (European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011), Wildlife Acts 1976-2010 and the Flora Protection Order (SI94 of 1999).'

Development Management Requirements (Sections 9.2.1.1-9.2.1.5):

'Ensure that an ecological impact assessment is carried out, by suitably qualified professional(s), for any proposed development likely to have a significant impact on rare and threatened species including those species protected by law and their habitats. Ensure appropriate avoidance and mitigation measures are incorporated into development proposals as part of any ecological impact assessment.'

Objective 9A:

'Continue to identify and map habitats and green infrastructure of county importance, and raise awareness and understanding of the county's natural heritage and biodiversity identifying green corridors and measures to connect them.'

Development Managements Requirements:

- *'To ensure that development proposals, where relevant, improve the ecological coherence of the Natura 2000 network and encourage the retention and management of landscape features that are of major importance for wild fauna and flora as per Article 10 of the Habitats Directive.'*
- *'To protect and where possible enhance wildlife habitats and landscape features which act as ecological corridors/networks and stepping stones, such as river corridors, hedgerows and road verges, and to minimise the loss of habitats and features of the wider countryside (such as ponds, wetlands, trees) which are not within designated sites.'*
- *'To ensure that appropriate mitigation and/or compensation measures to conserve biodiversity, landscape character and green infrastructure networks are required in developments where habitats are at risk or lost as part of a development.'*

'**Objective 9B:**

'To identify and map green infrastructure assets and sites of local biodiversity value over the lifetime of the Plan.'

Development Managements Requirements:

'Require all developments in the early pre-planning stage of the planning process to identify, protect and enhance ecological features and habitats, and making provision for local biodiversity (e.g. through protection of existing breeding sites, and provision of appropriate new infrastructure such as swift, bat and barn owl boxes, bat roost sites,

green roofs, etc.) and provide links to the wider Green Infrastructure network as an essential part of the design process.'

Woodlands, Trees and Hedgerows (Section 9.2.5)

'The Council will promote the planting of native tree and shrub species, by committing to using native species (of local provenance wherever possible) in its landscaping work and on County Council property and maximise the opportunity to enhance biodiversity within the City & County during the life time of the plan'.

Development Managements Requirements:

- *'To protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character of the county, and to ensure that proper provision is made for their protection and management, when undertaking, approving or authorising development.'*
- *'To ensure that when undertaking, approving or authorising development that sufficient information is provided to enable an assessment of impacts on woodlands, trees, and hedgerows.'*
- *'To have regard to, and seek the conservation of identified trees and woodlands from a) the National Survey of Ancient and Long-Established Woodlands, b) the Tree Register of Ireland (c) sites of significance identified in the Kilkenny Woodlands Survey 1997, (d) the National Survey of Native Woodlands, and (e) Survey of Mature Trees in Kilkenny City and Environs, in the assessment of planning applications.'*
- *'To retain hedgerows, and other distinctive boundary treatment such as stone walls, when undertaking, authorising or approving development; where the loss of the existing boundary is unavoidable as part of development, to ensure that a new hedgerow is planted using native species, and species of local provenance to replace the existing hedgerow and/or that the wall is re-built using local stone and local vernacular design.'*
- *'To discourage the felling of mature trees to facilitate development and, where appropriate make use of Tree Preservation Orders to protect important trees and groups of trees which may be at risk or have an amenity, biodiversity or historic value.'*
- *'To require the planting of native broadleaved species, and species of local provenance, in new developments as appropriate.'*

Invasive Species (Section 9.2.10):

Development Management Requirements:

- *'To require relevant development proposals to address the presence or absence of invasive alien species on proposed development sites and (if necessary) require applicants to prepare and submit an Invasive Species Management Plan where such a species exists to comply with the provisions of the European Communities (Birds and Natural Habitats) Regulations 2011-2015.'*
- *'For proposals connected to surface water systems, risks associated with the spread of crayfish plague shall be considered and applicants should submit a crayfish plague management strategy where appropriate.'*

Native Plant Species (Section 9.2.11):

'Where possible, the use of native plants and seeds from indigenous seed sources should be used on all developments and landscape projects/treatments. This will help to:

- *contribute to national commitments on the conservation of biological diversity by establishing native habitats and reducing the planting and dispersion of non-native plants.*
- *support a reduction in the threat posed by the importation of pests and diseases carried on non-native (and non-indigenously sourced) plant material.*
- *compensate for loss of habitat.*
- *maintain regional identity, landscape character and diversity.'*

Development Managements Requirements:

- *'The Council will promote the use of native plants and seeds from indigenous seed sources in all landscape projects.'*

2.4.1.2 Ferrybank – Belview Local Area Plan 2017

The Ferrybank-Belview Local Area Plan (FBLAP) 2017 outlines a strategy for the proper planning and sustainable development of an area of land in south Co. Kilkenny, stretching from Grannagh to Belview and from the Lower Suir Estuary to the line of the Waterford bypass (N25) [2].

The FBLAP was adopted by KCC on 18th December 2017 and came into effect on 15th January 2018. It was valid for six years following adoption by KCC; however, the FBLAP has not yet been replaced. On the 11th June 2024, KCC published an Issues Paper for the proposed Ferrybank/Belview Local Area Plan 2025-2031 [10]. The consultation period for this Issue Paper was closed on the 12th July 2024. However, on the 18th July 2025, KCC announced that it was now proposed to incorporate the Ferrybank / Belview settlement plants into Variation No. 6 of the KCCDP 2021-2027 [11]. This consultation is open until the 19th September 2025. This draft variation does not outline specific objectives or policies for the Ferrybridge / Belview area.

Therefore, at the time of writing this report, the objectives outlined in the FBLAP (2017) is considered to be the most relevant objectives relating to the Proposed Development. The FBLAP (2017) contains a number of policies and objectives that relate directly to the protection of biodiversity and natural heritage in the context of the Proposed Development.

Objective 1A:

'*To implement the provisions of Articles 6(3) and 6(4) of the EU Habitats Directive*.'

Objective 1B:

'*To ensure that any plan within the functional area of the Planning Authority is subject to appropriate assessment in accordance with the Guidance Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities, 2009 and is assessed in accordance with Article 6 of the Habitats Directive in order to avoid adverse impacts on the integrity and conservation objectives of the site.'*

Development Management Standards (Section 5.6)

5DM3:

'*Encourage appropriate screening of future developments in the Belview Industrial area. The following principles will be applied:*

- *Existing woodlands and hedgerows should be retained and incorporated wherever feasible.*
- *The protection and buffering of existing residential developments will be a priority.*

- *Landscaping schemes for any development should form an integral part of the overall development proposal. A woodland planting buffer of 15-20 metres will generally be required inside any industrial site boundary unless a suitable alternative mitigation measure is agreed with the Planning Authority. This landscape buffer will be required to be densely planted with a mix of coniferous and deciduous species. In all cases the Council encourages advance planting which it considers would be beneficial to ensure some plant maturation prior to construction.*
- *Buildings and other structures shall be located so as to provide optimum screening and noise buffering to surrounding land-uses, particularly to existing residential properties. In cases where structures are to be constructed proximate to existing residential structures, the potential for these structures to impose on the neighbouring residential amenity by virtue of their heights and bulk should be appropriately mitigated in the assessment of all planning applications.'*

5DM4:

'To require that all significant industrial developments in the Belview area must submit a Construction Management Plan prior to commencement of a development.'

Objective 8B:

'To protect and, where possible, enhance the natural heritage sites designated under EU Legislation and National Legislation (Habitats Directive, Birds Directive, European Communities (Birds and Natural Habitats) Regulations 2011 and Wildlife Acts). This protection will extend to any additions or alterations to sites that may be arise during the lifetime of this plan.'

Objective 8C:

'To protect and, where possible, enhance the plant and animal species and their habitats that have been identified under European legislation (Habitats and Birds Directive) and protected under national Legislation (European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011), Wildlife Acts 1976-2010 and the Flora Protection Order (SI94 of 1999).'

Heritage Development Management Standards (Section 7.4)

7DMA:

'*Require the incorporation of natural features where appropriate and to protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character, and to ensure that proper provision is made for their protection and management, when undertaking, approving or authorising development*.'

7DMB:

'To ensure that when undertaking, approving or authorising development that sufficient information is provided to enable an assessment of impacts on woodlands, trees and hedgerows.'

7DMC:

'Ensure that an ecological assessment is carried out for any proposed development likely to have a significant impact on rare and threatened species including those species protected by law and their habitats. Ensure appropriate avoidance and mitigation measures are incorporated into development proposals as part of any ecological impact assessment.'

7DMD:

'All lighting within the Plan area will be directional lighting designed specifically in relation to biodiversity.'

3 RECEIVING ENVIRONMENT

3.1 Methodology

3.1.1 Desk Study

Desk based studies that were completed for this BMP were in accordance with best practice guidelines and legislation and included:

- Review of aerial maps of the Site and surrounding area;
- The Kilkenny County Council Planning Portal to obtain details about existing / proposed developments in the vicinity of the Site [12];
- The Waterford City and County Council Planning Portal to obtain details about existing / proposed developments in the vicinity of the Site [13];
- The National Parks and Wildlife Service ('NPWS') website was consulted with regard to the most up to date detail on conservation objectives for the European Designated sites relevant to this assessment [14];
- The National Biodiversity Data Centre ('NBDC') website was consulted with regard to species distributions [15];
- The Environmental Protection Agency ('EPA') Maps website was consulted to obtain details about watercourses in the vicinity of the Site [16];
- BirdWatch Ireland – The Irish Wetland Bird Survey ('I-WeBS') data, which is coordinated by BirdWatch Ireland and under contract to the NPWS, was reviewed with regard to wintering waterbird population within the vicinity of the Site [17];
- Inland Fisheries Ireland ('IFI') Water Framework Directive ('WFD') Fish website was consulted to obtain details about fish monitoring undertaken throughout Ireland [18];
- Fish Report prepared by Dr. Martin O'Farrell of Aztec Management Consultants in support of the Port of Waterford Maintenance Dredging Programme (Dumping at Sea EPA Reg. No.: S0012-05) [19];
- The Irish Whale and Dolphin Group ('IWDG') records of historical sightings within the vicinity of the Waterford Estuary from 2013 to 2022 [20];
- The IWDG sightings portal to obtain information about recent sightings in the vicinity of the Waterford Estuary from June 2022 to July 2025 [21]; and,
- Delft Hydraulics [22] and ABP Marine Environmental Research Ltd. ('ABPmer') modelled reports (2017 & 2023) [23, 24] for the Waterford Estuary that assess the on-going estuary processes, trends, and physical characteristics and assess the physical effects, if any, of on-going port operations, including maintenance dredging and disposal.

3.1.2 Habitat Survey

An initial site assessment of the proposed Biodiversity Enhancement Area was undertaken by two suitably qualified and experienced MOR Environmental Ecologists on 27th January 2021. Updated surveys were completed on 17th August 2023 and 10th July 2024 to assess the area and determine if there had been any changes in the onsite habitats. The surveys aimed to identify the extent and quality of habitats present on the Site.

These surveys were undertaken at the Biodiversity Enhancement Area using the Heritage Councils – '*A Guide to Habitats in Ireland*' [25] and was conducted in line with the Heritage Council's '*Best Practice Guidance for Habitat Survey & Mapping'* [26]. The surveys were also

undertaken utilising the Irish Ramsar Wetlands Committee's *'Irish Wetland Types - an identification guide and field survey manual'* [27].

The assessment was extended to also identify the potential for these habitats to support other features of nature conservation importance, such as species afforded legal protection under either Irish or European legislation.

3.2 Results

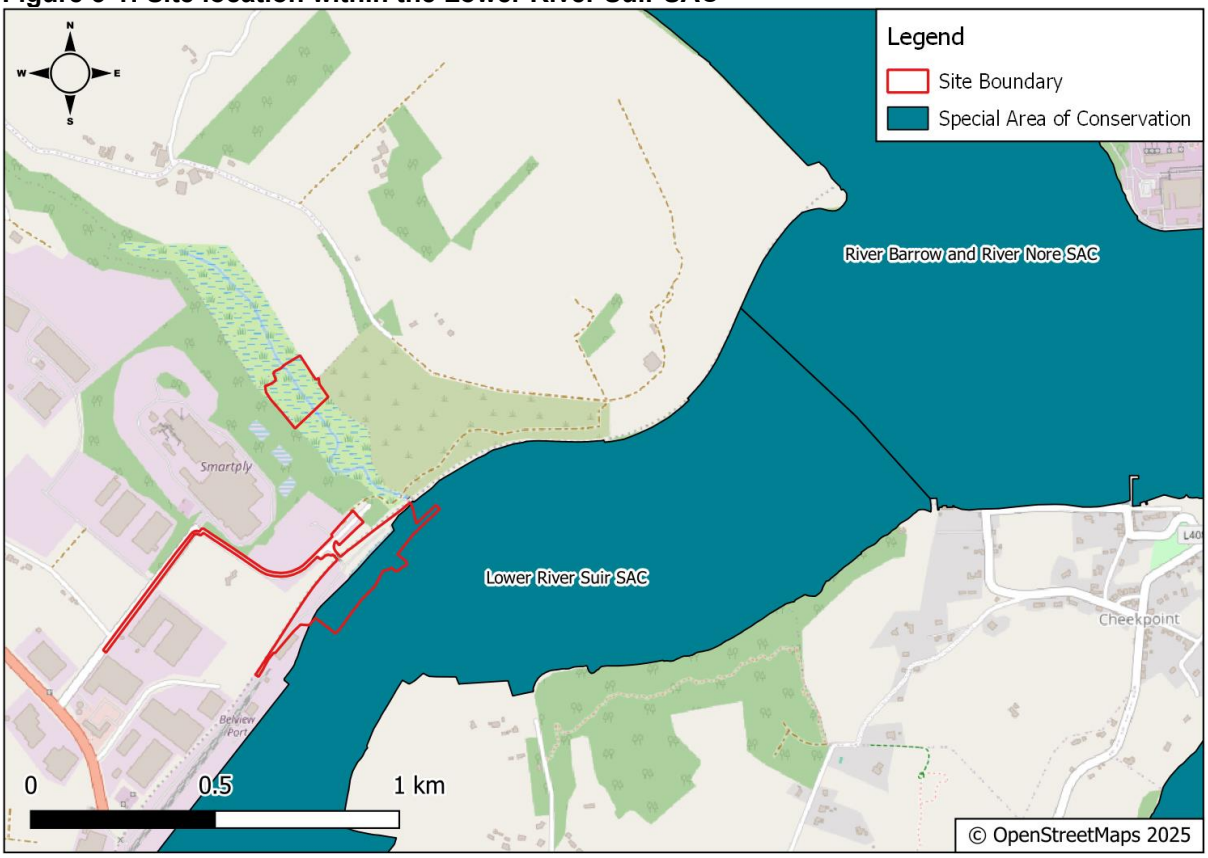
3.2.1 Designated Sites

The existing Belview Port is located within the boundary of the Lower River SAC, ca. 1ha of the existing Port overlaps with the SAC. This area is comprised of industrial built land.

In addition, the Site Boundary, in which works associated the Proposed Development will be located, overlaps with a section of the Lower River Suir SAC and ca. 1.3ha of reclamation works will be required.

The Biodiversity Area is ca. 360m north of the Lower River SAC; however, is hydrologically linked with the SAC via the Luffany Stream.

Figure 3-1: Site location within the Lower River Suir SAC



3.2.2 Existing Baseline Environment

3.2.2.1 Habitats

The Biodiversity Enhancement Area was comprised predominantly of agricultural grassland with small areas of wet grassland that were limited in size due to overgrazing and poaching of the ground. This grassland was heavily grazed by cattle at the time of the surveys, and areas of pooled stagnant water were noted throughout the disturbed ground.

A total of six habitats were noted within the Biodiversity Enhancement Area, as listed below:

- Improved Agricultural Grassland (GA1) / Wet Grassland (GS4);
- Reed and Large Sedge Swamps (FS1);
- Drainage Ditch (FW4);
- Hedgerow / Treeline (WL1 / WL2);
- Mixed Broadleaved Woodland (WD1); and,
- Drumdowney Lower Stream / Luffany River (FW2).

In addition, it was noted that the onsite habitats in which the Proposed Development will be located was predominantly comprised of the existing Belview Port and the Lower Suir Estuary. The habitats located onsite in which the Proposed Development will be located included:

- Buildings and Artificial Surfaces (BL3);
- Dry Meadows and Grassy Verges (GS2);
- Scrub (WS1);
- Mixed Broadleaved Woodland (WD1);
- Recolonising Bare Ground (ED3);
- Muddy Sand Shores (LS3);
- Sea Walls, Piers and Jetties (CC1); and,
- Lower Suir Estuary - Tidal River (CW2).

A detailed description of the habitats is outlined in Chapter 6 – Biodiversity of the EIAR. The distribution of the habitats and location of features of interest within the Site are shown in Figure 3-1.

3.2.2.2 Protected / Notable Species

Based on identified features, signs of activity and on-site habitats within the Biodiversity Enhancement Area, the following species are currently on-site or have the potential to utilise the Biodiversity Enhancement Area:

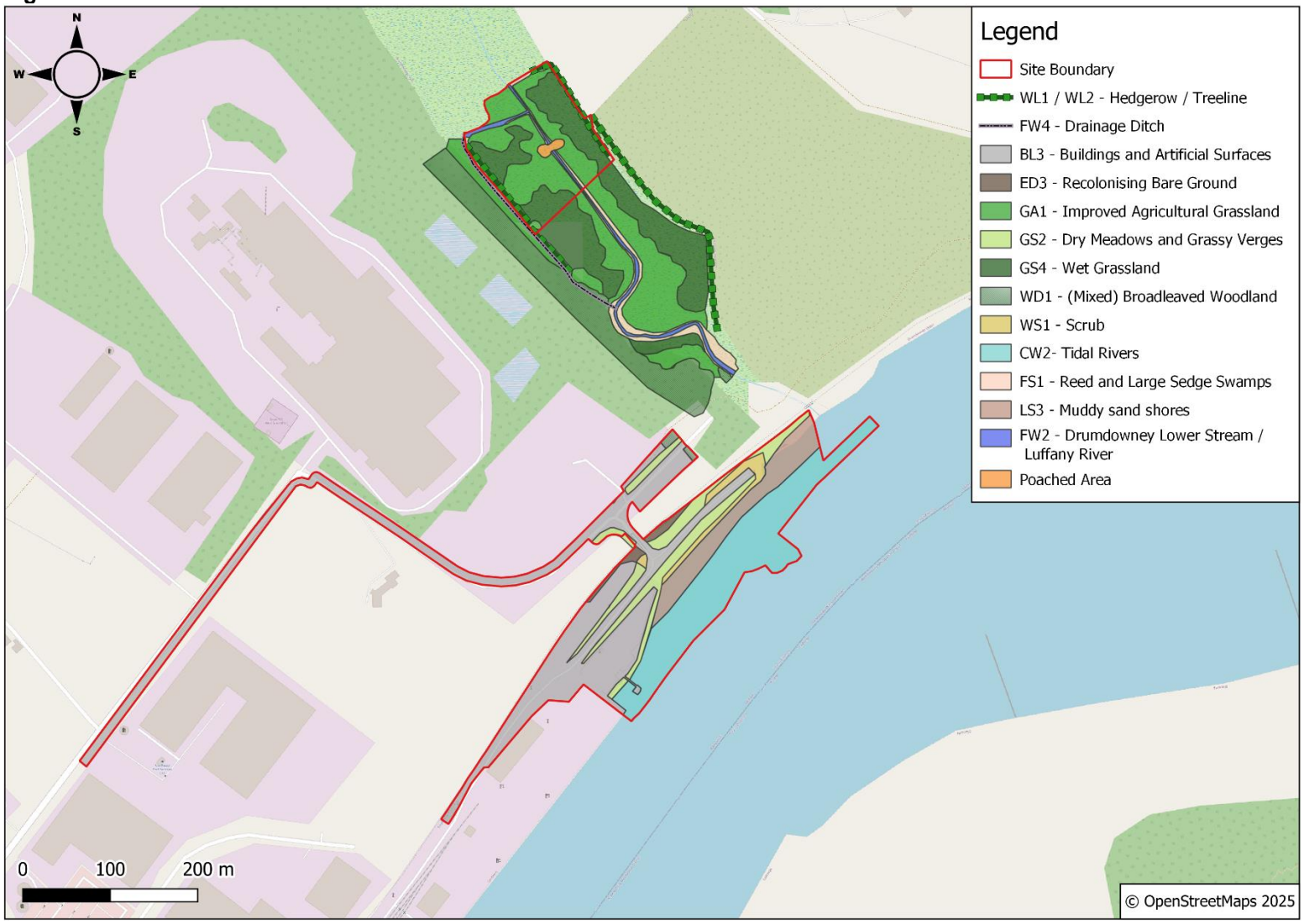
- Amphibians;
- Birds;
- Bats;
- Fish;
- Otter; and,
- Other Mammals (including deer, fox and small mammals such as rabbit).

No species of conservation interest or habitats were identified within the Biodiversity Enhancement Area or within the surrounding area. The potential presence of protected species within the study area was assessed through the NBDC records within the last ten years recorded within 2km of the Site (Grid Ref: S61S, S61M, S61L, S61R, S61W, S61X, S6814, S6815, S6312, S6313, S6314, S6411, S6511, S6611, S6711, S6812, S6813).

It should be noted that the Biodiversity Enhancement Area does not have suitable habitat for marine mammals, given the freshwater nature of the onsite watercourses.

A detailed description of the habitats and receptors of ecological significance are outlined in Chapter 6 – Biodiversity of the EIAR submitted as part of the planning application.

Figure 3-2: Baseline Habitats



4 BIODIVERSITY ENHANCEMENT MEASURES

4.1 Protection Measures for the Protection of Flora and Fauna

As part of the Proposed Development, comprehensive mitigation measures will be implemented to protect fauna and habitats of local biodiversity value occurring at the Site throughout the construction and operational phase of the Proposed Development as outlined in Chapter 6 (Biodiversity), Chapter 7 (Land and Soils), Chapter 8 (Water), Chapter 9 (Air Quality) and Chapter 11 (Terrestrial Noise and Vibration).

In addition, ecological clerk of works ('ECoW') monitoring will be undertaken as required, as outlined in the EIAR.

4.2 Overview of Enhancement Measures

In order to appropriately offset the reclamation works, biodiversity enhancement measures will be implemented in order to enhance the area for local wildlife and further safeguard the nearby European Designated sites.

In order to maximise the floral and faunal biodiversity and to enhance the ecological value of the Biodiversity Enhancement Area, the following measures will be implemented:

- Installation of stock-proof fencing around the perimeter to exclude cattle but allow the free movement of other species, including otter, badger, deer, etc.;
- The creation of pond complexes;
- Enhancement of existing hedgerows with additional species-rich riparian woodland planting along the eastern and western boundaries;
- Allow for the natural regeneration of wet grassland habitat and reed and large sedge swamp habitat following the removal of livestock from the area; and,
- The provision of wildlife shelters providing nesting opportunities for protected and locally important species, including sand martin nest bank, kingfisher nest bank, bat boxes, habitat piles / hibernaculum, deadwood habitat and artificial otter holts.

The indicative locations of the proposed measures are illustrated in Figure 4-8 and in Attachment A, the proposed Landscape Plan prepared by Macro Works Ltd.

4.3 Protection of Habitat Linkages and Ecological Corridors

An ecological corridor is generally a linear habitat feature (such as watercourses, treelines, hedgerows, etc.) that links areas of habitats and allows for different species to move between these areas. Ecological corridors are considered to be important for a variety of different reasons, most notably for the maintenance of genetic diversity and the avoidance of fragmentation within the landscape and risks associated with inbreeding.

The importance of ecological corridors is well documented and there are provisions in both European and Irish legalisation for the protection of such features which provide ecological coherence.

Article 10 of the Directive specifically refers to linear landscape features and steppingstone habitats:

> '*Member States shall endeavour, where they consider it necessary, in their land-use planning and development policies and, in particular, with a view to improving the ecological coherence of the Natura 2000 network, to encourage the management of features of the landscape which are of major importance for wild fauna and flora.*

> *Such features as those which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems for marking field boundaries) or their function as stepping stones (such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species*.'

The Local Government (Planning and Development) Act, 1963 (Third Schedule, Part IV, Paragraph 8A) was amended as a result of the adoption of the Habitats Directive, and local authorities can now refuse planning permission without compensation for developments which threaten functioning ecological corridors or stepping stones. The amendment cites the following:

> '*Protection of features of the landscape which are of major importance for wild fauna and flora in accordance with the Habitats Directive.' (S.I. 94 of 1997, 26(c)).*

The Biodiversity Enhancement Area will be linked to the Lower Suir Estuary and the Lower River Suir SAC via the Luffany Stream. The Luffany Stream within the Biodiversity Enhancement Area will be retained and protected. In addition, the Proposed Development has been designed to include the 'open quay' design, which will allow the movement of aquatic species, otter, birds and other wildlife that utilise the Lower Suir Estuary under the wharf. This will ensure that the ecological corridor through the existing Belview Port will be maintained.

In addition, other existing ecological corridors within the Biodiversity Enhancement Area will be protected and enhanced which will include:

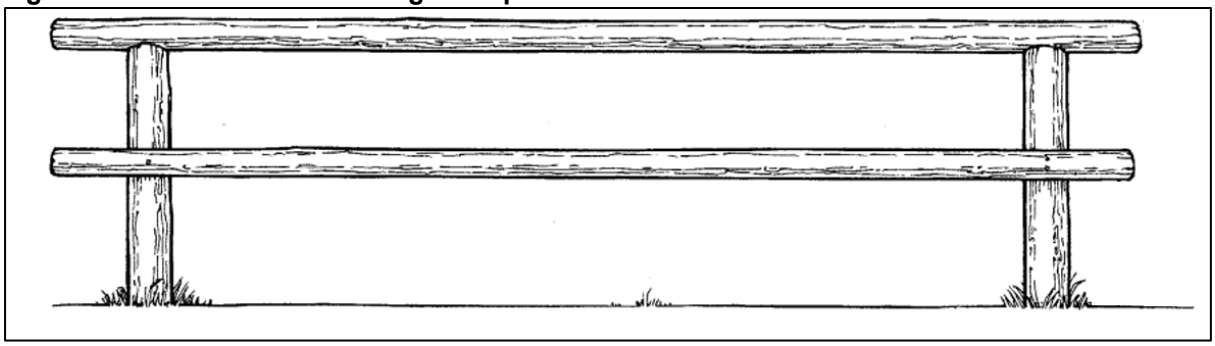
- Planting of riparian buffers along the eastern and western perimeters;
- Annual inspections of woodland to determine the health of the plants;
- Where dead trees are identified - removal of dead trees and replacement with new suitably sized native tree species; and,
- Where sparse areas are identified – additional supplementary planting of native tree species should be undertaken.

4.3.1 Stock Proof Fencing

The stock-proof fencing will include 2-rail post and rail type fencing, as this will allow for the movement of deer within the area. Wooden fencing will be utilised as this will blend in with the natural landscape and will allow perching for birds. In addition, a minimum of a 300mm gap will be included at the bottom of the fence to allow for the movement of otter and badger within the area.

Refer to the example in Figure 4-1.

Figure 4-1: Post and Rail Fencing Example



4.4 Habitats

The habitat creation and enhancement measures will be implemented in order to increase opportunities for usage by a variety of wildlife in the area. The proposed plantings will be native and, where practically possible, of local providence / known benefit to local fauna.

4.4.1 Riparian Woodland / Treeline Enhancement

The eastern and western boundaries of the Biodiversity Enhancement Area were bordered by the existing hedgerow / treelines.

It is proposed to include a 10-15m riparian treeline / wooded buffer along the eastern and western boundaries to strengthen the existing hedgerow / treelines and enhance this ecological corridor. These wooded buffers will provide shelter and a source of food for a variety of species throughout the year, including birds, small mammals, amphibians, and butterflies. It will also allow movement of species such as badger and other small mammals through the Biodiversity Enhancement Area and provide connectivity to the wider landscape.

An indicative list of native species that may be planted in this area is outlined in Table 3-1.

Table 4-1: Native Tree and Understorey Species Planting

Common Name	***Scientific Name***
Tree Species	
Sycamore	*Acer pseudoplatanus*
Alder	*Alnus glutinosa*
Silver birch	*Betula pendula*
Downy birch	*Betula pubescens*
Beech	*Fagus sylvatica*
Ash	*Fraxinus excelsior*
Crab apple	*Malus sylvestris*
Scots pine	*Pinus sylvestris*
Aspen	*Populus tremula*
Pedunculate oak	*Quercus robur*
White willow	*Salix Alba*
Rowan	*Sorbus aucuparia*
Understory Species	
Hazel	*Corylus avellana*
Hawthorn	*Crataegus monogyna*
Holly	*Ilex aquifolium*
Wild / native privet	*Ligustrum vulgare*

Common Name	***Scientific Name***
Goat / pussy willow	*Salix caprea*
Grey willow	*Salix cinerea*
Elder	*Sambucus nigra*

4.4.2 Pond Complex Creation

It is proposed to create a pond complex (a mosaic of permanent, semi-permanent and seasonal ponds of varying sizes and depths within close proximity to one another).

Pond complexes can create a protective network for local biodiversity (i.e., should one pool become unsuitable, species can move to another one).

The creation of pond complexes will require the regrading of the ground to create ponds of varying depths and sizes with shallow slopes. It is proposed that the pond complexes will include:

- Large main pond with a minimum diameter of ca. 12m and a maximum depth of ca. 30m;
- A mosaic of micro ponds with a maximum diameter of ca. 1m; and,
- Bare ground scrapes within the vicinity.

The large main pond will have gradual sloping shoreline banks (1:20 or 3° slope) to encourage plant growth and diversity as well as creating shallow areas for egg laying and newt larva. The availability of relatively warm, still water with emergent wetland vegetation will be essential to allow species to breed and reproduce. These water features will provide suitable habitat for damselflies and dragonflies, which will provide food sources for frogs, birds and bats.

To allow the natural recolonisation of species within the pond and the perimeter of the pond there will be no lining along the bottom of the pond. It is proposed to allow these areas to be naturally recolonised by local wetland botanical species from the existing seed bank. In addition, the pond complex will be allowed to seasonally fluctuate as ephemeral drawdown can be a benefit for many wet-grassland species.

4.4.3 Natural Regeneration of Wet Grassland

It is proposed to allow the Biodiversity Enhancement Area to recolonise with wet grassland habitat naturally. The recolonisation of this habitat will be from local wet grassland botanical species in the existing seed bank. The objective of wet grassland habitat will be to enhance the quality of existing habitats on-site and also to create a diversity of habitats within the area. The perimeter fencing that will prevent livestock from entering the area will allow natural regeneration of this habitat. Furthermore, there will be no fertilisers, pesticides or herbicides used within the area in order to maintain suitable soil conditions for natural recolonisation.

4.4.4 Natural Regeneration of Reed and Large Sedge Swamp

Along the banks of the Luffany Stream and the Drumdowney Lower Stream, it is proposed to allow reed and large sedge swamp habitat to recolonise naturally. The recolonisation of this habitat will be from local botanical species in the existing seed bank. As per the wet grassland, this reed and sedge swamp will benefit from the removal of cattle with no fertilisers, pesticides or herbicides being used.

4.5 Fauna

The recommendations proposed below detail measures that will enhance the attractiveness of the Biodiversity Enhancement Area to wildlife in the surrounding areas.

Please note that all measures outlined below are indicative only and intended to guide the biodiversity management plan. Final specifications, including the type, number and precise locations of features, will be determined by an experienced ecologist prior to implementation and the Planning Authority will be notified. This will allow the ecologist to assess the exact conditions on-site and thus ensure that measures will be sited in the most appropriate location possible.

4.5.1 Otter Holts

Given the presence of otter within the area, an artificial otter holt will be installed. An otter holt has the potential to provide a refuge for commuting and breeding otter (refer to Figure 4-2).

The artificial otter holt will be constructed using cut logs or recycled materials. In addition, it is proposed to plant saplings of blackthorn and/or willow around the holt to enable scrub to establish and conceal the holt to ensure there is minimal disturbance.

Figure 4-2: Otter Holt Construction



4.5.2 Sand Martin Nest Hotel

A sand martin nest hotel will be installed in an appropriate location and will provide vital roosting spaces for sand martins in the area. The proposed sand martin nest hotel also has the potential to be used by kingfisher in the locality. Refer to the examples provided in Figure 4-3.

Figure 4-3: Sand Martin Hotel Examples



4.5.3 Kingfish Artificial Nesting Bank

There is a potential to enhance the habitats for kingfisher by providing an artificial nesting bank. Refer to the examples provided in Figure 4-4. Artificial nesting banks can be easily installed and provide vital shelter and nesting areas in habitats devoid of natural opportunities.

The artificial nest bank will include suitable nest tunnels and chambers for kingfisher. The proposed kingfisher nest bank also has the potential to be used by sand martin in the locality.

Figure 4-4: Example of Artificial Kingfisher Nesting Bank



4.5.4 Bat Boxes

Artificial bat boxes will also be erected on suitable mature trees or freestanding poles. Artificial bat boxes can provide vital roosting places in habitats devoid of natural roosting opportunities.

Bat boxes will be placed in a position sheltered from strong winds and exposed to the sun for part of the day. The boxes will be located in / close proximity to the proposed riparian woodland planting and placed a minimum of 2m above the ground. Figure 4-5 below shows suitable bat roost box examples, including a Pole Mounted Bat Box, Bat Box Schwegler 1FF and Vivara Small Bat Box.

Figure 4-5: Suitable Bat Roost Boxes



4.5.5 Hibernaculum and Habitat Piles

Hibernacula and habitat piles are valuable habitats and support a range of biodiversity, including insects, amphibians and small mammals. These habitats act as refuges and

hibernation sites for amphibians as well as a host of other species of inverts and small mammals. The objective will be to create a diverse a habitat as possible.

Hibernacula and habitat piles can be created through the placement of either piles of rocks or logs around the margins of hedgerows/treelines, near wetland habitats and adjacent to drainage ditches. Hibernaculums and habitat piles must be placed in a position with adequate sunlight, and the exact locations will be determined by an ecologist.

Refer to examples below Figures 4-6 and 4-7.

Figure 4-6: Typical Hibernaculum and Cross Section

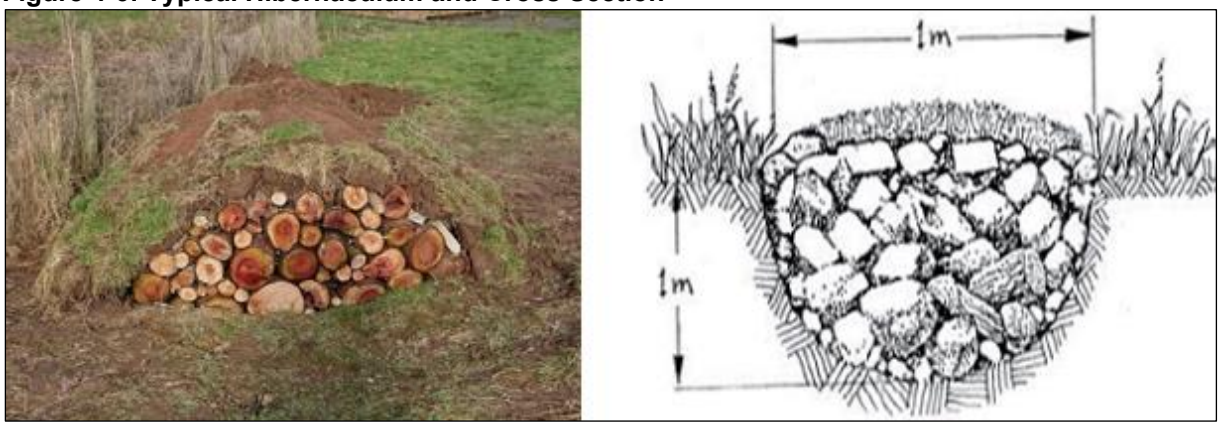


Figure 4-7: Habitat Piles

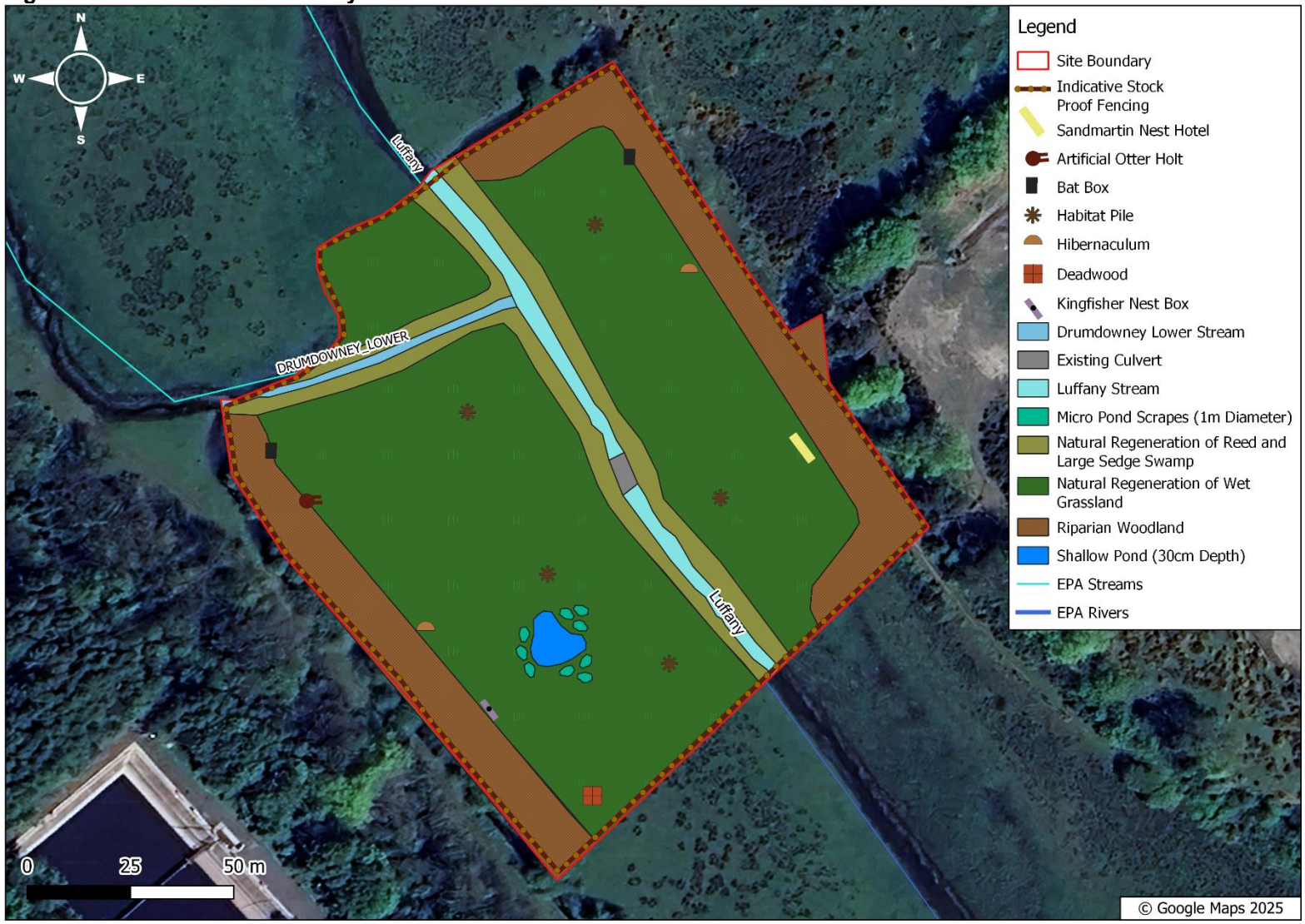


4.5.6 Deadwood Habitats

The primary purpose of deadwood habitats will be to provide additional habitat space for small organisms, insects and other invertebrates. The objective will be to create a diversity of habitats.

Deadwood provides habitat for beetles, centipedes, woodlice and spiders, and materials with holes act as shelter for solitary bees, which are crucial for pollination. The artificial shelters can come in a variety of sizes and can be used by a range of smaller animals, such as toads and hedgehogs, who can use these artificial habitats for hibernation or breeding. Deadwood habitat will be positioned in areas sheltered from wind and rain and with access to sunlight.

Figure 4-8: Indicative Biodiversity Enhancement Plan



5 IMPLEMENTATION STRATEGIES AND AFTERCARE

5.1.1 Ecological Monitoring During Implementation

A suitably qualified ecologist will be responsible for the oversight and ecological monitoring during the implementation of the BMP. This will ensure that the recommendations made within this BMP will be implemented correctly.

Following the construction of the Proposed Development, a comprehensive review of this BMP will be undertaken along with an updated walkover by the appointed and suitably qualified ecologist to ensure that all measures will still be relevant and up to date.

In the event that the implementation strategies or measures are required to be updated, the Planning Authority will be notified of the amendments prior to any work commencing. Furthermore, all guidance outlined in this BMP will be reviewed, and updates required that are relevant to this BMP will be included in an updated BMP. This will then be submitted to the Planning Authority prior to any works commencing.

5.1.2 Ecological Monitoring Post-Implementation

In order to monitor the effects of the implemented recommendations, annual ecological surveys will be undertaken - this will include periodical dissemination of monitoring and survey results to relevant bodies, including the Planning Authority, as required. The duration of monitoring will be confirmed in the updated BMP.

This monitoring shall include the assessment of the ecological enhancement measures (e.g., bat boxes, etc.) and where uptake has been unsuccessful or inhibited.

The locations and implementation of these measures will be re-evaluated based on the assessment of results / observations collected during the ecological monitoring. Should an updated plan be required arising from observations collected during the ecological monitoring, this will be submitted as required to the Planning Authority.

The management and implementation of the target habitats and species will be undertaken in accordance with all relevant guidance as outlined in Section 2. It is important to note that whilst management practices will only be altered if there is a good ecological reason for doing so, but they should not be rigidly adhered to if they are obviously detrimental.

An annual assessment by the project ecologist will be undertaken to verify that the management actions have been completed and to assess their effectiveness. This will include a review of the BMP and include revisions to reflect the conditions on the ground, and will be updated, as necessary.

Following the annual assessment, an annual monitoring report will also be prepared and made available to relevant bodies as requested. The report will also outline the recommendations for both future management options and monitoring works.

It should be noted that there will be possible opportunities to include monitoring programmes that will be shared with the NPWS and BirdWatch Ireland. In addition, survey data will be made available to the NBDC.

5.2 Riparian Woodland / Treeline Enhancement

Annual inspections of the trees will take place for a period of five years to ensure tree health and establishment. Trees that fail to become established within five years of planting will be replaced by trees of a similar size and species within the next planting season.

5.3 Fauna Enhancement Measures

The hibernaculum and habitat piles created will not require any maintenance or monitoring once created.

The sand martin nest hotel, kingfisher artificial nesting bank, bat boxes and deadwood habitat will be inspected each year, and any required maintenance will be carried out:

- Bird boxes will be checked outside of the nesting and breeding bird season, typically from March 1st to August 31st; and,
- Bat boxes will be inspected outside of the breeding season (mid-May to mid-August) to ensure no disturbance to breeding females or young bats occur.

Bird boxes and bat boxes may require cleaning to prevent the accumulation of biological waste and parasites. In such circumstances, boxes will be cleaned with warm water, and no additional substances will be used in order to prevent the introduction of harmful chemicals.

6 CONCLUSION

As outlined above, this BMP has been prepared to outline a package of appropriate measures to offset the habitat loss as a result of the reclamation works.

The location of the Biodiversity Enhancement Area was selected following careful consideration of ecological suitability, deliverability, long-term management potential and availability. The Port of Waterford has acquired these lands specifically for this purpose, thereby ensuring security of tenure and the ability to deliver lasting biodiversity commitments outlined in this BMP.

The Biodiversity Enhancement Area will provide suitable foraging, commuting and roosting habitat for the species currently utilising the muddy sand shores and tidal river with the reclamation area, particularly otter (designated for the Lower River Suir SAC), waterbirds and local wildlife.

7 REFERENCES

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APPENDICES

APPENDIX A



macroworks

Registered Landscape Architect

LEGEND:

- RIPARIAN WOODLAND
- NATURAL REGENERATION OF REED AND LARGE SEDGE SWAMP
- NATURAL REGENERATION OF WET GRASSLAND
- EXISTING WATERWAYS (DRUMDOWNEY AND LUFFANY)
- SHALLOW POND (12M DIAMETER)
- MICRO POND SCRAPES (1M DIAMETER)
- SITE BOUNDARY
- BAT BOX
- HABITAT PILE
- HIBERNACULUM
- INDIVIDUAL BIODIVERSITY FEATURES

NOTES:

The function of the proposed mitigation planting is primarily for screening and softening of the proposed development, but it will also enhance the ecological corridors within the surrounding area.

Species mix to be finalised in conjunction with the project ecologist.

For detail of each intervention, refer to ecologists report.

RIPARIAN ENHANCEMENT SPECIES:

Botanical name	Common name	Size	%
Primarystructure;			
Salix spp.	Willow	1+2tr 80-100cm	30%
Alnus glutinosa	Alder	1+2tr 80-100cm	30%
Secondary structure;			
Prunus spinosa	Blackthorn	1+2tr 80-100cm	15%
Ilex aquifolium	Holly	1+2tr 80-100cm	15%
Shrub species structure;			
Rubus fruticosus	Bramble	1+1tr 40-60cm	2.5%
Corylus avellana	Hazel	1+1tr 40-60cm	2.5%
Rosa canina	Dog-rose	1+1tr 40-60cm	2.5%
Euonymus europaeus	Spindle	1+1tr 40-60cm	2.5%

REVISIONS:

1.	DRAFT	27/08/2025
2.		
3.		
4.		
5.		
6.		

Prepared by:
MACRO WORKS,
HIBERNIA HOUSE,
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LOUGHLINSTOWN, DUBLIN 18
00353 (01) 2303585
info@macroworks.ie

Site location:
Port of Waterford,
COUNTY KILKENNY

Drawing Title:
LANDSCAPE PLAN - BIODIVERSITY MANAGEMENT PLAN

Project:
Proposed ORE Capable Terminal on a 250m Wharf Extension & Ancillary Operational Support Infrastructure

Drawn by: JD
Checked by: CD

Drawing Ref:
LD.WTRFRD_ORE_BDVRSTY

Scale: 1:500 @ A1
Date: AUG 2025

DRAFT

APPENDIX 7

APPENDIX 7-1

SOCOTEC

Environmental Chemistry

Certificate of Analysis

Client: Port of Waterford Company

Project: 23051381

Quote: BEC230128507 V1.2

Project Ref: Port of Watford

Site: Soil Analysis

Contact: Ian Moriarty

Address: Third Floor
Marine Point, Belview Port
Waterford
Eire
X91 W0XW

E-Mail: im@portofwaterford.com

Phone: 1

No. Samples Received: 7

Date Received: 15/05/2023

Analysis Date: 26/05/2023

Date Issued: 26/05/2023

Report Type: Final Version 01

This report supersedes any versions previously issued by the laboratory



Reported by Customer Service Specialist
Aniko Gondolne-Mantler
01283 554434

SOCOTEC

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

Samples Analysed

Text ID	Sample Reference	Sampling Date	Sample Type	Sample Description
23051381-001	MPSS1	21/04/2023 00:00:00	SOLID	Soil Sample
23051381-002	MPSS2	21/04/2023 00:00:00	SOLID	Soil Sample
23051381-003	MPSS3	21/04/2023 00:00:00	SOLID	Soil Sample
23051381-004	MPSS4	20/04/2023 00:00:00	SOLID	Soil Sample
23051381-005	MPSS5	20/04/2023 00:00:00	SOLID	Soil Sample
23051381-006	MPSS6	20/04/2023 00:00:00	SOLID	Soil Sample
23051381-007	MPSS7	20/04/2023 00:00:00	SOLID	Soil Sample

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

UKAS TESTING 1252

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
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					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	20/04/2023
Antimony as Sb	ICPMSW (Dissolved)	0.01	mg/kg^	N		<0.01		<0.01		<0.01		<0.01
Arsenic as As	ICPMSW (Dissolved)	0.01	mg/kg^	N		0.04		0.03		0.02		0.03
Barium as Ba	ICPWATVAR (Dissolved)	0.1	mg/kg^	N		<1.0 D		<0.1		<0.1		<0.1
Cadmium as Cd	ICPMSW (Dissolved)	0.0002	mg/kg^	N		<0.0002		<0.0002		0.0003		<0.0002
Chloride as Cl	KONENS	10	mg/kg^	N		7780		5810		5360		4300
Total Chromium as Cr	ICPMSW (Dissolved)	0.01	mg/kg^	N		<0.01		<0.01		<0.01		<0.01
Copper as Cu	ICPMSW (Dissolved)	0.01	mg/kg^	N		<0.01		<0.01		<0.01		<0.01
Lead as Pb	ICPMSW (Dissolved)	0.01	mg/kg^	N		<0.01		<0.01		<0.01		<0.01
Mercury as Hg	ICPMSW (Dissolved)	0.0003	mg/kg^	N		<0.0003		<0.0003		<0.0003		<0.0003
Molybdenum as Mo	ICPMSW (Dissolved)	0.01	mg/kg^	N		0.06		0.05		0.05		0.03
Nickel as Ni	ICPMSW (Dissolved)	0.01	mg/kg^	N		<0.01		<0.01		<0.01		<0.01
Phenol Index	SFAPI	0.5	mg/kg^	N		<0.5		<0.5		<0.5		<0.5
Selenium as Se	ICPMSW (Dissolved)	0.01	mg/kg^	N		<0.01		<0.01		<0.01		<0.01
Total Sulphur as SO4	ICPWATVAR (Dissolved)	30	mg/kg^	N		975		1140		1260		1080
TDS as mg/kg	PHCONDW	700	mg/kg^	N		20100		15200		14500		11900
Leached Organic Carbon	WSLM13	2	mg/kg^	N		75.0		62.1		48.8		51.5
Fluoride as F	ISEF	1	mg/kg^	N		4		4		4		3
Zinc as Zn	ICPMSW (Dissolved)	0.02	mg/kg^	N		<0.02		<0.02		<0.02		<0.02
Conductivity at 25°C	PHCONDW	100	µS/cm	N		3060		2290		2190		1780

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

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mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	004	005		006		007	
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					Sample Type	SOLID	LPL	SOLID	LPL	SOLID	LPL	SOLID
					Sampling Date	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Antimony as Sb	ICPMSW (Dissolved)	0.01	mg/kg^	N			<0.01		<0.01		<0.01	
Arsenic as As	ICPMSW (Dissolved)	0.01	mg/kg^	N			0.03		0.04		0.03	
Barium as Ba	ICPWATVAR (Dissolved)	0.1	mg/kg^	N			<0.1		<0.1		<0.1	
Cadmium as Cd	ICPMSW (Dissolved)	0.0002	mg/kg^	N			0.0003		<0.0002		<0.0002	
Chloride as Cl	KONENS	10	mg/kg^	N			4530		5680		4330	
Total Chromium as Cr	ICPMSW (Dissolved)	0.01	mg/kg^	N			<0.01		<0.01		<0.01	
Copper as Cu	ICPMSW (Dissolved)	0.01	mg/kg^	N			0.02		<0.01		<0.01	
Lead as Pb	ICPMSW (Dissolved)	0.01	mg/kg^	N			<0.01		<0.01		<0.01	
Mercury as Hg	ICPMSW (Dissolved)	0.0003	mg/kg^	N			<0.0003		<0.0003		<0.0003	
Molybdenum as Mo	ICPMSW (Dissolved)	0.01	mg/kg^	N			0.02		0.06		0.05	
Nickel as Ni	ICPMSW (Dissolved)	0.01	mg/kg^	N			<0.01		<0.01		<0.01	
Phenol Index	SFAPI	0.5	mg/kg^	N			<0.5		<0.5		<0.5	
Selenium as Se	ICPMSW (Dissolved)	0.01	mg/kg^	N			<0.01		<0.01		<0.01	
Total Sulphur as SO4	ICPWATVAR (Dissolved)	30	mg/kg^	N			816		954		802	
TDS as mg/kg	PHCONDW	700	mg/kg^	N			12500		15000		11800	
Leached Organic Carbon	WSLM13	2	mg/kg^	N			64.7		66.1		61.1	
Fluoride as F	ISEF	1	mg/kg^	N			3		3		3	
Zinc as Zn	ICPMSW (Dissolved)	0.02	mg/kg^	N			0.04		0.03		<0.02	
Conductivity at 25°C	PHCONDW	100	µS/cm	N			1870		2300		1780	

SOCOTEC

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

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mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	MPSS1		MPSS2		MPSS3		MPSS4
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	20/04/2023
pH	PHCONDW	1	pH units	N		8.1		8.0		7.9		8.0
TDS as mg/l	PHCONDW	70	mg/l	N		2080		1560		1490		1210
ANC	ANC	0.04	mol/kg^	N			3.04		3.12		2.72	
pH (2.5:1 extraction)	PHSOIL	1	pH units	UM			7.8		7.7		7.7	
Chloride as Cl	KONENS	1	mg/l	U		806		595		549		437
Phenol Index	SFAPI	0.05	mg/l	U		<0.05		<0.05		<0.05		<0.05
Fluoride as F	ISEF	0.1	mg/l	U		0.4		0.4		0.4		0.3
Total Organic Carbon	WSLM59	0.02	% m/m^	U			1.00		0.83		0.60	
LOI @ 450°C	LOI(%MM)	0.2	% m/m^	N			5.5		4.6		4.1	
Leached Organic Carbon	TOCW	0.4	mg/l	U		7.77		6.36		5.00		5.23
Antimony as Sb	ICPMSW (Dissolved)	0.001	mg/l	U		0.001		<0.001		<0.001		<0.001
Arsenic as As	ICPMSW (Dissolved)	0.001	mg/l	U		0.004		0.003		0.002		0.003
Cadmium as Cd	ICPMSW (Dissolved)	0.00002	mg/l	U		0.00002		0.00002		0.00003		<0.00002
Total Chromium as Cr	ICPMSW (Dissolved)	0.001	mg/l	U		<0.001		<0.001		<0.001		<0.001
Copper as Cu	ICPMSW (Dissolved)	0.001	mg/l	U		<0.001		<0.001		<0.001		<0.001
Lead as Pb	ICPMSW (Dissolved)	0.001	mg/l	U		<0.001		<0.001		<0.001		<0.001
Mercury as Hg	ICPMSW (Dissolved)	0.00003	mg/l	U		<0.00003		<0.00003		<0.00003		<0.00003
Molybdenum as Mo	ICPMSW (Dissolved)	0.001	mg/l	U		0.006		0.005		0.005		0.003
Nickel as Ni	ICPMSW (Dissolved)	0.001	mg/l	U		<0.001		<0.001		<0.001		<0.001

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

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Analysis	Method Code	MDL	Units	Accred.	Sample ID	004	005		006		007	
					Customer ID	MPSS4	MPSS5		MPSS6		MPSS7	
					Sample Type	SOLID	LPL	SOLID	LPL	SOLID	LPL	SOLID
					Sampling Date	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
pH	PHCONDW	1	pH units	N			8.1		8.0		7.8	
TDS as mg/l	PHCONDW	70	mg/l	N			1270		1560		1210	
ANC	ANC	0.04	mol/kg^	N		4.80		5.84		2.56		2.64
pH (2.5:1 extraction)	PHSOIL	1	pH units	UM		7.7		7.7		7.4		7.5
Chloride as Cl	KONENS	1	mg/l	U			461		589		443	
Phenol Index	SFAPI	0.05	mg/l	U			<0.05		<0.05		<0.05	
Fluoride as F	ISEF	0.1	mg/l	U			0.3		0.3		0.3	
Total Organic Carbon	WSLM59	0.02	% m/m^	U		1.16		1.17		1.21		0.98
LOI @ 450°C	LOI(%MM)	0.2	% m/m^	N		3.3		3.1		5.7		5.1
Leached Organic Carbon	TOCW	0.4	mg/l	U			6.58		6.86		6.25	
Antimony as Sb	ICPMSW (Dissolved)	0.001	mg/l	U			<0.001		<0.001		<0.001	
Arsenic as As	ICPMSW (Dissolved)	0.001	mg/l	U			0.003		0.004		0.003	
Cadmium as Cd	ICPMSW (Dissolved)	0.00002	mg/l	U			0.00003		<0.00002		0.00002	
Total Chromium as Cr	ICPMSW (Dissolved)	0.001	mg/l	U			<0.001		<0.001		<0.001	
Copper as Cu	ICPMSW (Dissolved)	0.001	mg/l	U			0.002		<0.001		<0.001	
Lead as Pb	ICPMSW (Dissolved)	0.001	mg/l	U			<0.001		<0.001		<0.001	
Mercury as Hg	ICPMSW (Dissolved)	0.00003	mg/l	U			<0.00003		<0.00003		<0.00003	
Molybdenum as Mo	ICPMSW (Dissolved)	0.001	mg/l	U			0.002		0.006		0.005	
Nickel as Ni	ICPMSW (Dissolved)	0.001	mg/l	U			0.001		<0.001		<0.001	

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

1252

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	MPSS1		MPSS2		MPSS3		MPSS4
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	20/04/2023
Selenium as Se	ICPMSW (Dissolved)	0.001	mg/l	U		<0.001		<0.001		<0.001		<0.001
Zinc as Zn	ICPMSW (Dissolved)	0.002	mg/l	U		<0.002		<0.002		0.002		0.002
Barium as Ba	ICPWATVAR (Dissolved)	0.01	mg/l	U		<0.10 D		<0.01		<0.01		<0.01
Total Sulphur as SO4	ICPWATVAR (Dissolved)	3	mg/l	U		101		117		129		110
Benzene HS_1D_AR	BTEXHSA	0.01	mg/kg^	UM			<0.017		<0.016		<0.016	
Ethylbenzene HS_1D_AR	BTEXHSA	0.01	mg/kg^	UM			<0.017		<0.016		<0.016	
m/p-Xylene HS_1D_AR	BTEXHSA	0.02	mg/kg^	UM			<0.034		<0.032		<0.031	
o-Xylene HS_1D_AR	BTEXHSA	0.01	mg/kg^	UM			<0.017		<0.016		<0.016	
Toluene HS_1D_AR	BTEXHSA	0.01	mg/kg^	UM			<0.017		<0.016		<0.016	
Total BTEX HS_1D_AR	BTEXHSA	0.06	mg/kg^	UM			<0.102		<0.096		<0.094	
Acenaphthene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Acenaphthylene	PAHMSUS	0.08	mg/kg^	U			<0.14		<0.13		<0.13	
Anthracene	PAHMSUS	0.08	mg/kg^	U			<0.14		<0.13		<0.13	
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Chrysene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	004	005		006		007	
					Customer ID	MPSS4	MPSS5		MPSS6		MPSS7	
					Sample Type	SOLID	LPL	SOLID	LPL	SOLID	LPL	SOLID
					Sampling Date	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Selenium as Se	ICPMSW (Dissolved)	0.001	mg/l	U			<0.001		<0.001		<0.001	
Zinc as Zn	ICPMSW (Dissolved)	0.002	mg/l	U			0.004		0.003		0.002	
Barium as Ba	ICPWATVAR (Dissolved)	0.01	mg/l	U			<0.01		<0.01		<0.01	
Total Sulphur as SO4	ICPWATVAR (Dissolved)	3	mg/l	U			83		99		82	
Benzene HS_1D_AR	BTEXHSA	0.01	mg/kg^	UM		<0.014		<0.014		<0.018		<0.017
Ethylbenzene HS_1D_AR	BTEXHSA	0.01	mg/kg^	UM		<0.014		<0.014		<0.018		<0.017
m/p-Xylene HS_1D_AR	BTEXHSA	0.02	mg/kg^	UM		<0.029		<0.027		<0.036		<0.034
o-Xylene HS_1D_AR	BTEXHSA	0.01	mg/kg^	UM		<0.014		<0.014		<0.018		<0.017
Toluene HS_1D_AR	BTEXHSA	0.01	mg/kg^	UM		<0.014		<0.014		<0.018		<0.017
Total BTEX HS_1D_AR	BTEXHSA	0.06	mg/kg^	UM		<0.086		<0.082		<0.106		<0.101
Acenaphthene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Acenaphthylene	PAHMSUS	0.08	mg/kg^	U		<0.11		<0.11		<0.14		<0.14
Anthracene	PAHMSUS	0.08	mg/kg^	U		<0.11		<0.11		<0.14		<0.14
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Chrysene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14

SOCOTEC

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

UKAS TESTING 1252

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	MPSS1		MPSS2		MPSS3		MPSS4
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	20/04/2023
Coronene	PAHMSUS	0.08	mg/kg^	N			<0.14		<0.13		<0.13	
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Fluoranthene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Fluorene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Naphthalene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Phenanthrene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Pyrene	PAHMSUS	0.08	mg/kg^	UM			<0.14		<0.13		<0.13	
Total PAH 16	PAHMSUS	1.28	mg/kg^	U			<2.17		<2.05		<2.00	
Total PAH 17	PAHMSUS	1.36	mg/kg^	N			<2.31		<2.18		<2.13	
PCB 101	PCBECD	0.005	mg/kg^	UM			<0.008		<0.008		<0.008	
PCB 118	PCBECD	0.005	mg/kg^	UM			<0.008		<0.008		<0.008	
PCB 138	PCBECD	0.005	mg/kg^	UM			<0.008		<0.008		<0.008	
PCB 153	PCBECD	0.005	mg/kg^	UM			<0.008		<0.008		<0.008	
PCB 180	PCBECD	0.005	mg/kg^	UM			<0.008		<0.008		<0.008	
PCB 28	PCBECD	0.005	mg/kg^	UM			<0.008		<0.008		<0.008	
PCB 52	PCBECD	0.005	mg/kg^	UM			<0.008		<0.008		<0.008	
Total PCB 7 Congeners	PCBECD	0.035	mg/kg^	UM			<0.059		<0.056		<0.055	
>C10-C40 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	20	mg/kg^	U			42.6		39.5		47.3	

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

UKAS TESTING 1252

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	004	005		006		007	
					Customer ID	MPSS4	MPSS5		MPSS6		MPSS7	
					Sample Type	SOLID	LPL	SOLID	LPL	SOLID	LPL	SOLID
					Sampling Date	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Coronene	PAHMSUS	0.08	mg/kg^	N		<0.11		<0.11		<0.14		<0.14
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Fluoranthene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Fluorene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Naphthalene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Phenanthrene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Pyrene	PAHMSUS	0.08	mg/kg^	UM		<0.11		<0.11		<0.14		<0.14
Total PAH 16	PAHMSUS	1.28	mg/kg^	U		<1.83		<1.75		<2.27		<2.15
Total PAH 17	PAHMSUS	1.36	mg/kg^	N		<1.94		<1.86		<2.41		<2.29
PCB 101	PCBECD	0.005	mg/kg^	UM		<0.007		<0.007		<0.009		<0.008
PCB 118	PCBECD	0.005	mg/kg^	UM		<0.007		<0.007		<0.009		<0.008
PCB 138	PCBECD	0.005	mg/kg^	UM		<0.007		<0.007		<0.009		<0.008
PCB 153	PCBECD	0.005	mg/kg^	UM		<0.007		<0.007		<0.009		<0.008
PCB 180	PCBECD	0.005	mg/kg^	UM		<0.007		<0.007		<0.009		<0.008
PCB 28	PCBECD	0.005	mg/kg^	UM		<0.007		<0.007		<0.009		<0.008
PCB 52	PCBECD	0.005	mg/kg^	UM		<0.007		<0.007		<0.009		<0.008
Total PCB 7 Congeners	PCBECD	0.035	mg/kg^	UM		<0.050		<0.048		<0.062		<0.059
>C10-C40 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	20	mg/kg^	U		<28.6		32.4		<35.5		<33.7

SOCOTEC

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

UKAS TESTING 1252

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	MPSS1		MPSS2		MPSS3		MPSS4
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	20/04/2023
Total TPH >C8-C40 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	20	mg/kg^	U		43.6		40.3		48.4		
Total Moisture at 35°C	CLANDPREP	0.1	%	N		41.1		37.5		36.1		
Description of Solid Material	CLANDPREP		-	N		SILT		SILT		SILT		
Equivalent Weight of Dry Material (kg)	Leachate Prep CEN 10:1		kg	N		0.090		0.090		0.090		
Fraction above 4mm (%)	Leachate Prep CEN 10:1		%	N		0		0		0		
Fraction of non-crushable material (%)	Leachate Prep CEN 10:1		%	N		0		0		0		
Volume of Water for 10:1 Leach (ltr)	Leachate Prep CEN 10:1		l	N		0.829		0.844		0.843		
Weight of Sample Leached (kg)	Leachate Prep CEN 10:1		kg	N		0.161		0.146		0.147		
WAC Report	WAC		-	N		See Attached		See Attached		See Attached		

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	004	005		006		007	
					Customer ID	MPSS4	MPSS5		MPSS6		MPSS7	
					Sample Type	SOLID	LPL	SOLID	LPL	SOLID	LPL	SOLID
					Sampling Date	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Total TPH >C8-C40 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	20	mg/kg^	U		<28.6		33.4		<35.5		<33.7
Total Moisture at 35°C	CLANDPREP	0.1	%	N		30.0		26.9		43.6		40.6
Description of Solid Material	CLANDPREP		-	N		SILT		SILT		SILT		SILT
Equivalent Weight of Dry Material (kg)	Leachate Prep CEN 10:1		kg	N		0.090		0.090		0.090		0.090
Fraction above 4mm (%)	Leachate Prep CEN 10:1		%	N		0		0		0		0
Fraction of non-crushable material (%)	Leachate Prep CEN 10:1		%	N		0		0		0		0
Volume of Water for 10:1 Leach (ltr)	Leachate Prep CEN 10:1		l	N		0.857		0.854		0.827		0.846
Weight of Sample Leached (kg)	Leachate Prep CEN 10:1		kg	N		0.133		0.136		0.163		0.144
WAC Report	WAC		-	N		See Attached		See Attached		See Attached		See Attached

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	Port of Waterford Company	
Site	Soil Analysis	
Project	23051381	
Sample No	Sample Description	Issue Date
23051381-001	MPSS1	26/05/2023

Leaching Data	
Weight of Sample (kg)	0.161
Moisture content @ 105°C (% Wet Weight)	43.9
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (ltres)	0.829
Fraction of sample above 4mm %	0
Fraction of non-crushable material %	0

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
U	WSLM59	Total Organic Carbon (% M/M)	1.00	3	5	6
N	LOI450	Loss on Ignition (%)	5.5			10
UM	BTEXHSA	Sum of BTEX (mg/kg)	<0.102	6		
UM	PCBUSECD	Sum of 7 Congener PCBs (mg/kg)	<0.059	1		
U	TPHFIDUS	>C10-C40 Aliphatic (mg/kg) EH_1D_AL	42.6	500		
N	PAHMSUS	Sum of 17 PAHs (mg/kg)	<2.31	100		
UM	PHSOIL	pH (pH Units)	7.8		>6	
N	ANC	Acid Neutralisation Capacity (mol/kg)	3.04		To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	10:1 Single Stage Leachate	Cumulative Amount Leached at 10:1	Landfill Waste Acceptance Criteria Limit Values		
			mg/l except **	mg/kg (dry wt)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM3**	pH (pH Units)	8.1				
N	WSLM2**	Conductivity (µS/cm)	3060				
U	ICPMSW	Arsenic	0.004	0.04	0.5	2	25
U	ICPWATVAR	Barium	<0.10	<1.0	20	100	300
U	ICPMSW	Cadmium	0.00002	<0.0002	0.04	1	5
U	ICPMSW	Chromium	<0.001	<0.01	0.5	10	70
U	ICPMSW	Copper	<0.001	<0.01	2	50	100
U	ICPMSW	Mercury	<0.00003	<0.0003	0.01	0.2	2
U	ICPMSW	Molybdenum	0.006	0.06	0.5	10	30
U	ICPMSW	Nickel	<0.001	<0.01	0.4	10	40
U	ICPMSW	Lead	<0.001	<0.01	0.5	10	50
U	ICPMSW	Antimony	0.001	<0.01	0.06	0.7	5
U	ICPMSW	Selenium	<0.001	<0.01	0.1	0.5	7
U	ICPMSW	Zinc	<0.002	<0.02	4	50	200
U	KONENS	Chloride	806	7780	800	15000	25000
U	ISEF	Fluoride	0.4	4	10	150	500
U	ICPWATVAR	Sulphate as SO4	101	975	1000	20000	50000
N	WSLM27	Total Dissolved Solids	2080	20100	4000	60000	100000
U	SFAPI	Phenol Index	<0.05	<0.5	1		
U	WSLM13	Dissolved Organic Carbon	7.77	75.0	500	800	1000

Tests where the accreditation is set to U are UKAS accredited, those where the accreditation is set to N are not UKAS accredited.
Calculated data is not UKAS accredited
Landfill Waste Acceptance Criteria limit values correct as of 11th March 2009.

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Clidnt	7ort ops atdrporh CoVmanD	
Wtd	Wbil enalDyiy	
7rojdct	µU1E3U03	
WaVmld - o	WaVmld Bdycrimtion	Nyyl d Batd
µU1E3U03R1µ	M7WWµ	µ8/1E/µ1µU

fdacSing Bata	
s digSt opWaVmld (Pg)	1.358
Moiytl rd contdnt @ 31E°C (% s dt s digSt)	U0.U
Xql iHaldnt <digSt baydh on hrDing @ 31E°C (Pg)	1.161
uoll Vd ops atdr rdql irdh por 31v8 ytagd (ltrdy)	1.055
>raction opyaVmld aboHd 5VV %	1
>raction opnonRcrl ySabld Vatdrial %	1

Note: The >4mm fraction is crushed using a disc mill

ecrdhitation	MdtSoh Cohd	Wblih s aytd enalDyiy (BrDLayiy)	Concdntration in Wblih (BrDs digSt Layiy)	fanhpill s aytd eccdmtancd Critdria fiVit uall dy		
				Nidrt s aytd fanhpill	Wtabld - onRvdactiHd za4arhol y s aytd in - onRza4arhol y fanhpill	za4arhol y s aytd fanhpill
A	s WfME6	Total Organic Carbon (% M/M)	1.0U	U	E	8
-	fONSE1	foyy on Ngnition (%)	5.8			31
AM	LTXkzWe	WlV opLTXk (Vg/Pg)	91.168	8		
AM	7CLAWXCB	WlV opF Congdndr 7CLy (Vg/Pg)	91.1E8	3		
A	T7z>NBAW	_C31RC51 elimSatic (Vg/Pg) Xz*3B*ef	U6.E	E11		
-	7ezMWAW	WlV op3F 7ezy (Vg/Pg)	9µ.30	311		
AM	7zWONl	mz (mz Anity)	F.F		_8	
-	e- C	ecih - dl traliyation CamacitD(Vol/Pg)	U.3µ		To bd dHall atdh	To bd dHall atdh

ecrdhitation	MdtSoh Cohd	fdacSatd enalDyiy	31v8 Wingld Wtagd fdacSatd	Cl Vl latiHd eVol nt fdacSdh at 31v8	fanhpill s aytd eccdmtancd Critdria fiVit uall dy		
			Vg/l d: cdmt 22	Vg/Pg (hrD<t)	Nidrt s aytd fanhpill	Wtabld - onRvdactiHd za4arhol y s aytd in - onRza4arhol y fanhpill	za4arhol y s aytd fanhpill
-	s WfMU22	mz (mz Anity)	0.1				
-	s WfMµ22	ConhlctiHtD(ZWcV)	µµ61				
A	NC7MWs	erydnic	1.11U	1.1U	1.E	µ	µE
A	NC7s eTuev	Laril V	91.13	91.3	µ1	311	U11
A	NC7MWs	CahVil V	1.1111µ	91.111µ	1.15	3	E
A	NC7MWs	CSroVil V	91.113	91.13	1.E	31	F1
A	NC7MWs	Commdr	91.113	91.13	µ	E1	311
A	NC7MWs	MdrclrD	91.1111U	91.111U	1.13	1.µ	µ
A	NC7MWs	MolDbhdnl V	1.11E	1.1E	1.E	31	U1
A	NC7MWs	-icPdl	91.113	91.13	1.5	31	51
A	NC7MWs	fdah	91.113	91.13	1.E	31	E1
A	NC7MWs	entiVonD	91.113	91.13	1.18	1.F	E
A	NC7MWs	Wdldnil V	91.113	91.13	1.3	1.E	F
A	NC7MWs	Kinc	91.11µ	91.1µ	5	E1	µ11
A	xO- X- W	CSlorihd	E6E	E031	011	3E111	µE111
A	NWX>	>Il orihd	1.5	5	31	3E1	E11
A	NC7s eTuev	WlmSatd ay WO5	33F	3351	3111	µ1111	E1111
-	s WfMµF	Total BiyyolHdh Wblihy	3E81	3Eµ11	5111	81111	311111
A	W>e7N	7Sdnol Nihd:	91.1E	91.E	3		
A	s WfM3U	BiyyolHdh Organic Carbon	8.U8	8µ.3	E11	011	3111

Tdyty <Sdrd tSd accrdhitation iy ydt to A ard Axe Waccrdhitdh, tSoyd <Sdrd tSd accrdhitation iy ydt to - ard not Axe Waccrdhitdh.
Calcl latdh hata iy not Axe Waccrdhitdh
fanhpill s aytd eccdmtancd Critdria liVit Hall dy corrdct ay op33tS MarcS µ116.

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	Port of Waterford Company	
Site	Soil Analysis	
Project	µ*15_*6_	
Sample No	Sample Description	Issue Date
µ*15_*6_-11*	MPSS*	µ0/15/µ1µ*

Leaching Data	
Weight of Sample (kg)	1._47
Moisture content @ _15°C (% Wet Weight)	*6.6
Equivalent <eight based on drying @ _15°C (kg)	1.181
Volume of Water required for _1w stage (ltres)	1.64*
Fraction of sample above 4mm %	1
Fraction of non-crushable material %	1

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
U	WSLM58	Total Organic Carbon (% M/M)	1.01	*	5	0
N	LOI451	Loss on Ignition (%)	4._			1
UM	BTEXHSA	Sum of BTEX (mg/kg)	91.184	0		
UM	PCBUSECD	Sum of 7 Congener PCBs (mg/kg)	91.155	_		
U	TPHFIDUS	>C_1-C41 Aliphatic (mg/kg) EH3_D3AL	47.*	511		
N	PAHMSUS	Sum of _7 PAHs (mg/kg)	9µ._*	_11		
UM	PHSOIL	pH (pH Units)	7.7		>0	
N	ANC	Acid Neutralisation Capacity (mol/kg)	µ.7µ		To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	_1w Single Stage Leachate	Cumulative Amount Leached at _1w	Landfill Waste Acceptance Criteria Limit Values		
			mg/l e: cept 22	mg/kg (dry <t)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM*22	pH (pH Units)	7.8				
N	WSLMµ22	Conductivity (ZS/cm)	µ_81				
U	ICPMSW	Arsenic	1.11µ	1.1µ	1.5	µ	µ5
U	ICPWATVAR	Barium	91.1_	91._	µ1	_11	*11
U	ICPMSW	Cadmium	1.1111*	1.111*	1.14	_	5
U	ICPMSW	Chromium	91.11_	91.1_	1.5	_1	71
U	ICPMSW	Copper	91.11_	91.1_	µ	51	_11
U	ICPMSW	Mercury	91.1111*	91.111*	1.1_	1.µ	µ
U	ICPMSW	Molybdenum	1.115	1.15	1.5	_1	*1
U	ICPMSW	Nickel	91.11_	91.1_	1.4	_1	41
U	ICPMSW	Lead	91.11_	91.1_	1.5	_1	51
U	ICPMSW	Antimony	91.11_	91.1_	1.10	1.7	5
U	ICPMSW	Selenium	91.11_	91.1_	1._	1.5	7
U	ICPMSW	Kinc	1.11µ	91.1µ	4	51	µ11
U	x ONENS	Chloride	548	5*01	611	_5111	µ5111
U	ISEF	Fluoride	1.4	4	_1	_51	511
U	ICPWATVAR	Sulphate as SO4	_µ8	_µ01	_111	µ1111	51111
N	WSLMµ7	Total Dissolved Solids	_481	_4511	4111	01111	_11111
U	SFAPI	Phenol Inde:	91.15	91.5	_		
U	WSLM_*	Dissolved Organic Carbon	5.11	46.6	511	611	_111

Tests <here the accreditation is set to U are Ux AS accredited, those <here the accreditation is set to N are not Ux AS accredited.
Calculated data is not Ux AS accredited
Landfill Waste Acceptance Criteria limit values correct as of __th March µ118.

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	7ort of Waterford Company	
Site	Soil Analysis	
7roject	µ*E51*91	
Sample No	Sample Description	Issue Date
µ*E51*91-EE4	M7SS4	µ0/E5/µEµ*

Leaching Data	
Weight of Sample (Pg)	E.1**
Moisture content @ 1E5°C (% Wet Weight)	*µ.*
Xquivalent <eight based on drying @ 1E5°C (Pg)	E.E6E
Volume of Water required for 1Ewl stage (ltres)	E.95F
>raction of sample above 4mm %	E
>raction of non-crushable material %	E

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
U	WSLM56	Total Organic Carbon (% M/M)	1.10	*	5	0
N	LOI45E	Loss on Ignition (%)	*.*			1E
UM	BTXk HSA	Sum of BTXk (mg/Pg)	8E.E90	0		
UM	7CBUSXCD	Sum of F Congener 7CBs (mg/Pg)	8E.E5E	1		
U	T7H>IDUS	_C1E-C4E Aliphatic (mg/Pg) XH31D3AL	8µ9.0	5EE		
N	7AHMSUS	Sum of 1F 7AHs (mg/Pg)	81.64	1EE		
UM	7HSOIL	pH (pH Units)	F.F		_0	
N	ANC	Acid Neutralisation Capacity (mol/Pg)	4.9E		To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	1Ewl Single Stage Leachate	Cumulative Amount Leached at 1Ewl	Landfill Waste Acceptance Criteria Limit Values		
			mg/l e: cept 22	mg/Pg (dry <t)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM*22	pH (pH Units)	9.E				
N	WSLMµ22	Conductivity (ZS/cm)	1F9E				
U	IC7MSW	Arsenic	E.EE*	E.E*	E.5	µ	µ5
U	IC7WATVAR	Barium	8E.E1	8E.1	µE	1EE	*EE
U	IC7MSW	Cadmium	8E.EEEEµ	8E.EEEµ	E.E4	1	5
U	IC7MSW	Chromium	8E.EE1	8E.E1	E.5	1E	FE
U	IC7MSW	Copper	8E.EE1	8E.E1	µ	5E	1EE
U	IC7MSW	Mercury	8E.EEEE*	8E.EEE*	E.E1	E.µ	µ
U	IC7MSW	Molybdenum	E.EE*	E.E*	E.5	1E	*E
U	IC7MSW	NicPel	8E.EE1	8E.E1	E.4	1E	4E
U	IC7MSW	Lead	8E.EE1	8E.E1	E.5	1E	5E
U	IC7MSW	Antimony	8E.EE1	8E.E1	E.E0	E.F	5
U	IC7MSW	Selenium	8E.EE1	8E.E1	E.1	E.5	F
U	IC7MSW	Kinc	E.EEµ	8E.Eµ	4	5E	µEE
U	xONXNS	Chloride	4*F	4**EE	9EE	15EEE	µ5EEE
U	ISX>	>luoride	E.*	*	1E	15E	5EE
U	IC7WATVAR	Sulphate as SO4	11E	1E9E	1EEE	µEEEE	5EEEE
N	WSLMµF	Total Dissolved Solids	1µ1E	116EE	4EEE	0EEEE	1EEEEE
U	S>A7I	7henol Inde:	8E.E5	8E.5	1		
U	WSLM1*	Dissolved Organic Carbon	5.µ*	51.5	5EE	9EE	1EEE

Tests <here the accreditation is set to U are Ux AS accredited, those <here the accreditation is set to N are not Ux AS accredited.
Calculated data is not Ux AS accredited
Landfill Waste Acceptance Criteria limit values correct as of 11th March µEE6.

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	7ort of Waterford Company	
Site	Soil Analysis	
7roqect	23E513<1	
Sample No	Sample Description	Issue Date
23E513<1-EE5	M7SS5	28/E5/2E23

Leaching Data	
Weight of Sample (Pg)	E.138
Moisture content 6 1E5@C (% Wet Weight)	33.<
X° uivalent weight based on drying 6 1E5@C (Pg)	E.Ej E
Volume of Water re° uired for 1E:1 stage (ltres)	E.<54
Fraction of sample above 4mm %	E
Fraction of non-crushable material %	E

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
U	WSLM5j	Total Organic Carbon (% M/M)	1.10	3	5	8
N	LOI45E	Loss on Ignition (%)	3.1			1E
UM	BTXk HSA	Sum of BTXk (mg/Pg)	9E.E<2	8		
UM	7CBUSXCD	Sum of 0 Congener 7CBs (mg/Pg)	9E.E4<	1		
U	T7HFIDUS	>C1E-C4E Aliphatic (mg/Pg) XH_1D_AL	32.4	5EE		
N	7AHMSUS	Sum of 10 7AHs (mg/Pg)	91.<8	1EE		
UM	7HSOIL	pH (pH Units)	0.0		>8	
N	ANC	Acid Neutralisation Capacity (mol/Pg)	5.<4		To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	1E:1 Single Stage Leachate	Cumulative Amount Leached at 1E:1	Landfill Waste Acceptance Criteria Limit Values		
			mg/l except **	mg/Pg (dry wt)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM3**	pH (pH Units)	<.1				
N	WSLM2**	Conductivity (µS/cm)	1<0E				
U	IC7MSW	Arsenic	E.EE3	E.E3	E.5	2	25
U	IC7WATVAR	Barium	9E.E1	9E.1	2E	1EE	3EE
U	IC7MSW	Cadmium	E.EEEE3	E.EEE3	E.E4	1	5
U	IC7MSW	Chromium	9E.EE1	9E.E1	E.5	1E	0E
U	IC7MSW	Copper	E.EE2	E.E2	2	5E	1EE
U	IC7MSW	Mercury	9E.EEEE3	9E.EEE3	E.E1	E.2	2
U	IC7MSW	Molybdenum	E.EE2	E.E2	E.5	1E	3E
U	IC7MSW	NicPel	E.EE1	9E.E1	E.4	1E	4E
U	IC7MSW	Lead	9E.EE1	9E.E1	E.5	1E	5E
U	IC7MSW	Antimony	9E.EE1	9E.E1	E.E8	E.0	5
U	IC7MSW	Selenium	9E.EE1	9E.E1	E.1	E.5	0
U	IC7MSW	Zinc	E.EE4	E.E4	4	5E	2EE
U	KONXNS	Chloride	481	453E	<EE	15EEE	25EEE
U	ISXF	Fluoride	E.3	3	1E	15E	5EE
U	IC7WATVAR	Sulphate as SO4	<3	<18	1EEE	2EEEE	5EEEE
N	WSLM20	Total Dissolved Solids	120E	125EE	4EEE	8EEEE	1EEEEE
U	SFA7I	7henol Index	9E.E5	9E.5	1		
U	WSLM13	Dissolved Organic Carbon	8.5<	84.0	5EE	<EE	1EEE

Tests where the accreditation is set to U are UKAS accredited, those where the accreditation is set to N are not UKAS accredited.
Calculated data is not UKAS accredited
Landfill Waste Acceptance Criteria limit values correct as of 11th March 2EEj .

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	7ort of Waterford Company	
Site	Soil Analysis	
7roject	0*E51*81	
Sample No	Sample Description	Issue Date
0*E51*81-EE<	M7SS<	0</E5/0E0*

Leaching Data	
Weight of Sample (Pg)	E.1<*
Moisture content @ 1E5°C (% Wet Weight)	44.8
Xquivalent weight based on drying @ 1E5°C (Pg)	E.E6E
Volume of Water required for 1E:1 stage (ltres)	E.80F
>raction of sample above 4mm %	E
>raction of non-crushable material %	E

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
U	WSLM56	Total Organic Carbon (% M/M)	1.01	*	5	<
N	LOI45E	Loss on Ignition (%)	5.F			1E
UM	BTXk HSA	Sum of BTXk (mg/Pg)	9E.1E<	<		
UM	7CBUSXCD	Sum of F Congener 7CBs (mg/Pg)	9E.E<0	1		
U	T7H>IDUS	_C1E-C4E Aliphatic (mg/Pg) XH31D3AL	9*5.5	5EE		
N	7AHMSUS	Sum of 1F 7AHs (mg/Pg)	90.41	1EE		
UM	7HSOIL	pH (pH Units)	F.4		_<	
N	ANC	Acid Neutralisation Capacity (mol/Pg)	0.5<		To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	1E:1 Single Stage Leachate	Cumulative Amount Leached at 1E:1	Landfill Waste Acceptance Criteria Limit Values		
			mg/l except 22	mg/Pg (dry wt)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM*22	pH (pH Units)	8.E				
N	WSLM022	Conductivity (µS/cm)	0*EE				
U	IC7MSW	Arsenic	E.EE4	E.E4	E.5	0	05
U	IC7WATVAR	Barium	9E.E1	9E.1	0E	1EE	*EE
U	IC7MSW	Cadmium	9E.EEEE0	9E.EEE0	E.E4	1	5
U	IC7MSW	Chromium	9E.EE1	9E.E1	E.5	1E	FE
U	IC7MSW	Copper	9E.EE1	9E.E1	0	5E	1EE
U	IC7MSW	Mercury	9E.EEEE*	9E.EEE*	E.E1	E.0	0
U	IC7MSW	Molybdenum	E.EE<	E.E<	E.5	1E	*E
U	IC7MSW	NicPel	9E.EE1	9E.E1	E.4	1E	4E
U	IC7MSW	Lead	9E.EE1	9E.E1	E.5	1E	5E
U	IC7MSW	Antimony	9E.EE1	9E.E1	E.E<	E.F	5
U	IC7MSW	Selenium	9E.EE1	9E.E1	E.1	E.5	F
U	IC7MSW	Zinc	E.EE*	E.E*	4	5E	0EE
U	KONXNS	Chloride	586	5<8E	8EE	15EEE	05EEE
U	ISX>	>luoride	E.*	*	1E	15E	5EE
U	IC7WATVAR	Sulphate as SO4	66	654	1EEE	0EEEE	5EEEE
N	WSLM0F	Total Dissolved Solids	15<E	15EEE	4EEE	<EEEE	1EEEEE
U	S>A7I	7henol Index	9E.E5	9E.5	1		
U	WSLM1*	Dissolved Organic Carbon	<.8<	<<.1	5EE	8EE	1EEE

Tests where the accreditation is set to U are UKAS accredited, those where the accreditation is set to N are not UKAS accredited.
Calculated data is not UKAS accredited
Landfill Waste Acceptance Criteria limit values correct as of 11th March 0EE6.

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Clidnt	7ort ops atdrporh CoVmanD	
Wtd	Wbil enalDyiy	
7rojdct	Z21E32U3	
WaVmld - o	WaVmld Bdycrimtion	Nyyl d Batd
Z21E32U3R11F	M7WWF	Z8/1E/Z1Z2

fdacSing Bata	
s digSt opWaVmld (Pg)	1.355
Moiytl rd contdnt @ 31E°C (% s dt s digSt)	2F.E
Xql iHaldnt 9digSt baydh on hrDing @ 31E°C (Pg)	1.101
uoll Vd ops atdr rdql irdh por 31<3 ytagd (ltrdy)	1.U58
>raction opyaVmld aboHd 5VV %	1
>raction opnonRcrl ySabld Vatdrial %	1

Note: The >4mm fraction is crushed using a disc mill

ecrdhitation	MdtSoh Cohd	Wolih s aytd enalDyiy (BrDLayiy)	Concdntration in Wolih (BrDs digSt Layiy)	fanhpill s aytd eccdmtancd Critdria fiVit uall dy		
				Nidrt s aytd fanhpill	Wtabld - onRvdactiHd za4arhol y s aytd in - onRza4arhol y fanhpill	za4arhol y s aytd fanhpill
A	s WfME0	Total Organic Carbon (% M/M)	1.0U	2	E	8
-	fONSE1	foyy on Mgnition (%)	E.3			31
AM	LTXkzWe	WlV opLTXk (Vg/Pg)	61.313	8		
AM	7CLAWXCB	WlV opF Congdndr 7CLy (Vg/Pg)	61.1E0	3		
A	T7z>NBAW	_C31RC51 elimSatic (Vg/Pg) Xz*3B*ef	622.F	E11		
-	7ezMWAW	WlV op3F 7ezy (Vg/Pg)	6Z.Z0	311		
AM	7zWONl	mz (mz Anity)	F.E		_8	
-	e-C	ecih - dl traliyation CamacitD(Vol/Pg)	Z.85		To bd dHall atdh	To bd dHall atdh

ecrdhitation	MdtSoh Cohd	fdacSatd enalDyiy	31<3 Wingld Wtagd fdacSatd	CIVIlatiHd eVolnt fdacSdh at 31<3	fanhpill s aytd eccdmtancd Critdria fiVit uall dy		
			Vg/l dwcdmt µu	Vg/Pg (hrD9t)	Nidrt s aytd fanhpill	Wtabld - onRvdactiHd za4arhol y s aytd in - onRza4arhol y fanhpill	za4arhol y s aytd fanhpill
-	s WfM2µu	mz (mz Anity)	F.U				
-	s WfMZµu	ConhlctiHtD(KWcV)	3FU1				
A	NC7MWs	erydnic	1.112	1.12	1.E	Z	ZE
A	NC7seTuev	Laril V	61.13	61.3	Z1	311	211
A	NC7MWs	CahVil V	1.1111Z	61.111Z	1.15	3	E
A	NC7MWs	CSroVil V	61.113	61.13	1.E	31	F1
A	NC7MWs	Commdr	61.113	61.13	Z	E1	311
A	NC7MWs	MdrclrD	61.11112	61.1112	1.13	1.Z	Z
A	NC7MWs	MolDbhdnlV	1.11E	1.1E	1.E	31	21
A	NC7MWs	-icPdl	61.113	61.13	1.5	31	51
A	NC7MWs	fdah	61.113	61.13	1.E	31	E1
A	NC7MWs	entiVonD	61.113	61.13	1.18	1.F	E
A	NC7MWs	WdldnilV	61.113	61.13	1.3	1.E	F
A	NC7MWs	xinc	1.11Z	61.1Z	5	E1	Z11
A	:O-X-W	CSlorihd	552	5221	U11	3E111	ZE111
A	NWX>	>llorihd	1.2	2	31	3E1	E11
A	NC7seTuev	WlmSatd ay WO5	UZ	U1Z	3111	Z1111	E1111
-	s WfMZF	Total BiyyolHdh Wolihy	3Z31	33U11	5111	81111	311111
A	W>e7N	7Sdnol Nihdw	61.1E	61.E	3		
A	s WfM32	BiyyolHdh Organic Carbon	8.ZE	83.3	E11	U11	3111

Tdyty 9Sdrd tSd accrdhitation iy ydt to A ard A: eWaccrdhitdh, tSoyd 9Sdrd tSd accrdhitation iy ydt to - ard not A: eWaccrdhitdh.
CalcI latdh hata iy not A: eWaccrdhitdh
fanhpill s aytd eccdmtancd Critdria liVit Hall dy corrdct ay op33tS MarcS Z110.

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

Deviating Sample Report

Sample Reference	Text ID	Method Code	Incorrect Container	Incorrect Label	Headspace	Incorrect/No Preservative	No Sampling Date	Holding Time
MPSS1	23051381-001	**BTEXHSA**						✓
MPSS1	23051381-001	**PAHMSUS**						✓
MPSS1	23051381-001	**PHSOIL**						✓
MPSS1	23051381-001	**TPHFIDUS (Aliphatic)**						✓
MPSS1	23051381-001	**WSLM59**						✓
MPSS2	23051381-002	**BTEXHSA**						✓
MPSS2	23051381-002	**PAHMSUS**						✓
MPSS2	23051381-002	**PHSOIL**						✓
MPSS2	23051381-002	**TPHFIDUS (Aliphatic)**						✓
MPSS2	23051381-002	**WSLM59**						✓
MPSS3	23051381-003	**BTEXHSA**						✓
MPSS3	23051381-003	**PAHMSUS**						✓
MPSS3	23051381-003	**PHSOIL**						✓
MPSS3	23051381-003	**TPHFIDUS (Aliphatic)**						✓
MPSS3	23051381-003	**WSLM59**						✓
MPSS4	23051381-004	**BTEXHSA**						✓
MPSS4	23051381-004	**PAHMSUS**						✓
MPSS4	23051381-004	**PHSOIL**						✓
MPSS4	23051381-004	**TPHFIDUS (Aliphatic)**						✓
MPSS4	23051381-004	**WSLM59**						✓
MPSS5	23051381-005	**BTEXHSA**						✓
MPSS5	23051381-005	**PAHMSUS**						✓
MPSS5	23051381-005	**PHSOIL**						✓
MPSS5	23051381-005	**TPHFIDUS (Aliphatic)**						✓
MPSS5	23051381-005	**WSLM59**						✓
MPSS6	23051381-006	**BTEXHSA**						✓
MPSS6	23051381-006	**PAHMSUS**						✓
MPSS6	23051381-006	**PCBECD**						✓
MPSS6	23051381-006	**PHSOIL**						✓
MPSS6	23051381-006	**TPHFIDUS (Aliphatic)**						✓
MPSS6	23051381-006	**WSLM59**						✓
MPSS7	23051381-007	**BTEXHSA**						✓
MPSS7	23051381-007	**PAHMSUS**						✓

MPSS7	23051381-007	**PCBECD**						✓
MPSS7	23051381-007	**PHSOIL**						✓
MPSS7	23051381-007	**TPHFIDUS (Aliphatic)**						✓
MPSS7	23051381-007	**WSLM59**						✓

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

Analysis Method

Method Code	Method Description	Analysis Method
ANC	ANC: Acid Neutralisation Capacity (mol/kg)	Air Dried & Ground
BTEXHSA	BTEX for WAC by GCFID	As Received
CLANDPREP	Basic Solid Description	As Received
CLANDPREP	DW35 - CLand Prep and Dry Weight Correction to 35°C	As Received
ICPMSW (Dissolved)	Antimony (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Antimony in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Arsenic (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Arsenic in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Cadmium (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Cadmium in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Chromium (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Chromium in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Copper (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Copper in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Lead (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Lead in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Mercury (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Mercury in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Molybdenum (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Molybdenum in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Nickel (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Nickel in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Selenium (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Selenium in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Zinc (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Zinc in Solids (BSEN 12457-2)	Filtered
ICPWATVAR (Dissolved)	Barium (Diss.) in Lab Leachate by ICPOES	Filtered
ICPWATVAR (Dissolved)	Barium in Solids (BSEN 12457-2)	Filtered
ICPWATVAR (Dissolved)	Total Sulphur as SO4 (Diss.) in Lab Leachate	Filtered
ICPWATVAR (Dissolved)	Total Sulphur as SO4 in Solids (BSEN 12457-2)	Filtered
ISEF	Fluoride by ISE	Filtered
ISEF	Fluoride in Solids (BSEN 12457-2)	Filtered
KONENS	Chloride by Colorimetry	Filtered
KONENS	Chloride in Solids (BSEN 12457-2)	Filtered
Leachate Prep CEN 10:1	WAC Leachate Prep, 1-Stage 10:1 (BSEN 12457-2)	As Received
LOI(%MM)	LOI: Loss on Ignition @ 450°C	Air Dried & Ground
PAHMSUS	17 PAHs (inc. Coronene) for WAC by GCMS	As Received
PCBECD	PCBs, ICES 7 Congeners inc. Total Calculation	As Received
PHCONDW	Electrical Conductivity @ 25°C	Filtered
PHCONDW	pH	Filtered
PHCONDW	TDS: Total Dissolved Solids (Calc)	Filtered
PHCONDW	Total Dissolved Solids in Solids (BSEN 12457-2)	Filtered
PHSOIL	pH (2.5:1)	As Received
SFAPI	Phenol Index (Total) by SFA	Filtered
SFAPI	Phenol Index in Solids (BSEN 12457-2)	Filtered
TOCW	LOC: Leached Organic Carbon	Filtered
TPHFIDUS (Aliphatic)	TPH (>C8-C40) Aliphatic and Carbon Band (>C10-C40)	As Received
WAC	WAC Report	
WSLM13	Leached Organic Carbon in Solids (BSEN 12457-2)	Filtered
WSLM59	TOC: Total Organic Carbon	Air Dried & Ground

Client:	Port of Waterford Company
Project Name:	Port of Watford-Soil Analysis
Project No:	23051381
Date Issued:	26/05/2023

Result Report Notes

Letters alongside results signify that the result has associated report notes.
The report notes are as follows:

Letter	Note
A	Due to the matrix of the sample the laboratory has had to deviate from our standard protocols to be able to process the sample and provide a result. Where applicable the accreditation has been removed and this should be taken into consideration when utilising the data.
B	The QC associated with this result has not wholly met the QMS requirements, the accreditation has therefore been removed. However, the Laboratory has confidence in the performance of the method as a whole and that the integrity of the data has not been significantly compromised.
C	Due to matrix interference, the internal standard and/or surrogate has not met the QMS requirements. This should be taken into consideration when utilising the data.
D	A non-standard volume or mass has been used for this test which has resulted in a raised detection limit.
E	Due to the parameter value being beyond our calibration range (and following the maximum size of dilution allowed, where applicable), the result cannot be quantified and as such the result will appear as a greater than symbol (>) with the accreditation removed. This data should be used for indicative purposes only.
F	Based on the sample history, appearance and smell a dilution was applied prior to testing . Unfortunately, the result is either above (>) or below (<) our calibration range. Results above our calibration range have accreditation removed. The data should be used for indicative purposes only.
G	The day 5 oxygen reading was below the capability of the instrument to detect, and therefore the calculated BOD has been reported unaccredited for guidance purposes only.

HWOL Acronym Key

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e everything extracted by the solvent(s)
CU	Clean up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
+	Operator to indicate cumulative e.g. EH_CU+HS_1D_Total

Client: Port of Waterford Company
Project Name: Port of Watford-Soil Analysis
Project No: 23051381
Date Issued: 26/05/2023

Additional Information

This report refers to samples as received. SOCOTEC UK Ltd takes no responsibility for accuracy or competence of sampling by others.

Results within this report relate only to the samples tested.

The accreditation codes are as follows:

U = UKAS accredited analysis
M = MCERT accredited analysis
N = Unaccredited analysis

Any units marked with ^ signify results are reported on a dry weight basis of 35° C.

All Air Dried and Ground Samples (ADG) are oven dried at less than 35° C.

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Opinions and interpretations given are outside the scope of our UKAS accreditation.

Any samples marked with * are not covered by our scope of UKAS accreditation. If applicable, further report notes have been added.

Any solid samples where the Major Constituents are not one of the following (Sand, Silt, Clay, Made Ground) are not one of our accredited matrix types.

Any samples marked with ‡ have had MCERTS accreditation removed for this result

Any samples marked with a tick in the deviant table is deviant for the specific reason.

Any samples reported as IS, NA, ND mean the following:

IS = Insufficient Sample to complete analysis
NA = Sample is not amenable for the required analysis
ND = Results cannot be determined

Items listed with a 'SUB' method code prefix have been carried out by an external subcontracted laboratory.

Our deviating sample report does not include deviancy information for Subcontracted analysis. Please see the report from the subcontracted lab for information regarding any deviancies for this analysis.

Summaries of analysis methods are available upon request.

End of Certificate of Analysis

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01869

Issue Version: 1

Customer: Port of Waterford, Gorteens, Waterford, Ireland, X91 W0XW

Customer Reference: Port of Waterford - MPSS PSA

Date Sampled: 20-Apr-23

Date Samples Received: 04-May-23

Test Report Date: 26-May-23

Condition of samples: Ambient Satisfactory

Opinions and Interpretations expressed herein are outside the scope of our UKAS accreditaion
The results reported relate only to the sample tested
The results apply to the sample as received

JMColbourne

Authorised by: Jane Colbourne

Position: Customer Service Specialist

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Certificate of Analysis

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Test Report ID MAR01869
Issue Version 1
Customer Reference Port of Waterford - MPSS PSA

		Units	%	%	%
		Method No	SUB_01*	SUB_01*	SUB_01*
		Limit of Detection	N/A	N/A	N/A
		Accreditation	N	N	N
Client Reference:	SOCOTEC Ref:	Matrix	Gravel (>2mm)	Sand (63-2000 µm)	Silt (<63 µm)
MPSS1	MAR01869.001	Sediment	0.00	38.53	61.47
MPSS2	MAR01869.002	Sediment	0.00	49.79	50.21
MPSS3	MAR01869.003	Sediment	0.00	55.07	44.93
MPSS4	MAR01869.004	Sediment	13.63	45.35	41.02
MPSS5	MAR01869.005	Sediment	59.88	19.95	20.17
MPSS6	MAR01869.006	Sediment	0.00	40.85	59.15
MPSS7	MAR01869.007	Sediment	0.00	39.58	60.42

* See Report Notes

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Test Report ID MAR01869
Issue Version 1
Customer Reference Port of Waterford - MPSS PSA

REPORT NOTES

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
SUB_01*	MAR01869.001-007	Analysis was conducted by an approved subcontract laboratory.

DEVIATING SAMPLE STATEMENT

Deviation Code	Devation Definition	Sample ID	Deviation Details. The following information should be taken into consideration when using the data contained within this report
D1	Holding Time Exceeded	N/A	N/A
D2	Sample Contaminated through Damaged Packaging	N/A	N/A
D3	Sample Contaminated through Sampling	N/A	N/A
D4	Inappropriate Container/Packaging	N/A	N/A
D5	Damaged in Transit	N/A	N/A
D6	Insufficient Quantity of Sample	N/A	N/A
D7	Inappropriate Headspace	N/A	N/A
D8	Retained at Incorrect Temperature	N/A	N/A
D9	Lack of Date & Time of Sampling	N/A	N/A
D10	Insufficient Sample Details	N/A	N/A
D11	Sample integrity compromised or not suitable for analysis	N/A	N/A

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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR01869
Issue Version	1
Customer Reference	Port of Waterford - MPSS PSA

Method	Sample and Fraction Size	Method Summary
Particle Size Analysis	Wet Sediment	Wet and dry sieving followed by laser diffraction analysis.

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APPENDIX 8

APPENDIX 8-1

Port of Waterford

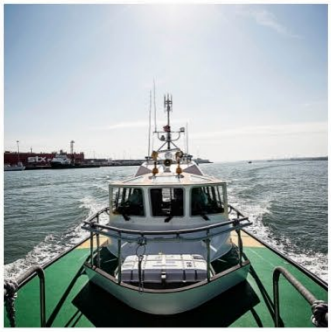
Port of Waterford: Belview Extension

Numerical hydrodynamic modelling

October 2024







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Port of Waterford: Belview Extension

Numerical hydrodynamic modelling

October 2024



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	Numerical hydrodynamic modelling	
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Prepared	Approved	Authorised
A M Fulford	J Coyle	H Roberts
	pp 	

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Contents

1 Introduction 1
1.1 Belview Port extension 1
1.2 Model updates 1
2 Method of Data Presentation 3
3 Scheme Modelling Results 4
3.1 Flow regime 4
3.2 Sediment transport 7
4 Conclusions 9
5 References 10

Figures

Figure 1. Indicative proposed layout of Belview Port extension 1
Figure 2. Proposed detail of Belview Port extension (typical cross-section) 1
Figure 3. Refined model mesh down-estuary of Belview, aligned to proposed extension scheme, with reclaim and sloped fronting seawall implemented within bathymetry 2
Figure 4. Predicted change in flow speed for peak flood (top) and peak ebb (bottom) on a mean spring tide 5
Figure 5. Hydrodynamic timeseries comparison at locations adjacent to Belview for baseline and scheme (quay extension) scenarios 6
Figure 6. Predicted change in bed shear stress (BSS) for peak flood (top) and peak ebb (bottom) on a mean spring tide 8

1 Introduction

The Port of Waterford (PoW) is considering the future options for development and improving efficiency (technical and financial) of existing operations. To complement and inform this Master Planning programme, the PoW has previously commissioned ABPmer to develop detailed estuary wide numerical hydrodynamic and sediment transport models (ABPmer, 2018). These models are capable of replicating the present environmental conditions, in order to assess the physical effects of on-going port operations (e.g. maintenance dredging and disposal) along with the changes that will result from potential development options (e.g. new berths).

This study has implemented these existing modelling tools to investigate the potential impacts arising from an extension to the quay at Belview Port.

The previous modelling study has been supported by the development of an estuary (conceptual) understanding. This creates the baseline information related to the on-going estuary processes, trends, and physical characteristics, and has aided the subsequent interpretation of the field survey measurements and modelling results, in the context of the natural physical environment and client objectives. The estuary (conceptual) understanding has been documented previously, in ABPmer 2017a. The model build and calibration has also been supported by an extensive survey campaign, which is described, along with presentation of the results, in ABPmer 2017b.

1.1 Belview Port extension

Scheme details – Comprises a down-estuary berth extension at Belview (as described below). It does not include any further marine works, either up estuary or down estuary of the wharves (noting that a number of additional marine elements have previously been assessed as part of the wider Master Planning works).

The Proposed Development will comprise of an Offshore Renewable Energy (ORE) Capable Terminal located on a 250 m wharf extension, ancillary works and biodiversity enhancement area (gross area 7.9949 ha), partly on land and partly in the near shore area of the coastal planning authority (Kilkenny County Council) at Port of Waterford, Belview, Co. Kilkenny. The 250 m extension to the existing wharves will be located at the container / bulk handling terminal at Belview Port, and will provide a continuation of the existing wharves, comprising a reinforced concrete suspended deck supported on reinforced concrete beams and steel piles with the structure extending into the River Suir (SAC) and partly on land with a retaining structure to the rear. The Proposed Development will require land reclamation, covering an area of ca. 1.25 ha using reclaimed material and quarried rock.

The proposed extent and layout of the extension is provided in Figure 1, with a typical cross-section through the extension also provided in Figure 2.

1.2 Model updates

As noted above, ABPmer have utilised the previous numerical modelling tools that were used to inform the PoW Master Planning options assessment (ABPmer, 2018). Whilst these previous studies have also included implementation of an extension to the existing Belview wharves, these previous assessments also included a number of other scheme elements (including turning circles, training walls and additional dredging). The present study provides an updated modelling assessment, covering just the wharf extension element.

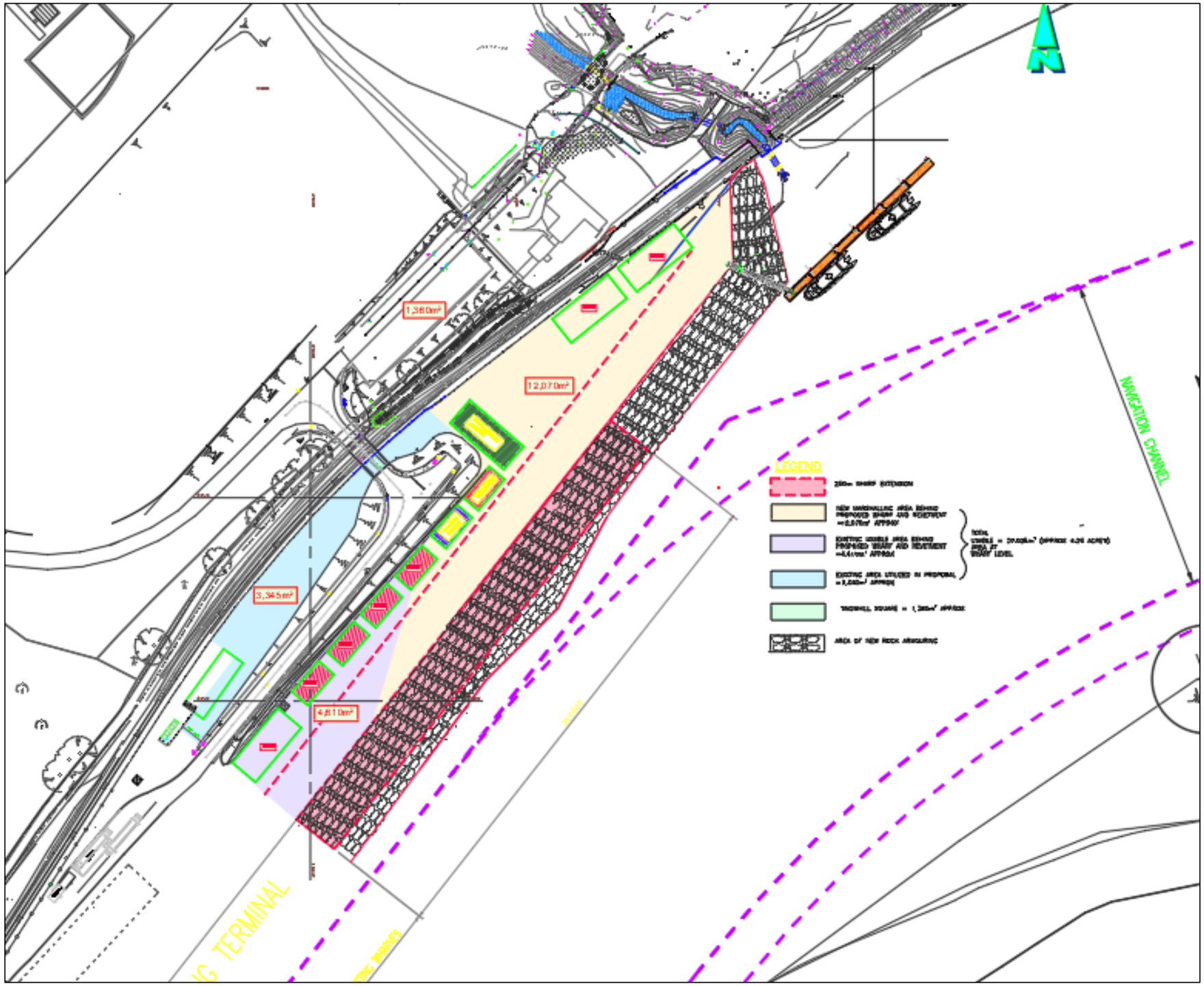


Figure 1. **Indicative proposed layout of Belview Port extension**

In order to suitably implement the proposed Belview quay extension, the following updates have been undertaken.

- Refine model mesh in the vicinity of the proposed quay extension to align cells with the proposed new sloping seawall and berth pocket (see Figure 3);
- The refined model mesh has been used to rerun the existing (baseline) scenario, in order to ensure model performance is maintained and to provide context to the predicted changes as a result of the quay extension scheme;
- The Belview quay extension has been implemented within the model bathymetry to represent:
  - the reclaimed area of quayside; and
  - the sloped fronting seawall.
- The proposed scheme scenario has been run through the model and differences to the updated baseline have been analysed to consider the potential changes (as a result of the scheme) on the existing hydrodynamic and sediment transport characteristics in the vicinity of Belview Port.

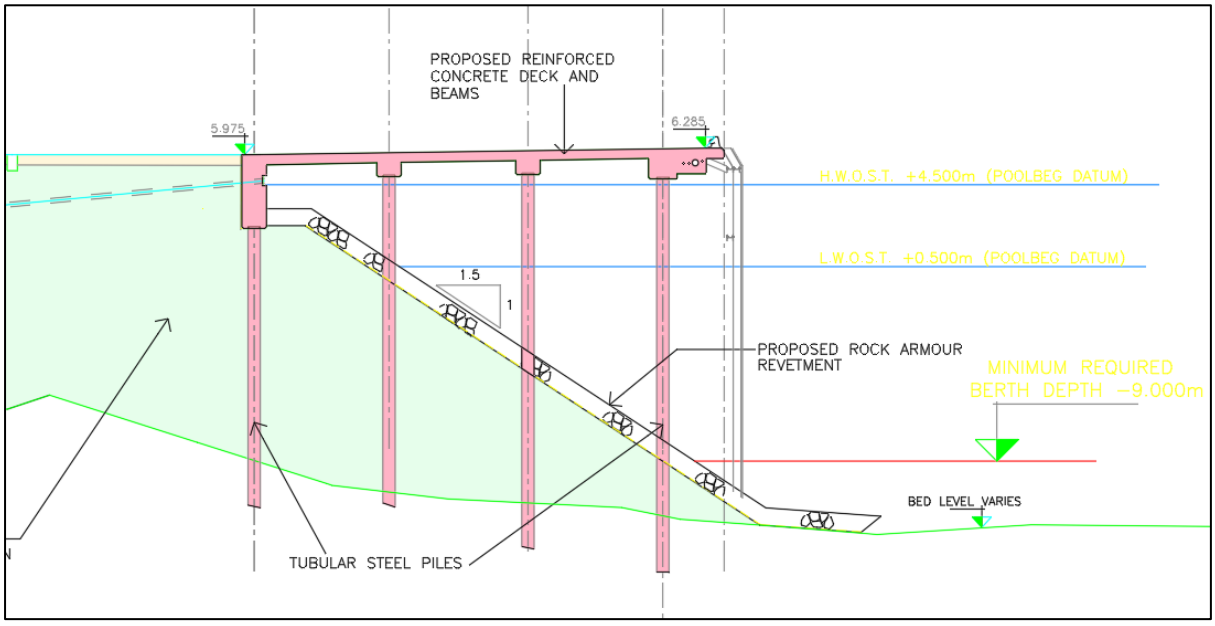


Figure 2. Proposed detail of Belview Port extension (typical cross-section)

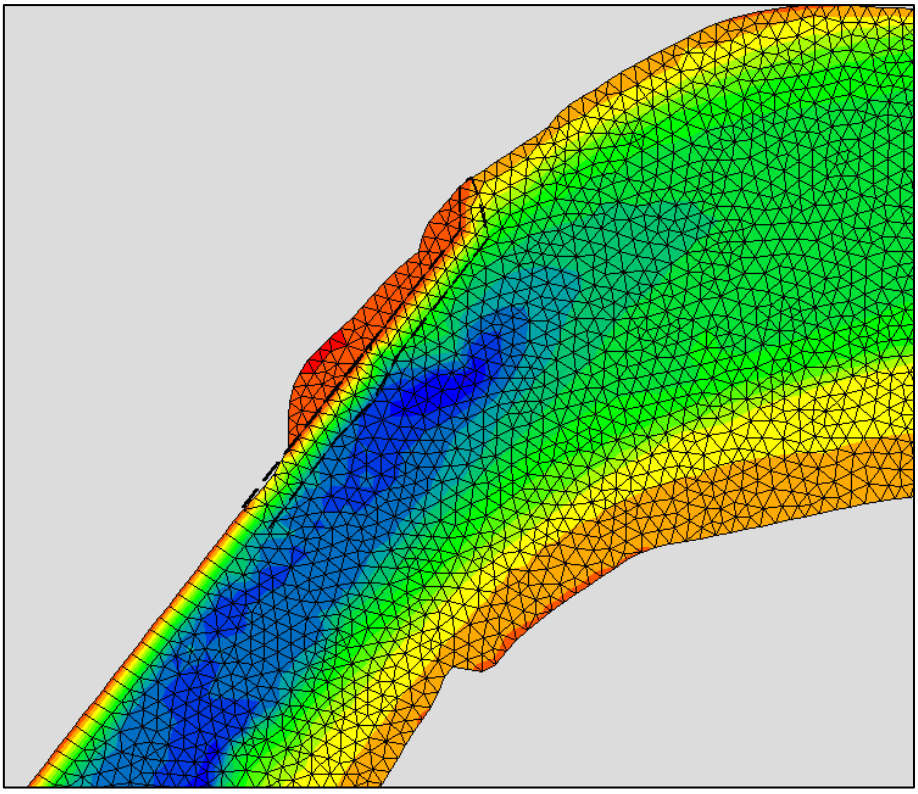


Figure 3. **Refined model mesh down-estuary of Belview, aligned to proposed extension scheme, with reclaim and sloped fronting seawall implemented within bathymetry**

2 Method of Data Presentation

To describe the predicted effects from the quay extension scheme at Belview, the absolute effects to the flows and bed shear stress are presented, as well as comparisons with the equivalent existing baseline conditions.

The most significant changes from the scheme have occurred during spring tides. Neap tide changes are much smaller in both extent and magnitude. For this reason, the modelling results for flows (magnitude and direction) and bed shear stresses have concentrated on the changes occurring on two consecutive spring tides, at the time of peak spring range, within the complete 15-day spring/neap cycle model run.

In keeping with the modelling undertaken previously for the Master Planning options assessment (ABPmer, 2018), two forms of output (described in the following sub-sections) are provided to illustrate the modelled effects of the proposed scheme. These are:

- Plan (map) plots; and
- Timeseries plots.

Together, these forms of output present the spatial (plan) and temporal changes resulting from the development scheme, on the different process parameters. This allows discussion of the scheme effects on port operations and other estuary uses and users, as well as quantification of effects.

Extracted timeseries locations have been selected in the main channel adjacent to the existing Belview Port and at up- and down-estuary locations. The up-estuary location is sited in the cut-back area between the Belview and O-Brien's wharves, whilst the down-estuary location is sited immediately to the northeast of the new quay extension, in front of the existing outfall for the drainage creek. These extraction locations are shown on the top panel of Figure 4.

The predicted changes, as a result of the proposed quay extension, are described in the following Section.

3 Scheme Modelling Results

The assessment of potential effects of the Belview Port extension has considered the changes to flows and bed shear stress, as compared to the existing (baseline) conditions.

The results from the two model runs (baseline and scheme) are compared together, with the resultant differences indicating the extent and magnitude of change resulting from the proposed scheme.

3.1 Flow regime

Comparison of the depth averaged flow vectors at peak flood and ebb flows in the vicinity of the Belview Port are almost identical between baseline and scheme scenarios. Figure 4 shows the predicted magnitude and extent of change in flow speed over the peak spring tides. The model results indicate that the effects of the proposed port expansion are predominantly confined to the areas immediately adjacent to the quay extension works, extending slightly into the main channel and up-estuary, along the line of the existing Belview quay wall. The flow speed changes at these peak flood and ebb spring tides are typically less than -0.3 m/s on the ebb tide and less than -0.6 m/s on the flood tide. The magnitude of change reduces with distance from the extension works, with no change in flow conditions predicted up- or down- estuary of Belview Port itself.

In general, predicted changes are slightly greater (in terms of both magnitude and extent) on the flood tide than on the ebb tide. Additionally, local changes on the spring tide are generally greater (approximately double the magnitude) than those exhibited over the neap tide.

The temporal differences, over two successive spring tides, is shown in the timeseries plots in Figure 5. Here, three extraction locations have been selected (shown in Figure 4):

- Main channel;
- Up-estuary; and
- Down-estuary

In each case, the timeseries of current speed and direction have been extracted for both the existing (baseline) and quay extension scenarios.

From these plots (Figure 5), it can be seen that the quay extension results in a very small (<0.1 m/s) increase in peak flood flow speed in the main channel, just off the north-eastern tip of the existing quay wall. Baseline flows in this area are around 1.0 m/s. This increase is limited to the peak flow period only, with negligible change in flow speeds predicted throughout the remainder of the tide. Within the main channel, changes to flow direction as a result of the scheme are also negligible throughout the tide, with no change in the overall phasing of flood and ebb states.

At the -up-estuary location (Figure 5), between the wharves at Belview and O'Brien's, the north-easterly extension of quay at Belview has only negligible effect on the flow regime (reduction in peak flood flow speed of < 0.01 m/s). There is no predicted change in flow direction at this location.

Close to the proposed quay extension, at the 'down-estuary' extraction point, changes in flow speed are slightly larger (Figure 5). Peak flood speeds are predicted to reduce by up to 0.03 m/s (compared to baseline flows of around 0.2 to 0.3 m/s), with a similar magnitude reduction on peak ebb. In addition,

the phasing of the peak flow on the ebb tide is pushed slightly later in the tidal signal, occurring around 80 minutes after the baseline case.

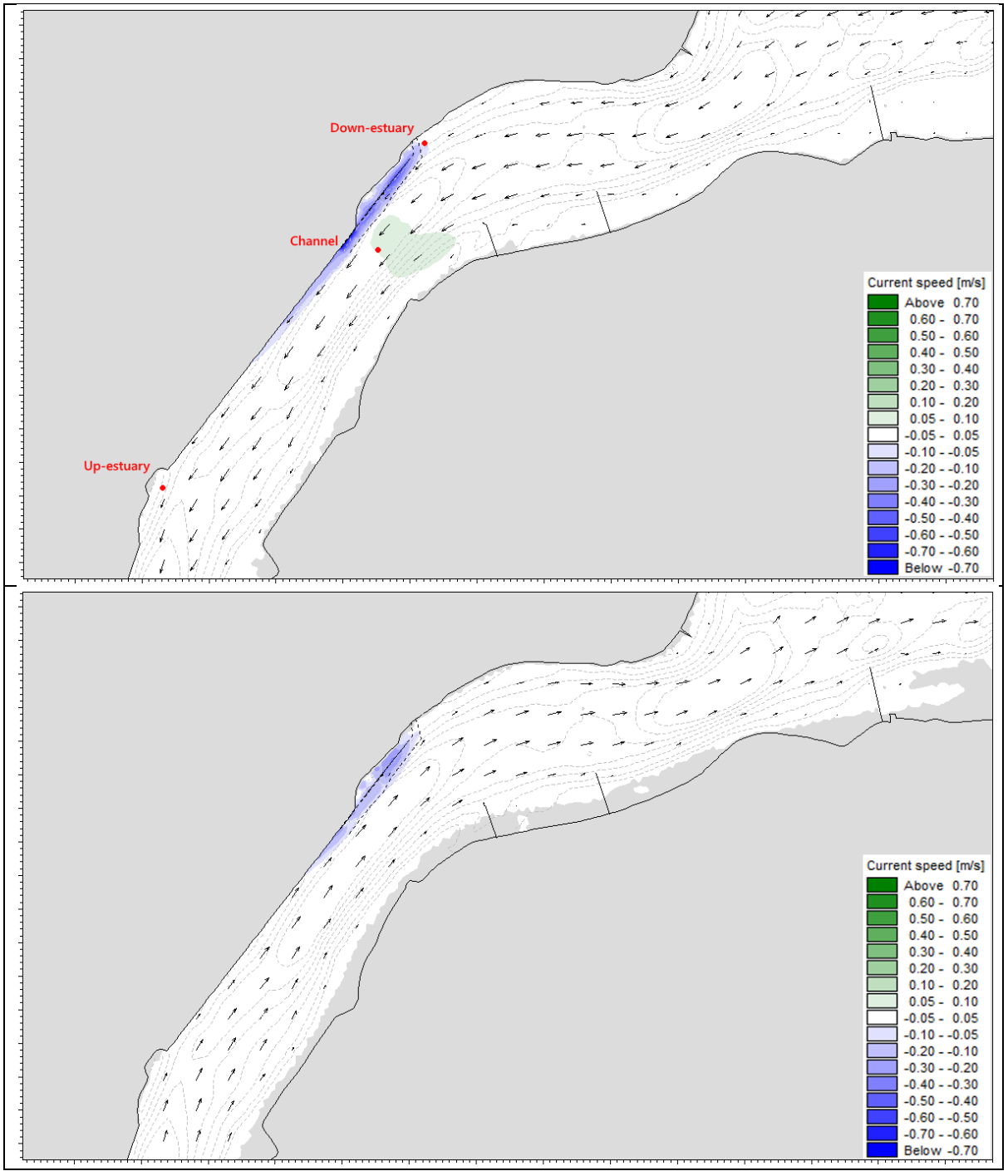


Figure 4. Predicted change in flow speed for peak flood (top) and peak ebb (bottom) on a mean spring tide

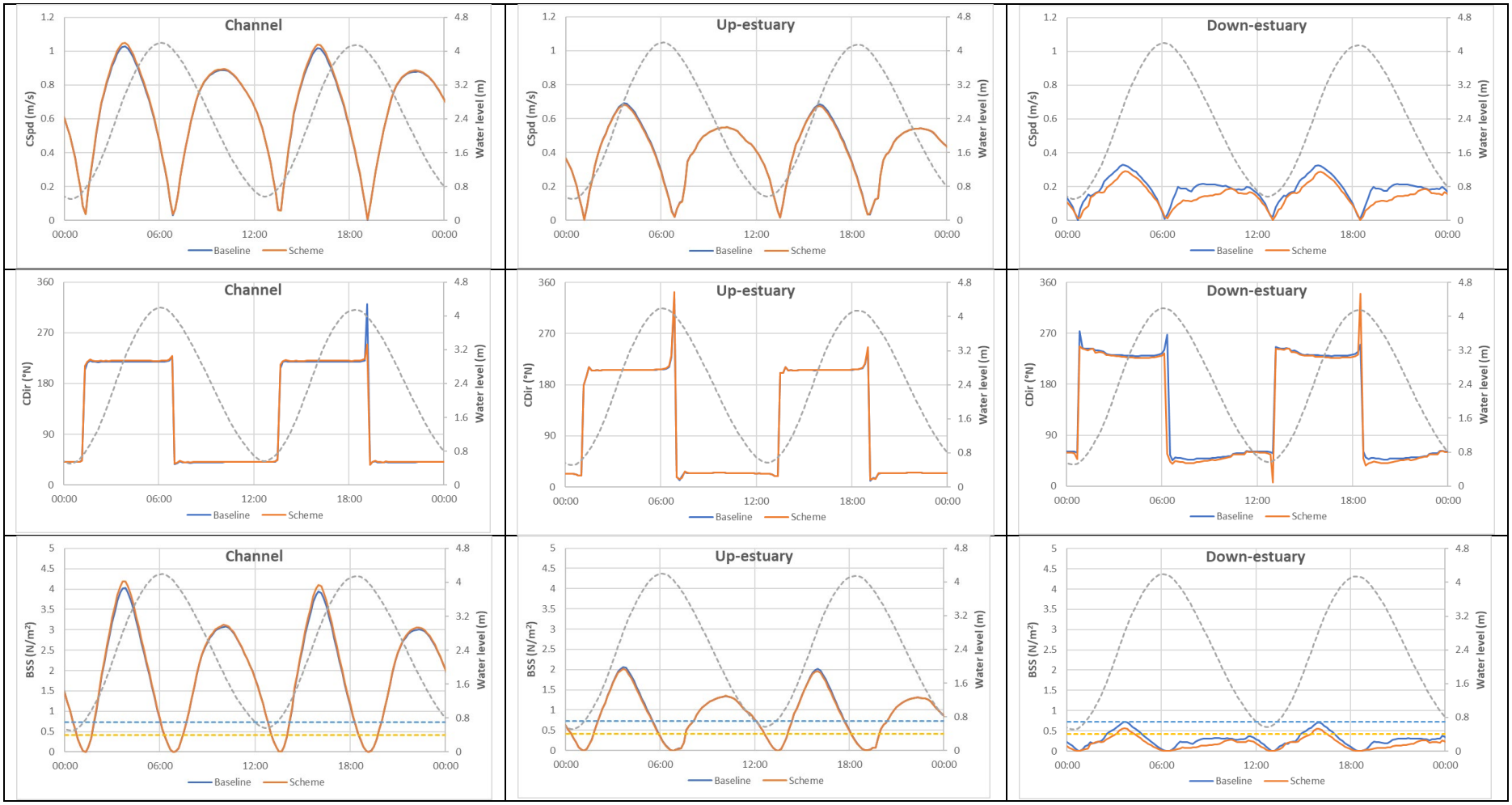


Figure 5. **Hydrodynamic timeseries comparison at locations adjacent to Belview for baseline and scheme (quay extension) scenarios**

3.2 Sediment transport

In addition to the depth averaged flows considered above, the potential for the proposed quay extension to affect local patterns of sediment erosion and deposition as also been considered. Figure 6 shows the predicted magnitude and extent of change in bed shear stress (BSS) over the peak spring tides. BSS is a measure of the force exerted on the seabed by the motion of the water as the tide floods and ebbs. Comparison of this BSS force, in relation to the typical thresholds of erosion and deposition, have been used to inform an assessment of potential changes to bed levels across the study area.

As with the above changes to flow speeds, the model results indicate that the effects of the proposed port expansion are predominantly confined to the areas immediately adjacent to the quay extension works, extending into the main channel and across to the opposite bank. Predicted changes extend up-estuary to the cut-back area between Belview and O'Brien's wharves and down-estuary to just east of the western-most groyne on the south bank of the river. The BSS changes at the time of peak flood and ebb spring tides are typically less than ±0.5 N/m^2 across much of the extent, increasing to around -1.2 N/m^2 along the face of the existing Belview quay wall. As with the predicted changes to flows, the magnitude of change in BSS reduces with distance from the extension works.

Predicted changes in BSS are generally slightly greater (in terms of both magnitude and extent) on the flood tide than on the ebb tide. As with changes to flows, BSS effects on the spring tide are generally greater than those exhibited over the neap tide.

The temporal change, over two successive spring tides, is shown in the timeseries plots in Figure 5, at the same three extraction locations provided for flow changes (above). Extraction locations are shown in Figure 4.

At each location, the lower panels of Figure 5 show the timeseries of BSS for both the existing (baseline) and quay extension scenarios.

From these plots, it can be seen that the quay extension results in a small (0.3 to 0.4 N/m^2 compared with baseline values up to 4 N/m^2) increase in BSS within the main channel, just off the north-eastern tip of the existing quay wall. This increase is limited to the peak flow (flood and ebb) periods only, with negligible change in BSS predicted throughout the remainder of the tide.

These predicted changes to BSS do not result in a material impact on the baseline erosion or deposition thresholds. In each case, the values predicted for the quay extension scenario still exceed the thresholds by a comparable magnitude and for an equivalent period of the tidal cycle. Consequently, existing (baseline) patterns of erosion and accretion within the main channel are unlikely to be affected by the proposed scheme.

At the -up-estuary location (Figure 5), between the wharves at Belview and O'Brien's, the north-easterly extension of quay at Belview has no impact on BSS under ebb tidal conditions and only a negligible effect over peak flood tides (reduction in peak flood BSS of < 0.1 N/m^2 compared with baseline values of 2 N/m^2). As with the channel location, this small change has no material effect on the magnitude or period of threshold exceedance for either erosion or deposition.

Close to the proposed quay extension, at the 'down-estuary' extraction point (fronting the outfall of the drainage creek), changes in BSS are slightly larger (Figure 5). Peak flood BSS is predicted to reduce by around 0.2 N/m^2 (against a baseline of around 0.8 N/m^2), with a slightly smaller reduction (around 0.1 N/m^2) over peak ebb conditions. With regards the typical sediment transport thresholds, BSS exceeds the deposition threshold for slightly less time (and by a slightly smaller amount) over the tidal

cycle, suggesting some small increase in sedimentation could occur. BSS values on the peak tides are not typically high enough to remobilise settled material (either for baseline or quay extension scenarios), although vessels manoeuvring in the vicinity of the Belview wharf would be expected to result in sufficient bed disturbance to mobilise newly settled material from the bed. Furthermore, any draining of the creek through the existing outfall (the operation of which is not currency included in the model) would also help to maintain material in suspension in this area.

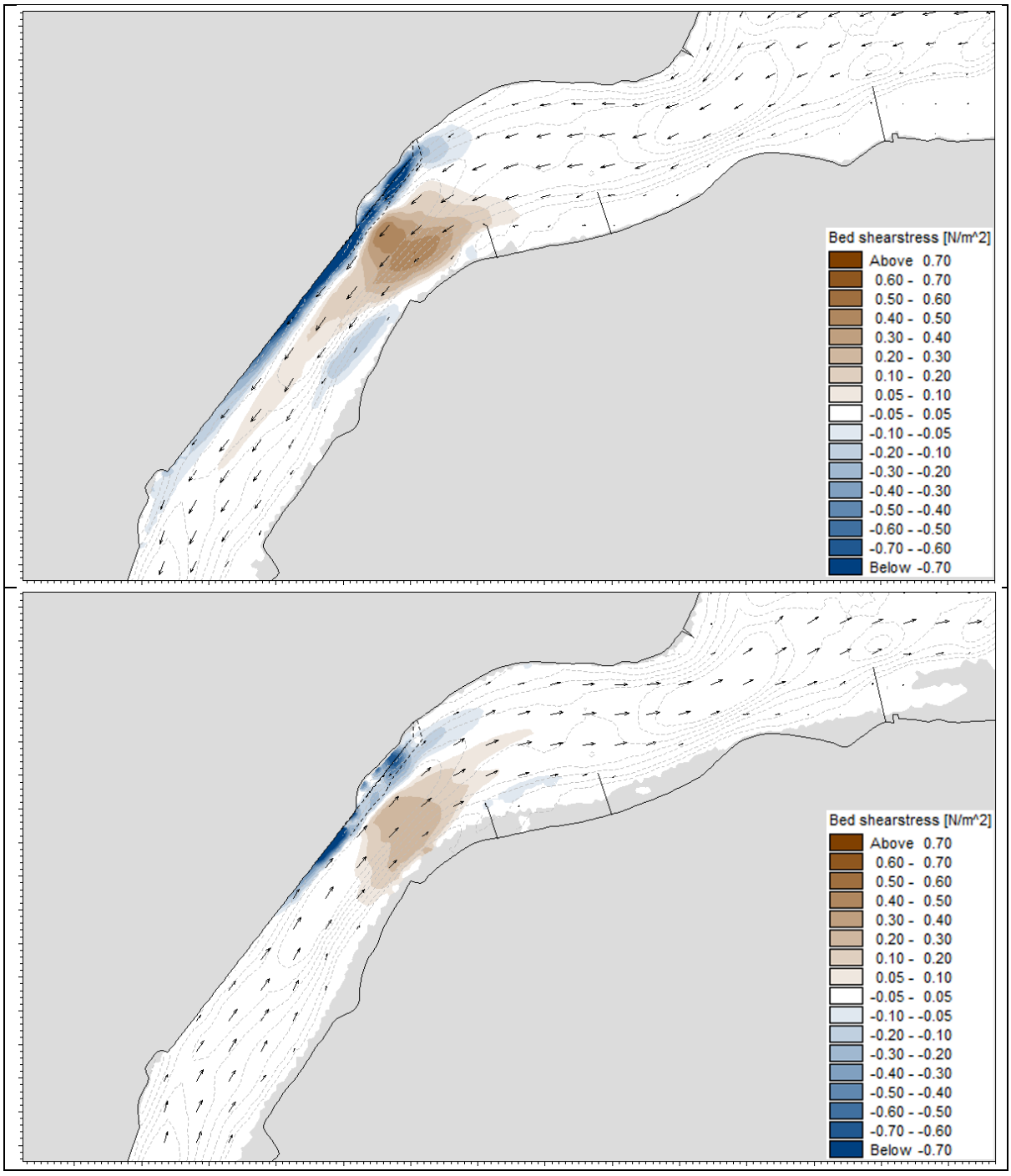


Figure 6. **Predicted change in bed shear stress (BSS) for peak flood (top) and peak ebb (bottom) on a mean spring tide**

4 Conclusions

Following on from the previous numerical modelling study to inform the PoW Master Planning (ABPmer, 2018), an updated numerical model has been utilised to assess the potential hydrodynamic and sedimentary effects of a proposed quay extension at Belview Port.

The existing modelling tools have been refined in the area down-estuary of the existing Belview wharf (in the vicinity of the proposed extension) in order to sufficiently implement the scheme details, including a landward reclaim and a sloped fronting seawall to the extended quay. An updated baseline scenario (using the refined model mesh and the existing baseline bathymetry) has been used to provide context to the changes to hydrodynamics and sediment transport predicted by the model as a result of the scheme.

The summary findings from the modelling study are as follows:

- Changes to flow speeds are generally small and tend to be confined to the area immediately adjacent to, and up-estuary of, the proposed quay extension at Belview.
- Flow speed reductions are greatest (in both extent and magnitude) over peak flood on a spring tide, although the absolute magnitude and extent of change is generally small. Changes on the ebb tide tend to be lower and changes over neap tidal conditions are lower still. The magnitude of change reduces with distance from the proposed works.
- A small area of increased flow speed is predicted in the main channel, just off the north-eastern tip of the existing Belview quay wall. Again, increases are greatest on flood tides, as compared to ebb states, although the magnitude of change is generally small in both cases.
- The baseline tidal vectors are generally unaffected by the scheme, with only negligible change in current direction predicted everywhere except within the footprint of the extension itself.
- Associated changes to BSS are also generally limited in extent to the region adjacent to the Belview Port, extending across the main channel to the opposite bank of the river.
- BSS changes are greatest during flood tides and along the face of the existing Belview quay wall, up-estuary of the proposed extension (where reductions in BSS of up to 1.2 N/m^2 are predicted).
- Immediately to the northeast (down-estuary) of the quay extension, reductions in BSS may lead to some small increase in deposition, although the movement of vessels in the vicinity and the drainage creek outfall at this location are likely to help remobilise any newly settled material.
- Across the remainder of the study area, the predicted changes to BSS do not result in any material change to the baseline exceedance of the typical erosion and deposition thresholds, meaning local and regional patterns of sediment transport are likely to remain unaffected by the proposed quay extension works.

5 References

ABPmer, (2017a). Waterford Estuary: Estuary Understanding, ABPmer Report No. R.2826.

ABPmer, (2017b). Waterford Estuary: Hydrographic Survey Programme- Report, ABPmer Report No. R.2839.

ABPmer, (2018). Port of Waterford Marine Master Plan: Option Assessment, ABPmer Report No. R.2987. July 2018.

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APPENDIX 9

APPENDIX 9-1

TECHNICAL NOTE

MALONE O'REGAN ENVIRONMENTAL

E2068 – $PM_{2.5}$ and PM_{10} Monitoring for Proposed ORE Capable Terminal on a 250m Wharf Extension & Ancillary Operational Support Infrastructure

Re: Monitoring of Ambient $PM_{2.5}$ and PM_{10} at Port of Waterford, Belview, Co. Kilkenny

1 INTRODUCTION

Malone O'Regan Environmental ('MOR Environmental') was commissioned by Port of Waterford Company (hereafter referred to as 'Port of Waterford') to carry out ambient PM_{10} monitoring at the existing port facility in Belview, Co. Kilkenny (ITM X: 666422, Y: 613637) (hereafter referred to as 'the Site'). MOR Environmental installed a PM monitor (Osiris TNO4361) on the Site between the 21st and 27th August 2023. The PM monitor was installed by experienced MOR Environmental staff. It was set up and calibrated in accordance with the manufacturer's instructions.

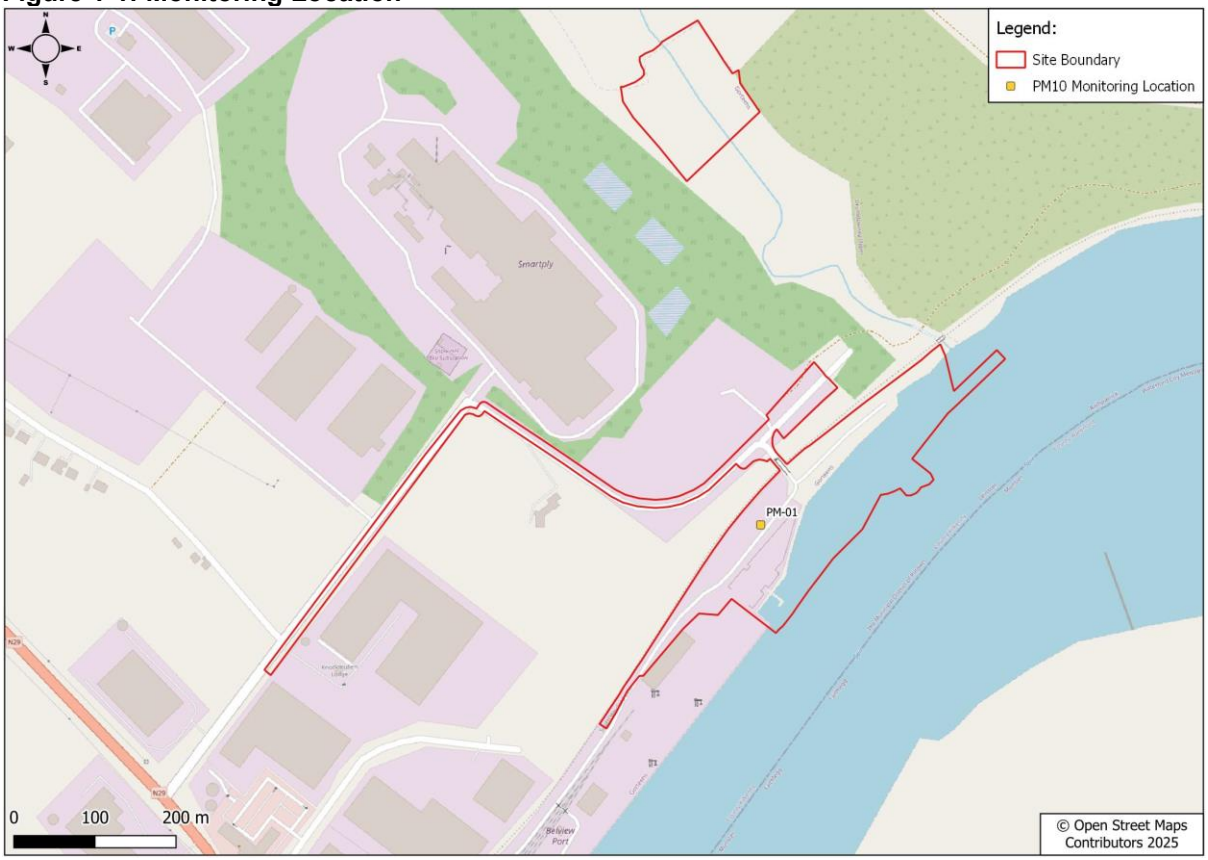
Monitoring Location: The unit was set up north of the existing port berth, in the northwestern portion of the Site's main development area (ITM X: 666337, Y: 613601). The location of the monitor is shown in Figure 1-1 below.

The monitoring results include cumulative PM_{10} concentrations comprising:

- Background suspended $PM_{2.5}$ and PM_{10} concentrations in the area arising from nearby traffic emissions, agricultural and industrial activities, and natural sources; and,
- Suspended $PM_{2.5}$ and PM_{10} resulting from the Site activities.

During the monitoring event, typical port activities (bulk handling, container operations, cargo storage and vessel pilotage) were occurring across the Port, with bulk cargo handling being the dominant activity.

Figure 1-1: Monitoring Location



2 AIR QUALITY STANDARDS

Table 2-1 below lists the applicable air quality standards ('AQS') for $PM_{2.5}$ and PM_{10}, as set out in the Air Quality Directive (2008/50/EC) and S.I. No. 180 of 2011.

Table 2-1: Current EU and Irish Air Quality Standards for Particulates

Pollutant	Concentration	Maximum No. of Exceedances permitted	Exceedance Expressed as Percentile	Measured as
$PM_{2.5}$	20 µg/m3	-	-	Annual mean
PM_{10}	50µg/m^3	35 times in a year	90.40th percentile	24-hour mean
	40µg/m^3	-	-	Annual mean

New air quality standards for 2030 onwards have been established by Directive (EU) 2024/2881 of the European Parliament and of the Council of 23rd October 2024 on ambient air quality and cleaner air for Europe. These future 2030 limit values are laid out in Table 2-2 below.

Table 2-2: 2030 EU Air Quality Standards for Particulates

Pollutant	Concentration	Maximum No. of Exceedances permitted	Exceedance Expressed as Percentile	Measured as
$PM_{2.5}$	25 µg/m3	18 times per year	95.1th percentile	24-hour mean
	10 µg/m3	-	-	Annual mean
PM_{10}	45 µg/m3	18 times per year	95.1th percentile	24-hour mean
	20 µg/m3	-	-	Annual mean

The Environmental Protection Agency ('EPA') in Ireland also defines the Air Quality Index for Health ('AQIH'). AQIH is a score from 1 to 10 that describes the current air quality shown by the local EPA's air quality station and whether this might affect human health. 1–3 corresponds to good air quality, 4–6 corresponds to fair air quality, 7–9 corresponds to poor air quality and 10 corresponds to very poor air quality. These descriptors are based on the current air quality standards and do not encompass the targets set out in the 2030 standards. More detailed information is provided on https://airquality.ie/information/air-quality-index-for-health.

3 WEATHER STATION DATA

A wind rose diagram, showing dominant wind direction, was prepared for the monitoring location (Figure 3-1) utilising data from the Davis Vantage Vue weather station installed by MOR Environmental throughout the monitoring event. A summary of 24-hour wind speed, rainfall and temperature was recorded (Table 3-1 below).

Figure 3-1: Wind rose from the 21st to 27th August 2023 at Monitoring Location

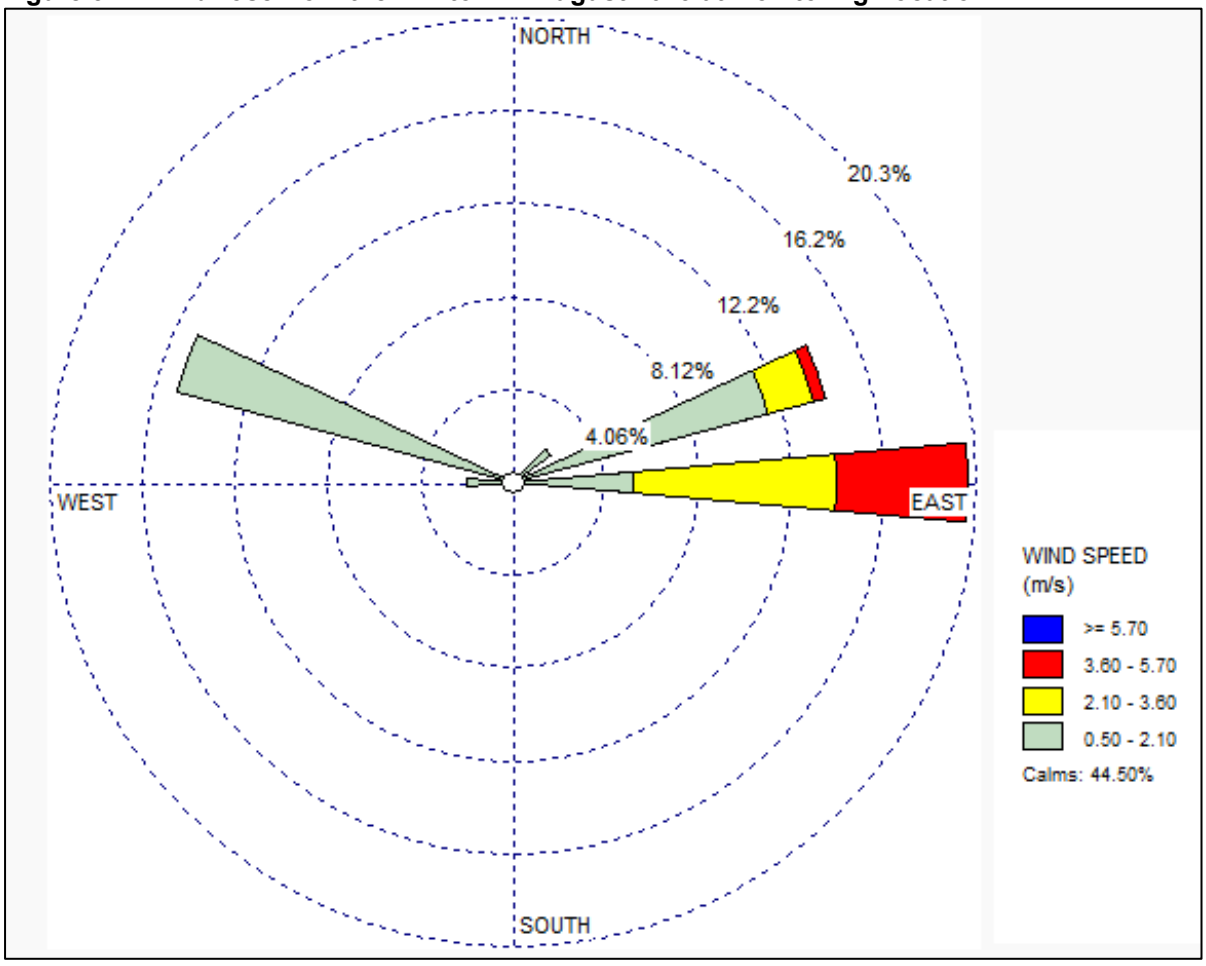


Table 3-1: Weather Station Data for Port of Waterford

Date	Mean wind speed (m/s)	Rainfall (mm)	Temperature (°C)
21/08/2023	4.3	0.0	18.6
22/08/2023	2.3	0.0	17.9
23/08/2023	1.0	0.0	16.4
24/08/2023	0.5	0.0	15.3
25/08/2023	0.4	0.0	15.3
26/08/2023	0.8	0.0	15.8
27/08/2023	0.8	0.0	15.4
Event	**1.4**	**0.0**	**16.4**

4 MONITORING RESULTS

Tables 4-1 and 4-2 below detail $PM_{2.5}$ and PM_{10} monitoring results, respectively, collated at the Site throughout the monitoring event. Figure 4-1 presents the $PM_{2.5}$ and PM_{10} results in a graphical format in the context of the 24-hour AQS for each pollutant. Note that the data corresponding to the 21st and 27th August represent only partial daily averages, as full datasets were limited on these dates due to the installation and subsequent removal of the monitoring instrument.

Table 4-1: $PM_{2.5}$ Monitoring Results at Port of Waterford, August 2023

Monitoring event	Monitored PM_{10} µg/m³ 24-hour mean	% of 24-hour mean current AQS	% of 24-hour mean 2030 AQS
21/08/2023[a]	3.14	-	6.3%
22/08/2023	2.55	-	5.1%
23/08/2023	1.35	-	2.7%
24/08/2023	1.02	-	2.0%
25/08/2023	0.89	-	1.8%
26/08/2023	1.29	-	2.6%
27/08/2023[b]	0.78	-	1.6%
Event	**1.55**	**-**	**3.2%**

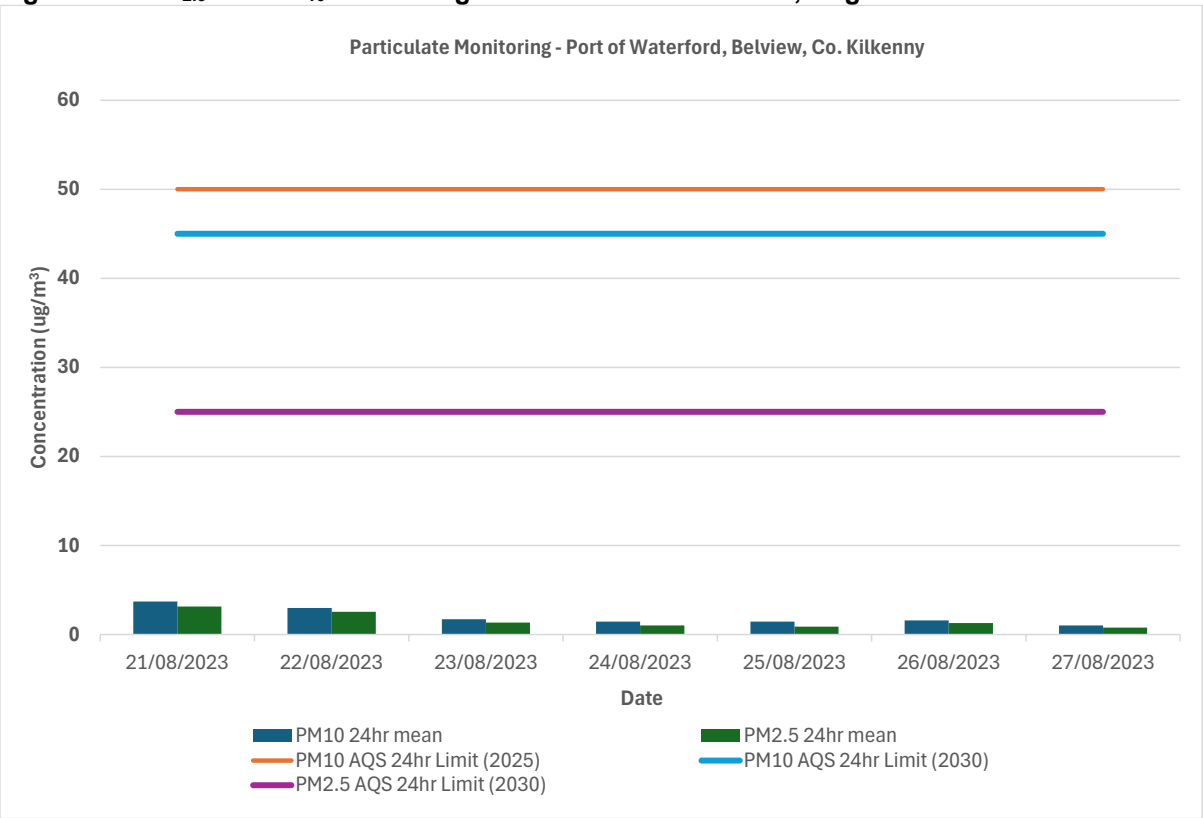
[a] No data recorded between hours of 00:00-11:00 (monitor installation)
[b] No data recorded between hours of 06:00-00:00 (monitor removal)

Table 4-2: PM_{10} Monitoring Results at Port of Waterford, August 2023

Monitoring event	Monitored PM_{10} µg/m³ 24-hour mean	% of 24-hour mean current AQS	% of 24-hour mean 2030 AQS
21/08/2023[a]	3.70	7.4%	8.2%
22/08/2023	3.00	6.0%	6.7%
23/08/2023	1.71	3.4%	3.8%
24/08/2023	1.46	2.9%	3.2%
25/08/2023	1.44	2.9%	3.2%
26/08/2023	1.58	3.2%	3.5%
27/08/2023[b]	1.03	2.1%	2.3%
Event	**1.97**	**4.0%**	**4.4%**

[a] No data recorded between hours of 00:00-11:00 (monitor installation)
[b] No data recorded between hours of 06:00-00:00 (monitor removal)

Figure 4-1: $PM_{2.5}$ and PM_{10} Monitoring Data at Port of Waterford, August 2023



$PM_{2.5}$

The maximum full 24-hour mean $PM_{2.5}$ concentration recorded at the monitoring location was 2.55µg/m^3 on 22nd August 2023. The minimum full 24-hour mean PM_{10} concentration recorded was 0.89µg/m^3 on 25th August 2023.

The 24-hour mean concentrations of ambient $PM_{2.5}$ at the monitoring location were below the current and 2030 AQS daily limits throughout the monitoring event.

All 24-hour mean concentrations of $PM_{2.5}$ recorded during the monitoring event were within the EPA's criteria for '1-good' air quality (0-16µg/m^3).

PM_{10}

The maximum full 24-hour mean PM_{10} concentration recorded at the monitoring location was 3.00µg/m^3 on 22nd August 2023. The minimum full 24-hour mean PM_{10} concentration recorded was 1.44µg/m^3 on 25th August 2023.

The 24-hour mean concentrations of ambient PM_{10} at the monitoring location were below the current and 2030 AQS daily limits throughout the monitoring event.

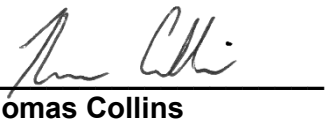
All 24-hour mean concentrations of PM_{10} recorded during the monitoring event were within the EPA's criteria for '1-good' air quality (0-16µg/m^3).

5 CONCLUSION

Based on the $PM_{2.5}$ and PM_{10} data presented over the monitoring event (21st to 27th August 2023), the following can be concluded:

- 24-hour mean PM_{10} concentrations corresponding to the 21st and 27th August represent only partial daily averages, as full datasets were limited on these dates due to the installation and removal of the monitoring equipment;
- For the duration of the monitoring event, the average 24-hour mean $PM_{2.5}$ concentrations at the monitoring location was 1.55µg/m^3, which is 3.2% of the 2030 target daily AQS limit value of 25µg/m^3;
- For the duration of the monitoring event, the average 24-hour mean PM_{10} concentrations at the monitoring location was 1.97µg/m^3, which is 4.0% of the current daily AQS limit value of 50µg/m^3, or 4.4% of the 2030 target daily AQS limit value of 45µg/m^3; and
- All 24-hour mean $PM_{2.5}$ and PM_{10} concentrations were within the EPA's current criteria for '1-good' air quality (0-16µg/m^3).

Yours sincerely,
for Malone O'Regan Environmental



Thomas Collins

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APPENDIX 10

APPENDIX 10-1

1 CHARACTERISING CLIMATE HAZARDS

1.1 Frequency of Climate Hazards according to Annex B [1]

Table 1-1: Classifying the frequency of climate hazards

Frequency	Frequency Occurrence in a Year	Description
Very Frequent	>100%	Occurs several times in a single year
Frequent	50 to 100%	Occurs once in a 1-to-2-year period
Common	10 to 50%	Occurs once in a 2-to-10-year period
Occasional	1 to 10%	Occurs once in a 10–100-year period
Rare	<1%	occurs once in over 100 years

1.2 Vulnerability Types

Table 1-2: Description of different vulnerability types [1]

Vulnerability Type	Frequency Occurrence in a Year
Physical Vulnerability	Properties of an asset related to the structure or facilities can exacerbate/reduce the impacts before, during, or after a hazard event e.g. poor design and the construction of the building, provision of active cooling. **or;** Ability of a population/persons to access equipment or resources that can exacerbate/reduce the impacts before, during, or after a hazard event.

1.3 Level of Impacts

Table 1-3: Description of level of impacts [1]

Impact	Description	Level of Impact
Catastrophic	Widespread service failure with services unable to cope with wide-scale impacts	5
Major	Services seen to be in danger of failing completely with severe/widespread decline in service provision	4
Moderate	Service provision under severe pressure. Appreciable decline in	3

Impact	Description	Level of Impact
	service provision at a community level	
Minor	Isolated but noticeable examples of service declines	2
Negligible	Appearance or threat but no actual impact on service provision	1

1.4 Magnitude of Impact for Asset Damage Category

Table 1-4: Magnitude of impact relating to Asset Damage [1]

Risk Area	Negligible	Minor	Moderate	Major	Catastrophic
Asset Damage	Impact can be absorbed through normal activity	An adverse event that can be absorbed by taking business continuity action	A serious event that requires additional emergency business continuity	A critical event that requires extraordinary/emergency business continuous actions	Disaster with the potential to lead to shutdown or collapse or loss of assets network

2 IDENTIFICATION OF CLIMATE HAZARDS

2.1 Kilkenny County Council Climate Change Risk Assessment

The Kilkenny County Council Climate Change Risk Assessment [2] has evaluated the risks due to climate change using the following scale (Table 2-1 below). The Risk is measured as a product of the Impact and Frequency of hazards.

Table 2-1: Kilkenny County Council Risk Scale

Impact Description	Impact Score	Frequency Description	Frequency Score
Catastrophic	5	Very Frequent	5
Major	4	Frequent	4
Moderate	3	Common	3
Minor	2	Occasional	2
Negligible	1	Rare	1

2.2 Met Éireann Historical Data

Meteorological data from the Met Éireann Historical Database was analysed to assess the frequency of climate hazards. The overall Risk of the Proposed Development to climate hazards was then determined based on the frequency of climate hazards score (Table 1-1) and their impact on the Proposed Development as presented in Table 1-3 above.

2.3 EPA Climate Ireland Platform

The EPA's Climate Ireland Platform presents climate projections for Ireland under two key future emissions scenarios – Representative Concentration Pathway ('RCP') 4.5 and RCP8.5. The Climate Ireland platform was used to determine the potential changes in the frequency of climate hazards relevant to the Proposed Development.

2.4 Port of Waterford Site Specific Flood Risk Assessment

The Port of Waterford Site Specific Flood Risk Assessment ('SSFRA'), prepared in 2025 [3], was consulted to assess the risk of the Proposed Development to river and tidal flooding, due to its location within a tidally influenced area and its proximity to the River Suir Estuary and the Luffany Stream.

2.5 Geological Survey Ireland Landslide Susceptibility Mapping

The Geological Survey Ireland ('GSI') Landslide Susceptibility Mapping resource [5] was used to assess the potential risk of landslides in relation to the Proposed Development. The resource assesses landslide susceptibility based on geological, topographical and environmental factors and identifies areas prone to landslides by considering past landslide events.

2.6 European Forest Fire Information System Wildfire Risk Viewer

The European Forest Fire Information System ('EFFIS') Wildfire Risk Viewer [4] was utilised to assess wildfire risk. The Wildfire Risk Viewer evaluates the level of risk based on the vegetation type, classifying land as *Low*, *Medium* or *High* Risk.

2.7 Climate Hazards Associated with the Proposed Development

Table 2-2 below highlights the hazards identified through desk-based research.

Table 2-2: Hazards Identified as Relevant to the Proposed Development from Available Resources

Source	Hazards Identified	Category of Risk (if applicable)
Kilkenny County Council Climate Change Risk Assessment [2]	Heatwave	Minor
	Drought	Minor
	Cold Spell	Minor
	Severe Windstorm	Minor
	River Flood	Moderate
	Extreme precipitation	Minor
Port of Waterford SSFRA [3]	Fluvial flooding	Imperceptible
	Tidal/Coastal Flooding	Imperceptible
GSI Landslide Susceptibility Mapping **[5]**	Landslides	Negligible
EFFIS Wildfire Risk Viewer [4]	Wildfires	Negligible
Met Éireann Historical Data [5]	Severe Wind	Moderate
	Extreme Rainfall	Moderate
	Cold Snaps	Minor
	Heatwaves/Droughts	Minor

3 REFERENCES

[1] GOI, “Technical Annex B Climate Change Risk Assessment,” Government of Ireland , Dublin, 2023.

[2] RPS Group Limited, “Tier 1 Climate Change Risk Assessment, Kilkenny County Council,” 2023.

[3] IE Consulting , “Port of Waterford Company Site Specific Flood Risk Assessment,” IE Consulting , Carlow, 2025 .

[4] Geological Survey Ireland, “Landslides Susceptibility Mapping,” August 2025. [Online].

[5] Met Éireann, “Historical Data,” [Online]. Available: https://www.met.ie/climate/available-data/historical-data. [Accessed August 2025].

APPENDIX 10-2

Baseline Operational Emissions (2023/2022 Port of Waterford)				
Port of Waterford Baseline Operational Emission Source	**2023 Fuel Use (litres) - As presented in Section 17.4.2**	**Emission factor ($kgCO_2e$ per litre)**	**Baseline $kgCO_2$ (2023)**	**Baseline tCO_2 (2023)**
Ships	548,379	2.77	1,519,010	1,519
Tugboats	59,625	2.77	165,161	165
Cranes^	130,000	3.34	434,394	434
Ancillary Equipment	10,000	3.34	33,415	33
Pilot Launches	11,500	~	0	0
	2022 Consumption (kWh) - As presented in Section 17.4.2	**Emission factor ($kgCO_2e$ per litre)**	**Baseline $kgCO_2$ (2022)**	**Baseline tCO_2 (2022)**
Electricity	1,436,085	0.33	475,201	475
Total Baseline Operational Emissions (tCO_2)			**2,627,181**	**2,628**

SEAI 2022 Electricity Emission Factor (kg of CO_2e per kWh)	0.33
TII Diesel: Emission Factor (kg of CO_2e per Litre)	3.34
2023 DESNZ Marine GAS OIL: Emission Factor (kg of CO_2e per Litre)	2.77

Area	Material	Unit	Embodied tCO_2e
Buildings	Concrete	2,335 Tonnes	249
	Masonry	390 Tonnes	31
	Steel	312 Tonnes	436
	Glazing	12.1 Tonnes	11
	Cladding	140.8 Tonnes	7
	Concrete Piles	145 No.	99
	Wood	78 Tonne	53
Wharf	Dredging	7,000 Tonnes	84
	Site Clearance	1,080 Tonnes	1
	Imported Engineering fill	160,000 Tonnes	316
	Imported rock armour	20,000 Tonnes	3,510
	Stone - cl804	2,635 Tonnes	67
	Concrete (Beam Elements and Deck)	6,634 Tonnes	1,027
	Precast Concrete Slabs	3,010 Tonnes	367
	Paving	875 Tonnes	14
	Steel Tubular Piles	420 No.	1,000
	Steel Fender Panels	112 Tonnes	157
Total			7,428

Construction Plant GHG Emissions						
Plant Type	**Operating Hours during Construction Phase**	**Fuel use (l/h)**	**Emission Factor (kg of CO_2e per litre)**	**Fuel Consumption for Entire Construction Phase**	**kg/CO_2e**	**tCO_2e Entire Construction Phase**
1582T Non- powered steel construction barge (e.g. Skerchi) 60m x 21.5m x 4m	Not Independently Powered					
Barge mounted boom crawler crane to 250T	252	26	2.667	6,552	17,474	17
Spud-leg Barge (e.g. ACN5)	Not Independently Powered					
Impact hydraulic piling hammer e.g. CX85 / CX110	Not Independently Powered					
Vibratory piling hammer e.g. ICE 1412 / PVE 38M	Not Independently Powered					
Tugboat	252	500	2.667	126,000	336,042	336
Safety boat	4,284	112	2.667	479,808	1,279,648	1,280
Work boats	5,040	150	2.667	756,000	2,016,252	2,016
Lighting Towers	15,876	1	2.667	10,319	27,522	28
90T boom crawler crane	756	26	2.667	19,656	52,423	52
65T boom crawler crane dragline (dredging/silt removal)	1,260	26	2.667	32,760	87,371	87
Mobile cranes 25T - 160T as required	1,260	16	2.667	20,160	53,767	54
Articulated Trucks (30T) e.g. Cat C13	3,276	57	2.667	186,732	498,014	498
Large Dozers (50T) e.g. Cat D9	504	39	2.667	19,656	52,423	52
Medium Dozers (23T) e.g. Cat D6	1,008	18	2.667	18,144	48,390	48
Graders (10T)	252	13	2.667	3,276	8,737	9

Large 18-20T Vibratory Rollers	252	18	2.667	4,536	12,098	12
Small 3-5T Tandem Vibratory Rollers	1,764	15	2.667	26,460	70,569	71
Large, tracked excavator (65T) e.g. Cat365	504	14	2.667	7,056	18,818	19
Medium, tracked excavator (22T) e.g. Cat320	1,260	12	2.667	15,120	40,325	40
Small, tracked excavator (16T) e.g. Cat316	756	10	2.667	7,560	20,163	20
Mini excavator (1.5-2T)	504	3	2.667	1,512	4,033	4
Wheeled excavator (10T) JCB	1,512	14	2.667	21,168	56,455	56
Shuttering, scaffoldings etc.	12		2.667	-	-	-
(MEWP) Mobile access platforms	1,260	3	2.667	3,780	10,081	10
Dredger	252	46	2.667	11,592	30,916	31
Telehandler	2,268	6	2.667	13,608	36,293	36
Total:						**4,778**

Total Employee Vehicle GHG Emisisons					
Phase	No. of Journeys 1 way	Return	Distance (km)	Total KM	Car Tonnes CO2e
1	168	336	30	10,080	2
2	168	336	30	10,080	2
3	420	840	30	25,200	5
4a	756	1,512.00	30	45,360	10
4b	2,520	5,040	30	151,200	33
4c	1,575	3,150	30	94,500	20
5a	1,890	3,780	30	113,400	25
4d	2,100	4,200	30	126,000	27
4e	1,680	3,360	30	100,800	22
4f	1,260	2,520	30	75,600	16
4g	1,386	2,772	30	83,160	18
4h	1,848	3,696	30	110,880	24
5b	2,100	4,200	30	126,000	27
5c	6,300	12,600	30	378,000	82
6	252	504	30	15,120	3
Total					**317**

Total HGV Movement GHG Emissions					
Phase	No. of Journeys 1 way	Return	Distance(km)	Total KM	HGV Tonnes CO2e
1	30	60	80.4	4,824	5
2	74	147	80.4	11,819	13
3	84	168	80.4	13,507	14
4	9,135	18,270	80.4	1,468,908	1,576
5	504	1,008	80.4	81,043	87

6	210	420	80.4	33,768	36
7	420	840	80.4	67,536	72
8	1,323	2,646	80.4	212,738	228
9	218.4	436.8	80.4	35,119	38
10	441	882	80.4	70,913	76
11	126	252	80.4	20,261	22
12	168	336	80.4	27,014	29
13	378	756	80.4	60,782	65
14	504	1,008.0	80.4	81,043	87
15	42.0	84.0	80.4	6,754	7
Total					**2,356**

Overall Construction Phase	
Source	**Total**
Transport	2,674
Plant	4,778
Built Environment – Commercial	7,428
Total	**14,879**

Emission Ceiling	**Tonnes of CO_{2e} for two years**	**Construction Phase as %tage of Emission Ceiling for 2026 2028***
National Emissions Ceiling 2026 - 2030	80,000,000	0.02%
Transport Emissions Ceiling 2026 - 2030	14,800,000	0.02%
Built Environment - Commercial Emission Ceiling 2026 - 2030	2,500,000	0.37%

**Percentages represent total Construction Phase GHG emissions / two years of the National Second Carbon Budget and relevant Sectoral Emissions Ceilings (2026-2030).*

Annual Operational HGV Movement					
	No. of Journeys 1 way	Return	Distance (km)	Total KM	HGV Tonnes CO_2e
Projected Yearly HGV Movements as a result of 250m Quay Extension with ORE Capability	52,925	105,850	93.2	9,865,220	10,585
Total					**10,585**

Annual Operational Employee Vehicle Movement					
	Employee Numbers per year	No. of Return Journeys	Annual Distance Travelled km/Operational phase (includes return trip)	kg/CO_2e	Total Annual Tonnes CO_2e/Operational Phase
Operational Phase	36,500	73,000	1,095,000	237,133	237
Total					**237**

Annual Operational Ship Movements					
	No. of Journeys 1 way	Return	Distance (km)	Total KM	Tonnes CO_2e
CTV Return Trip Daily	1,460	2,920	30	87,600	346
SOV Return Trip Every Second Week	52	104	30	3,120	12.3
Estimated Freight Ship increase as a result of berth extension	120	240	370	88,800	3,732
Tugboats	46	92	8	736	31
Total					**4,122**

Annual Electricity Consumption		
Fuel Type	**Consumption per year (kWh)**	**Total tCO_2e/year**
Two Quayside Fixed Cranes	440,618	113.4
Lighting	66,640	17.2
Ancillary	16,660	4.3
New Buildings	73,000	18.8
PV System	273,000 (generated)	-56.0
Total		**97.6**

Emission Factors	
Electricity Emission Factor (tonne of CO_2e per kWh) (TII)	0.000257382
Diesel: Emission Factor (tonne of CO_2e per Litre) (TII)	0.003341496
Marine Gas Oil: Emission Factor (tonne of CO_2e per Litre) (DEFRA)	0.00310202

Predicted Solar Generation Emissions Offset				
Maximum Solar Panel Array (m_2)	**Predicted Generation per year (kWh)**	**SEAI Emission Factor (gCO_2/kWh)**	**Total $kgCO_2$/year**	**Total tCO_2/year**
2,100	273,000	204.3	55,784	56

Annual Fuel Consumption			
Plant	**Fuel Type**	**Consumption per year (L)**	**Total tCO_2e/year**
Mobile Harbour Crane	Diesel (L)	60,000	200.5
Secondary Handling Machinery	Diesel (L)	10,000	33.4
Total			**233.9**

Total Operational Emissions	
Source	**Annual**
Total Operational Emissions	15,275
Electricity Emissions	97.6
Transport Emissions	15,121
Built Environment – Commercial	276

Emission Ceiling	**Tonnes of CO_{2e} per year**	**Annual Operational Phase as %tage of Emission Ceiling for 2026 - 2030***
National Emissions Ceiling 2026 - 2030	40,000,000	0.04%
Electricity Emissions Ceiling 2026 - 2030	4,000,000	0.002%
Transport Emissions Ceiling 2026 - 2030	7,400,000	0.2%
Built Environment – Commercial Emissions Ceiling 2026 - 2030	1,000,000	0.03%

**Percentages represent total Operational Phase GHG emissions / one-year National Second Carbon Budget and relevant Sectoral Emissions Ceilings (2026-2030).*

Baseline Operational Emissions (2023/2022 Port of Waterford)					
Port of Waterford Baseline Operational Emission Source	**2023 Fuel Use (litres) - As presented in Section 17.4.2**	**Emission factor ($kgCO_2e$ per litre)**	**Baseline $kgCO_2$ (2023)**	**Baseline tCO_2 (2023)**	**Baseline tCO_2 (2 years)**
Ships	548,379	2.77	1,519,010	1,519	3,038
Tugboats	59,625	2.77	165,161	165	330
Cranes^	130,000	3.34	434,394	434	869
Ancillary Equipment	10,000	3.34	33,415	33	67
Pilot Launches	11,500	~	0	0	0
	2022 Consumption (kWh) - As presented in Section 17.4.2	**Emission factor ($kgCO_2e$ per litre)**	**Baseline $kgCO_2$ (2022)**	**Baseline tCO_2 (2022)**	**Baseline tCO_2 (2 years)**
Electricity	1,436,085	0.33	475,201	475	950
Total Baseline Operational Emissions (tCO_2)			**2,627,181**	**2,628**	**5,254**

SEAI 2022 Electricity Emission Factor (kg of CO_2e per kWh)	0.33
TII Diesel: Emission Factor (kg of CO_2e per Litre)	3.34
2023 DESNZ Marine GAS OIL: Emission Factor (kg of CO_2e per Litre)	2.77

Operational Phase Cumulative Assessment				
Port of Waterford Baseline Emission Source	**Baseline (2023) tCO_2e**	**Proposed Development Operational Phase Emission Source**	**Proposed Development Operational Phase tCO_2e**	**Cumulative tCO_2e by Emission Source**
Ships	1,519	Freight Ships, CTV, SOV, Tugboat	4,121	5,805
Tugboats	165			
Cranes	434	Secondary Handling Machinery and Mobile Harbour Crane	233.9	700.9
Ancillary Equipment	33			
Pilot Launches	0	N/A	~	0
N/A	~	Operational traffic (HGVs and operational staff)	10,822	10,822
Port of Waterford Dredging Operations	**Baseline (2019) tCO_2e**	Proposed Development Operational Phase Emission Source	**Proposed Development Operational Phase tCO_2e**	**Cumulative tCO_2e by Emission Source**
Dredging	1,035	N/A	~	1,035
Ploughing/bed levelling	285	N/A	~	285
Port of Waterford Baseline Emission Source	**Baseline (2022) tCO_2e**	**Proposed Development Operational Phase Emission Source**	**Proposed Development Operational Phase tCO_2e**	**Cumulative tCO_2 by Emission Source**
Electricity	475	Electricity	97.6	572.6
Total Cumulative Emissions Operational Phase tCO_2e				**19,221**

Emission Ceiling	**Tonnes of CO_{2e} per year**	**Cumulative Emissions as %tage of Emission Ceiling for 2026 – 2030***
National Emissions Ceiling 2026 - 2030	40,000,000	0.05%

**Percentages represent total cumulative GHG emissions / one-year National Second Carbon Budget*

Arklow Bank Wind Park Phase 1		Unit
Capacity	25	MW
Offshore wind capacity ireland	0.4	%
Hours in a year	8760	Hours
	87,600	MWh
	87,600,000	KWh
Total tCO_2e/year	**22,547**	**tCO_2e/year**

Electricity Emission Factor (tonne of CO_2e per kWh) (TII)	0.000257382

APPENDIX 10-3

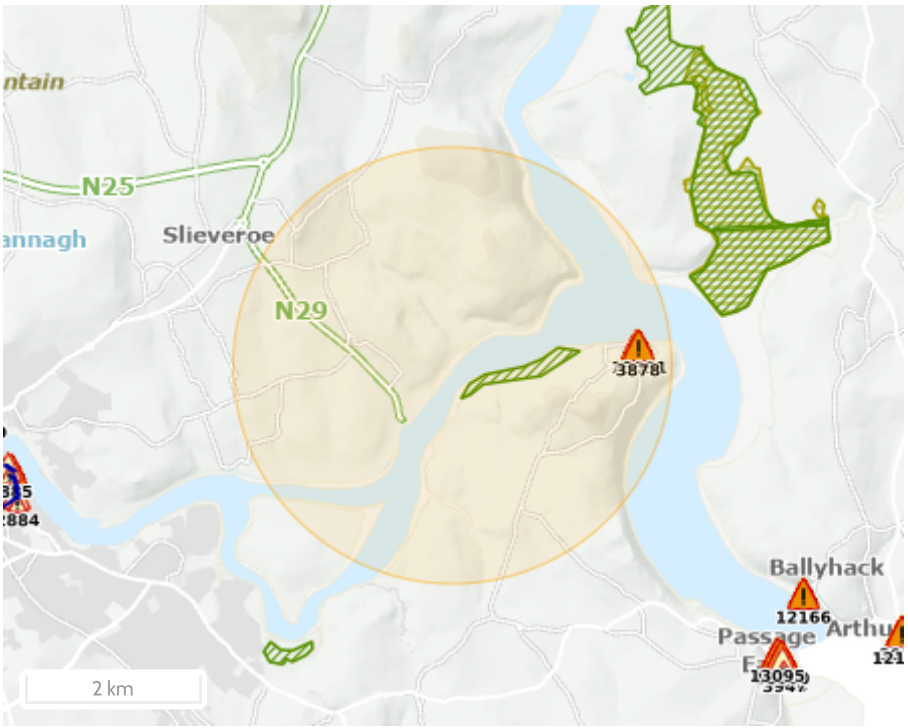
Past Flood Event Local Area Summary Report

OPW Oifig na nOibreacha Poiblí Office of Public Works

Report Produced: **31/7/2025 10:06**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "**Website**"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

2 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Cheekpoint recurring (ID-3878)	n/a	Approximate Point
	Additional Information: Reports (2) Press Archive (2)		
2.	Flooding at Cheekpoint on 03/02/2014 (ID-13091)	03/02/2014	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		

APPENDIX 10-4

Calafort Phort Láirge
Port of Waterford

Sustainability Policy

Port of Waterford is committed to reducing the impact of its activities on the environment, that commitment is essential to our sustainability and energy reduction targets.

To this end, Port of Waterford has implemented an environmental and energy management system and is committed to continually improve its energy and sustainability performance.

In order to meet this commitment, Port of Waterford will aim to

- Comply with applicable legal requirements and other requirements to which the organisation subscribes related to its energy use, consumption and efficiency.
- Build a company culture that promotes and celebrates sustainability and sound energy management practices, by raising staff awareness through communication and training.
- Explore and look to offer low-emission energy transport services to importers and exporters.
- Prioritise sustainable projects within the Port of Waterford Masterplan 2020-2040.
- Take care of the ecology of the natural resource that is Waterford Estuary, in order to maintain and enhance biodiversity.
- Establish a method for the setting and attainment of key goals in relation to sustainability and energy management.
- Investigate renewable and alternative sources of energy.
- Ensure energy efficiency and sustainability are key considerations in the procurement of new equipment and products.

Signed  Date 21.8.24

David Sinnott

Chief Executive

APPENDIX 11

APPENDIX 11-1

Glossary of Acoustic Terminology

Abbreviation / Description Descriptor	
A Weighted	A time weighting given to noise values to amend the values to suit the human ear response to the various frequency components of the sound.
Acoustic environment	Sound from all sound sources as modified by the environment (BS ISO 12913-1:2013).
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far. *Note: The ambient sound comprises the residual sound and the specific sound when present.*
Ambient sound level, L_a = $L_{Aeq,\,T}$	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T. *Note: the ambient sound level is a measure of the residual sound and the specific sound when present.*
Background sound level, $L_{A90,\,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
dB (decibel)	A relative unit of measurements, based on a logarithmic scale to describe the ratio between the measured level and a reference or threshold level of 0dB. Unless otherwise stated 0dB within this report is $2x10^{-5}$ pascals (Pa).
Day	A 24 hour period from midnight to midnight.
Daytime	A 12 hour period between 07:00 – 19:00 hours, as per NG4
Evening-Time	A 4 hour period between 19:00 – 23:00 hours, as per NG4
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,\,T}$	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T=t_2-t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given the following equation: $$L_{AeqT} = 10\lg_{10}\left\{(1/T)\int_{t_1}^{t_2}[p_A(t)^2/p_0^2]dt\right\}$$ where: p_0 is the reference sound pressure (20 μPa); and $p_A(t)$ is the instantaneous A-weighted sound pressure (Pa) at time t *Note: The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.*
$L_{AN,T}$	The Fast interval, A-Weighted noise level in the for the 'N' percentile of the sampling interval 'T'.
$L_{A10,T}$	The A-Weighted noise level for the 10%ile of the sampling interval 'T', typically utilised to represent peak noise events such as intermittent passing traffic.
$L_{A90,T}$	The A-Weighted noise level in the lower 90 percentile of the sampling interval 'T', excludes intermittent features typical of traffic. See also background sound level.
$L_{A95,T}$	The A-Weighted noise level for the 95%ile of the sampling interval 'T'. Representative of steady noise events at a monitoring location.

$L_{Aeq,T}$	The equivalent continuous sound level, used to describe the fluctuating noise in terms of a single noise level over the same sampling time period (T). Also see ambient sound.
L_{den}	Day-evening-night equivalent level, calculated as: $Lden = 10Log\frac{1}{24}\left(12*10\frac{Lday}{10}+4*10\frac{Levening+5}{10}+8*10\frac{Lnight+10}{10}\right)$ Where the L_{day}, $L_{evening}$ and L_{night} are as defined in ISO1996-2:1987, and for the duration of 12 hours, 4 hours and 8 hours respectively, are A-weighted long term Leq sound level.
L_{day}	Day equivalent level. A-weighted Leq sound level measured over the 12 hour period from 07:00 hours to 19:00 hours.
$L_{evening}$	Evening equivalent level. A-weighted Leq sound level measured during the evening period of 19:00 hours to 23:00 hours.
L_{Amax}	The maximum RMS A-Weighted sound pressure level occurring within a specified time period.
L_{night}	Night equivalent level. A-weighted Leq sound level measured during the night period of 23:00 hours to 07:00 hours.
Measurement time interval, T_m	total time over which measurements are taken. *Note: This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.*
Rating level, $L_{Ar,\,Tr}$	specific sound level plus any adjustment for the characteristic features of the sound.
Reference time interval, T_r	specified interval over which the specific sound level is determined. *Note: This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h*
Residual sound	ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level, L_r = $L_{Aeq,T}$	equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.
Specific sound level, L_s = $L_{Aeq,Tr}$	equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.
Specific sound source	sound source being assessed.
Night-Time	An 8 hour period between 23:00 – 07:00 hours, as per NG4
Noise Ambient	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far. Also see ambient sound.
Noise Background	The steady existing noise level present without contribution from any intermittent sources, The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, 'T' ($L_{AF90,T}$). Also see background sound level, $L_{A90,\,T}$.
Noise Specific	The sound arising from the source under investigation, disregarding all external and residual sources. Also see specific sound source.
NSR	Noise Sensitive Receptor - an identified dwelling, amenity area, recreational zone or other such place where a change in noise may result in a nuisance impact.
RMS	Root Mean Squared, mathematical method to account for swells and troughs within wave forms, such as sound.

Sound Power Level (L_W)	The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) per m2. Utilised to express the intensity at source of a noise emission.
Sound Pressure Level (L_P)	Fluctuations in air pressure caused by the passage of a sound wave. The measurement of sound/noise through the use of a sound level meter, is a representation of these fluctuations in air pressure as they pass the instrument microphone.
Time Weighting	One of the averaging time for noise monitoring instrumentation: F – Fast, instrument samples every 125 milliseconds; S – Slow, instrument samples every 1 second; I – Impulsive, instrument samples every 35 milliseconds.

Note:

Unless otherwise stated all broadband noise values are A-weighted with a fast response.

Where 0dB is referenced it refers to the threshold of hearing – $2x10^{-5}$Pa.

All 1/3 octave values are unweighted/linear. (z-weighted on the Bruel and Kjaer software)

APPENDIX 11-2

1 RESULTS – WEATHER DATA

The daily summary for the weather data is presented in Table below.

Table 1-1: Daily Weather Data Summary

Date	Temp Low (°C)	Temp Median (°C)	Temp max (°C)	Wind Speed Min (m/s)	Wind Speed Median (m/s)	Wind Speed Max (m/s)	Wind Dir Dominant	Rain Total (mm)
26/05/2023	14.0	21.0	24.0	0.0	1.0	3.0	SW	0.0
27/05/2023	12.0	17.0	25.0	0.0	0.0	2.0	N	0.0
28/05/2023	12.0	14.0	21.0	0.0	1.0	3.0	NW	0.0
29/05/2023	12.0	15.0	21.0	0.0	1.0	3.0	NW	0.0
30/05/2023	11.0	16.9	23.0	0.0	1.0	2.1	SSW	0.0
31/05/2023	12.5	16.2	18.7	0.0	0.9	1.8	WSW	0.0
01/06/2023	11.9	16.3	22.7	0.3	0.8	2.0	S	0.0
02/06/2023	12.2	15.3	21.5	0.0	0.6	2.0	SW	0.0
03/06/2023	11.3	16.9	23.4	0.0	0.4	2.0	NW	0.0
04/06/2023	13.0	17.8	24.1	0.0	0.5	1.7	S	0.0
05/06/2023	13.3	17.3	24.4	1.7	0.8	1.7	NW	0.0
06/06/2023	12.3	16.3	21.2	0.1	0.6	2.0	SSW	0.0
07/06/2023	10.8	14.8	19.8	0.1	0.9	1.9	SW	0.0
08/06/2023	13.2	17.2	19.4	0.5	3.2	6.2	N	0.3
09/06/2023	13.2	16.7	20.4	1.2	3.9	6.6	N	0.0
10/06/2023	15.4	16.2	18.5	0.7	2.2	5.1	N	4.2
11/06/2023	15.2	16.6	19.1	0.0	1.2	2.6	SE	0.3
12/06/2023	15.2	18.5	21.1	0.0	0.9	2.6	W	0.0
13/06/2023	16.1	20.2	24.9	0.0	1.2	4.1	N	0.0
14/06/2023	13.9	17.3	22.0	0.0	2.1	5.1	N	0.0
15/06/2023	14.4	18.4	23.0	0.0	1.3	3.0	SE	0.0
16/06/2023	14.9	16.7	17.4	0.1	1.7	3.4	ENE	14.9
17/06/2023	15.1	16.4	19.8	0.3	2.0	3.7	NE	19.4
18/06/2023	15.4	17.6	19.4	0.0	1.9	3.3	ENE	0.6

Date	Temp Low (°C)	Temp Median (°C)	Temp max (°C)	Wind Speed Min (m/s)	Wind Speed Median (m/s)	Wind Speed Max (m/s)	Wind Dir Dominant	Rain Total (mm)
19/06/2023	13.9	17.6	19.9	0.0	2.1	5.3	SE	5.1
20/06/2023	15.6	18.3	21.1	0.0	1.9	4.5	SE	0.8
21/06/2023	13.1	18.7	21.5	0.0	1.0	4.5	ESE	0.0
22/06/2023	13.1	18.5	22.0	0.0	1.5	4.5	SE	0.0
23/06/2023	16.3	18.2	19.4	1.6	3.3	5.1	SE	11.3
24/06/2023	17.0	18.8	20.5	1.3	3.6	6.1	SE	0.0
25/06/2023	13.5	17.3	20.8	0.1	1.7	5.3	SE	27.3
26/06/2023	11.3	16.0	19.0	0.0	1.9	4.0	SSE	0.0
27/06/2023	15.3	17.7	21.3	0.7	3.1	5.2	SE	0.3
28/06/2023	13.9	16.8	20.8	0.4	1.6	0.4	0	0.0
29/06/2023	10.5	16.1	19.2	0.0	1.4	3.3	SSE	0.0
30/06/2023	13.6	16.3	19.7	1.1	2.3	4.5	SSE	4.5
01/07/2023	13.5	16.4	20.0	0.6	2.4	3.5	S	0.0
02/07/2023	11.5	14.9	18.7	0.6	1.5	2.9	SSE	0.0
03/07/2023	11.7	14.9	18.9	0.7	2.4	5.2	S	0.0
04/07/2023	11.2	13.9	17.3	0.1	1.6	4.2	SSE	16.0
05/07/2023	10.3	15.0	18.1	0.1	1.6	3.9	SSE	0.8
06/07/2023	12.2	16.1	17.1	0.5	4.8	7.4	ESE	9.8
07/07/2023	16.6	17.7	19.1	1.9	5.1	7.0	ESE	5.8
08/07/2023	15.1	17.2	19.3	0.8	4.2	6.5	SE	0.6
09/07/2023	14.8	16.7	18.6	0.2	3.6	5.1	SE	1.7
10/07/2023	14.0	16.1	18.6	0.2	2.6	6.2	SE	18.4
11/07/2023	13.1	16.5	21.2	0.0	1.3	3.1	S	0.0
12/07/2023	13.6	16.9	20.4	0.6	2.0	4.2	SSE	1.3
13/07/2023	12.2	16.3	18.8	0.0	2.3	5.0	SE	0.0
14/07/2023	13.8	15.2	19.4	0.8	3.4	4.9	SE	42.4
15/07/2023	14.0	15.0	18.4	1.3	3.1	4.4	SSE	4.3

Date	Temp Low (°C)	Temp Median (°C)	Temp max (°C)	Wind Speed Min (m/s)	Wind Speed Median (m/s)	Wind Speed Max (m/s)	Wind Dir Dominant	Rain Total (mm)
16/07/2023	12.6	14.6	17.8	0.2	1.8	3.2	SSE	12.2
17/07/2023	10.7	15.5	18.6	0.1	1.2	2.9	SSE	3.0
18/07/2023	13.0	16.0	21.1	0.1	1.3	3.0	ESE	16.4
19/07/2023	13.1	16.0	20.4	0.1	0.8	2.0	SSW	0.0
20/07/2023	11.2	15.9	18.9	0.0	0.6	1.7	S	0.0
21/07/2023	11.2	15.0	17.9	0.1	1.1	3.1	S	3.2
22/07/2023	13.9	16.9	18.6	0.4	1.6	3.3	SSE	16.8
23/07/2023	14.5	16.4	20.2	0.1	1.5	2.6	SSE	24.4
24/07/2023	11.8	15.6	19.1	0.1	1.2	2.4	WNW	0.0
25/07/2023	10.8	15.2	19.2	0.1	0.7	2.7	SSE	0.0

APPENDIX 11-3

1 RESULTS – ACOUSTIC BASELINE

1.1 Unattended measurements

The results from the survey are shown in Table 1-1 and 1-2 below. Highlighted values indicate instrumentation errors. Red text indicates results exhibiting values higher than typical noise nuisance level. Highlighted values indicated data was lost due to battery failure, storage full or the equipment fall, values not taken into full calculations.

Table 1-1. Results for location NM1

Date	L_{day} (dB)	$L_{evening}$ (dB)	L_{night} (dB)
26/05/2023	39	40	38
27/05/2023	43	43	40
28/05/2023	40	37	37
29/05/2023	38	38	36
30/05/2023	35	10	0
31/05/2023	17	37	35
01/06/2023	43	35	35
02/06/2023	39	38	36
03/06/2023	39	39	35
04/06/2023	38	36	34
05/06/2023	37	37	34
06/06/2023	38	37	36
07/06/2023	39	36	35
08/06/2023	39	35	35
09/06/2023	38	38	34
10/06/2023	38	40	39
11/06/2023	43	42	39
12/06/2023	40	40	39
13/06/2023	41	43	39
14/06/2023	40	41	40
15/06/2023	42	41	40
16/06/2023	40	30	26
17/06/2023	37	41	40
18/06/2023	43	42	42
19/06/2023	41	43	34
20/06/2023	46	42	40
21/06/2023	45	41	39
22/06/2023	46	45	42
23/06/2023	49	47	45
24/06/2023	46	44	45
25/06/2023	40	41	45
26/06/2023	45	42	46

Table 1-2. Results for location NM2

Date	L_{day} (dB)	$L_{evening}$ (dB)	L_{night} (dB)
26/05/2023	46	45	46
27/05/2023	48	45	47
28/05/2023	49	48	47
29/05/2023	48	47	47
30/05/2023	49	46	47
31/05/2023	46	46	6
01/06/2023	0	0	0
02/06/2023	0	0	0
03/06/2023	0	0	0
04/06/2023	0	0	0
05/06/2023	0	0	0

Date	L_{day} (dB)	$L_{evening}$ (dB)	L_{night} (dB)
06/06/2023	0	0	0
07/06/2023	30	45	45
08/06/2023	47	45	6
09/06/2023	28	45	45
10/06/2023	42	43	44
11/06/2023	44	44	45
12/06/2023	46	44	45
13/06/2023	46	45	47
14/06/2023	45	43	45
15/06/2023	45	44	45
16/06/2023	40	32	29
17/06/2023	39	43	44
18/06/2023	45	44	45
19/06/2023	41	44	36
20/06/2023	33	0	0
21/06/2023	0	0	0
22/06/2023	36	44	43
23/06/2023	50	55	48
24/06/2023	50	46	43
25/06/2023	41	46	45
26/06/2023	47	44	6
27/06/2023	18	44	43
28/06/2023	47	46	46
29/06/2023	48	44	44
30/06/2023	48	45	46
01/07/2023	48	45	44
02/07/2023	48	44	44
03/07/2023	47	44	44
04/07/2023	44	46	45
05/07/2023	44	44	43
06/07/2023	47	48	19
07/07/2023	46	43	46
08/07/2023	44	43	43
09/07/2023	45	43	44
10/07/2023	46	45	44
11/07/2023	43	45	35
12/07/2023	12	44	45
13/07/2023	46	44	43
14/07/2023	49	44	43
15/07/2023	46	45	44
16/07/2023	45	45	45
17/07/2023	45	47	47
18/07/2023	45	46	46
19/07/2023	45	46	48
20/07/2023	45	46	46
21/07/2023	43	46	46
22/07/2023	44	46	NA
23/07/2023	NA	NA	39
24/07/2023	46	43	44

Table 1-3. Results for location NM3

Date	L_{day} (dB)	$L_{evening}$ (dB)	L_{night} (dB)
27/06/2023	11	42	40
28/06/2023	47	43	43
29/06/2023	45	42	43
30/06/2023	46	44	46

Date	L_{day} (dB)	$L_{evening}$ (dB)	L_{night} (dB)
01/07/2023	50	43	43
02/07/2023	47	44	43
03/07/2023	49	40	42
04/07/2023	42	40	41
05/07/2023	45	41	39
06/07/2023	45	48	47
07/07/2023	44	39	44
08/07/2023	45	34	32
09/07/2023	45	39	38
10/07/2023	46	43	40
11/07/2023	44	41	42
12/07/2023	46	38	41
13/07/2023	45	40	35
14/07/2023	38	15	14
15/07/2023	15	15	14
16/07/2023	16	15	13
17/07/2023	16	15	14
18/07/2023	35	40	41
19/07/2023	43	40	40
20/07/2023	45	44	45
21/07/2023	41	41	38
22/07/2023	41	38	37
23/07/2023	NA	43	40
24/07/2023	45	--	--

1.2 Attended Measurements

Attended measurements were conducted during various days for the different periods, day, evening and night-time.

The results and comments are presented in Table 1-4.

Table 1-4: Attended measurements

Period		Location	Date and Star Time	Elapsed Time (hh:mm:ss)	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)	L_{AFmax} (dB)	Commentary
Week 1 (26th May - 1st June)	Daytime	NM1	2023-05-26 15:51:38	00:30:00	39	33	61	Air emission off-site (S) (Smartply stack) faint. Birdsong nearby. Car door and resident speaking at 15:57, car near SLM. Plane overhead (N) at 15:58. Large bang off-site (S) at 16:10.
		NM2	2023-05-26 14:00:00	00:30:00	45	43	61	Air emission (N) constant (Smartply stack). Birdsong nearby regularly.
		NM4	2023-05-26 17:46:32	00:30:00	42	38	63	Constant air emission off-site (N) faint (form facility across water). Bird-song regular. Pedestrian skipping at 17:49 and 18:12. Power tool (N) offsite at 17:53, 17:55, 17:57:18:13 and 18:14. Power tools nearby house (E) at 18:02.
Week 2 (2nd June - 8th June)	Daytime	NM1	02/06/2023 13:14	00:30:00	41	32	65	Smartply air emission(stack) constant (S). Plane overhead (S) at 13:28. Birdsong audible regularly nearby. Port alarm audible (SE) faint at 13:26. Loading off-site (S) at 13:26 and 13:38. Off-site RA at 13:34 and 13:37 (S). Wind speed: 0.5-1.5m/s.
		NM2	02/06/2023 10:13	00:30:00	48	44	73	Smartply air emission constant (N) faint. An additional air emission from Smartply was also audible constantly. Gantry/alarm audible (S) at port at 10:30, 10:32, 10:34, 10:37 and 10:39 (not highly audible). Truck passing on nearby road (N) AT 10:30, 10:33, 10:37, 10:38, 10:39 and 10:40. Wind speed: 0.5-1.5m/s.
		NM3	02/06/2023 15:58	00:30:00	37	31	58	Bird-song prevalent noise occurrent. Faint door slam at house (S) of exterior gate at 16:16. Port not audible. Hitch hikers faintly audible speaking in nearby forest at 16:10. Wind speed: 0.5-1.5m/s.
		NM4	02/06/2023 14:49	00:30:00	40	37	56	Air emission off-site (N) constant faint from Great Island Power Station. Car pass at 14:52, 14:53, 14:56, 15:13, 15:15 and 15:19. Fain radio in nearby house (S) until 15:10. Birdsong more audible at 15:01. Banging at off-site factory at 15:09. Resident in nearby garden faintly audible at 15:15. Wind speed: 0.5-1.5m/s.

Period		Location	Date and Star Time	Elapsed Time (hh:mm:ss)	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)	L_{AFmax} (dB)	Commentary
	Night	N1 R1	2023-06-07 23:02:22	00:15:00	34	31	57	Smartply air emission constant (faint). Faint banging (S) off-site at 23:02, 23:05, 23:06, 23:07, 23:09 and 23:11. Reverse alarms (S) off-site at 23:09.
		N2 R1	2023-06-07 23:34:12	00:15:00	42	40	52	Smartply stack emission constant (faint). Another different smartply air emission audible constant (eastern side). A steam like sound was audible from the eastern part of smartply every 30 seconds.
		N3 R1	2023-06-08 00:25:14	00:15:00	33	29	51	Leaves rustling. Brief electronic noise from van at 00:29. No POW or Smartply audible.
		N4 R1	2023-06-08 00:56:52	00:15:00	39	37	59	Air emission (N) off-site constant (Great island) Wind slightly audible. Metal clip on nearby pole causing a faint rattling noise
Week 3 (9th June - 15th June)	Evening	N1 R1	2023-06-13 19:01:40	00:30:00	51	39	66	Strimmer highly audible on resident property and nearby field (N).Car pass in other nearby property at 19:13 and 19:19. Smartply stack emission faintly audible. Bird-call audible. Strimmer stopper at 19:23. Birdsong and air emission for the rest. Loading/banging off-site at 19:07, 19:08, 19:09:19:16 and 19:17. Reverse alarms (S) off-site at 19:12 and 19:24. Alarm off-site at 19:27 and 19:28.
		N2 R1	2023-06-13 19:47:44	00:30:00	43	40	57	Birdcall and smartply stack emission audible constantly. Intermittent air emission eastern side of smartply every few seconds. Plane overhead at 19:52. Reverse alarms at 19:52, 19:53, 20:02 and 20:14.
		N3 R1	2023-06-13 21:18:24	00:30:00	37	34	59	Bird-song dominant. Faint air emission smartply (W). Faint generator/air emission on POW (southern side) constant Faint bagging on POW at 21:24, :21:25, 21:30, 21:34, 21:37 and 21:42. (southern side)

Period		Location	Date and Star Time	Elapsed Time (hh:mm:ss)	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)	L_{AFmax} (dB)	Commentary
		N4 R1	2023-06-13 22:02:50	00:30:00	41	35	65	Pedestrians talking (young adults meeting up near) nearby NSLs through entire measurements. More pedestrians at 22:15 and 22:25. Bird-call audible. 22:22 Pedestrian clapping. Constant but faint air emission on Great Island (N) Car pass at 212:04, 22:30, 22:31 and 22:32. Air emission increased at Great Island at 22:18, 22:20, 22:27 and 22:32.
Week 4 (16th June - 22nd June)	**Day**	N1 R3	2023-06-20 12:04:10	00:30:00	45	42	60	Bird song + smartply emission constant. Faint bang (SE) likely POW at 12:07/07/12/13/19/21. Faint POW reverse siren (SE) at 12:13/223/30. Screeching metal noise POW at 12:21/23/24. Site alarm (SE) at 12:05/06/07/10. Bang (S) offsite at 12:06/07/09/12. Faint POW truck banging (SE) at 12:00. Distant lawnmowers (chainsaw) at 12:16. Car pass in other property (E) nearby at 12:19 (faint). Offsite reverse alarms (S) at 12:08/32. (Difficult to distinguish noises from all industrial sites due to poor visibility with trees in distances). Wind speed: 0-1.5m/s.
		N2 R3	2023-06-20 11:08:58	00:30:00	48	44	63	Bird song dominant. Smartply air emission (N). Truck pass in the main road at 11:09/11/13(x)/14/15/16/17/19/21/23/25/27/30/31/32/33. Horn (N) at 11:14. Horn (S) at 11:25 (likely POW) Bang audible (S) at 11:10/11/12/13/15/30/32 (likely POW) Light hammering (SW) between 11:14 and 11:24. (Likely offsite, sounds like drilling). Chainsaw (E) at 11:30 (moderate). Loud bang (S) (POW likely). Wind speed: 0-1.5m/s.

Period		Location	Date and Star Time	Elapsed Time (hh:mm:ss)	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)	L_{AFmax} (dB)	Commentary	
		N3 R3	2023-06-20 13:17:02	00:30:00	49	39	69	Bird song dominant. Lawnmower from other resident property audible (S) between 13:24 and 13:47. Resident (N) car briefly idling beside SLM at 13:30. Lawnmower (W) close nearby briefly at 13:43. No POW noise. Wind speed: 0-1.5m/s.	
		N4 R3	2023-06-20 13:59:44	00:30:00	59	38	81	Construction workers hammering on pier constantly (Dominant). Bird song constant. Workers talking on pier regularly. Power-tool on pier at 14:05/25. Car pass at 14:00/08/14/16/17/21/27/28. Resident (S) hitting door mat on ground (leaning dust off it). No POW noise. Wind speed: 0-1.5m/s.	
Week 5 (23rd June - 29th June)	**Night**	N1 R2	2023-06-27 23:16:32	00:15:00	41	38	53	Smartply stack constant (N). Offsite banging (S) at 23:25/26/27. Offsite reverse alarms (S) at 23:26/27. Air emission at western party of Smartply at 23:34. Bang at POW at 23:28. Wind speed: 0-2m/s.	
		N2 R2	2023-06-27 23:44:10	00:15:00	39	39	44	Air emission at eastern part of Smartply dominant. (Slight hissing sound at the end of each 30seconds.) Smartply stack emission audible but less dominant. Wind speed: 0-2m/s.	
		2023-06-27 N3 Exterior gate 15 NM3B	2023-06-27 16:58:22	00:15:00	47	42	62	Bird song. Plane (N) at 17:02. Bang (W) at 17:05. Car pass at 17:10. Wind speed: 0-2m/s.	Three locations tested for comparison. Wind speed was too high so 15min test runs were used instead of 30min.

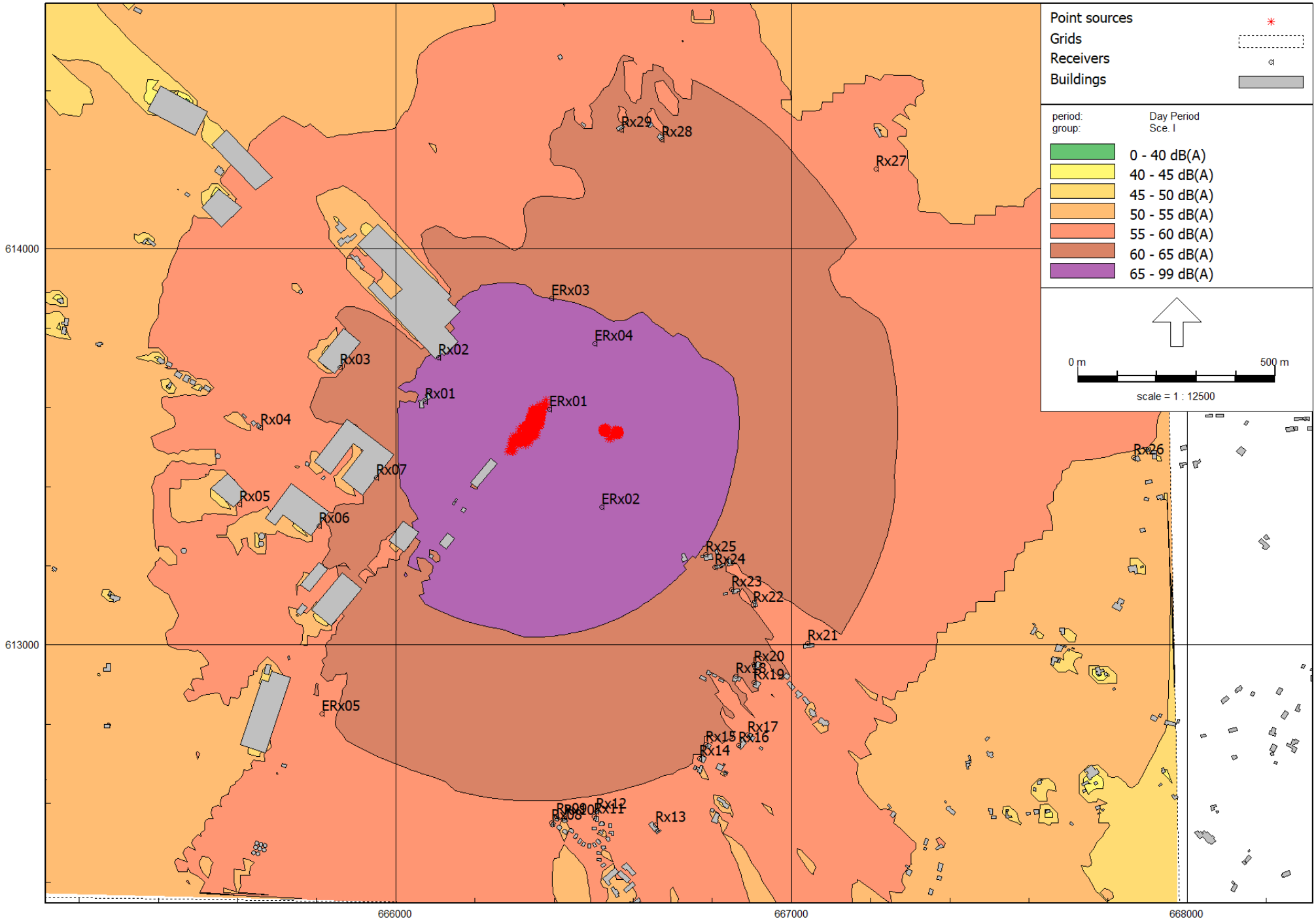
Period		Location	Date and Star Time	Elapsed Time (hh:mm:ss)	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)	L_{AFmax} (dB)	Commentary	
		2023-06-27 N3 Football Pitch 15 NM3C	2023-06-27 17:21:44	00:15:00	49	46	61	Wind highly audible (0-7.3m/s). Faint bang site at 17:28/34. Site alarm POW at 17:28.	
		2023-06-27 N3 House 15min Test NM3A	2023-06-27 16:28:44	00:15:00	50	44	67	POW site alarm (W) at 16:28/29/30/31/32/37/41. POW bang (W) at 14:28/29/30/31/32/36/37/40. POW reverse alarms (W) at 14:33/36/38/39/40. Plane (W) at 14:29. Bird song faintly audible. Wind speed: 0-6m/s.	
		2023-06-28 N3 Pitch Night Test NM3C	2023-06-28 00:32:56	00:15:00	34	32	54	Pitch GAA. Constant faint air emission (SW) likely POW southern part of site. Faint bang (SW) 00:35/36/42. Wind speed: 0-1.5m/s.	
		2023-06-28 N3 R2 Night Exterior NM3B	2023-06-28 00:53:26	00:15:00	28	27	46	POW Reverse alarms faintly audible (W) at 00:58 and 01:00. Insect (flies) audible near SLM. Faint van electric noise (Dylan's) at 00:52. Wind speed:0-1m/s.	Two locations tested for N3 as the gate is in a woodland area.
		2023-06-28 N4 R2 Night	2023-06-28 01:26:56	00:15:00	36	33	61	Smartply faintly audible constantly (W). Faint water movement nearby (N). Brief air emission (N) at 01:38. Wind speed: 0-2.5m/s.	
Wee	**Day**	N1 R3						Rain	

Period		Location	Date and Star Time	Elapsed Time (hh:mm:ss)	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)	L_{AFmax} (dB)	Commentary
		N2 R3						Rain
		N3 R3	2023-07-04 10:31:20	00:30:00	40	37	68	Bird song/call constant. Wind/trees rustling. The property bushes prevent surveyor from seeing any activity (likely all sources from POW). Site alarm (W) at 10:31/32/35/43/49/50/51/553/56 (faint moderate) HGV engine (W) at 10:34/35/37/38/39/41/43/45/48/50/51/52/55/58 (faint) Reverse alarms (W) between 10:37 and 10:53 (faint). Unique siren alarm (W) at 11:00 (moderate). Wind speed: 0-3m/s.
		N4 R3	2023-07-04 11:22:16	00:30:00	56	40	86	Birdcall (seagulls). Plane (S) at 11:37. JCB engine audible on Pier (N) construction active. JCB pass near SLM (idling) at 11:29. JCB loading (N) at 11:32/37/40/41. Car pass at 11:25/27/42/47/48. Worker talking nearby at 11:28/31/39. Wind speed: 0-2m/s.
Week 7 (7th July- 13th July)	Evening	N1	2023-07-11 21:01:58	00:30:00	42	40	52	Smartply stack constant faint (S). Loading offsite (S) at 21:03/06/07/08/14. Site alarm (S) offsite at 21:04/06/09/18/25. Forklift reverse alarms (S) (likely Target business). Plane (N) at 21:13. Horn (S) offsite at 21:23. Wind speed: 0-3m/s.
		N2	2023-07-11 21:45:10	00:30:00	41	40	56	Smartply stack constant but faint (NW). Secondary air emission every 30 seconds approx at eastern part of Smartply with steam (same as previous events). Plane (N) at 22:13. Wind speed: 0-2m/s.

Period		Location	Date and Star Time	Elapsed Time (hh:mm:ss)	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)	L_{AFmax} (dB)	Commentary
		N3	2023-07-11 19:15:44	00:30:00	49	44	66	Football club match moderate-highly audible throughout (dominant). Wind/trees rustling moderately audible throughout. Gantry and crane on POW audible faintly throughout. Gantry movement audible at: 19:24/31/33/37/39/42/43 (electronic movement noise with a faint alarms when moving/active) Crane at: 19:29/31/32/33/34/36/37/40/42 (electronic movement). Car pass at 19:45. Wind speed: 0-4.5m/s.
		N4	2023-07-11 19:56:50	00:30:00	45	39	69	Birdcall regularly audible. Wind highly audible. Car pass at 20:07/09/12/15/16/21/24. Car idling near NSL at 19:37, 20:09 and 20:10. Pedestrians talking loudly near SLM between 20:08 and 20:10. Wind speed: 0-4.5m/s.
Week 8 (14th July- 21st July)	Day	N1	NA	NA	NA	NA	NA	
		N2	NA	NA	NA	NA	NA	
		N3 football club	2023-07-17 12:41:56	00:30:00	42	38	58	
		N4	2023-07-17 11:43:06	00:30:00	44	34	62	

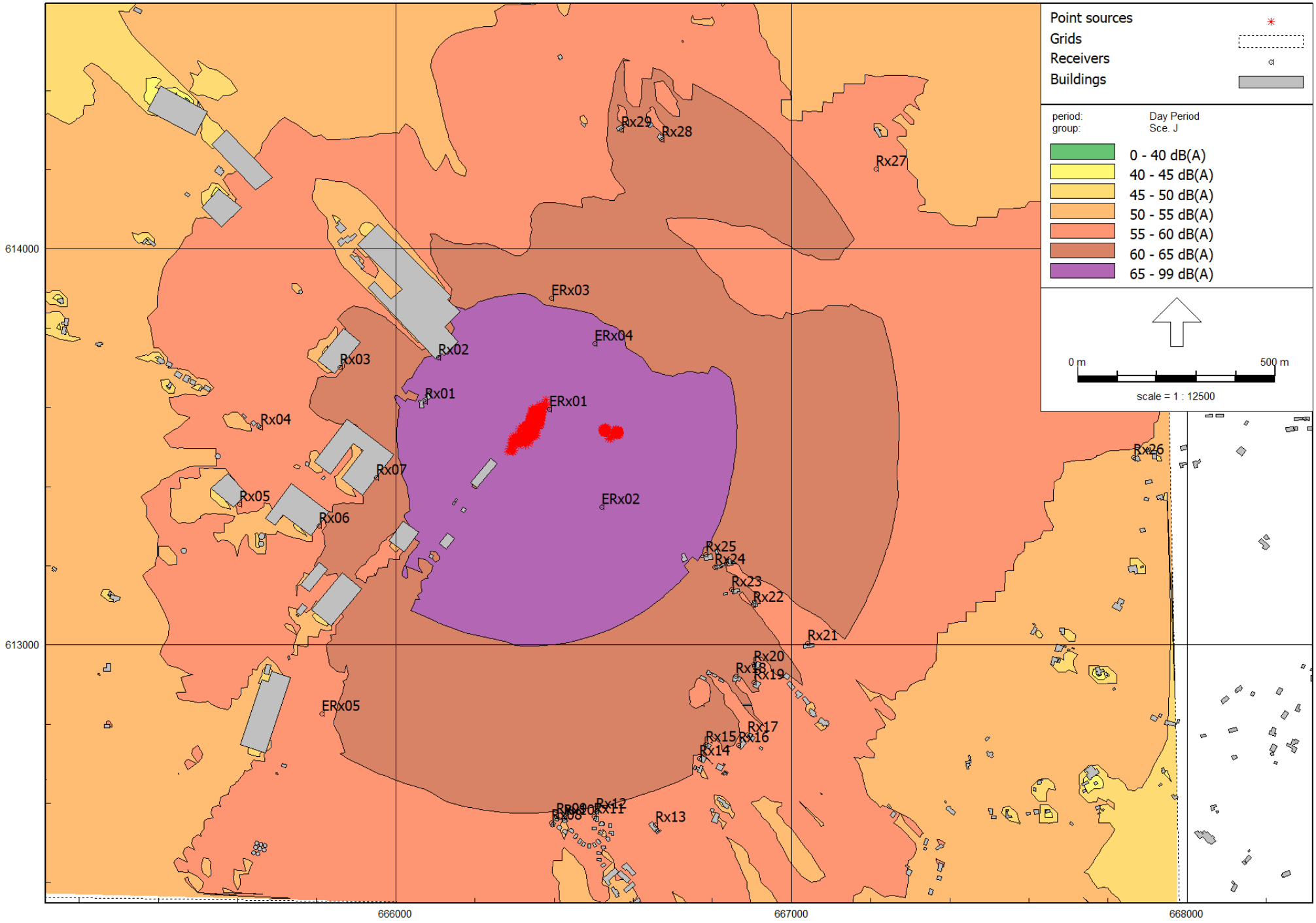
APPENDIX 11-4

APPENDIX 11-4-1



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APPENDIX 11-4-2



construction model v1 - Scenario J

28 Nov 2024, 18:40

Kerri Nolan - Malone O'Regan Environmental Services Ltd

ISO 9613, [version of Area - construction model v1] , iNoise V2024 Pro Licensed to Kerri Nolan - Malone O'Regan Environmental Services Ltd

APPENDIX 12

APPENDIX 12-1

1 RESULTS – UNDERWATER BASELINE

Hydrophone was installed 15th January, until 15th March at 16:10 there was no available data on txt format. The data from 16th March have been analysed.

Hydrophone didn't change the hour, so after 28th March, the data was moved manually an hour forward.

The following periods have been analysed by:

- 15th March 2023 to 31st March 2023
- 1st April 2023 to 15th April 2023
- 16th April 2023 to 30th April 2023
- 1st May 2023 to 15th May 2023
- 16th May 2023 to 31st May 2023
- 1st June 2023 to 15th June 2023
- 16th June 2023 to 30th June 2023
- 1st July 2023 to 15th July 2023
- 16th July 2023 to 31st July 2023
- 1st August 2023 to 15th August 2023
- 16th August 2023 to 31st August 2023
- 1st September 2023 to 15th September 2023
- 16th September 2023 to 30th September 2023
- 1st October 2023 to 15th October 2023
- 16th October 2023 to 31st October 2023
- 1st November 2023 to 15th November 2023
- 16th November 2023 to 30th November 2023
- 1st December 2023 to 15th December 2023
- 16th December 2023 to 31st December 2023
- 1st January 2024 to 15th January 2024
- 16th January 2024 to 31st January 2024
- 1st February 2024 to 15th February 2024
- 16th February 2024 to 29th February 2024
- 1st March 2024 to 15th March 2024

Table 1-1 explained the amount of data to analyse.

Table 1-1: Data to analyse.

Description	Formula	Total
Data every 1 second	=2*1second	2 results every 1 second
Data in 1min	=60*2	120
Files of 10min	=60*2*10	1,200
Lines in 1hr (6*10min=1hr)	=60*2*10*6	7,200
Lines in 24hr	=60*2*10*6*24	172,800
Lines in 365 days (16/03/2023 – 15/03/2024)	=60*2*10*6*24*365	63,072,000

Table 1-2: 24-hour average results

Day	Low frequency (62.5-500Hz) dB	Medium frequency (500-2000 Hz) dB	High frequency (2000-25562.5 Hz) dB	Overall dB
16/03/2023	99	107	107	111
17/03/2023	95	106	106	109
18/03/2023	110	117	115	120
19/03/2023	89	98	105	106
20/03/2023	103	115	109	116
21/03/2023	98	107	110	112
22/03/2023	99	107	109	111
23/03/2023	100	107	109	111
24/03/2023	102	109	109	113
25/03/2023	97	105	108	110
26/03/2023	114	120	115	122
27/03/2023	87	93	100	101
28/03/2023	93	105	109	111
29/03/2023	95	104	108	110
30/03/2023	100	107	107	111
31/03/2023	102	111	111	114
01/04/2023	109	115	114	118
02/04/2023	98	104	104	108
03/04/2023	88	95	99	100
04/04/2023	87	96	104	105
05/04/2023	86	97	104	105
06/04/2023	89	98	101	103
07/04/2023	87	94	100	101
08/04/2023	89	95	102	103
09/04/2023	109	112	106	115
10/04/2023	99	108	110	112
11/04/2023	98	108	111	113
12/04/2023	111	119	117	121
13/04/2023	101	109	108	112
14/04/2023	100	107	107	111
15/04/2023	88	96	102	104
16/04/2023	86	96	101	103
17/04/2023	95	106	105	109
18/04/2023	97	105	107	109
19/04/2023	108	111	107	114
20/04/2023	99	106	107	110
21/04/2023	93	101	104	106
22/04/2023	87	96	107	107
23/04/2023	91	103	111	111
24/04/2023	89	99	107	108
25/04/2023	89	96	102	103
26/04/2023	87	94	99	100
27/04/2023	88	95	99	101
28/04/2023	86	102	104	106
29/04/2023	85	97	103	104
30/04/2023	88	97	100	102

Day	Low frequency (62.5-500Hz) dB	Medium frequency (500-2000 Hz) dB	High frequency (2000-25562.5 Hz) dB	Overall dB
01/05/2023	90	100	102	104
02/05/2023	98	107	102	109
03/05/2023	90	97	101	103
04/05/2023	93	102	106	108
05/05/2023	90	100	103	105
06/05/2023	86	94	100	101
07/05/2023	86	98	107	108
08/05/2023	89	100	107	108
09/05/2023	87	96	103	104
10/05/2023	95	104	106	108
11/05/2023	100	107	106	110
12/05/2023	89	97	100	102
13/05/2023	86	94	99	100
14/05/2023	96	105	105	108
15/05/2023	96	104	105	108
16/05/2023	91	102	102	105
17/05/2023	93	98	101	103
18/05/2023	88	96	101	102
19/05/2023	92	101	103	105
20/05/2023	88	97	100	102
21/05/2023	86	94	100	101
22/05/2023	96	105	106	109
23/05/2023	91	100	102	105
24/05/2023	95	102	104	106
25/05/2023	96	102	103	106
26/05/2023	93	97	99	102
27/05/2023	85	93	98	100
28/05/2023	92	100	102	105
29/05/2023	98	107	106	110
30/05/2023	96	103	103	106
31/05/2023	93	100	102	104
01/06/2023	93	101	103	105
02/06/2023	91	98	101	103
03/06/2023	94	100	102	105
04/06/2023	96	101	103	106
05/06/2023	99	105	106	109
06/06/2023	105	104	104	109
07/06/2023	98	102	104	106
08/06/2023	101	106	106	110
09/06/2023	102	105	105	109
10/06/2023	95	101	103	105
11/06/2023	95	101	100	104
12/06/2023	98	102	101	106
13/06/2023	101	105	102	108
14/06/2023	99	102	100	106
15/06/2023	100	106	103	109
16/06/2023	101	104	105	108

Day	Low frequency (62.5-500Hz) dB	Medium frequency (500-2000 Hz) dB	High frequency (2000-25562.5 Hz) dB	Overall dB
17/06/2023	103	107	107	111
18/06/2023	102	103	101	107
19/06/2023	104	104	102	108
20/06/2023	104	106	105	110
21/06/2023	101	104	100	107
22/06/2023	100	104	102	107
23/06/2023	101	105	107	110
24/06/2023	101	104	101	107
25/06/2023	104	108	108	112
26/06/2023	103	107	104	110
27/06/2023	106	108	107	112
28/06/2023	109	109	106	113
29/06/2023	104	107	105	110
30/06/2023	109	109	108	113
01/07/2023	115	116	115	120
02/07/2023	114	114	111	118
03/07/2023	111	111	110	116
04/07/2023	107	109	108	113
05/07/2023	107	107	105	111
06/07/2023	109	107	107	112
07/07/2023	116	119	111	121
08/07/2023	108	107	103	111
09/07/2023	103	108	104	110
10/07/2023	102	108	109	112
11/07/2023	103	107	104	110
12/07/2023	104	108	105	111
13/07/2023	103	107	102	109
14/07/2023	113	112	111	117
15/07/2023	118	117	113	121
16/07/2023	107	109	107	112
17/07/2023	105	108	105	111
18/07/2023	105	110	110	114
19/07/2023	105	107	104	110
20/07/2023	105	106	103	110
21/07/2023	106	111	111	115
22/07/2023	104	108	109	112
23/07/2023	116	119	113	122
24/07/2023	107	107	105	111
25/07/2023	103	106	103	109
26/07/2023	104	108	107	111
27/07/2023	107	110	105	112
28/07/2023	108	110	108	114
29/07/2023	110	110	106	114
30/07/2023	108	109	106	113
31/07/2023	108	109	106	113
01/08/2023	108	110	106	113
02/08/2023	115	114	114	119

Day	Low frequency (62.5-500Hz) dB	Medium frequency (500-2000 Hz) dB	High frequency (2000-25562.5 Hz) dB	Overall dB
03/08/2023	122	118	116	124
04/08/2023	115	119	116	122
05/08/2023	134	127	116	135
06/08/2023	108	110	107	113
07/08/2023	106	110	107	113
08/08/2023	108	110	104	113
09/08/2023	107	109	104	112
10/08/2023	107	108	102	111
11/08/2023	109	111	106	114
12/08/2023	111	111	106	114
13/08/2023	109	109	103	113
14/08/2023	109	111	107	114
15/08/2023	109	111	103	114
16/08/2023	106	109	112	114
17/08/2023	108	110	108	113
18/08/2023	129	125	115	131
19/08/2023	116	115	109	119
20/08/2023	109	110	109	114
21/08/2023	113	116	111	119
22/08/2023	107	108	105	112
23/08/2023	105	108	107	112
24/08/2023	105	107	104	110
25/08/2023	105	106	103	110
26/08/2023	118	114	111	120
27/08/2023	106	108	106	112
28/08/2023	106	109	106	112
29/08/2023	110	111	109	115
30/08/2023	114	113	105	117
31/08/2023	117	114	106	119
01/09/2023	114	112	104	116
02/09/2023	112	112	106	115
03/09/2023	115	117	109	120
04/09/2023	112	113	106	116
05/09/2023	110	110	105	114
06/09/2023	105	108	102	111
07/09/2023	102	106	101	109
08/09/2023	102	106	101	108
09/09/2023	107	116	111	117
10/09/2023	104	108	102	110
11/09/2023	104	109	108	112
12/09/2023	112	112	110	116
13/09/2023	104	107	104	110
14/09/2023	105	109	111	114
15/09/2023	111	111	113	117
16/09/2023	112	111	107	116
17/09/2023	108	108	103	111
18/09/2023	110	112	106	115

Day	Low frequency (62.5-500Hz) dB	Medium frequency (500-2000 Hz) dB	High frequency (2000-25562.5 Hz) dB	Overall dB
19/09/2023	116	115	109	119
20/09/2023	108	109	108	113
21/09/2023	106	107	107	111
22/09/2023	118	115	109	120
23/09/2023	103	104	105	109
24/09/2023	105	105	105	110
25/09/2023	106	106	106	111
26/09/2023	106	106	105	110
27/09/2023	121	118	111	123
28/09/2023	115	113	105	117
29/09/2023	115	116	106	119
30/09/2023	116	115	112	120
01/10/2023	111	110	104	114
02/10/2023	112	111	105	115
03/10/2023	115	121	112	122
04/10/2023	105	106	107	111
05/10/2023	106	107	108	112
06/10/2023	104	105	104	109
07/10/2023	104	104	103	108
08/10/2023	92	100	99	103
09/10/2023	96	102	99	104
10/10/2023	101	104	100	107
11/10/2023	103	109	112	114
12/10/2023	101	107	109	112
13/10/2023	110	111	112	116
14/10/2023	107	108	106	112
15/10/2023	106	105	99	109
16/10/2023	104	105	101	108
17/10/2023	109	108	108	113
18/10/2023	115	117	114	121
19/10/2023	111	112	112	116
20/10/2023	111	111	111	116
21/10/2023	110	110	108	114
22/10/2023	100	103	102	106
23/10/2023	101	108	115	116
24/10/2023	97	101	102	105
25/10/2023	106	106	104	110
26/10/2023	113	112	110	116
27/10/2023	116	114	103	118
28/10/2023	119	116	109	121
29/10/2023	120	118	111	122
30/10/2023	119	116	108	121
31/10/2023	117	115	110	120
01/11/2023	121	120	113	124
02/11/2023	111	109	108	114
03/11/2023	109	109	107	113
04/11/2023	118	115	112	120

Day	Low frequency (62.5-500Hz) dB	Medium frequency (500-2000 Hz) dB	High frequency (2000-25562.5 Hz) dB	Overall dB
05/11/2023	102	104	103	108
06/11/2023	109	108	107	113
07/11/2023	100	105	109	111
08/11/2023	108	108	107	112
09/11/2023	111	111	109	115
10/11/2023	118	117	113	121
11/11/2023	106	104	101	109
12/11/2023	113	110	109	116
13/11/2023	118	115	111	120
14/11/2023	111	110	107	114
15/11/2023	108	107	103	111
16/11/2023	111	110	102	114
17/11/2023	112	109	109	115
18/11/2023	112	111	108	115
19/11/2023	110	109	108	114
20/11/2023	120	116	113	122
21/11/2023	108	108	107	112
22/11/2023	99	102	104	107
23/11/2023	113	112	111	117
24/11/2023	106	105	104	110
25/11/2023	103	104	105	109
26/11/2023	107	107	106	111
27/11/2023	109	108	104	112
28/11/2023	107	107	105	111
29/11/2023	108	107	105	111
30/11/2023	112	110	108	115
01/12/2023	105	105	107	111
02/12/2023	101	104	104	108
03/12/2023	105	105	108	111
04/12/2023	128	122	116	129
05/12/2023	111	107	107	113
06/12/2023	115	112	109	117
07/12/2023	102	107	108	111
08/12/2023	107	107	107	112
09/12/2023	123	120	118	125
10/12/2023	116	115	113	120
11/12/2023	113	112	110	117
12/12/2023	111	111	106	115
13/12/2023	123	119	113	124
14/12/2023	108	109	107	113
15/12/2023	111	111	108	115
16/12/2023	111	112	109	116
17/12/2023	111	110	109	115
18/12/2023	108	110	109	114
19/12/2023	107	110	109	114
20/12/2023	117	115	113	120
21/12/2023	130	124	118	131

Day	Low frequency (62.5-500Hz) dB	Medium frequency (500-2000 Hz) dB	High frequency (2000-25562.5 Hz) dB	Overall dB
22/12/2023	119	115	113	121
23/12/2023	111	111	110	115
24/12/2023	110	110	107	114
25/12/2023	109	109	104	113
26/12/2023	112	112	112	117
27/12/2023	121	119	113	124
28/12/2023	114	113	109	117
29/12/2023	113	112	106	116
30/12/2023	120	117	112	122
31/12/2023	120	118	115	123
01/01/2024	102	105	110	112
02/01/2024	104	105	110	112
03/01/2024	100	101	102	106
04/01/2024	106	109	110	113
05/01/2024	107	110	110	114
06/01/2024	103	105	105	109
07/01/2024	98	102	101	105
08/01/2024	103	104	104	108
09/01/2024	110	111	109	115
10/01/2024	106	104	103	109
11/01/2024	107	105	101	110
12/01/2024	107	105	101	110
13/01/2024	105	104	100	108
14/01/2024	107	105	104	110
15/01/2024	106	106	105	110
16/01/2024	105	104	105	109
17/01/2024	112	116	115	119
18/01/2024	102	103	101	107
19/01/2024	103	104	104	109
20/01/2024	107	107	110	113
21/01/2024	120	114	112	122
22/01/2024	116	112	111	118
23/01/2024	111	110	111	115
24/01/2024	111	109	108	114
25/01/2024	107	106	105	111
26/01/2024	107	106	107	112
27/01/2024	107	113	109	115
28/01/2024	106	105	101	109
29/01/2024	113	113	112	117
30/01/2024	104	105	101	108
31/01/2024	106	105	104	110
01/02/2024	98	102	103	107
02/02/2024	99	102	100	105
03/02/2024	97	101	99	104
04/02/2024	104	105	105	109
05/02/2024	107	106	104	110
06/02/2024	106	107	108	112

Day	Low frequency (62.5-500Hz) dB	Medium frequency (500-2000 Hz) dB	High frequency (2000-25562.5 Hz) dB	Overall dB
07/02/2024	98	103	102	106
08/02/2024	117	115	113	120
09/02/2024	113	110	105	115
10/02/2024	115	111	107	117
11/02/2024	116	113	103	118
12/02/2024	116	114	106	118
13/02/2024	115	113	107	117
14/02/2024	115	112	109	118
15/02/2024	115	116	112	120
16/02/2024	103	105	101	108
17/02/2024	104	103	106	109
18/02/2024	103	103	104	109
19/02/2024	104	103	101	108
20/02/2024	113	108	105	114
21/02/2024	118	112	107	119
22/02/2024	114	111	110	117
23/02/2024	116	111	109	118
24/02/2024	116	110	103	117
25/02/2024	122	116	113	123
26/02/2024	115	112	107	117
27/02/2024	108	108	103	111
28/02/2024	109	108	110	114
29/02/2024	109	108	106	113
01/03/2024	125	122	117	127
02/03/2024	124	120	114	126
03/03/2024	99	102	99	105
04/03/2024	120	116	111	122
05/03/2024	101	104	102	107
06/03/2024	106	105	102	109
07/03/2024	120	113	108	121
08/03/2024	125	121	115	127
09/03/2024	116	112	110	118
10/03/2024	114	112	104	116
11/03/2024	114	112	110	117
12/03/2024	117	113	108	119
13/03/2024	116	114	111	119
14/03/2024	118	113	111	120
15/03/2024	112	111	106	115

APPENDIX 14

APPENDIX 14-1



Plate 14-1. Looking NW from Area A, south of the railway line in 2000. Area B lies in the middle ground of the photograph. The ruined mill (see Plate 8 and 9) stands just to the left of the photograph.



Plate 14-2. Area B, looking east, as it is in July 2024 with views towards the mill obscured by the stacks of timber



Plate 14-3. Looking W/SW from Area B at the entrance roadway (Area C) in July 2024. The entrance bridge to Area A (over the railway-line) is on the



Plate 14-4. The entrance bridge (over the railway-line) to the existing wharf at Bellview Port, July 2024



Plate 14-5. From Area B, looking W. The area as it was in 2007 when the compound/hard standing to the north was laid out. The hard standing with the gardens of Knockmullen House in the



Plate 14-6. Looking NW at the northern side of Area B in 2007 when the compound was created. The surface was cut down and then covered with introduced hardcore. The original ground level may be seen in the background beneath the tree line, screening the Smartly plant.



Plate 14-7. Looking E, the northern part of Area B in 2007. The ground has been reduced by 2m to 3m. Views of this area are now obscured by the storage of bulk timber (see Plate 2).



Plate 14-8. The ruined mill, a Protected Structure (RPS D136) from across the railway line, looking N (from the northern boundary of Area A), photographed in 2007. Since then the mill has become completely obscured by vegetation (see Appendix 1 for photographs taken in c. 2000 when there was greater visibility) .



Plate 14-9. The mill (RPS D136), looking NE, from across the railway line in 2007 before it was completely obscured by vegetation.



Plate 14-10. Looking E along the disused railway-line (July 2024). The eastern end of Area A is to the right of the photo.



Plate 14-11. The dock to the E of the mill looking S in 2007, (the E end of Area A is in the background of the



Plate 14-12. Looking at the outflow channel at the northeastern end of Area A (Winter 2022)



Plate 14-13 Area D, looking N in 2007. The Luffany Stream flows through the low-lying valley. Subsequently, the area became increasingly flooded (see Plate 14 and 15).



Plate 14-14. Area D photographed in Winter 2022 when the flood waters were high within the valley.



Plate 14-15. Area D looking N in the Winter of 2022. A stone wall (outside the redline boundary) defines the eastern side of the low land flanking the Luffany Stream



Plate 14-16. Area D looking northwest, the area is largely flooded in periods of wet weather.



Plate 14-17. The railway bridge over the Luffany Stream outlet defines the northeastern corner of Area A.



Plate 14-18 Looking upstream to the wharf at Bellview Port (Area A). The northern boundary of Area A is the railway-line. Glass House (RPS C483) stands in ruins within the vegetation to the north of the railway-line (see Appendix 3, for details of the house as it was pre the growth of vegetation)

APPENDIX 14-2

The Glass House, Gorteens
Co. Kilkenny

An Historic Building Appraisal

Report June 2000

For Maurice F Hurley

Contents

1.0 Introduction

2.0 Context

3.0 Exterior of house

4.0 Description of the interiors: ground floor

5.0 Description of the interiors: first floor

6.0 Description of the interiors: attic

7.0 Rear yard and outbuildings

8.0 Outline conservation plan

9.0 Conclusions

10.0 Photographic Record

1. Introduction

1.1 This report was commissioned by the Port of Waterford Company in order to assess the historic fabric and identify the authentic contents of the Glass House, Gorteens, Co. Kilkenny

1.2 On June 6th, 2000, an inspection of the interior and exterior of the house and associated outbuildings was carried out. All photographs, save where noted, were taken on that date.

1.3 For the sake of clarity of the descriptions included in this report, the main façade of the house is taken as facing south.

1.4 At various points in the report the reader is referred to plans and elevations prepared by Malone O'Regan Consulting Engineers.

2. Context

2.1 The Glass House is located in the townland of Gorteens, Co. Kilkenny. Located on elevated ground on the northern side of the River Suir, the house is situated approximately 6km downstream from Waterford City.

2.2 While the complex is the product of several phases of construction, the original core of the house is early eighteenth century in date. In 1714, Edmond Forstall sold lands at Gorteens to John Walker for £200.[1] Walker's sons, Maynard and Hovenden, commenced glass production here in 1729. The glassworks produced bottles, tableware and window glass and it was amongst the earliest glass-making factories in Ireland. By January 1737 Hovenden had become a Church of Ireland clergyman, moved to Waterford City and relinquished his rights to both the Glass House and nearby mill to Maynard for a rent of £130 per annum. In February 1739 *Faulkiner's Dublin Journal* carried an advertisement offering the lease of the glass works. Production probably ceased by 1739 and the glassworks was definitely closed by 1746.[2]

2.3 The house is currently property of the Port of Waterford Company and has been vacant for a number of years. The house and its associated outbuildings have been the subject of systematic vandalism and removal/damage of authentic fixtures and features such as floorboards, joists, fireplaces, doors, windows and slate cladding.

2.4 The building and associated site is not protected under either the National Monuments Acts or the Local Government (Planning & Development) Act of 1999.

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[1] Taken from 'Archaeological Impact Study' (November 1999) prepared by M. F. Hurley with historical research by Jack Burchill)

[2] *Ibid.*

3. Exterior of building

3.1 **Composition**: The main building is an eight-bay, two-storey, gable-ended, house with single-bay extension on the western end (see section 10.0: Photographic Record, Plate 1). Placed off-centre (to east) in the elevation is the former entrance that consists of flat-headed doorway flanked by narrow sidelights. The remains of a flat-roofed timber portico front this entrance (Plate 4). The timber pilasters of the portico that framed a central door and sidelights have been removed. Over the entranceway, there is a tripartite opening consisting of a round-headed embrasure with flanking sidelights. The single-bay extension (Plate 5) to the west is of two-storeys but is lower in total height than the main elevation. This extension has a flat-roofed bow-front projection at ground floor level.

It is evident that the original building consisted of five or six bays that correspond to the portion of the house defined by the western gable wall and the chimney set off-centre on the roof ridge. The three easternmost bays appear to have been a mid-eighteenth-century extension. Similarly the tripartite openings on the ground and first floors would appear to be of the same period and represent an attempt to rationalise the building's principal elevation.

To the rear of the house, there are two conjoined two-storey gabled-ended projections on the western side of the house and a number of smaller single- and two-storey annexes built up against these two principal extensions and the rear wall of the house (Plate 6). Of the two principal rear extensions, the eastern one is original to the early-eighteenth-century house (centrally placed, it forms a distinctive T-plan with the original core of the house).

3.2 **Roof**: The roof of the main elevation is double-pitched while the single-bay extension on the western gable is hipped. The principal rear extensions are gable-ended and double-pitched. The roof cladding is natural slate, set in diminishing courses. However the slate cladding of the central and western portions of the main roof and the entire cladding of the principal rear extensions have been recently stripped/removed.

There are three chimneys atop the roof ridge of the main elevation: one on each gable end and a single stack placed off-centre (to east). This latter chimney indicates the eastern gable of the original early-eighteenth-century house. The two gable-ended rear extensions had chimneys atop the gable tops but the easternmost extension's chimney has been truncated to match the roof profile.

3.3 **Walls**: The exterior walls are rendered in hard modern cement. The render obscures the cornice at eaves level. It appears that the walls are, in the main, constructed in brick. The majority of the rear walls are rendered in pebbledash.

3.4 **Openings**: All the ground floor embrasures have been blocked up with concrete blocks. Off centre to east, a modern flat-roofed portico (described above) fronts the entrance. Directly over the entrance, there is a tripartite opening consisting of a large round-headed embrasure flanked by narrow rectangular sidelights.

The window embrasures on the ground floor are long and narrow. In the second bay from the east, the fragmentary remains of a nine-over-six-pane timber sash window survive in situ. Over this window, at first floor level is a six-over-six pane timber sash window (the first-floor embrasures are smaller than the ground floor window embrasures). The sills of the windows are of cut limestone but some of these have been removed.

3.5 **Site:** The site is entered from the west through a low stone gateway with cut limestone pillars and a wooded driveway that widens on approaching the western end of the house. Immediately to the rear (north) of the house is a courtyard that is formed by three ranges of outbuildings. The courtyard is entered from the south-west through a gateway (Plate 55) formed by two large stone-built piers (the gates have been removed). An archway that gives access to additional outbuildings and lands to the rear of the house pierces the northern range. (The courtyard and outbuildings are described in section 7.0.)

In general, the grounds that surround the house are wooded and overgrown. Immediately to the south of the house is a level area that overlooks the river. This area is overgrown and after a short distance from the house, the lands fall steeply down to the boundary wall adjacent to a public pathway.

The Glass House and the associated outbuildings were at the core of the early-eighteenth-century glass-works. It is possible that additional evidence of the glass-works will be uncovered through a programme of archaeologically monitored trial investigations.

4. Interior of building: ground floor

4.1 The entrance on the main elevation is blocked and access to the ground floor is possible through partially blocked window embrasures. This former entrance lobby is approximately square in plan. The floorboards and the ceilings and floor above have been removed (Plates 10 & 11). A brick-built projecting chimney breast, with fireplaces on ground and first floors, is centrally placed on the east wall (Plate 11). This wall is the gable wall of the original early-eighteenth-century house. A simple plaster cornice survives at ceiling height. The walls of the first floor room over the lobby area have a smooth plaster finish and are devoid of any authentic features save for the tripartite opening mentioned earlier.

It is evident from the exposed brick surrounds of the sidelights of the entrance that these sidelights were inserted into an earlier embrasure (Plate 12). It is likely that the entrance was inserted in the mid-eighteenth-century when the three-bay extension to the east was added and there was a need to provide a central entrance to the lengthened elevation. The lobby was formerly the two-bay easternmost room of the early-eighteenth-century house.

4.2 To the west of the former lobby area is a large room lit by three windows (Plate 14). While the floorboards have been removed the riven-lath-and-plaster ceiling and floor joists above survive. At ceiling height, a beam (Plate 13) is evident between the second and third bay. It is possible that the beam indicates the location of a cross-wall that was later removed during alterations to the house. Centrally placed on the western wall is a projecting chimney breast from which the fire surround has been removed. Adjacent to the chimney breast, a doorway leads to the modern western extension (Plates 16 & 17).

4.3 To the east of the former lobby area is a large room lit by three windows (Plate 18). A fireplace is centrally placed on the eastern gable wall. (It is noteworthy that here the chimney-breast does not project from the wall face). As with the lobby area, both the floorboards and the ceiling/first floor over this room have been removed. However at ceiling height, a decorative plaster cornice survives in situ. It is apparent from imprints left in the plaster between each ground floor window that the room was, at one time, timber-panelled to at least chair rail height (Plate 22). A doorway (Plate 21) situated in the western end of the north wall of the room gives access to a spine corridor that runs east-west along the northern side of the house (Plate 24).

4.4 In the central rear extension, there are fragmentary remains of a dog-leg staircase (Plate 25). In the rear extension to the west of the staircase, is a large room with a Wyatt window situated in the western wall (Plates 28 & 29). Save for the window and the plastered walls, wall presses and ceilings, this room is devoid of any original fabric.

4.5 There are a number of modern single storey lean-tos located off the rear of the house. These are of no significance to the overall character and form of the house.

5. Interior of building: first floor

5.1 From the first floor landing, one enters an east-west corridor that accesses all front rooms. To the west of the landing, a doorway gives access to a room situated in the westernmost rear extension (see section 5.5).

5.2 The room over the lobby/entrance was formerly lit by a tripartite opening that is now blocked up. As stated above, the floor has been removed and the room is devoid of authentic/original fabric or features save for the tripartite window embrasure.

5.3 To the east, the rear corridor rises a short of flight of steps to a doorway that gives access to a formerly large three-bay room. This room was sub-divided by stud-partitions to form smaller rooms (Plates 31 - 33). The room's floor has been removed and, save for the single multiple-paned window on the front elevation, the rooms are devoid of authentic fabric or features. (The windows either side of the eastern fireplace are late-nineteenth- or early twentieth-century in date.)

5.4 Towards the western end of the first floor are two small rooms each lit by two windows (Plates 34 - 36). In these rooms, there is very little authentic fabric surviving save for sash boxes and floor/ceiling joists. These rooms appear to have been open to the elements over the past few years and are, consequently, in poor condition. At the west end of this floor is the first floor room of the western extension (Plate 37).

5.5 As noted above, the rear extension on the western end of the house is a gable-ended. At first floor level, this is lit by two large windows (Plate 38) in the western wall and in the north wall is a centrally placed chimney breast flanked to the west by a large window embrasure (Plate 39). In the eastern wall of this room, as noted above, is a doorway that links the room to the landing in the adjacent rear extension.

5.6 In the south-east corner of the landing is a newel staircase (Plate 40) that leads to the attic storey. The staircase is enclosed on two sides by timber uprights filled with brick-noggin.

6. Interior of building: attic

6.1 The attic of the house is accessed via a newel stairs in the easternmost gable-ended rear extensions of the house. The attic would have provided habitable space in the early eighteenth century. The aforementioned rear extension forms a T-shape plan with the original, early-eighteenth-century core of the house. This extension integrates with the core of the house by an arrangement of diagonally set rafters and crossed collar beams (Plates **43** & **44**). This arrangement of roof timbers is characteristic of early-Georgian rural houses. Two cross walls flank the crossing and each wall is pierced with a low door embrasure.

6.2 For the most part, the rafters are roughly hewn and joined by timber pegs (Plate **47** & **48**). The roof timbers are in good condition considering their age. However, the stripping of slate cladding is likely to lead to rapid deterioration of both the roof and the building. The slates, where they survive, are set in diminishing courses, bedded in sand and lime and fastened to laths (Plate **49**).

6.3 It is evident from an examination of the roof structure that the eastern three bays represent an extension to the original early eighteenth-century house. The differential between the rear roof profiles is one indication of this (Plate **52**), as is the original east gable wall of the house evident in the attic (Plate **51**). It would appear that the roof space of the eastern extension to the original house was not used as habitable space.

6.4 The western gable-ended rear projection is also a later addition to the early-eighteenth-century core of the house. The form of the roof timbers (Plate **53**) suggests that this extension is mid-eighteenth-century in date.

7. Rear yard and outbuildings

7.1 The yard to the rear (north) of the house is accessed by a gateway on the west of the house (Plate 55). The overgrown yard is roughly rectangular in plan and is bounded to the west, north and east by a variety of two-storey ranges of outbuildings.

7.2 The western range consists of two distinct sections: a single-storey, single roomed annex on the southern end of the range and an eight-bay, two-storey stone building divided internally by three cross walls (This range is labelled as *Building A* on drawings prepared by Malone O'Regan Consulting Engineers). A notable feature of the two-storey elevation is the three northernmost door embrasures that are surmounted by six-over-six-pane sash windows (Plate 62). Internally, one of the middle rooms has a large chimney breast that suggests the room was used as a forge (Plate 58). The roof of this western range of outbuildings is similar to that of the main house (i.e. timber pegging, incised Roman numerals on the rafters and collar beams). It is likely that this range of outbuildings is either contemporary to the original house or built shortly afterwards. If is therefore likely that this range of buildings functioned as ancillary workshops and/or living quarters for those employed in the production of glass.

7.3 The northern range (Plate 63) of the courtyard is composed of two stone buildings joined by a brick-built archway. (This range is labelled as *Buildings B & C* on drawings prepared by Malone O'Regan Consulting Engineers.) The western building is divided internally by two cross walls and door embrasures leading to the courtyard access each resultant room. The roof structure is similar to that of the western range. This building is devoid of any distinctive authentic fabric.

The central archway (Plate 64) is brick-built and the opening gives access through the northern range to an area to the rear. The archway is reminiscent of covered ways associated with larger and more formal farmbuildings and stables. The roof over this passage has been removed. The archway has the appearance of being a nineteenth-century intervention to an existing range of buildings.

To the east of the archway is a large, long building with a loft over the western half and open on the east. There is a brick-built fireplace and chimney breast in the westernmost ground floor room of this building (Plate 65) that suggests that this room and the loft over were used as living quarters, possibly for workers involved in the glass industry. It is noteworthy that the roof structure (Plate 66) is similar in form and detail to the western range and the main house located to the south.

7.4 The eastern range of buildings (Plate 67; labelled as *Building D* on drawings prepared by Malone O'Regan Consulting Engineers) is composed of two distinct portions: the northern portion which is irregular in plan and the southern portion composed of three-bays with a central round-headed door flanked by round-headed windows (Plate 68). The southern portion of the

range is a building of some charm. It likely that the doorway had a fanlight similar to the glazed hubs in the upper sashes of the flanking windows. Internally this building is devoid of any authentic fabric and the first floor is inaccessible. Given the architectural character of the building and its eighteenth-century date, it is likely that it had a significant administrative role in the functioning of the glass works.

7.5 The northern section of the eastern range is heavily modified and a large opening has been inserted in its eastern wall. On the northern wall are the remains of wall-hung, belt-driven machinery (Plate **70**). This cast-iron machinery is of nineteenth-century date and given the evidence of the wall-slot would have been connected with additional machinery and/or engine located in the eastern end of the northern range. The roof of this eastern range (Plate **71**) is similar in form and detailing to that of the other ranges and the early eighteenth-century roof on the main house.

7.6 To the north of the central archway of the northern range are two wood-drying sheds (Plate **72**). One shed, located to the east of the archway, is built against the wall of the northern range while the second is located on the west of the archway and is set at a right angle to the northern range.

7.7 Set a short distance to the east of the corner of the north and east ranges are two detached single-storey structures set at a right angle to each other. The southern building is a three-bay, gable-ended carriage shed (Plate **73**; labelled *Building G* on drawings prepared by Malone O'Regan Consulting Engineers). The elevation (west) is composed of two brick-built archways and a single rectangle door embrasure to south. King-post trusses (Plate 74) support the roof. The northern building (aligned east-west) is a four-bay, gable-ended stable (Plate **75**; labelled *Building F* on drawings prepared by Malone O'Regan Consulting Engineers). Both of these buildings are of mid- to late-nineteenth century date.

8. Outline Conservation Plan

8.1 This plan is intended only as a preliminary conservation proposal, to outline the most effective sequence for conservation works, and the manner in which they should be carried out. However, the most important part of any conservation plan is the establishment of a useful function for the building concerned.

8.2 The house and associated outbuildings have evidently fallen into a derelict state since they became unoccupied. In determining a use for the site, it should be recognised that the buildings, site and lands are of cultural significance and are capable of being adapted to sympathetic new uses. Given the lack of significant internal fabric (save for the roof structure and newel staircase) the buildings are capable of being restored to a known earlier external appearance and form while being adapted internally to new uses.

8.3 There is need for an **emergency programme of work.** It is imperative that regardless of whatever use/function or nature of redevelopment is likely to occur on site, that the house and the outbuildings are secured from further decay and damage. Of critical importance is the need to secure the roof structure. Not alone is the roof structure the most significant element of authentic internal fabric to survive in the house, it has, up until recently, helped to prevent greater levels of decay and damage from occurring within the building. However, as has been demonstrated, the roof has unfortunately been stripped of slates and it is a matter of urgency that the exposed roof timbers be protected with suitable temporary cladding (corrugated-iron sheeting or box-section aluminium sheeting etc). Access to the building should also be secured as so as to limit further damage to the interior of the building from vandalism, theft or fire.

8.4 On determining a use for the building and having acquired any necessary approval from the planning authority, it will be essential to undertake a programme of **necessary conservation works**. These will include:

- The **repair and recovering of the roofs** of the house and outbuildings. Wherever possible the existing roof structure should be retained. On the main house, the central crossed timbers are of cultural significance and heritage value and should be retained in situ. During the course of the works, the ends of all purlins, rafters and wall plates should be checked. It is likely that a significant number of the original timbers will have to be replaced. Any replacements and all repairs should match the original material and form. Large areas of the slate roofs have been damaged but where possible the existing slates should be reused. Where lacking, similar natural slates should make up the difference. In renewing/replacing the roof cladding, slates should be reset to match the existing pattern of diminishing courses evident on the front section of the main house. The existing chimney-stacks and pots should be retained.

- **Repairs to damaged wall sections and chimneys**. A structural engineer should inspect the buildings and should have particular regard to the iron

cross-tie evident in the western portion of the attic. It will be necessary to temporarily stabilise all walls. All loose and defective render should be cut out. (On the front façade, a panel of the existing render should be removed to reveal the character and condition of the wall surface). Where necessary, it may be required to cut out and replace/make good damaged bricks/stonework. It will be necessary to open and check all window heads, remove any bedded timbers in the walls, and lift all sills and re-bed these (or any replacement cut limestone sills) in DPC. All exposed surfaces should be brushed and washed free of any loose particles, be treated with fungicide and any deep holes pointed in advance with lime mortar. All rendering and plastering should be undertaken by a suitably qualified craftsperson using traditional lime products.

- Following these works, **a further programme of repair and new work** can proceed. This programme will include the repair of the damaged timber joists and floors, the repair/replacement of the main staircase, the conservation/repair of the newel staircase, and the replacement of the missing windows and doors. All new materials to be used for repair and replacement purposes should match the existing fabric. All replacement windows should be painted softwood sash windows, be single-glazed and fixed with putty in accordance with traditional practice. Furthermore, window casing and shutters to match the replacement windows should be introduced. The design of the replacement windows, doors and staircase (and possibly timber panelling) should be based on details taken both from the fragmentary remains of existing joinery, earlier photographic evidence and from examples of joinery in buildings of a similar period. It may be beneficial to contact the house's previous owners to source photographic material and information about the fabric of the house. The plaster cornices should be retained and repaired where possible.

8.5 Only after these works have been completed should these final phases of work be commenced (i.e. the installation of sanitary and electrical services and the reinstatement of the immediate grounds).

8.6 This schedule is an outline sequence only. More detailed recommendations and a schedule of works will be required once a firm proposal is developed for this historically important complex of buildings. As a matter of urgency however it is recommended that that work commence immediately on mitigating further damage/decay and introducing temporary roof cladding on the house and associated outbuildings.

9. Conclusions

9.1 The core of the house is early eighteenth century in date and may have been constructed soon after the acquisition of the lands at Gorteens by John Walker in 1714. The five or six bays defined by the western gable and the central chimney, along with the rear extension, conform to the T-shape plan that characterises early-eighteenth-century houses in Ireland. The three-bay eastern extension to the main elevation, the insertion of the ground-floor entrance and tripartite opening at first floor level and the addition of the westernmost extension to the rear occurred during the mid-eighteenth-century and may be contemporary with the operation of the glassworks (i.e. 1729 - 1746). The changes to the main elevation produced a façade similar to mid-eighteenth-century houses such as Clonbrogan, Fethard, Co. Tipperary, Streamstown, Kinnitty, Co. Offaly, and Coorevin, Co. Tipperary.

9.2 The house is currently ruinous although the walls and roof are still largely intact. Internally, there has been extensive alterations and damage to the fabric of the building. All fireplaces and surrounds have been removed and the floors and ceilings of most rooms have also been removed. Nonetheless, a few notable features survive including a newel staircase (connecting the first floor to the attic storey) and the original roof structure of the building. In any proposed programme of redevelopment/repair, these surviving elements should be retained and repaired as they serve to indicate the original early-eighteenth-century character of the house. Furthermore, there is significant evidence to specify facsimile/replacement timber sash windows and there is photographic and anecdotal evidence for the treatment of the main façade.

9.3 There has been a series of incremental modern accretions to the house and these are of no architectural or historic importance (indeed they tend to erode the building's inherent qualities). It may be possible to remove these elements in a proposed redevelopment of the building.

9.4 The cultural significance of this complex derives from it being one of the earliest glassworks in Ireland. Given the significance of Waterford Glass to the economy and society of this region, the Glass House is an important reminder of the origins of that important industry. Indeed it has been suggested that there is a direct link between this site and the glass industry in Waterford. Furthermore, the house and associated structures are very significant local/regional examples of modest early- and mid-eighteenth-century architecture. This building complex (and associated grounds) is a rare survivor from the early Georgian period and this quality coupled with the site's history, combine to make the Glass House an extremely important historic site.

9.5 It is recommended that a detailed conservation plan be drawn up for the site and buildings. The client's architect/engineer should engage a suitably qualified conservation consultant for the preparation of this plan and in drawing up proposal drawings.

9.6 Given the site's historical associations and the nature and age of the buildings themselves, it is likely that a conservation/restoration programme would qualify for funding/fiscal assistance from either the local authority (through the *Conservation Grant Scheme*) or central government (tax relief under the *1997 Tax Consolidation Act*).

9.7 As a matter of urgency there is a need to intervene to protect the roof structure of both the house and the outbuildings and ensure that there is no further damage wrought through vandalism and neglect. Equally it is imperative that a proposed use be established that is appropriate to the nature and character of the site. The proposed use should be capable of being integrated within the structure and form of the existing buildings. Indeed the history, form and landscape setting of the site may help attract an appropriate use/function as the perceptions of a new development at this location will be imbued with 'heritage value'.



1. The front elevation of the Glass House



2. Western four bays of the main elevation. (Note extent of ivy and creeper growth and the removed sills)



3. Eastern three bays of the main façade. (Note the central chimney; these bays represent a later extension to the original core of the house)



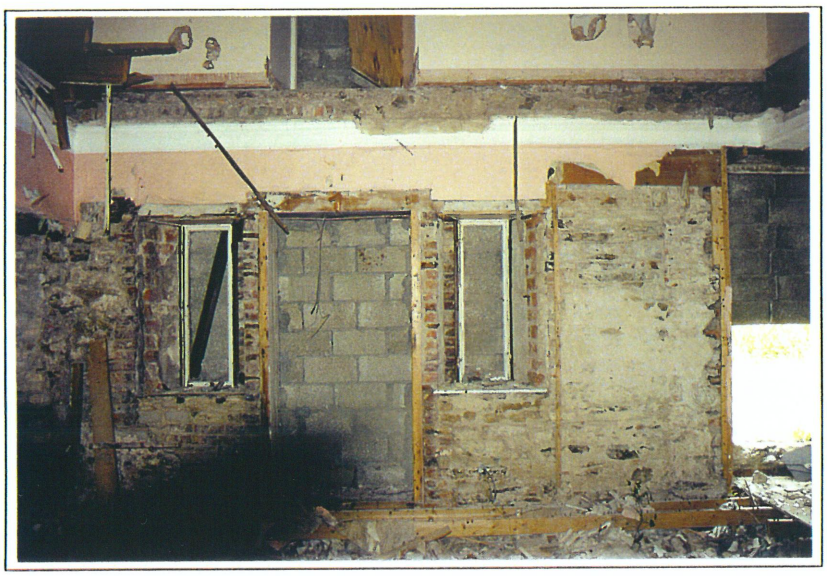
4. Flat-roofed entrance porch on the main elevation



5. Two-storey addition on the western side of the main elevation



6. Rear elevation of the house - slated area of roof corresponds to the three-bay eastern addition to the original core of the building. (Note gable-fronted extensions.)



7. Blocked entrance to the lobby area on ground floor level. (Note that the doorway is placed off-centre in the wall)



8. Western cross-wall of the former lobby area



9. Cornice detail in the former lobby area



10. Former entrance with tripartite-opening at first floor level



11. East wall of former lobby area (with projecting chimney breast)



12. Eastern sidelight of entrance: detail of brick infill of earlier embrasure



13. Western room, ground floor: looking west. Door to right of fireplace gives access to bow-fronted addition. (Note: brick construction of window embrasures)



14. Windows on southern wall of the ground-floor western room. (Note the cross beam between central window and window to left. Also note the sash rails surviving in the central window; form indicates a large upper sash and smaller lower sash)



15. Section of north wall of ground floor western room. (Note cross-beam at ceiling level and riven laths on timber uprights)



16. Interior of western bow-fronted extension (looking south-west)



17. Interior of western bow-fronted extension (looking north-west)



18. Eastern room, ground floor: window embrasures in south wall. Nine-pane-over-six arrangement evident from central window. (Note traces of settings for timber panelling to chair-rail height between embrasures)



19. East wall of ground-floor eastern room. This and the room over were part of extension of the original house. (Note unlike other rooms the chimney breast does not stand proud of the wall surface)



20. Detail of plaster cornice on the eastern ground-floor room



21. North-west corner of eastern ground-floor room



22. Detail of evidence for timber panelling between window embrasures in eastern ground-floor room



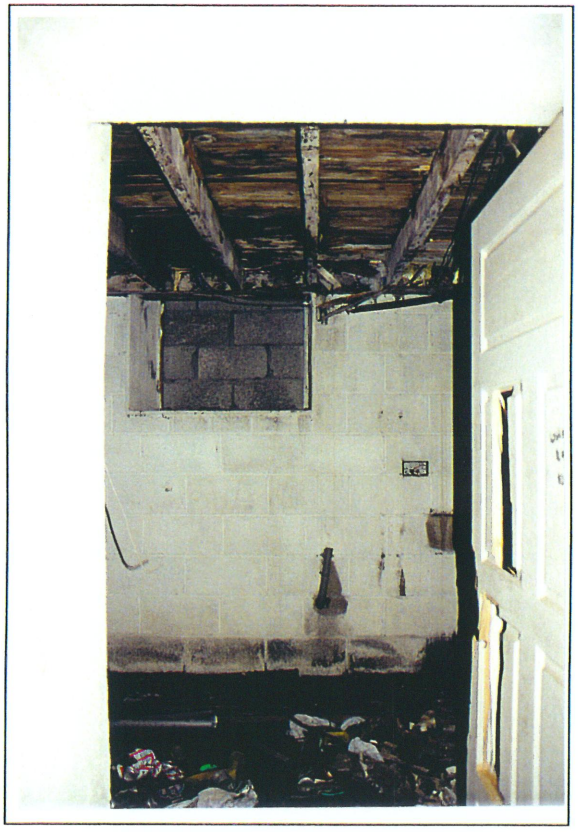
23. Detail of timber casing over window. (Note thin astragals of surviving portion of upper sash)



24. Looking east to corridor leading east-west along rear wall of house. (Note fire damage over passage embrasure)



25. Fragmentary remains of dog-leg staircase located in central rear extension of the house. (Note lined-and-ruled wall surface)



26. Modern utility room located off central rear extension



27. Small room to rear of bow-fronted annex on western gable of the house



28. Ground floor of westernmost rear extension: looking north-west. (Note partially blocked Wyatt window)



29. Ground floor of westernmost rear extension: looking north-east. The wall on right of picture is that of the central (original) rear extension of the house. (Note the exposed riven laths in the room's ceiling)



30. Exposed riven laths of ceiling adjacent to the staircase in the central rear extension



31. First floor, eastern room: view to east of fireplace and flanking window embrasures



32. First floor: stud-partition wall over central bay. (Note modern cut joists at ceiling height)



33. Fireplace on west wall of the eastern three-bay extension to the original house



34. Portion of first floor room adjacent to west of room over lobby (window shown is third window from west on the main façade)



35. First floor: westernmost room of original house



36. Projecting chimney breast on western wall of westernmost room of the original house. On right of the picture is a doorway leading to the extension on the western gable of the original house.



37. View to south-west of first room of extension on western gable of the original house (parapet wall of bow-fronted section visible through the window embrasure on the left)



38. View to west of window embrasures on west wall of first floor room in the westernmost rear extension



39. View to north-north-west of the fireplace centrally placed on the north wall of the first-floor room in the westernmost rear extension



40. Stairs leading from the first-floor landing to the attic of the central rear extension



41. Gable of the central rear extension with truncated chimney stack and flanking windows



42. Attic of westernmost rear extension - the cross-beams have been removed. (Note exposed brickwork)



43. Crossing of roof timbers. Flanked by cross walls, this crossing is located over the central portion of the original house



44. Detail of the converged roof timbers



45. Adjacent to the west of the crossed roof-timbers is an iron cross-tie



46. Door embrasure in wall under the crossed roof-timbers. (Note the slot in the diagonal roof timber)



47. General view of the roof timbers. Both original adze-hewn timbers and more modern machine-cut timbers are evident.



48. Detail of hewn timbers with incised Roman numerals and timber pegging



49. Natural slate cladding set in diminishing courses



50. Junction of original (currently unslated) section of original house and the slate-clad three-bay eastern extension



51. The western gable-end of the attic



52. Former eastern gable-end of the original house (embrasure on left give access to the easternmost portion of the attic)



53. Attic space of the eastern section of the house



54. Roof-timbers of the westernmost rear extension. (Note the incised Roman numerals)



55. Entrance to rear courtyard



56. Western range of outbuildings of the Glass House (this photograph was taken early in 2000 before widespread damage to the slate roof)



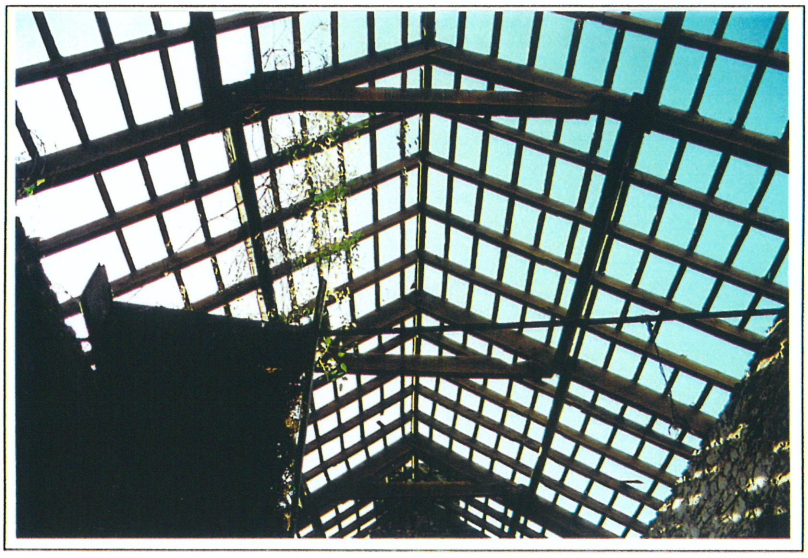
57. Close-up of the elevation of the western range. (Note cut-limestone sills, brick vousoirs of window heads and the extent of damage to slate cladding)



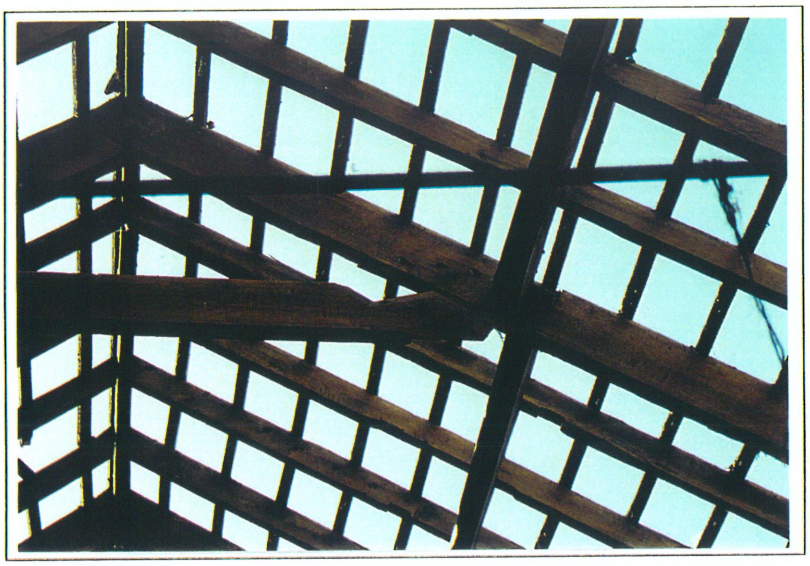
58. Large chimney breast of possible former forge in western range of outbuildings



59. Narrow embrasures in the west wall of the western range of outbuildings. (Note random rubble construction of wall)



60. Roof of western range of outbuildings. (Note the purlins and wooden pegging)



61. Detail of roof of western range of outbuildings. (Note Roman numerals and wooden pegging)



62. Elevation of northernmost portion of the western range of outbuildings



63. Northern range of outbuildings with central covered way



64. Central archway in the northern range



65. Room to east of the central archway



66. Roof to east of the central archway



67. Eastern range of outbuildings



68. Round-headed embrasures of the southernmost building of the eastern range. (Note: fine cut limestone sill and brick construction of door jamb)



69. Interior of southernmost building in the eastern range. The windows consist of a glazed hub in the upper sash and a six-pane lower sash. The attic room was inaccessible



70. Wall-hung, belt-driven machinery on the north wall of the eastern range



71. The roof timbers of the eastern range (Note roughly hewn collar beams, purlins and rafters)



72. Lean-to wood drying sheds to the rear of the northern range of outbuildings



73. Carriage shed located to the north-east of the main courtyard complex



74. Northern portion of the interior of the carriage shed. The timber king-post roof structure is composed of sawn timbers.



75. Stable block to north of carriage shed

APPENDIX 14-3

Industrial Archaeological Survey

of

Gorteens Flour Mill, Co Kilkenny



Fred Hamond

for

Maurice F. Hurley

May 2001

Contents

1. Introduction 1
2. Historical background 1
3. Buildings survey 3
4. Waterworks 8
5. Ancillary features 9
6. Discussion 9
7. Development impact and mitigation 9
8. Notes 10
9. Acknowledgements 10

Figures

Photographs

1. Introduction

1.1 Gorteens Mill is a late 18th century flour milling complex located on the left bank of the River Suir, 6km north-east of Waterford City (fig.1).

1.2 The Waterford Port Authority, which owns the site, proposes to demolish the mill in advance of an extension to Belview Port. As part of the planning process, Kilkenny County Council require an industrial archaeological assessment of the potential impact of this development on the mill.

1.3 This report, commissioned by Maurice Hurley (on behalf of the developers), presents a descriptive and photographic record of the upstanding remains associated with this complex. The site's industrial heritage significance is evaluated in the light of its history, surviving remains and current state. Finally, the impact of the proposed development is discussed and mitigating actions proposed.

2. Historical background

2.1 Using Ordnance Survey and earlier maps, valuation records and local history publications, it has been possible to reconstruct the broad outline of the site's evolution from the 18th century to the present day.

2.2 Industry is attested in Gorteens townland since the 1720s. The property known as Glass House, situated 600m south-west of the flour mill, recalls a glass works which commenced production in 1729. This enterprise has the distinction of being the first glass factory in the Waterford district. Following the death of its owner, John Head, in 1739, the premises, which also included a malthouse, were advertised for sale in 1740 but glass production does not appear to have recommenced.[1]

2.3 There was a corn mill in Gorteens Townland since at least 1735.[2] In this year John Walker transferred the glass house, *mill quarter* and other lands to Maynard and Hovenden Walker. This mill, which continued to be a corn mill until the mid 20th century, is located 1km north-west of the flour mill under review.

2.4 A paper mill is depicted where the flour mill now stands on a 1764 large-scale map by Richards and Scale. 'Gurteens Mill' [sic], a short distance upstream, is also captioned.[3]

2.5 The paper mill had been in use since 1762, if not earlier. Its rental value at that time was £23 per annum.[4] William McDannel of Glasshouse is noted as a paper miller in a lease of 1764. In February of that year he rented five acres of Glasshouse at £1/10/0 per acre.[5] In January 1769, he leased five acres at £1/15/0 per acre.[6]

2.6 A T-plan building is shown on an 1821 map and is captioned 'mill'. As will be discussed below, this was probably the flour mill under review, rather than the paper mill.[7]

2.7 The mill is depicted in its present planform on the 1839 Ordnance Survey 6" map (fig.2).[8] It is captioned 'flour mill' and a large mill pond adjoins at north-west. A separate building is also shown at the south-west end of what appears to be a quay along the river.

2.8 The 1845 Valuation Mill Book notes the complex as belonging to Michael Murphy and consisting of a house, offices and flour mill.[9] The latter encompassed two waterwheels The first was a breast-shot wheel measuring 18ft diameter by 4ft wide and with a 16in deep rim. It drove two pairs of stones (only one of which worked at a time), a set of fans, two sieves and a separator. This ancillary equipment would have been for grain cleaning and the separation of the wholemeal into bran and white flour. The wheel, also breast-shot, measured 20ft by 5ft breast-shot wheel and also had a 16in deep rim. It drove four sets of stones (two working at a time), three elevators and two flour machines. Its advantageous situation relative to water transport and proximity to Waterford is also noted. The entire complex was valued at £66/10/0 for ratable purposes.[10] Compared with the other corn mill in this townland, rated at only £6/2/0, and most other buildings in this region, this is a very high valuation and reflects the mill's size and commercial worth at that time.

2.9 An 1848 map of Waterford Harbour has a similar depiction of the mill as the 1839 OS map; it is captioned 'flour mill'.[11]

2.10 The Griffith Valuation, published in 1850, notes Kenny Purcell as the mill's owner. According to T.G. Fewer, Purcell was a Kilkenny-based attorney.[12] The valuation is now given as £97.[13]

2.11 The Valuation revision books, which commence around 1860, denote Robert Gouch as the occupant.[14] Its valuation is now £65. Sometime during this decade, Anthony Cadogan takes over the site, the valuation of which is reduced to £50. It is noted as having been rented on a 61-year lease at £40 per annum but is now described as an 'old dilapidated concern'. This entry suggests that original lease commenced around 1800. If this was the first lease of the flour mill, it would suggest an erection date around that time; the style and scale of the existing buildings would certainly accord with such a date. The Valuation Book goes on to note that as a condition of Cadogan taking over the site, he had to put it into working order at his own expense.

2.12 Cadogan appears to have re-leased the mill - first to Patrick Brennan, and then John Kennedy (from 1869). In 1889, the mill was revalued at £35, the Valuation Book noting "very little trade done in this mill for many years past". It was further reduced to £15 in 1893 and is described as "much dilapidated; works only one pair of stones irregularly". William Kennedy takes over in 1900.

2.13 The mill is captioned 'corn mill' on the 1902 OS 25" map (fig.3).[15] Its planform is identical to that shown on the 1839 map. A beacon is also shown at the south end of the quay.

2.14 In 1906, the Waterford - Rosslare railway was laid between the mill and river. This effectively cut off the mill from the quay.

2.15 The 1922 Valuation entry notes Annastain Kennedy as the occupant of the house. The mill is now described as 'vacant'. It does not appear to have been brought back into operation and disappears from the valuations in 1944.

2.16 The house is described as 'dilapidated' in the 1957 Valuation entry and a 'complete shambles; all derelict' in 1961. Its valuation is now a nominal £1.

3. Buildings survey

3.1 The site was surveyed by the author on 10-11 July 2000. Although the mill buildings are a single entity, they comprise eight contiguous units (fig.4), each of which will be described here. The remains of the water courses and quay will be described in the section 4. The reader is also referred to the photographs at the end of this report. At the time of survey, heavy overgrowth obscured many of the buildings, thus limiting the thoroughness of the descriptive survey and photographic record.

3.2 ***Block 1***

3.2.1 This, the largest unit in the entire site, is a five-storey/ single-bay building aligned east-west. It measures 21.95m (E-W) by 9.20m (N-S) in plan and survives to its full height.

3.2.2 The roof has completely disappeared, but the gable ends show it to have had a pitched profile. There is a small chimney to the apex of both gables. The walls are of random rubble with advanced stone eaves.

3.2.3 The principal elevation faces south towards the river and is eight openings wide. The entire wall surface has natural slate shingles but these were subsequently lime rendered; only where the render has fallen away are the shingles now visible. The two openings to the right-hand side are abutted to the first three floors by Block 3. All the openings have flat timber heads, but none of the actual frames survive. None of the window openings have cills. The exposed section of the ground floor has four openings. The three at left are windows, aligned between the columns of windows above. The fourth opening from left is the main entrance, formerly with a double-leaf door. The floors above each have regularly spaced window openings; those to the top floor are diminished in height. The abutted section of wall has a door to the ground floor, a door and brick-infilled window to the first and second floors, two windows (one infilled) to the third floor, and two windows to the fourth (top) floor.

3.2.4 The west gable was abutted at centre and right by a canopy (now gone) over the external waterwheel pit (described in section 4.2). The exposed wall surface is hung with slates. It is plastered to the upper part of the abutted portion. A circular opening (76cm dia) for a waterwheel axle is evident at ground level centre. To its right is a stone-infilled doorway, with another (open) at first floor level, directly above. Towards the top of the ground floor at left is an opening, probably for access to the wheel. A chimney breast projects at second floor level and extends up to the bottom of the top floor. There is an infilled window opening just above where it ends (it continues inside the wall to an apex chimney).

3.2.5 The north elevation is abutted at left to all floors by Block 4, and at centre to its bottom three floors by Block 5. The exposed section, which is three openings wide, is unrendered (the render has probably fallen off). There are no openings to the ground floor. The windows to the upper floors have shallow brick relieving arches over their timber heads. The wall to all but the right-hand corner of the top two floors has collapsed. The quoin at this end is of squared conglomerate blocks.

3.2.6 The west gable has a window at centre to all floors, detailed at those on the north elevation. To the left of the ground floor window is a small circular opening of unknown function (45cm internal dia).

3.2.7 Internally the floor is covered with collapsed walling and is heavily overgrown. Although none of the upper floors survive, wall markings show that the

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3.2.7 Internally the floor is covered with collapsed walling and is heavily overgrown. Although none of the upper floors survive, wall markings show that the

boards were laid on joists over principal beams. The inside wall surfaces are plastered, with a skirting board around each floor.

3.2.8 There are doorways (some infilled) through to Block 2 (both floors), Block 3 (both floors) and Block 4 (on all five floors). There are two infilled doorways into Block 5.

3.2.9 A square brick structure, possibly a flue, rises up the inside face of the north wall. There is also a chimney breast to the ground floor at the east end of the south wall; the flue continues inside the wall to the chimney on the east gable. There is a fireplace to the second and third floor of the west gable.

3.2.10 A partly infilled pitwheel pit is visible just inside the west gable, centred on the waterwheel axle opening. This accommodated a bevel gear mounted on the axle and was the first of a two-step great-spurwheel drive system to the millstones (fig.5). Some 2m above, the wall has a curved recess (with brick relieving arch over), which would have accommodated the great-spurwheel. There is also a rectangular recess above and to the left and right of the axle ope; these would have accommodated one end of the bridge tree which supported each stone spindle. The millstones would have been at first floor level at this end of the mill.

3.3 ***Block 2***

3.3.1 This area occupies a 2.80m wide space between Block 1 (at east) and 7 (at west). It accommodated the waterwheel which drove the milling machinery Block 1.

3.3.2 A section of roofing survives where it abuts Block 1. It was of natural slate, with single purlins and common rafters. It rested on a brick/ stone wall at south, and on a beam between Blocks 1 and 7 at north (there being no wall on this side).

3.3.3 The aforementioned wall is of stone (at left) and brick (at right) and has advanced brick eaves. Its external face is lined and rendered in cement and has raised stucco quoins at right. There is a doorway to its ground floor and window to first floor (with sliding sash frame and concrete cill). The wall finish and proportions of these openings match those to Block 7, and were deliberately designed to give their facades a uniform appearance when viewed from the south.

3.3.4 Internally, joist holes on the wall indicate the former existence of a first floor; it was probably raised over the waterwheel. This floor linked Blocks 1 and 7, there being a door in each gable. The ground floor was accessed by the door on the ground floor of Block 1, and from a flight of stone steps beside the water intake channel.

3.4 ***Block 3***

3.4.1 This three-storey/ single-bay building abuts the south-east end of Block 1. It measures 9.60m (N-S) by 5.40m (E-W) in plan. Wall breaks and the infilled window openings and slate shingles on the party wall with Block 1 show it to have been a later addition.

3.4.2 Vestiges of its pitched natural slate roof survive at the south end. It comprised simple tied trusses, single purlins, common rafters and slates with plastered undersides. The walls are of wet-dashed lime render over random rubble. These are now completely overgrown with vegetation, and the openings are now only visible from inside.

3.4.3 The elevation to west has a doorway at ground floor left and a low segmental-headed opening to its right. There is a loading door and window to the first floor and three windows to the second floor.

3.4.4 The south gable has a brick chimney flue rising left of centre. There are no openings save for a window to the second floor, with shallow segmental brick head; the actual stack has collapsed. There is a large crack down the right side of the flue. It is perhaps because of this that two metal ties bars have been inserted between the south end of the side walls.

3.4.5 The east elevation has, just left of centre, a wide doorway rising to the bottom of the second floor. It has a shallow semi-elliptical arch and is trimmed with dressed conglomerate blocks. Subsequently infilled with stone, a smaller doorway was afterwards inserted, probably in the mid 1900s (judging by its concrete right-hand jamb). There is a small window at first floor left, and three windows to the second floor.

3.4.6 All the window openings appear to have brick heads and have been infilled with rubble stone and plastered to the inside. This suggests some (unknown) change of use from its original purpose.

3.4.7 Internally none of the floors survive. Wall markings suggest that the first floor was only partly floored (to its NW corner). The wall surfaces are plastered. Soot staining on the inside of south gable at ground floor level indicates a former fireplace, now gone.

3.5 ***Block 4***

3.5.1 This five-storey/ single-bay building abuts Block 1 at north-east and appears to have been erected as a return at the same time. It measures 11.85m (N-S) by 7.00m (E-W).

3.5.2 Floor debris and the profile of the north gable indicate that it had a pitched natural slate roof, nothing of which survives in situ. The walls are of random rubble and the quoins at each end of the north gable are of dressed conglomerate blocks (similar to those at the north-west corner of Block 1).

3.5.3 The east wall has collapsed except at its north end.

3.5.4 The north gable is largely intact save for its bottom right-hand corner which has been washed away. There is a waterwheel pit to the outside (described in section 4.3) and circular opening (75cm dia) for a waterwheel axle at ground floor level. There is a window at centre to each of the four upper floors, detailed as those to the north elevation of Block 1. The bottom right-hand end of the gable is abutted by a random rubble boundary wall.

3.5.5 Only the left end of the west elevation survives to its full height. The lower floors are abutted at left by Block 6 and at right by Block 5. There are no windows to the ground floor, and the only one now visible on the first floor is infilled with brick.

3.5.6 Internally, the floor is completely covered with collapsed debris and heavily overgrown. All the upper floors are gone, but their joist lines and skirting boards are still evident in both end walls. There are ground floor doorways through to Blocks 1 and 5.

3.5.7 There is a partly infilled pitwheel pit to the inside of the north gable, centred on the waterwheel axle opening. The wall directly above has a curved recess to accommodate the former great-spurwheel and there is also a bridge tree recess to either side. As with Block 1, the millstones would have been at first floor level.

3.6 ***Block 5***

3.6.1 This two-storey/ single-bay block abuts the north face of Block 1 and west face of Block 4. It measures 6.15m (N-S) by 6.10m (E-W) in plan. Wall breaks show it to have been erected after Blocks 1 and 4.

3.6.2 Although now roofless, the flat wall heads indicate that it was formerly hipped. The walls are of random rubble with projecting masonry eaves (partly missing).

3.6.3 The west elevation has vestiges of two small cill-less window openings at first floor level, directly under the eaves.

3.6.4 The north elevation is abutted to left and centre by Block 6. The exposed section of wall has a low segmental-headed opening (in brick) to the ground floor and a loading door directly above (with brick right-hand jamb).

3.6.5 The internal space is covered with debris. It is possible that there was an internal dividing wall, now collapsed. The walls are unplastered. Doorways connect with Blocks 4 and 6. There is a brick-infilled window over the door to Block 4. In the party wall with Block 1 is a door to the ground floor and window to the first floor, both infilled.

3.6.6 There is a large recess on the inside face of the west wall, with timber head and stone relieving arch over; no markings are visible on the outside face.

3.7 ***Block 6***

3.7.1 This small one-storey building abuts the west wall of Block 4 and north wall of Block 5. It measures 4.65m (N-S) by 3.60m (E-W). Wall breaks show it to have been erected after Blocks 4 and 5.

3.7.2 A plaster line across the west face of Block 4 and the profile of the north gable of Block 6 both indicate that the latter had a monopitched roof (sloping to west), of which no other traces survive. The walls are of random rubble with a brick eaves course.

3.7.3 The west elevation has a window at left with shallow brick segmental relieving arch and brick jambs. There is a doorway at right, now partly infilled with stone. It is unclear whether it was once totally infilled, or only partly so in order to create a window.

3.7.4 The north gable also forms the boundary wall to this portion of the site. The wall head has been sloped up in brick to form the gable for the roof.

3.7.5 Internally the floor is covered in debris. The walls are plastered. A doorway connects with Block 5.

3.7.6 Towards the north end of the party wall with Block 4 is a brick-trimmed opening in line with the pitwheel pit in the latter. Recesses in the floor below this opening and in the north-east corner of the wall suggest that a shaft passed through this wall from Block 4 and that there was a large spurwheel (of maximum radius 1.52m) mounted on it where it projected into Block 5. There are no visible traces of any other machinery in this room.

3.8 ***Block 7***

3.8.1 This two-storey (+ attic)/ two-bay building was the former mill house. It measures 11.60m (E-W) by 5.75m (N-S).

3.8.2 The roof has collapsed except for a small section at its west end. Unusually the inside of the roof to the west bay is vaulted in brick. The chimney on the west gable apex has collapsed. The walls are of random rubble.

3.8.3 The principal elevation faces south and is four openings wide (two per bay). The wall is finished in lined cement render (which also extends across the face of Block 2) and has a projecting concrete eaves course and raised stucco quoin at left. The main entrance is in the second opening from left (into the west bay). This opening has a semicircular head and indicates that the door probably had a transom over. There is the ghost line of a flat-roofed porch, now gone. The remaining three openings to the ground floor and the four regularly spaced openings to the first floor are windows, all of which have concrete cills. Where the render has fallen off, their jambs are of brick.

3.8.4 The west gable is also finished with lined cement render. A chimney rises from its left end. It is almost completely abutted by a lower one-storey building of which only traces now remain. There is a doorway connection at right. The exposed section of gable has a small window to the attic floor.

3.8.5 The north elevation is completely abutted by Block 8.

3.8.6 The east gable is whitewashed. The plaster across the first floor relates to the first floor of Block 2. There is a doorway at first floor left.

3.8.7 Internally, the floor is completely covered with debris. All the upper floors have collapsed. The wall surfaces are plastered.

3.8.8 The ground floor of the west bay formerly had a stud wall to separate the hall from the room proper. There is also a door on the right-hand side of this passage to the east bay and at its far end into Block 8. The west bay room is lit by the single window to south. At the right-hand end of its end gable is a semicircular headed recess. At the left end of this gable is a doorway into the annex.

3.8.9 The first floor of the west bay has a brick-lined fireplace in the middle of its end gable. At the right-hand end of its back wall, above the hallway, is a recessed wall cupboard. Doorways connect with the first and attic floors of the east bay.

3.8.10 The east bay is separated from the hall by a brick party wall. The ground floor is accessed by a central doorway in this wall. The openings at either end of this wall are recessed cupboards, the backs of which have collapsed. There are two semicircular headed recessed cupboards along its back wall. There is a projecting chimney breast on its end gable (the chimney on the apex of this gable has collapsed).

3.8.11 The first floor of the east bay had two recessed cupboards on its party wall with the west bay, and two on its back wall. There is a small fireplace on its end gable, to the right of which a doorway connects with Block 2.

3.9 ***Block 8***

3.9.1 This one-storey/ single-bay building completely abuts the north side of Block 7 and has been cut into the bank. It measures 11.60m (E-W) by 3.00m (N-S). Wall breaks show that it was added to Block 7.

3.9.2 It has a monopitched natural slate roof (sloping to north), only traces of which now survive along the eaves. The walls are of random rubble.

3.9.3 Its east gable contains a door with shallow segmental brick relieving arch and brick right-hand jamb.

3.9.4 The north elevation is only visible at eaves level and has no openings.

3.9.5 The west gable has been raised in brick and finished in lined cement render (continued across from Block 7). There is a square window at right.

3.9.6 Internally, the walls are plastered. There are the remains of a large brick-vaulted fireplace at the west end. Joist holes suggest that there may once have been a loft at this end. There are five recessed cupboards along the north wall. A doorway connects with the hall of Block 7.

4 Waterworks

4.1 *Mill pond*

4.1.1 There was formerly a large pond immediately north-west of the buildings. Although now infilled as a result of a new road construction, an earth/ random rubble retaining embankment is still evident in the vicinity of its north-east corner.

4.1.2 The pond was fed from a headrace diverted off a stream which discharges into the Suir a short distance east of the mill complex.

4.1.3 A 1.00m wide opening for a sluice gate survives in the undergrowth at its north-east corner. This enabled the pond to be drained.

4.2 *Block 1*

4.2.1 A stone-lined waterwheel pit runs along the outside of the west gable of Block 1. Partly infilled with debris, it measures 1.52m in width (5ft 0in). This suggests that the wheel was probably about 1.37m wide (4ft 6in). A circular tar marking indicates where its rim had been painted and indicates that the wheel was at least 4.80m in diameter (15ft 9in). In all probability this pit accommodated the 18ft x 4ft wheel cited in the Valuation book as powering two sets of stones.

4.2.2 The water was directed towards the wheel from the south-east corner of the adjoining mill pond through a 1.22m wide channel faced with bricks (formerly cement rendered). The height of its bed relative to the waterwheel axle indicates that the wheel was breast fed (ie from the 9-10 o'clock position when looking towards the mill). There are vertical recesses in the brickwork denoting the former sluice gate, now gone, which regulated the flow of water on to the wheel.

4.2.3 The tailrace from the waterwheel pit is culverted underground as far as the river and was undoubtedly subjected to tidal inundation (thus backwatering the wheel and forcing it to stop). This channel is stone lined and has a semicircular stone arch; it measures 1.30m wide by at least 0.95m high (the bottom has silted up). Its discharge point has been buried during the course of recent road construction.

4.3 *Block 4*

4.3.1 A stone-lined waterwheel pit, now partly infilled, runs along the outside of the north gable of Block 4. It is 1.70m across (5ft 7in), indicating a waterwheel around 1.52m wide (5ft 0in). This equates with the 20ft x 5ft wheel cited in the Valuation as powering four sets of stones.

4.3.2 The intake channel from the south-east corner of the pond had a maximum width of 1.40m wide (one side of its brick lining has collapsed). The level of this channel shows that the wheel was breast-shot (fed at 2-3 o'clock).

4.3.3 The tailrace from the waterwheel disappears into a stone-lined culvert 1.85m wide by 1.55m high (to the crown of its segmental head). It runs south-east to the stream which supplied the pond, just before its confluence with the Suir.



1. General view of complex, from S; Block 7 at left, 1 at centre and gable of Block 3 at right.



2. Block 1: south face; note rendered slate shingles.



1. General view of complex, from S; Block 7 at left, 1 at centre and gable of Block 3 at right.



2. Block 1: south face; note rendered slate shingles.



3. Block 1: W gable *(view from right).*



4. Block 1: waterwheel axle opening on W gable *(view from right; J. Cronin).*



5. Block 1: NW corner *(view from right)*.



6. Block 1: exposed section of N elevation.



7. Block 1: first floor window on exposed section of N elevation *(view from right; J. Cronin)*.



8. Block 1: upper section of E gable *(view from right; J. Cronin)*.



9. Block 1: interior, looking W.



10. Block 1: inside face of E gable *(view from right)*.



11. Block 1: doorways through to Block 4 at E end of N elevation *(view from right)*.



12. Block 1: infilled openings at E end of S elevation, where abutted externally by Block 3 *(view from right; J. Cronin)*.



13. Block 1: internal fireplace at E end of S elevation *(view from right).*



14. Block 1: inside face of W gable showing opening for waterwheel axle; note recess for bridge tree just right of ranging rod.



15. Block 2: to S *(view from right; J. Cronin).*



16. Block 3: S gable *(view from right; J. Cronin).*



17. Block 4: collapsed section at right-hand end of N gable *(view from right; J. Cronin).*



18. Block 4; waterwheel axle opening *(J. Cronin).*



19. Block 4: interior, looking N *(view from right; J. Cronin).*



20. Block 4: interior, looking SW.



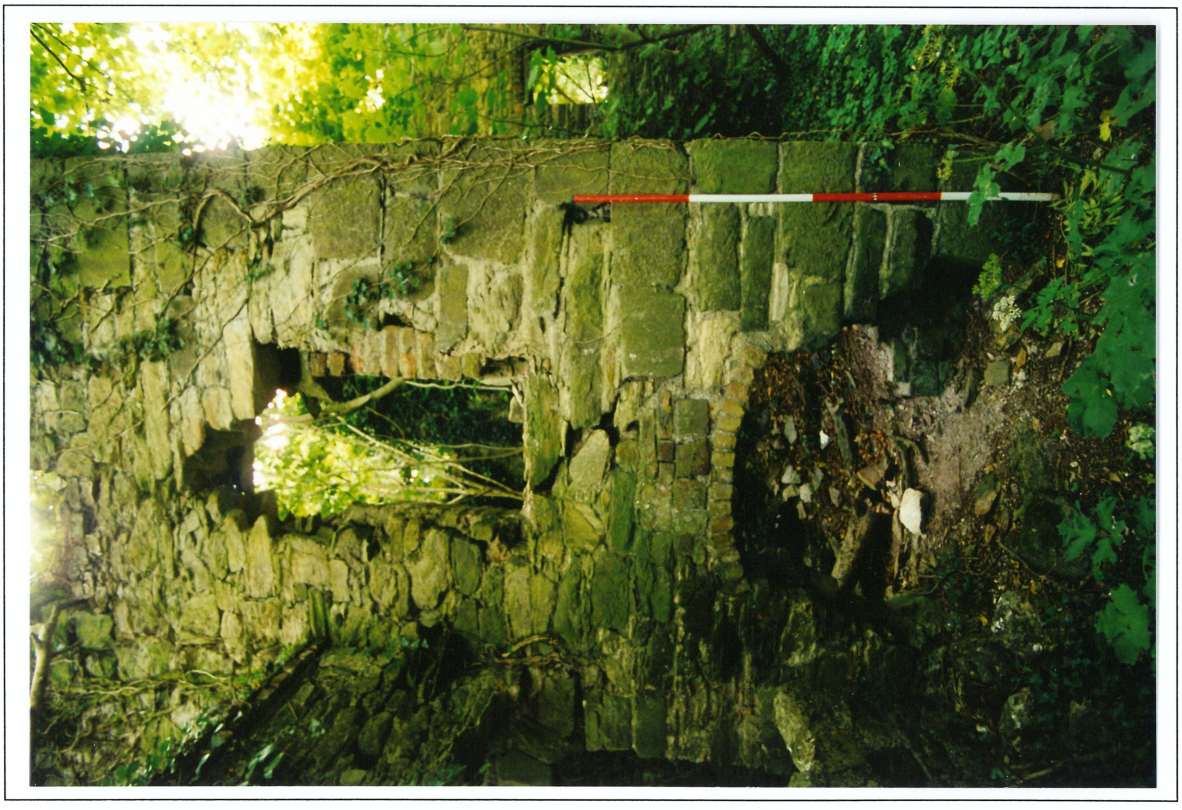
21. Block 4: inside face of N gable showing opening for waterwheel axle; note recess for great spurwheel below timber cill at top *(view from right)*.



22. Block 4: looking W along pitwheel pit on inside face of N gable *(view from right)*.



23. Block 5: W elevation (Block 6 visible at left).



24. Block 5: exposed section of N elevation *(view from right)*.



25. Block 5: view of interior, to SW.



26. Block 5: doorway in party wall with Block 4.



27. Block 5: inside face of N elevation; at centre is a doorway into Block 6.



28. Block 6: W elevation (north face of Block 5 at right).



29. Block 6: inside face of W elevation.



30. Block 6: doorway through from Block 5 *(view from right).*



31. Block 6: recess for spur wheel at NE corner of interior *(view from right)*.



32. Block 7, from SW; the shingled W gable of Block 1 rises behind.



33. Block 7, from S *(J. Cronin).*



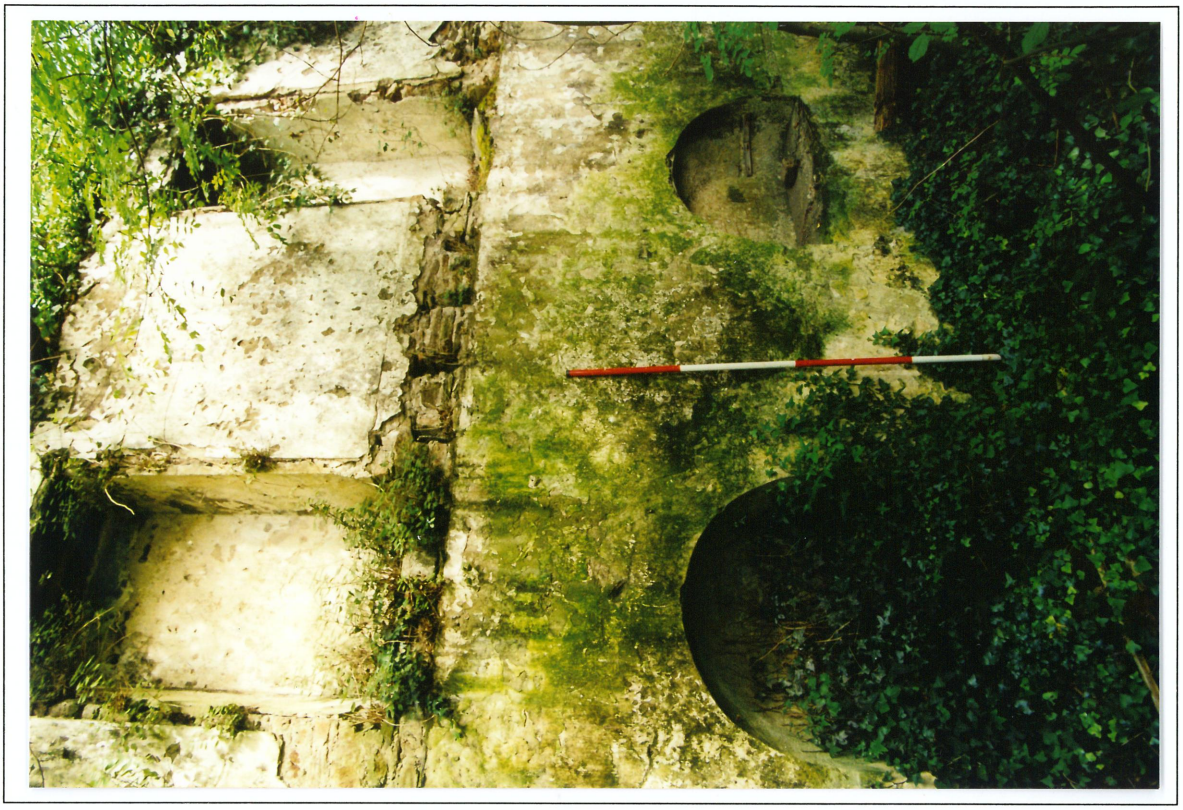
34. Block 7: brick vaulted roof and inside face of gable to west bay *(view from right).*



35. Block 7: inside face of south elevation; entrance at bottom left *(view from right; J. Cronin).*



36. Block 7: party wall between bays, from W *(view from right; J. Cronin).*



37. Block 7: inside face of back wall to west bay *(view from right)*.



38. Block 8: internal, to E; note wall cupboards along back wall.



39. Block 8: internal, to W; note remains of gable fireplace *(view from right)*.



40. Mill pond: view over infilled section, from NW.



41. Mill pond: water intake channel to Block 1, from N.



42. Block 1 waterworks: water intake, from S; gable of Blocks 8 and 7 at left.



43. Block 1 waterworks: sluice recesses in intake channel *(view from right; J. Cronin).*



44. Block 1 waterwheel pit; note where wheel has scored wall.



45. Block 1 tailrace culvert *(view from right)*.



46. Block 4: waterwheel pit and tailrace culvert *(view from right; J. Cronin)*.



47. Remains of quay wall.



Fig.2 Gorteens Mill as depicted on 1839 OS 6" map (enlarged to 1:5280). Glass House is at bottom left.

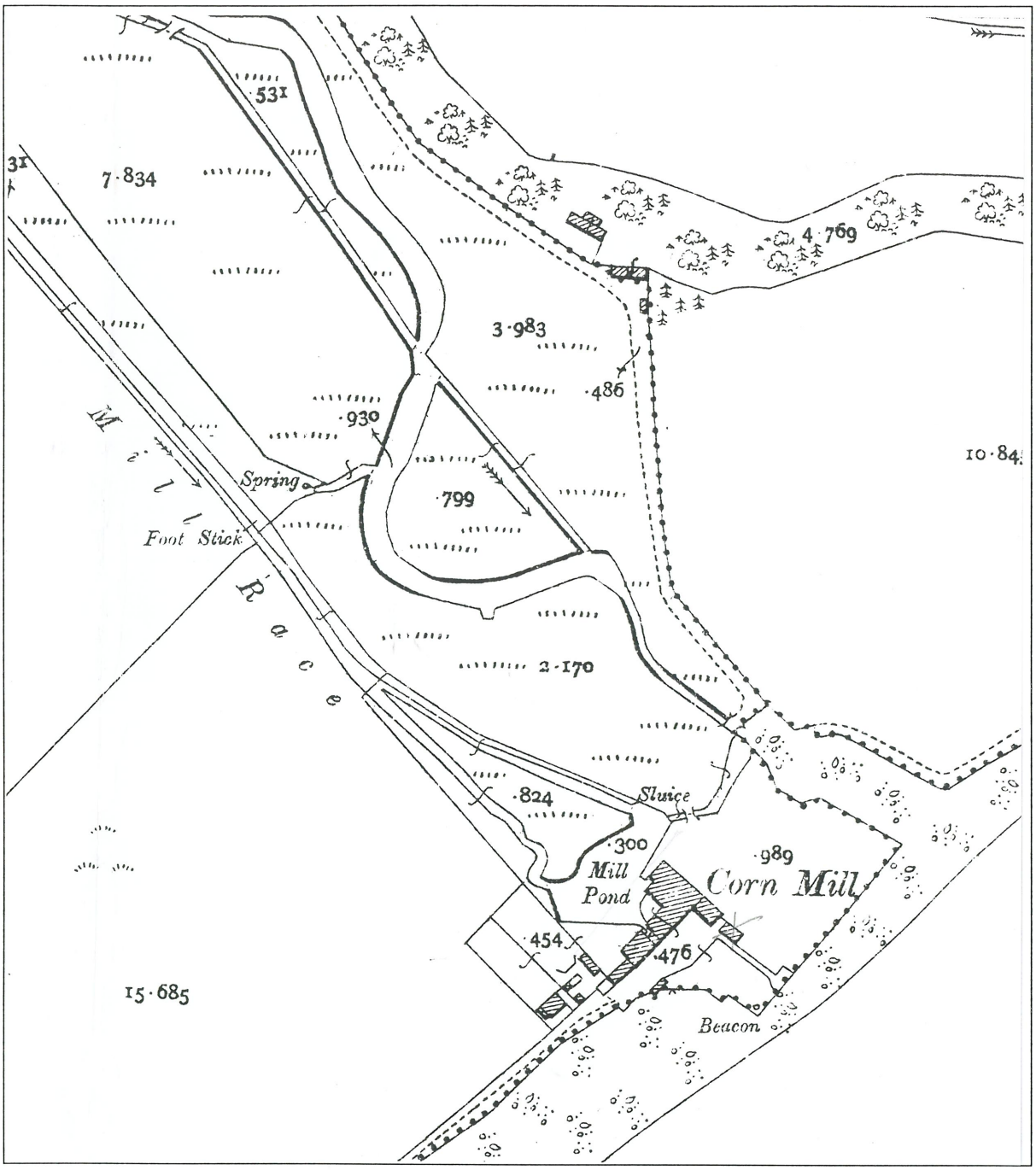


Fig.3 Gorteens Mill as depicted on 1902 OS 25" map.

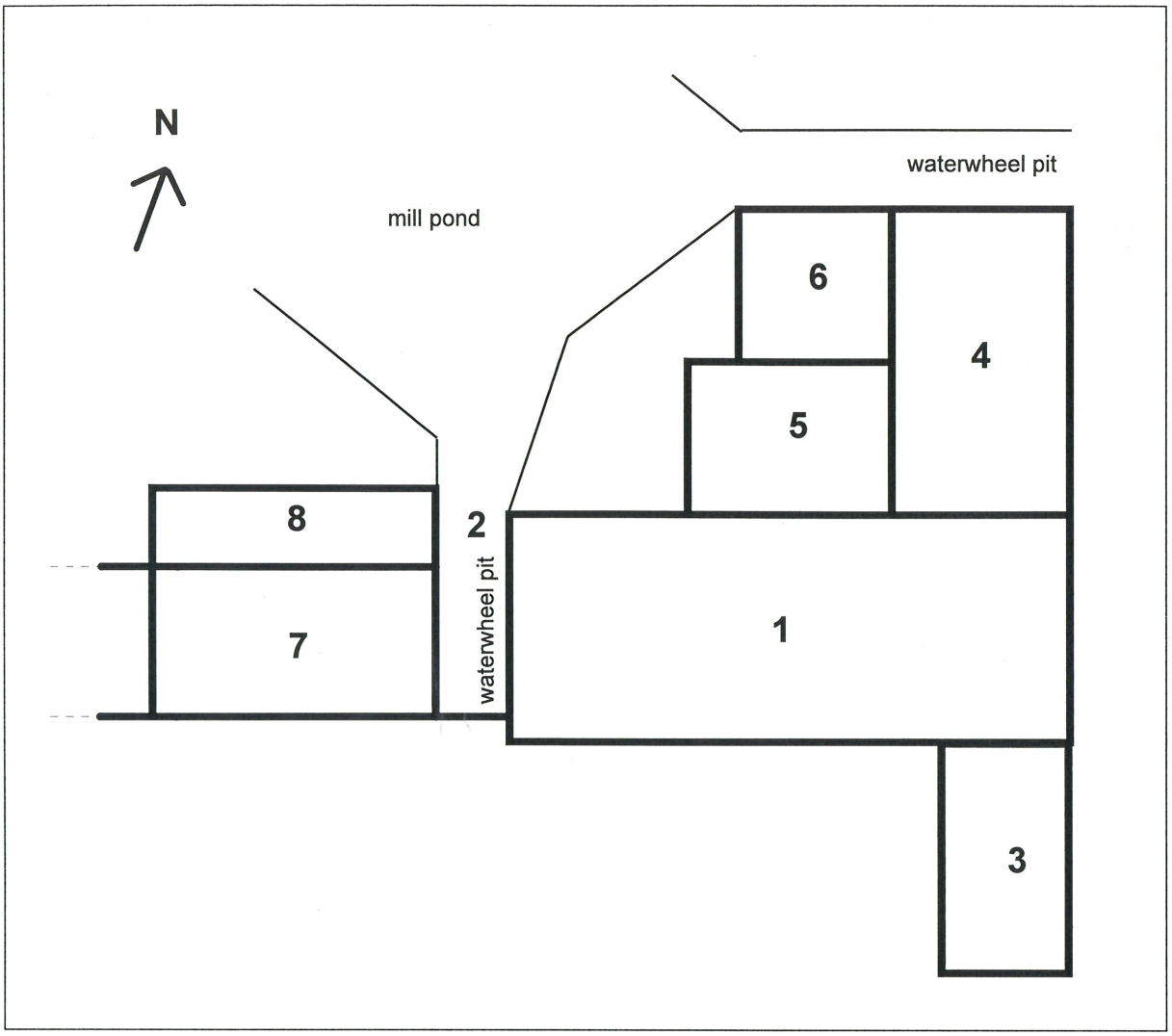


Fig.4 Schematic site plan (not to scale).
Numbers refer to blocks as described in text.

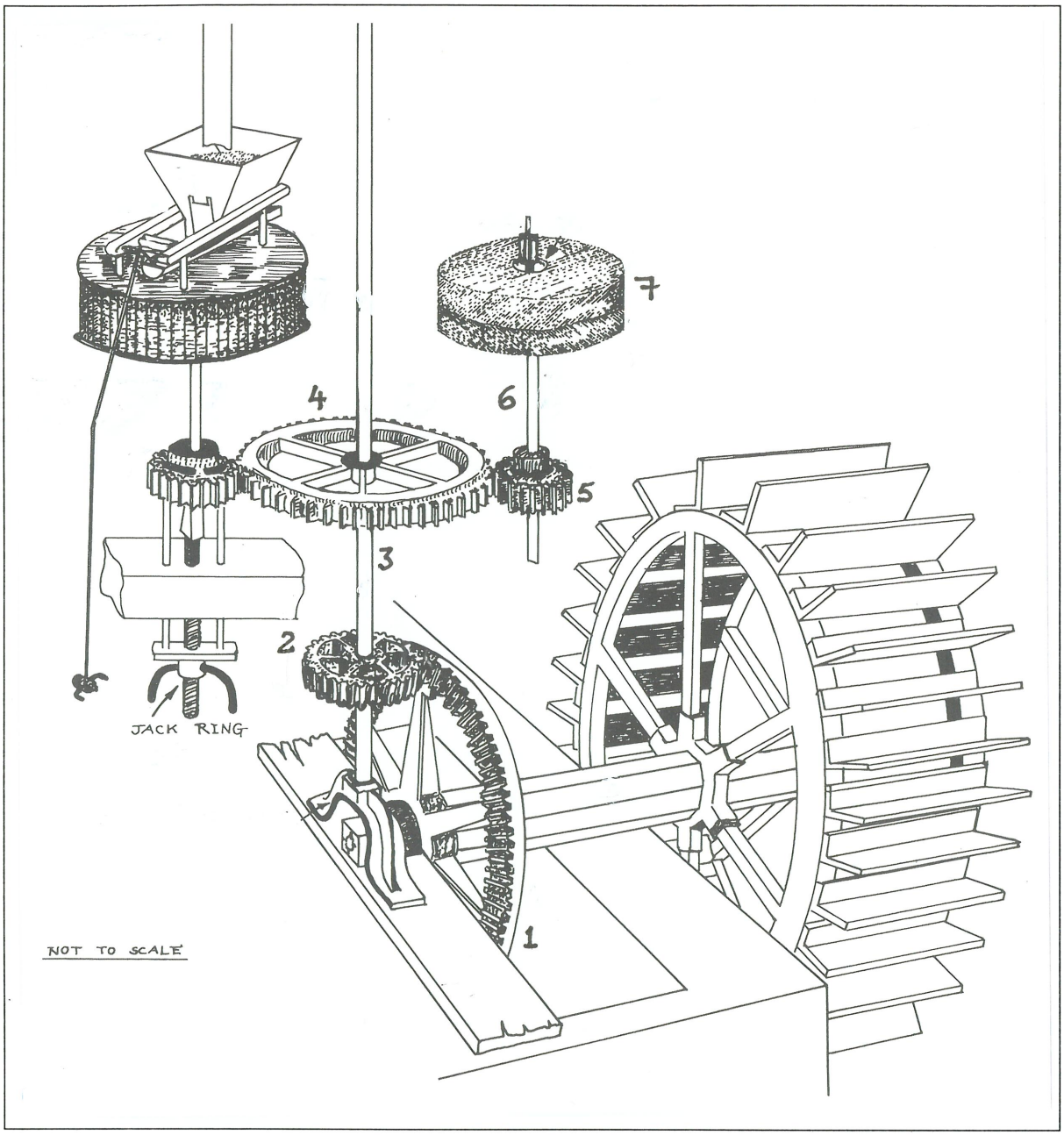


Fig.5 Schematic diagram of great spurwheel gear configuration, after J. Vince (1985), *Power before Steam*, p.57 (London: Murray). Key: 1- pitwheel, 2- wallower, 3- upright shaft, 4- great spurwheel, 5- stone nut, 6- stone spindle, 7- millstone.

APPENDIX 14-4

APPENDIX 1

The University of Sheffield

Department of Archaeology & Prehistory

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Tel: Sheffield 768555
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19. January 1989

Maurice F. Hurley
City Engineer's Department
The Mall
Waterford

Dear Mr. Hurley,

In reply to your letter of 10. January, I enclose information collected as a part of the Bally Lough Archaeological Project regarding the existence of stone age sites in the Gorteens Townland, Co. Kilkenny. I enclose a map with the location of the fields which have yielded stone age artefacts shown, as well as catalogue sheets listing the artefacts for each field. Locations 471 and 465 have yielded retouched flakes and formal tools, location 473 has been field-walked, but no artefacts were found. None of the finds composed a discrete cluster; however, in order to establish whether or not an undisturbed site is located under the surface, a test-pit excavation would be needed.

If I can be of further assistance, do please let me know.

Yours sincerely,

Marek Zvelebil
Co-Director,
Bally Lough Archaeological Project.

BALLY LOUGH ARCHAEOLOGICAL PROJECT

GENERAL LITHIC ANALYSIS FORM

SITE: Bl. 474 /E _____ PROV #: _____ SW COORD: _____

LEVELS: surface ANALYZED BY: JD Peterson DATE: 16 Sept. 87

ARTIFACT CATEGORIES	~~LEVEL~~ flint CT	UTIL	WGT	LEVEL _____ CT	UTIL	WGT	TOTALS CT	UTIL	WGT
Tested Core									
Failed Core									
Platform Core	1	–	64.1						
Pebble Core									
Keeled Core									
1-Sided Bi Core									
2-Sided Bi Core	1	–	149.0						
Exhausted Core									
Primary Flake									
Second. Flake									
Tert. Flake									
Blade									
Retouching Fl.									
Rejuv. Flake									
Retouched Fl/Bl	1	1	23.4						
Resharpening Fl									
Preform									
S it Pebble									
Ridged Splinter									
Shatter									
Formal Tool									
Reused Tool									
Exhausted Tool									
Broken Tool	1	1	12.5						
TOTALS	4	2	249.0						

SCRAPER

Comments: Cores: #= platform - multi (heavily battered)

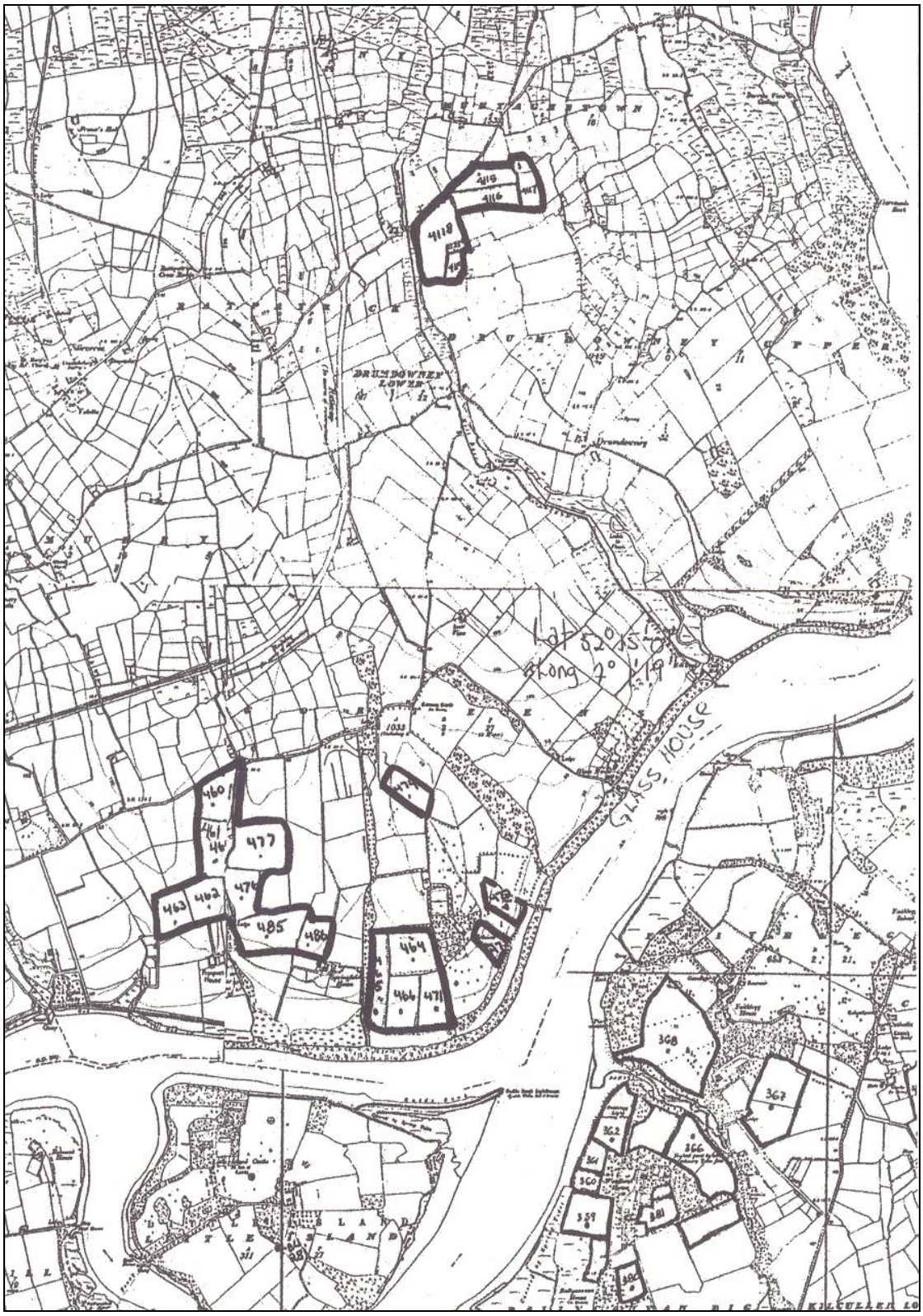


Figure 1. Map of area inspected for stone scatters as part of the Ballylough Archaeological Project

APPENDIX 16

APPENDIX 16-1

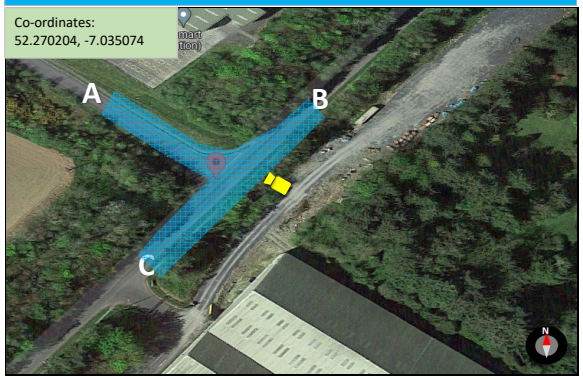
Irish Traffic Surveys LTD

Survey Name :	ITS J-737 Slieverue
Site:	Junction Turn Count Survey
Date:	23.05.23
Time:	07:00-19:00
Location:	L7582 / access road to the proposed development junction/Slieverue/Kilkenny
Classification:	Car, LGV, OGV1, OGV2, PSV, MC, PC

Site 1 - Cam R05



Mapping Image



Irish Traffic Surveys

Date:	23.05.23
Time Period:	07:00-19:00
Junction Type:	3-Arm
Reporting Interval:	15min
Classification scheme:	Car, LGV, OGV1, OGV2, PSV, MC, PC
Queues Required:	No
Pedestrian required:	No

Irish Traffic Surveys LTD

Survey Name :	ITS J-737 Slieverue
Site:	Junction Turn Count Survey
Date:	23.05.23
Time:	07:00-19:00
Location:	L7582 / access road to the proposed development junction/Slieverue/Kilkenny
Classification:	Car, LGV, OGV1, OGV2, PSV, MC, PC

Irish Traffic Surveys

	A => A								A => B								A => C							
TIME	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT
07:00	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	1
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	4
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
07:45	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	1	0	0	0	2
H/TOT	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	2	1	2	3	0	0	0	8
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4	0	0	0	6
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	6
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	11	0	0	0	15
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	5
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	6	0	0	0	8
09:45	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	2	0	4	0	0	0	6
H/TOT	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2	2	1	16	0	0	0	21
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	3	0	0	0	5
10:15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	2	0	0	0	3
10:30	0	0	0	0	0	0	0	0	2	0	1	1	0	0	0	4	1	0	1	3	0	0	0	5
10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	3	0	0	0	5
H/TOT	0	0	0	0	0	0	0	0	2	0	2	1	0	0	0	5	3	3	1	11	0	0	0	18
11:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	2	3	0	0	0	6
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0	0	4
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	4
H/TOT	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3	1	2	11	0	0	0	17
12:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	6	0	0	0	8
12:15	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	3	1	0	0	5	0	0	0	6
12:30	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	1	0	0	1	0	0	0	2
12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	4	0	0	0	7
H/TOT	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	6	6	1	0	16	0	0	0	23
13:00	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	0	0	0	3	0	0	0	3
13:15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	0	0	1	0	0	0	3
13:30	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	3	2	0	1	1	0	0	0	4
13:45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	0	0	6	0	0	1	9
H/TOT	0	0	0	0	0	0	0	0	3	0	1	3	0	0	0	7	6	0	1	11	0	0	1	19
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	4	0	0	0	9
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	6	0	0	0	9
14:30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	2	0	0	0	3
14:45	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	2	0	0	3	0	0	0	5
H/TOT	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	3	8	3	0	15	0	0	0	26
15:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	4	0	0	2	0	0	0	6
15:15	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	3	0	1	1	1	0	0	0	3
15:30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	2	0	0	0	3
15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
H/TOT	0	0	0	0	0	0	0	0	2	0	0	3	0	0	0	5	5	1	1	7	0	0	0	14
16:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	1
16:15	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	6	0	0	2	0	0	0	8
16:30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	6	1	0	3	0	0	0	10
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	4	0	0	0	8
H/TOT	0	0	0	0	0	0	0	0	1	0	0	3	0	0	0	4	15	2	1	9	0	0	0	27
17:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	5	0	2	4	0	0	0	11
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	0	0	0	6
17:30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3	1	0	1	0	0	0	5
17:45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1
H/TOT	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	10	3	2	8	0	0	0	23
18:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	1	0	0	0	0	0	3
18:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
18:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
H/TOT	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	3	1	0	0	0	0	0	4
12 HR TOT	0	0	0	0	0	0	0	0	13	0	4	23	0	0	0	40	66	18	12	118	0	0	1	215

B => A								B => B								B => C							
CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT
1	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	3	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	5	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	2	1	4	0	1	0	20
0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2	1	0	4	0	0	1	8
1	0	1	1	0	0	0	3	0	0	0	0	0	0	0	0	18	3	1	16	0	1	1	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	1	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	5	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	4	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	0	12	0	0	0	21
0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	7
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	4
0	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0	2	1	0	1	0	0	0	4
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	3	0	0	0	5
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4	0	0	3	0	0	0	7	0	0	0	0	0	0	0	0	8	4	0	11	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	2	4	0	0	0	11
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1	0	0	3	0	0	0	4	0	0	0	0	0	0	0	0	9	2	2	13	0	0	0	26
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0	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	45	4	1	8	0	0	0	58
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0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	4	0	0	5	0	0	0	9
9	1	4	21	0	0	0	35	0	0	0	0	0	0	0	0	133	28	13	135	0	2	3	314

C => A								C => B								C => C							
CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT
2	0	2	0	0	0	0	4	21	1	0	3	0	1	0	26	0	0	0	0	0	0	0	0
0	1	1	2	0	0	0	4	19	5	1	2	0	2	0	29	0	0	0	0	0	0	0	0
6	1	0	0	0	0	0	7	5	2	0	6	0	0	0	13	0	0	0	0	0	0	0	0
11	0	0	1	0	0	0	12	14	0	0	3	0	0	0	17	0	0	0	0	0	0	0	0
19	2	3	3	0	0	0	27	59	8	1	14	0	3	0	85	0	0	0	0	0	0	0	0
2	0	1	4	0	0	0	7	11	1	0	4	0	0	0	16	0	0	0	0	0	0	0	0
2	0	0	5	0	0	0	7	1	0	1	2	0	0	0	4	0	0	0	0	0	0	0	0
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7	0	2	17	0	0	0	26	16	2	2	20	0	0	0	40	0	0	0	0	0	0	0	0
0	2	0	4	0	0	0	6	2	0	0	1	0	0	0	3	1	0	0	0	0	0	0	1
1	1	0	4	0	0	0	6	3	1	1	4	0	0	0	9	0	0	0	0	0	0	0	0
2	1	0	4	0	0	0	7	0	1	0	2	0	0	0	3	0	0	0	0	0	0	0	0
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4	6	0	15	0	0	0	25	5	4	2	12	0	0	0	23	1	0	0	0	0	0	0	1
1	0	0	2	0	0	0	3	3	0	0	1	0	0	0	4	0	0	0	0	0	0	0	0
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2	0	0	5	0	0	0	7	0	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0
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1	1	0	1	0	0	0	3	0	0	0	11	0	0	0	11	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	8	1	0	0	0	0	0	9	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	2	8	1	0	4	0	0	0	13	0	0	0	0	0	0	0	0
71	14	11	115	0	0	0	211	115	25	15	133	0	4	0	292	1	1	0	0	0	0	0	2

Irish Traffic Surveys LTD

Survey Name :	ITS J-737 Slieverue
Site:	Junction Turn Count Survey
Date:	23.05.23
Time:	07:00-19:00
Location:	N29 / L7582 priority junction/Slieverue/Kilkenny
Classification:	Car, LGV, OGV1, OGV2, PSV, MC, PC

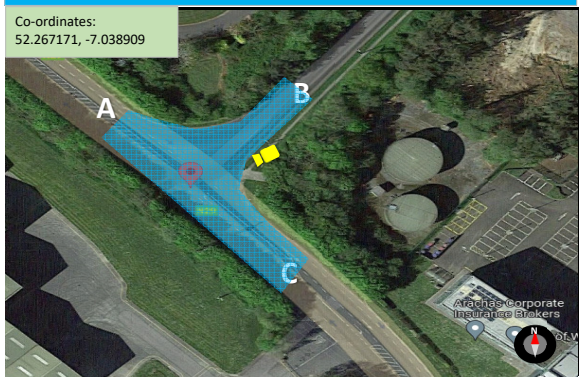
Irish Traffic Surveys

Site 2 - Cam ITS10



Mapping Image

Co-ordinates:
52.267171, -7.038909



Date:	23.05.23
Time Period:	07:00-19:00
Junction Type:	3-Arm
Reporting Interval:	15min
Classification scheme:	Car, LGV, OGV1, OGV2, PSV, MC, PC
Queues Required:	No
Pedestrian required:	No

Irish Traffic Surveys LTD

Survey Name :	ITS J-737 Slieverue
Site:	Junction Turn Count Survey
Date:	23.05.23
Time:	07:00-19:00
Location:	N29 / L7582 priority junction/Slieverue/Kilkenny
Classification:	Car, LGV, OGV1, OGV2, PSV, MC, PC

Irish Traffic Surveys

	A => A								A => B								A => C							
TIME	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT
07:00	0	0	0	0	0	0	0	0	30	1	1	4	0	1	0	37	6	2	1	6	0	0	0	15
07:15	0	0	0	0	0	0	0	0	20	9	1	4	0	2	0	36	10	4	1	5	0	0	1	21
07:30	0	0	0	0	0	0	0	0	17	3	0	4	0	0	0	24	10	4	1	8	0	0	0	23
07:45	0	0	0	0	0	0	0	0	36	0	0	2	0	0	1	39	13	4	0	6	0	0	0	23
H/TOT	0	0	0	0	0	0	0	0	103	13	2	14	0	3	1	136	39	14	3	25	0	0	1	82
08:00	0	0	0	0	0	0	0	0	15	1	0	6	0	0	0	22	13	3	0	5	0	0	0	21
08:15	0	0	0	0	0	0	0	0	4	0	0	1	0	0	0	5	7	1	0	5	0	0	0	13
08:30	0	0	0	0	0	0	0	0	5	1	0	10	0	0	0	16	25	1	0	7	0	0	0	33
08:45	0	0	0	0	0	0	0	0	3	1	2	8	0	0	0	14	27	6	0	9	0	0	0	42
H/TOT	0	0	0	0	0	0	0	0	27	3	2	25	0	0	0	57	72	11	0	26	0	0	0	109
09:00	0	0	0	0	0	0	0	0	3	3	0	4	0	0	0	10	14	5	0	5	0	0	0	24
09:15	0	0	0	0	0	0	0	0	8	2	0	6	0	0	1	17	13	2	0	9	0	0	0	24
09:30	0	0	0	0	0	0	0	0	3	1	0	2	0	0	0	6	8	0	1	6	0	0	0	15
09:45	0	0	0	0	0	0	0	0	0	4	0	5	0	0	0	9	4	0	1	11	0	0	0	16
H/TOT	0	0	0	0	0	0	0	0	14	10	0	17	0	0	1	42	39	7	2	31	0	0	0	79
10:00	0	0	0	0	0	0	0	0	4	0	0	3	0	0	0	7	7	1	0	7	0	0	0	15
10:15	0	0	0	0	0	0	0	0	6	0	0	6	0	0	0	12	6	1	3	6	0	0	0	16
10:30	0	0	0	0	0	0	0	0	2	1	1	7	0	0	0	11	2	1	0	9	0	0	0	12
10:45	0	0	0	0	0	0	0	0	5	1	0	6	0	0	0	12	5	0	0	6	0	0	0	11
H/TOT	0	0	0	0	0	0	0	0	17	2	1	22	0	0	0	42	20	3	3	28	0	0	0	54
11:00	0	0	0	0	0	0	0	0	2	2	0	12	0	0	0	16	2	0	1	7	0	0	0	10
11:15	0	0	0	0	0	0	0	0	4	0	0	5	0	0	0	9	3	0	0	3	0	0	0	6
11:30	0	0	0	0	0	0	0	0	3	0	0	8	0	0	0	11	5	1	0	9	0	0	0	15
11:45	0	0	0	0	0	0	0	0	2	1	0	5	0	0	0	8	8	0	1	7	0	0	0	16
H/TOT	0	0	0	0	0	0	0	0	11	3	0	30	0	0	0	44	18	1	2	26	0	0	0	47
12:00	0	0	0	0	0	0	0	0	2	1	0	6	0	0	0	9	2	0	0	8	0	0	0	10
12:15	0	0	0	0	0	0	0	0	1	0	1	6	0	0	0	8	2	0	0	7	0	0	0	9
12:30	0	0	0	0	0	0	0	0	3	1	0	3	0	1	0	8	1	0	1	5	0	0	0	7
12:45	0	0	0	0	0	0	0	0	1	1	0	10	0	0	0	12	3	0	1	7	1	0	0	12
H/TOT	0	0	0	0	0	0	0	0	7	3	1	25	0	1	0	37	8	0	2	27	1	0	0	38
13:00	0	0	0	0	0	0	0	0	3	1	0	8	0	0	0	12	4	1	0	6	0	0	0	11
13:15	0	0	0	0	0	0	0	0	5	1	0	6	0	0	0	12	13	0	1	2	0	0	0	16
13:30	0	0	0	0	0	0	0	0	4	4	0	6	0	0	0	14	5	0	2	8	0	0	0	15
13:45	0	0	0	0	0	0	0	0	10	1	1	7	0	0	0	19	9	4	0	4	0	0	0	17
H/TOT	0	0	0	0	0	0	0	0	22	7	1	27	0	0	0	57	31	5	3	20	0	0	0	59
14:00	0	0	0	0	0	0	0	0	7	1	1	7	0	0	0	16	3	0	0	7	0	0	0	10
14:15	0	0	0	0	0	0	0	0	2	2	0	5	0	0	0	9	5	0	1	5	0	0	0	11
14:30	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	3	6	1	2	6	0	0	0	15
14:45	0	0	0	0	0	0	0	0	3	0	0	7	0	0	0	10	6	0	0	5	0	0	0	11
H/TOT	0	0	0	0	0	0	0	0	13	3	1	21	0	0	0	38	20	1	3	23	0	0	0	47
15:00	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	4	1	1	5	0	0	0	11
15:15	0	0	0	0	0	0	0	0	4	1	0	4	0	0	0	9	3	0	0	6	0	0	0	9
15:30	0	0	0	0	0	0	0	0	3	0	0	4	0	0	0	7	2	1	1	2	0	0	0	6
15:45	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3	6	0	0	3	0	0	0	9
H/TOT	0	0	0	0	0	0	0	0	7	1	1	15	0	0	0	24	15	2	2	16	0	0	0	35
16:00	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	7	2	0	0	7	0	0	0	9
16:15	1	0	0	0	0	0	0	1	0	3	0	5	0	0	0	8	5	0	0	8	0	0	0	13
16:30	0	0	0	0	0	0	0	0	1	0	0	5	0	0	0	6	2	1	2	2	0	0	0	7
16:45	0	0	0	0	0	0	0	0	4	0	0	1	0	0	0	5	1	1	0	2	0	0	0	4
H/TOT	1	0	0	0	0	0	0	1	7	3	0	16	0	0	0	26	10	2	2	19	0	0	0	33
17:00	0	0	0	0	0	0	0	0	1	0	0	3	0	0	0	4	0	0	2	3	0	0	0	5
17:15	0	0	0	0	0	0	0	0	1	0	0	3	0	0	0	4	1	0	0	4	0	0	0	5
17:30	0	0	0	0	0	0	0	0	3	0	0	1	0	0	0	4	3	0	0	1	0	0	0	4
17:45	0	0	0	0	0	0	0	0	1	0	0	3	0	0	0	4	2	0	0	3	0	0	0	5
H/TOT	0	0	0	0	0	0	0	0	6	0	0	10	0	0	0	16	6	0	2	11	0	0	0	19
18:00	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	1	0	0	1	3
18:15	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	3	0	0	0	2	0	0	0	2
18:30	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	4	2	1	0	1	0	0	0	4
18:45	0	0	0	0	0	0	0	0	14	1	0	0	0	0	0	15	4	0	0	0	0	0	0	4
H/TOT	0	0	0	0	0	0	0	0	17	1	0	4	0	0	1	23	7	1	0	4	0	0	1	13
12 HR TOT	1	0	0	0	0	0	0	1	251	49	9	226	0	4	3	542	285	47	24	256	1	0	2	615

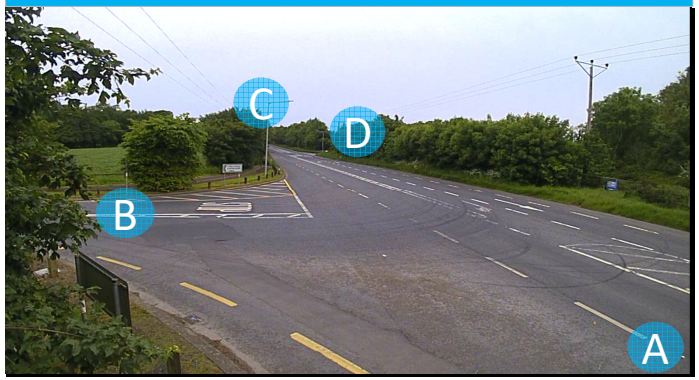
B => A								B => B								B => C							
CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT
2	0	0	3	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
11	0	1	4	0	0	1	17	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	3
13	4	2	2	0	1	0	22	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	3
2	0	0	6	0	0	1	9	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	3
28	4	3	15	0	1	2	53	0	0	0	0	0	0	0	0	1	2	2	5	0	0	0	10
2	0	0	3	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
3	0	0	4	0	0	0	7	0	0	0	0	0	0	0	0	0	3	3	1	0	0	0	7
0	1	0	10	0	0	0	11	0	0	0	0	0	0	0	0	2	0	1	1	0	0	0	4
3	1	0	6	0	0	0	10	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	3
8	2	0	23	0	0	0	33	0	0	0	0	0	0	0	0	2	4	4	5	0	0	0	15
1	1	1	10	0	0	0	13	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
4	0	0	8	0	0	0	12	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2
0	0	1	8	0	0	0	9	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
3	3	0	4	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3
8	4	2	30	0	0	0	44	0	0	0	0	0	0	0	0	3	0	0	4	0	0	0	7
3	1	0	6	0	0	0	10	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	5
2	1	0	4	0	0	0	7	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	3
4	1	0	5	0	0	0	10	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	3
2	5	0	7	0	0	0	14	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	3
11	8	0	22	0	0	0	41	0	0	0	0	0	0	0	0	2	2	6	4	0	0	0	14
5	1	2	4	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
0	1	0	9	0	0	0	10	0	0	0	0	0	0	0	0	1	1	2	1	0	0	0	5
3	0	0	7	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
2	1	0	5	0	0	0	8	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	4
10	3	2	25	0	0	0	40	0	0	0	0	0	0	0	0	2	1	3	5	0	0	0	11
2	1	0	8	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
2	0	0	9	0	0	0	11	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	3
2	0	0	6	0	0	0	8	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	3
12	0	1	8	0	0	0	21	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	3
18	1	1	31	0	0	0	51	0	0	0	0	0	0	0	0	2	1	4	3	0	0	0	10
7	0	0	7	0	0	1	15	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
2	1	0	5	0	0	0	8	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
7	2	2	5	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
5	1	0	6	0	0	1	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	4	2	23	0	0	2	52	0	0	0	0	0	0	0	0	2	1	0	1	0	0	0	4
9	1	1	9	0	0	0	20	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	3
4	2	0	13	0	0	0	19	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
3	2	0	7	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	7	0	0	0	10	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	3
19	5	1	36	0	0	0	61	0	0	0	0	0	0	0	0	3	2	2	0	0	0	0	7
4	0	0	3	0	0	0	7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
2	2	1	7	0	0	0	12	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	4
5	0	0	7	0	0	0	12	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	3
1	1	0	4	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	3	1	21	0	0	0	37	0	0	0	0	0	0	0	0	5	1	1	1	0	0	0	8
22	3	0	3	0	1	0	29	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
12	4	0	4	0	0	0	20	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	3
24	2	0	7	0	0	1	34	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	4
19	2	1	8	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	11	1	22	0	1	1	113	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	8
19	3	1	5	0	0	0	28	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
1	1	0	3	0	1	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	3	0	3	0	0	0	17	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
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3	0	0	1	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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1	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1	0	6	0	0	0	15	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
252	53	14	268	0	3	5	595	0	0	0	0	0	0	0	0	28	19	24	29	0	0	0	100

C => A								C => B								C => C							
CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT
1	1	0	2	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	5	0	0	0	6	0	1	1	1	0	0	0	3	0	0	0	0	0	0	0	0
1	0	0	5	0	0	0	6	1	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0
0	1	0	3	0	0	0	4	1	0	0	3	0	0	0	4	0	0	0	0	0	0	0	0
2	2	1	15	0	0	0	20	2	1	1	6	0	0	0	10	0	0	0	0	0	0	0	0
3	0	1	10	0	0	0	14	0	0	1	4	0	0	0	5	0	0	0	0	0	0	0	0
0	2	0	6	0	0	0	8	0	0	2	5	0	0	0	7	0	0	0	0	0	0	0	0
3	1	0	3	0	0	0	7	0	0	0	5	0	0	0	5	0	0	0	0	0	0	0	0
3	3	0	4	0	0	0	10	1	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0
9	6	1	23	0	0	0	39	1	0	3	15	0	0	0	19	0	0	0	0	0	0	0	0
2	1	0	8	0	0	0	11	1	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0
0	0	0	4	0	0	0	4	0	2	0	3	0	0	0	5	0	0	0	0	0	0	0	0
3	1	1	7	0	0	0	12	0	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0
7	2	2	4	0	0	0	15	1	1	2	3	0	0	0	7	0	0	0	0	0	0	0	0
12	4	3	23	0	0	0	42	2	3	2	11	0	0	0	18	0	0	0	0	0	0	0	0
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1	0	0	9	0	0	0	10	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
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7	3	2	32	0	0	0	44	1	0	4	9	0	0	0	14	0	0	0	0	0	0	0	0
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1	0	0	7	0	0	0	8	0	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0
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7	1	0	9	1	0	0	18	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0
17	1	1	24	1	0	0	44	4	0	4	6	0	0	0	14	0	0	0	0	0	0	0	0
15	2	1	9	0	0	0	27	0	1	1	1	0	0	0	3	0	0	0	0	0	0	0	0
9	2	1	1	0	0	0	13	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
10	1	2	1	0	0	0	14	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0
17	0	2	5	0	0	0	24	1	1	1	3	0	0	0	6	0	0	0	0	0	0	0	0
51	5	6	16	0	0	0	78	1	2	2	7	0	0	0	12	0	0	0	0	0	0	0	0
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7	0	0	9	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	1	0	23	0	0	0	45	2	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0
9	1	1	2	0	0	0	13	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
8	4	0	7	0	0	0	19	2	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0
11	2	1	1	0	0	0	15	4	0	1	2	0	0	0	7	0	0	0	0	0	0	0	0
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32	10	3	12	0	0	0	57	6	1	2	4	0	0	0	13	0	0	0	0	0	0	0	0
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39	9	0	5	0	0	0	53	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
17	3	0	3	0	0	0	23	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
68	14	0	19	0	0	0	101	7	2	2	2	0	0	0	13	0	0	0	0	0	0	0	0
25	0	0	4	0	0	0	29	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
16	2	0	4	0	0	0	22	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
13	0	1	5	0	0	0	19	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
4	1	0	1	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	3	1	14	0	0	0	76	1	1	0	1	0	0	0	3	0	0	0	0	0	0	0	0
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6	2	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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23	6	2	9	0	0	1	41	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
310	56	24	234	1	0	1	626	33	11	22	67	0	0	0	133	0	0	0	0	0	0	0	0

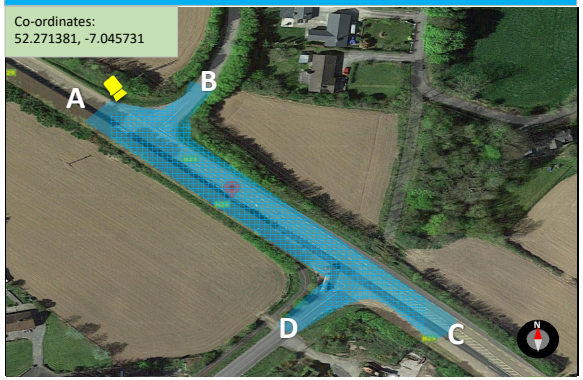
Irish Traffic Surveys LTD

Survey Name :	ITS J-737 Slieverue
Site:	Junction Turn Count Survey
Date:	23.05.23
Time:	07:00-19:00
Location:	N29 / L3412 / L7482 crossroads junction/Slieverue/Kilkenny
Classification:	Car, LGV, OGV1, OGV2, PSV, MC, PC

Site 3 - Cam S37



Mapping Image



Irish Traffic Surveys

Date:	23.05.23
Time Period:	07:00-19:00
Junction Type:	4-Arm
Reporting Interval:	15min
Classification scheme:	Car, LGV, OGV1, OGV2, PSV, MC, PC
Queues Required:	No
Pedestrian required:	No

Irish Traffic Surveys LTD

Survey Name :	ITS J-737 Slieverue
Site:	Junction Turn Count Survey
Date:	23.05.23
Time:	07:00-19:00
Location:	N29 / L3412 / L7482 crossroads junction/Slieverue/Kilkenny
Classification:	Car, LGV, OGV1, OGV2, PSV, MC, PC

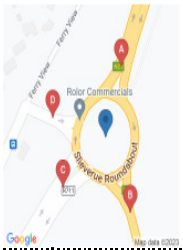


	A => A								A => B								A => C								A => D							
TIME	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	6	0	0	0	11	0	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	2	8	0	0	0	18	0	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	3	18	3	1	9	0	0	0	31	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	12	0	1	8	0	0	0	21	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	4	41	4	5	31	0	0	0	81	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1	12	0	0	0	17	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	2	0	10	0	0	0	13	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	2	2	0	12	0	0	0	16	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	5	4	1	0	11	0	0	0	16	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	6	11	5	1	45	0	0	0	62	0	0	0	0	0	0	0	0
09:00	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	3	2	1	19	0	0	0	25	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	2	0	0	11	0	0	0	13	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	3	2	1	1	15	0	0	0	19	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	10	4	2	10	0	0	0	26	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	4	1	1	0	0	0	0	6	17	7	4	55	0	0	0	83	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	5	3	0	11	0	0	0	19	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	2	2	1	14	0	0	0	19	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	5	3	0	10	0	0	0	18	0	0	0	0	0	0	0	0
10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	1	18	0	0	0	25	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	4	16	10	2	53	0	0	0	81	0	0	0	0	0	0	0	0
11:00	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4	2	0	4	9	0	0	0	15	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	10	0	0	0	16	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	7	0	0	17	0	0	0	24	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	3	1	0	11	0	0	0	15	0	0	0	1	0	0	0	1
H/TOT	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	6	14	3	6	47	0	0	0	70	0	0	0	1	0	0	0	1
12:00	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	3	5	1	0	12	0	0	0	18	0	0	0	0	0	0	0	0
12:15	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	2	0	0	15	0	0	0	17	0	0	0	0	0	0	0	0
12:30	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	4	1	0	7	0	0	0	12	0	0	0	0	0	0	0	0
12:45	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	15	2	1	21	0	0	0	39	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	6	0	1	1	0	0	0	8	26	4	1	55	0	0	0	86	0	0	0	0	0	0	0	0
13:00	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	4	17	2	1	14	1	0	0	35	1	0	0	1	0	0	0	2
13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	3	1	4	0	0	0	21	1	0	0	0	0	0	0	1
13:30	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	15	1	3	8	0	0	0	27	1	0	0	0	0	0	0	1
13:45	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	4	17	3	2	9	0	0	0	31	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	7	0	1	0	0	0	1	9	62	9	7	35	1	0	0	114	3	0	0	1	0	0	0	4
14:00	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4	10	1	1	12	0	0	1	25	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	7	2	0	16	0	0	0	25	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	4	1	0	16	0	0	0	21	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2	9	0	0	10	0	0	0	19	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	5	2	0	2	0	0	0	9	30	4	1	54	0	0	1	90	0	0	0	0	0	0	0	0
15:00	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	7	0	1	9	0	0	0	17	0	0	0	0	0	0	0	0
15:15	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	14	4	1	13	0	0	0	32	0	1	0	0	0	0	0	1
15:30	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	4	13	0	1	9	0	0	0	23	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	11	3	1	8	0	0	0	23	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	6	1	0	0	0	0	0	7	45	7	4	39	0	0	0	95	0	1	0	0	0	0	0	1
16:00	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3	23	5	0	7	0	1	0	36	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	12	5	0	9	0	0	0	26	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	6	1	0	0	0	0	1	8	62	8	0	11	0	0	0	81	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4	31	5	0	11	0	0	0	47	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	14	1	0	1	0	0	1	17	128	23	0	38	0	1	0	190	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	6	38	4	2	10	0	0	0	54	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	15	3	0	8	0	0	0	26	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	22	4	1	8	0	0	0	35	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1	0	4	0	0	0	10	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	10	80	12	3	30	0	0	0	125	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	1	0	9	0	0	1	22	0	0	0	0	0	0	0	0
18:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	2	1	2	0	0	0	18	0	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	5	2	0	0	0	0	0	7	0	0	0	0	0	0	0	0
18:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	1	4	0	0	0	10	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	32	7	2	15	0	0	1	57	0	0	0	0	0	0	0	0
12 HR TOT	0	0	0	0	0	0	0	0	63	11	3	4	0	1	4	86	502	95	36	497	1	1	2	1134	3	1	0	2	0	0	0	6

B => A								B => B								B => C								B => D							
CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	11	1	0	4	0	0	0	16	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	1	6	0	0	0	8	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4	2	0	3	0	0	0	9	0	0	0	0	0	0	0	0
3	1	0	0	0	0	0	4	0	0	0	0	0	0	0	0	5	2	0	5	0	0	0	12	1	0	0	0	0	0	0	1
11	1	0	0	0	0	0	12	0	0	0	0	0	0	0	0	21	5	1	18	0	0	0	45	1	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	5	0	0	0	10	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1	6	0	0	0	11	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	9	2	0	4	0	0	0	15	1	0	0	1	0	0	0	2
2	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	11	1	0	3	0	0	0	15	2	0	0	0	0	0	0	2
3	1	0	0	0	0	0	4	0	0	0	0	0	0	0	0	28	4	1	18	0	0	0	51	3	0	0	1	0	0	0	4
2	3	0	0	0	0	0	5	0	0	0	0	0	0	0	0	6	3	0	3	0	0	0	12	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	3	0	0	0	6	1	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	4	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	2	0	5	0	0	0	8	0	0	0	0	0	0	0	0
3	3	0	1	0	0	0	7	0	0	0	0	0	0	0	0	10	7	2	11	0	0	0	30	1	0	0	0	0	0	0	1
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	6	4	0	7	0	0	0	17	1	0	0	0	0	0	0	1
3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	2	4	1	5	0	0	0	12	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	2	2	0	0	0	10	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	2	0	0	0	7	1	0	0	0	0	0	0	1
4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	13	14	3	16	0	0	0	46	2	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	5	0	0	0	9	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	1	0	0	0	5	0	0	0	0	0	0	0	0
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0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	3	3	2	1	0	0	0	9	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	10	7	4	11	0	0	0	32	0	1	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	5	0	0	0	10	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	6	2	0	4	0	0	0	12	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1	1	3	0	0	0	10	2	0	0	0	0	0	0	2
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3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	25	3	2	15	0	1	0	46	3	1	0	0	0	0	0	4
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1	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	10	5	1	1	0	0	0	17	1	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	7	0	1	0	0	0	20	0	1	0	0	0	1	0	2
2	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	42	21	1	11	0	0	0	75	3	1	0	0	0	1	0	5
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	1	4	0	0	0	11	2	0	0	0	0	0	0	2
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	11	1	0	1	0	0	0	13	2	0	0	0	0	0	0	2
2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	2	0	2	0	0	0	8	0	0	0	0	0	0	0	0
5	1	0	0	0	0	0	6	0	0	0	0	0	0	0	0	27	5	1	11	0	0	0	44	5	0	0	0	0	0	0	5
0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3	3	1	4	0	0	0	11	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	5	3	0	3	0	0	0	11	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	2	0	0	0	0	10	2	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	3	2	3	0	0	0	14	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	18	13	5	10	0	0	0	46	2	0	0	0	0	0	0	2
2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	8	5	1	4	0	0	0	18	3	0	0	0	0	0	0	3
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	10	5	1	4	0	1	0	21	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	27	9	0	6	0	0	0	42	2	1	0	0	0	0	0	3
0	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	13	3	0	5	0	0	0	21	4	0	0	0	0	0	0	4
3	1	1	1	0	0	0	6	0	0	0	0	0	0	0	0	58	22	2	19	0	1	0	102	9	1	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	6	0	7	0	0	0	39	3	2	0	0	0	0	0	5
2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	15	6	0	5	0	0	0	26	1	0	0	0	0	0	0	1
3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	50	13	0	3	0	0	2	68	2	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	6	0	6	0	0	0	25	1	0	0	0	0	0	0	1
5	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	104	31	0	21	0	0	2	158	7	2	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	2	0	4	0	0	0	21	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	4	1	3	0	0	0	16	1	0	0	0	0	0	0	1
1	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	10	3	0	4	0	0	0	17	1	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	0	3	0	0	0	11	1	0	0	0	0	0	0	1
1	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	38	12	1	14	0	0	0	65	3	0	0	0	0	0	0	3
42	9	2	2	0	0	1	56	0	0	0	0	0	0	0	0	394	144	23	175	0	2	2	740	39	6	0	1	0	1	0	47

C => A								C => B								C => C								C => D							
CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT
31	3	2	9	0	1	0	46	15	8	1	3	0	0	0	27	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
26	11	2	10	0	2	1	52	23	26	1	5	0	0	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	7	1	12	0	0	0	42	40	14	0	2	0	0	0	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	4	0	8	0	0	0	59	38	12	1	1	0	2	0	54	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
126	25	5	39	0	3	1	199	116	60	3	11	0	2	0	192	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
27	4	0	12	0	0	0	43	18	6	1	6	0	0	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	9	0	0	0	24	9	3	0	1	0	0	0	13	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
27	1	1	14	0	0	0	43	4	4	0	3	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	8	1	19	0	0	0	57	12	2	0	2	0	0	0	16	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
97	14	2	54	0	0	0	167	43	15	1	12	0	0	0	71	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
16	3	0	8	0	0	0	27	6	1	0	4	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	3	0	14	0	0	0	38	2	2	0	2	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	2	0	9	0	0	0	20	3	1	2	6	0	0	0	12	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
5	4	1	16	0	0	0	26	5	1	0	4	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	12	1	47	0	0	0	111	16	5	2	16	0	0	0	39	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
11	0	0	11	0	0	0	22	3	1	0	7	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	2	14	0	0	0	27	3	3	0	3	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	2	1	15	0	0	0	23	3	9	0	2	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1	0	12	0	0	0	21	4	4	0	3	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	4	3	52	0	0	0	93	13	17	0	15	0	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	2	17	0	0	0	23	5	5	0	6	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	8	0	0	0	13	4	2	2	2	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	0	16	0	0	0	24	3	2	4	4	0	0	0	13	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
10	1	0	12	0	0	0	23	4	0	1	1	0	0	0	6	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
25	3	2	53	0	0	0	83	16	9	7	13	0	0	0	45	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3
4	1	0	13	0	0	0	18	2	1	0	1	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	13	0	0	0	16	1	0	0	3	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
3	1	1	9	0	1	0	15	8	2	0	5	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	17	1	0	0	25	4	1	1	1	0	1	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	3	3	52	1	1	0	74	15	4	1	10	0	1	0	31	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
5	2	0	13	0	0	0	20	6	3	0	5	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	2	1	9	0	0	0	29	9	3	0	4	0	0	0	16	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
6	3	2	12	0	0	0	23	10	3	0	2	0	0	0	15	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
18	5	1	10	0	0	0	34	8	8	1	3	0	0	0	20	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
46	12	4	44	0	0	0	106	33	17	1	14	0	0	0	65	1	0	0	0	0	0	0	1	2	0	0	0	0	0	0	2
9	1	1	15	0	0	0	26	8	0	1	5	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	2	0	8	0	0	0	20	5	3	1	2	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	2	8	0	0	0	17	3	0	0	2	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	13	0	0	0	20	14	1	1	6	0	0	0	22	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
32	4	3	44	0	0	0	83	30	4	3	15	0	0	0	52	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
2	2	1	10	0	0	0	15	2	1	0	3	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	2	0	10	0	0	0	17	3	2	1	6	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	1	6	0	0	0	14	6	1	0	4	0	0	0	11	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
3	0	1	4	0	0	0	8	3	1	0	3	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	4	3	30	0	0	0	54	14	5	1	16	0	0	0	36	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
2	0	0	13	0	0	0	15	5	1	2	11	0	0	0	19	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
6	3	0	12	0	0	0	21	4	1	0	5	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	7	0	0	0	14	6	1	0	2	0	0	0	9	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
4	0	0	2	0	0	0	6	5	1	1	5	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	4	1	34	0	0	0	56	20	4	3	23	0	0	0	50	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
0	0	2	7	0	0	0	9	2	3	0	2	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	6	0	0	0	8	7	0	0	3	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	2	0	0	0	5	2	0	0	3	0	0	0	5	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	3
2	0	0	6	0	0	0	8	2	1	0	2	0	0	0	5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
7	0	2	21	0	0	0	30	13	4	0	10	0	0	0	27	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	4
2	0	0	1	0	0	1	4	10	0	0	4	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	3	0	0	0	5	14	1	0	4	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	4	0	0	0	7	7	1	0	0	0	0	0	8	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
17	1	0	1	0	0	0	19	3	0	0	1	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	2	0	9	0	0	1	35	34	2	0	9	0	0	0	45	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
489	87	29	479	1	4	2	1091	363	146	22	164	0	3	0	698	1	1	0	0	0	0	0	2	18	2	0	0	0	0	0	20

D => A								D => B								D => C								D => D							
CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT	CAR	LGV	OGV1	OGV2	PSV	M/C	P/C	TOT
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	2	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	3	2	2	0	0	0	0	0	4	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1	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	0	0	0	0	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1	5	0	0	0	0	0	0	5	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	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	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	0	0	1	0	0	0	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	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1	6	0	0	0	0	0	0	6	1	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	3	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	2	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	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
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0	0	0	2	0	0	0	2	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	2	0	0	0	2	2	0	0	0	0	0	0	2	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	3	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
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2	0	0	0	0	0	0	2	4	2	0	0	0	0	0	6	6	1	0	0	0	0	0	7	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1	1	0	0	0	0	0	1	2	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
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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	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	0	0	1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
9	1	0	4	0	0	0	14	39	5	0	1	0	0	1	46	33	3	0	0	0	0	0	36	0	0	0	0	0	0	0	0



IDASO

Survey Name: 246 23415 - Slieverue, Co. Kilkenny
Site: Site 1
Location: Slieverue Roundabout (R711 / N29)
Date: Tue 05-Sep-2023

	A => A									A => B									A => C									A => D								
TIME	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU
07:00	0	0	2	1	2	1	0	6	8.3	0	0	54	10	0	16	0	80	100.8	2	0	49	33	1	0	0	85	83.9	0	0	1	0	0	0	0	1	1
07:15	0	0	1	2	0	1	0	4	5.3	0	0	74	20	2	13	0	109	126.9	0	0	70	26	2	0	1	99	101	0	0	2	0	0	1	0	3	4.3
07:30	0	0	3	2	0	0	0	5	5	1	1	67	19	3	11	0	102	116.4	0	1	58	22	3	0	0	84	84.9	0	0	1	3	0	0	0	4	4
07:45	0	0	2	2	1	2	0	7	10.1	0	0	77	18	1	11	0	107	121.8	0	1	51	18	6	4	1	81	89.6	0	0	4	4	0	0	0	8	8
H/TOT	0	0	8	7	3	4	0	22	28.7	1	1	272	67	6	51	0	398	465.9	2	2	228	99	12	4	2	349	359.4	0	0	8	7	0	1	0	16	17.3
08:00	0	0	0	4	1	0	0	5	5.5	0	0	38	8	2	16	0	64	85.8	0	1	76	17	2	1	3	100	104.7	0	0	6	0	0	0	0	6	6
08:15	0	0	4	1	0	0	0	5	5	0	0	25	5	1	12	0	43	59.1	0	0	72	1	2	1	0	76	78.3	0	0	9	5	0	0	0	14	14
08:30	0	0	3	1	2	0	0	6	7	0	0	24	4	0	15	0	43	62.5	0	1	62	8	3	0	0	74	74.9	0	0	10	0	1	0	0	11	11.5
08:45	0	0	3	3	1	1	0	8	9.8	0	0	26	4	1	15	0	46	66	1	0	66	9	1	1	0	78	79	1	0	20	1	0	0	0	22	21.2
H/TOT	0	0	10	9	4	1	0	24	27.3	0	0	113	21	4	58	0	196	273.4	1	2	276	35	8	3	3	328	336.3	1	0	45	6	1	0	0	53	52.7
09:00	0	0	7	1	0	4	0	12	17.2	0	1	20	5	2	12	0	40	56	0	0	76	7	0	1	0	84	85.3	0	0	6	1	0	0	1	8	9
09:15	0	0	2	1	0	1	0	4	5.3	0	0	14	3	3	14	0	34	53.7	0	0	56	7	0	2	1	66	69.6	0	0	2	0	0	0	0	2	2
09:30	0	0	1	1	0	1	0	3	4.3	0	0	12	3	3	14	0	32	51.7	0	0	82	6	1	1	1	91	93.8	0	0	6	1	0	0	0	7	7
09:45	0	0	3	1	1	0	0	5	5.5	0	0	9	1	2	8	0	20	31.4	0	1	47	5	4	0	0	57	58.4	1	0	1	3	0	0	0	5	6.2
H/TOT	0	0	13	4	1	6	0	24	32.3	0	1	55	12	10	48	0	126	192.8	0	1	261	25	5	4	2	298	307.1	1	0	15	5	0	0	1	22	22.2
10:00	0	0	3	1	1	0	0	5	5.5	0	0	11	2	0	12	0	25	40.6	0	0	55	10	6	1	1	73	78.3	0	0	1	0	1	0	0	2	2.5
10:15	0	0	1	1	1	0	0	3	3.5	0	0	6	6	1	17	0	30	52.6	0	0	40	10	3	2	1	56	61.1	0	0	3	0	0	0	0	3	3
10:30	0	0	4	1	0	0	0	5	5	0	0	6	5	0	15	0	26	45.5	0	0	66	4	4	0	1	75	78	1	0	2	1	0	1	0	5	5.5
10:45	0	0	2	3	0	0	0	5	5	0	0	8	3	2	12	0	25	41.6	0	1	44	4	4	1	0	54	56.7	0	0	3	1	2	0	0	6	7
H/TOT	0	0	10	6	2	0	0	18	19	0	0	31	16	3	56	0	106	180.3	0	1	205	28	17	4	3	258	274.1	1	0	9	2	3	1	0	16	18
11:00	0	0	6	3	1	1	0	11	12.8	0	0	6	1	1	17	0	25	47.6	1	0	36	9	2	2	0	50	52.8	0	0	3	1	0	1	0	5	6.3
11:15	0	0	1	0	3	1	0	5	7.8	0	0	5	2	1	12	0	20	36.1	0	2	45	9	3	3	2	64	70.2	0	0	4	0	0	0	0	4	4
11:30	0	0	2	4	1	1	0	8	9.8	0	0	12	0	0	13	0	25	41.9	0	0	47	7	2	1	0	57	59.3	0	0	3	0	0	1	0	4	5.3
11:45	0	0	2	1	2	0	0	5	6	0	0	9	3	1	11	0	24	38.8	0	0	49	9	2	1	0	61	63.3	0	1	7	1	0	0	0	9	8.4
H/TOT	0	0	11	8	7	3	0	29	36.4	0	0	32	6	3	53	0	94	164.4	1	2	177	34	9	7	2	232	245.6	0	1	17	2	0	2	0	22	24
12:00	0	0	7	1	0	1	0	9	10.3	0	0	2	5	1	8	0	16	26.9	0	1	31	3	3	0	0	38	38.9	0	0	3	0	0	0	0	3	3
12:15	0	0	4	4	0	0	0	8	8	0	0	7	1	1	12	0	21	37.1	0	1	39	14	0	0	0	54	53.4	0	0	4	0	1	0	0	5	5.5
12:30	0	0	2	1	0	1	0	4	5.3	0	0	6	3	0	11	0	20	34.3	0	0	36	3	1	0	0	40	40.5	0	0	3	1	0	0	0	4	4
12:45	0	0	1	1	1	0	0	3	3.5	0	0	7	3	0	11	0	21	35.3	0	0	41	4	3	0	0	48	49.5	0	0	3	1	0	1	0	5	6.3
H/TOT	0	0	14	7	1	2	0	24	27.1	0	0	22	12	2	42	0	78	133.6	0	2	147	24	7	0	0	180	182.3	0	0	13	2	1	1	0	17	18.8
13:00	0	0	3	0	2	0	0	5	6	0	0	7	0	1	9	0	17	29.2	0	0	55	8	2	0	0	65	66	0	0	3	0	0	0	0	3	3
13:15	0	0	4	1	1	0	0	6	6.5	0	0	12	6	0	19	0	37	61.7	0	1	43	11	1	1	1	58	60.2	0	0	4	0	0	0	0	4	4
13:30	0	0	9	0	0	2	0	11	13.6	0	0	11	4	0	10	0	25	38	0	0	54	9	2	2	3	70	76.6	0	0	6	0	0	0	0	6	6
13:45	0	0	7	4	0	0	0	11	11	0	0	16	4	2	9	0	31	43.7	0	0	50	4	1	0	0	55	55.5	0	0	1	1	0	0	0	2	2
H/TOT	0	0	23	5	3	2	0	33	37.1	0	0	46	14	3	47	0	110	172.6	0	1	202	32	6	3	4	248	258.3	0	0	14	1	0	0	0	15	15
14:00	0	0	4	2	1	1	0	8	9.8	0	0	6	3	0	12	0	21	36.6	0	0	45	7	0	1	0	53	54.3	0	0	5	0	0	0	0	5	5
14:15	0	0	3	2	3	2	0	10	14.1	0	0	12	4	0	12	0	28	43.6	0	0	46	5	1	0	1	53	54.5	0	0	14	2	0	1	1	18	20.3
14:30	0	0	6	0	0	2	0	8	10.6	0	0	2	1	3	9	0	15	28.2	0	0	41	5	1	1	0	48	49.8	0	0	9	0	0	0	0	9	9
14:45	0	0	0	1	1	1	0	3	4.8	0	0	7	2	1	13	0	23	40.4	0	1	40	7	0	0	0	48	47.4	0	0	7	1	0	0	0	8	8
H/TOT	0	0	13	5	5	6	0	29	39.3	0	0	27	10	4	46	0	87	148.8	0	1	172	24	2	2	1	202	206	0	0	35	3	0	1	1	40	42.3
15:00	0	0	4	2	0	0	0	6	6	0	0	5	2	1	11	0	19	33.8	0	0	49	10	2	0	0	61	62	0	0	4	0	0	0	0	4	4
15:15	0	0	2	0	2	0	0	4	5	0	0	2	1	2	14	0	19	38.2	0	0	58	11	0	0	2	71	73	0	0	2	1	2	0	0	5	6
15:30	0	0	5	2	1	0	0	8	8.5	0	0	4	2	0	9	0	15	26.7	0	0	41	4	1	2	0	48	51.1	0	0	3	1	1	0	1	6	7.5
15:45	0	0	2	4	1	0	0	7	7.5	0	0	8	0	0	9	0	17	28.7	0	1	44	4	1	1	2	53	56.2	0	0	2	2	0	0	0	4	4
H/TOT	0	0	13	8	4	0	0	25	27	0	0	19	5	3	43	0	70	127.4	0	1	192	29	4	3	4	233	242.3	0	0	11	4	3	0	1	19	21.5
16:00	0	0	1	1	0	1	0	3	4.3	0	0	7	2	1	10	0	20	33.5	0	0	39	6	0	1	1	47	49.3	0	0	4	2	0	0	0	6	6
16:15	0	0	5	2	0	1	0	8	9.3	0	0	5	3	1	9	0	18	30.2	3	0	51	9	2	1	0	66	65.9	0	0	4	1	0	0	0	5	5
16:30	0	0	2	0	0	1	0	3	4.3	0	0	7	1	0	8	0	16	26.4	1	2	46	9	0	0	0	58	56	0	0	2	1	0	1	0	4	5.3
16:45	0	0	13	2	1	0	0	16	16.5	0	1	8	2	3	9	0	23	35.6	0	1	44	11	1	1	1	59	61.2	0	0	12	0	0	0	0	12	12
H/TOT	0	0	21	5	1	3	0	30	34.4	0	1	27	8	5	36	0	77	135.7	4	3	180	35	3	3	2	230	232.4	0	0	22	4	0	1	0	27	28.3
17:00	0	0	3	3	1	1	0	8	9.8	0	0	10	1	0	10	0	21	34	0	0	56	11	2	0	0	69	70	0	1	3	1	1	0	0	6	5.9
17:15	0	0	4	2	0	1	0	7	8.3	0	0	6	2	0	5	0	13	19.5	0	1	67	9	0	0	0	77	76.4	0	0	3	3	0	0	0	6	6
17:30	0	0	2	2	0	1	0	5	6.3	0	0	10	1	1	3	0	15	19.4	0	0	75	8	0	0	1	84	85	0	0	12	2	0	0	0	14	14
17:45	0	0	3	1	0	0	0	4	4	0	0	5	2	1	3	0	11	15.4	0	2	54	9	1	0	1	67	67.2	0	0	7	2	0	0	0	9	9
H/TOT	0	0	12	8	1	3	0	24	28.4	0	0	31	6	2	21	0	60	88.3	0	3	252	37	3	0	2	297	298.7	0	1	25	8	1	0	0	35	34.9
18:00	0	0	5	0	0	0	0	5	5	0	0	6	1	0	6	0	13	20.8	0	0	41	4	0	0	0	45	45	0	0	9	3	0	0	0	12	12
18:15	0	0	1	0	0	1	0	2	3.3	0	0	10	2	0	2	0	14	16.6	0	1	36	5	0	0	1	43	43.4	0	0	7	1	0	0	0	8	8
18:30	0	0	6	1	1	1	0	9	10.8	0	0	10	0	0	2	0	12	14.6	0	3	41	8	1	0	1	54	53.7	0	0	7	0	0	0	0	7	7
18:45	0	0	4	0	0	0	0	4	4	0	0	5	1	0	2	0	8	10.6	0	0	41	3	1	0	0	45	45.5	0	0	8	0	0	0	0	8	8
H/TOT	0	0	16	1	1	2	0	20	23.1	0	0	31	4	0	12	0	47	62.6	0	4	159	20	2	0	2	187	187.8	0	0	31	4	0	0	0	35	35
12 TOT	0	0	164	73	33	32	0	302	360.1	1	3	706	181	45	513	0	1449	2136	8	23	2451	422	78	33	27	3042	3131	3	2	245	48	9	7	3	317	330

B => A									B => B									B => C									B => D								
P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU
0	0	5	3	0	13	0	21	37.9	0	0	0	0	0	0	0	0	0	2	0	8	1	0	0	0	11	9.4	0	0	0	0	0	0	0	0	0
0	0	8	2	0	15	0	25	44.5	0	0	0	0	0	0	0	0	0	0	0	5	1	0	0	0	6	6	0	0	1	0	0	0	0	1	1
0	0	10	3	0	15	0	28	47.5	0	0	0	0	0	0	0	0	0	0	0	19	2	0	0	0	21	21	0	0	1	0	0	0	0	1	1
0	0	9	1	2	13	0	25	42.9	0	0	0	0	0	0	0	0	0	0	0	11	1	0	0	0	12	12	0	0	0	0	0	0	0	0	0
0	0	32	9	2	56	0	99	172.8	0	0	0	0	0	0	0	0	0	2	0	43	5	0	0	0	50	48.4	0	0	2	0	0	0	0	2	2
0	0	9	0	1	13	0	23	40.4	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	4	0	0	1	0	0	0	0	1	1
0	0	8	2	0	13	0	23	39.9	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	4	4	0	0	0	0	0	0	0	0	0
0	0	12	1	4	15	0	32	53.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	1	0	0	8	8.5
0	0	4	1	3	9	0	17	30.2	0	0	0	0	0	0	0	0	0	0	0	5	2	0	0	0	7	7	0	0	9	0	0	0	0	9	9
0	0	33	4	8	50	0	95	164	0	0	0	0	0	0	0	0	0	0	0	12	3	0	0	0	15	15	0	0	16	1	1	0	0	18	18.5
0	0	9	3	1	13	0	26	43.4	0	0	0	0	0	0	0	0	0	0	0	6	1	0	0	0	7	7	0	0	0	0	0	0	0	0	0
0	0	5	4	0	17	1	27	50.1	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0
0	0	5	2	0	20	0	27	53	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0	0	6	6.5	0	0	0	0	0	0	0	0	0
0	0	4	0	2	10	0	16	30	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0
0	0	23	9	3	60	1	96	176.5	0	0	0	0	0	0	0	0	0	0	0	19	1	1	0	0	21	21.5	0	0	0	0	0	0	0	0	0
0	0	7	3	2	13	0	25	42.9	0	0	0	0	0	0	0	0	0	0	0	4	1	2	1	0	8	10.3	0	0	1	0	0	0	0	1	1
0	0	4	1	2	7	0	14	24.1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2	0	0	0	0	0	0	0	0	0
0	0	6	0	0	10	0	16	29	0	0	0	0	0	0	0	0	0	0	0	2	3	0	0	0	5	5	0	0	2	0	0	0	0	2	2
0	0	12	4	0	21	0	37	64.3	0	0	1	0	0	0	0	1	1	0	0	5	1	0	0	0	6	6	0	0	1	0	0	1	0	2	3.3
0	0	29	8	4	51	0	92	160.3	0	0	1	0	0	0	0	1	1	0	0	11	7	2	1	0	21	23.3	0	0	4	0	0	1	0	5	6.3
0	0	6	2	2	16	0	26	47.8	0	0	0	0	0	0	0	0	0	0	0	8	1	1	0	0	10	10.5	0	0	1	0	0	1	0	2	3.3
0	0	3	2	0	10	0	15	28	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	3	4.3	0	0	0	0	0	0	0	0	0
0	0	4	1	2	9	0	16	28.7	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	7	7	0	0	1	0	0	0	0	1	1
0	0	9	2	2	13	0	26	43.9	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5	5	0	0	1	0	0	0	0	1	1
0	0	22	7	6	48	0	83	148.4	0	0	0	0	0	0	0	0	0	0	0	22	1	1	1	0	25	25.8	0	0	3	0	0	1	0	4	5.1
0	0	5	2	0	13	0	20	36.9	0	0	2	0	0	0	0	2	2	0	0	4	0	1	0	0	5	5.5	0	1	2	0	0	0	0	3	2.4
0	0	7	3	1	11	0	22	36.8	0	0	0	0	0	0	0	0	0	0	0	8	4	0	0	0	12	12	0	0	1	0	0	1	0	2	3.3
0	0	2	3	2	13	0	20	37.9	0	0	0	0	0	0	0	0	0	0	0	6	0	2	0	0	8	9	0	0	2	0	0	1	0	3	4.3
0	0	9	3	0	9	0	21	32.7	0	0	0	0	0	0	0	0	0	0	0	10	1	0	0	0	11	11	0	0	4	1	0	0	0	5	5
0	0	23	11	3	46	0	83	144.3	0	0	2	0	0	0	0	2	2	0	0	28	5	3	0	0	36	37.5	0	1	9	1	0	2	0	13	15
0	0	14	3	0	11	0	28	42.3	0	0	0	0	0	0	0	0	0	0	0	9	1	0	2	0	12	14.6	0	0	3	0	0	0	0	3	3
0	0	12	2	1	8	0	23	33.9	0	0	0	0	0	0	0	0	0	0	0	9	3	1	0	0	13	13.5	0	0	2	0	0	0	0	2	2
0	0	9	6	2	7	0	24	34.1	0	0	0	0	0	0	0	0	0	0	1	7	2	1	0	0	11	10.9	0	0	3	1	0	0	0	4	4
0	0	8	2	1	18	0	29	52.9	0	0	0	0	0	0	0	0	0	0	0	8	5	0	1	0	14	15.3	0	0	4	0	0	0	0	4	4
0	0	43	13	4	44	0	104	163.2	0	0	0	0	0	0	0	0	0	0	1	33	11	2	3	0	50	54.3	0	0	12	1	0	0	0	13	13
0	0	5	0	1	15	0	21	41	0	0	0	0	0	0	0	0	0	0	0	9	2	1	0	0	12	12.5	0	0	0	0	0	0	0	0	0
0	0	6	1	2	14	0	23	42.2	0	0	0	0	0	0	0	0	0	0	0	5	1	0	1	0	7	8.3	0	0	4	0	0	0	0	4	4
0	0	7	3	3	11	0	24	39.8	0	0	0	0	0	0	0	0	0	0	0	6	1	1	0	0	8	8.5	0	0	10	1	0	0	0	11	11
0	0	9	4	0	14	0	27	45.2	0	0	0	0	0	0	0	0	0	0	0	7	0	1	0	0	8	8.5	0	0	3	0	0	0	0	3	3
0	0	27	8	6	54	0	95	168.2	0	0	0	0	0	0	0	0	0	0	0	27	4	3	1	0	35	37.8	0	0	17	1	0	0	0	18	18
0	0	12	2	2	11	0	27	42.3	0	0	0	0	0	0	0	0	0	0	0	3	3	1	0	0	7	7.5	0	0	1	0	0	1	0	2	3.3
0	0	9	2	2	12	0	25	41.6	0	0	0	0	0	0	0	0	0	0	0	6	3	0	0	0	9	9	0	0	1	1	0	0	0	2	2
0	0	8	3	0	9	0	20	31.7	0	0	0	0	0	0	0	0	0	1	0	7	0	0	0	0	8	7.2	0	0	0	0	0	1	0	1	2.3
0	0	9	2	1	13	0	25	42.4	0	0	0	0	0	0	0	0	0	0	0	6	4	0	0	0	10	10	1	0	3	0	0	0	0	4	3.2
0	0	38	9	5	45	0	97	158	0	0	0	0	0	0	0	0	0	1	0	22	10	1	0	0	34	33.7	1	0	5	1	0	2	0	9	10.8
0	0	39	14	0	14	0	67	85.2	0	0	0	0	0	0	0	0	0	0	0	14	2	0	1	0	17	18.3	0	0	2	0	0	0	0	2	2
0	0	11	2	0	10	0	23	36	0	0	0	0	0	0	0	0	0	0	0	7	1	0	0	0	8	8	0	0	1	1	0	0	0	2	2
1	1	62	16	2	11	0	93	106.9	0	0	0	0	0	0	0	0	0	0	0	30	8	0	0	0	38	38	0	0	10	0	0	0	0	10	10
0	0	20	10	4	10	0	44	59	0	0	0	0	0	0	0	0	0	0	0	14	2	0	0	0	16	16	0	0	2	2	0	0	0	4	4
1	1	132	42	6	45	0	227	287.1	0	0	0	0	0	0	0	0	0	0	0	65	13	0	1	0	79	80.3	0	0	15	3	0	0	0	18	18
0	0	56	14	1	3	0	74	78.4	0	0	0	0	0	0	0	0	0	0	1	23	2	0	0	0	26	25.4	0	0	10	0	0	1	0	11	12.3
0	0	27	12	2	13	0	54	71.9	0	0	0	0	0	0	0	0	0	0	0	8	6	1	0	0	15	15.5	0	0	4	0	0	0	0	4	4
0	0	48	4	0	6	0	58	65.8	0	0	0	0	0	0	0	0	0	0	0	18	4	2	0	0	24	25	0	1	4	0	0	0	0	5	4.4
0	0	16	7	1	5	0	29	36	0	0	0	0	0	0	0	0	0	0	0	15	1	0	0	0	16	16	0	0	1	0	0	0	0	1	1
0	0	147	37	4	27	0	215	252.1	0	0	0	0	0	0	0	0	0	0	1	64	13	3	0	0	81	81.9	0	1	19	0	0	1	0	21	21.7
0	0	20	4	0	3	0	27	30.9	0	0	0	0	0	0	0	0	0	0	0	6	1	0	0	0	7	7	0	0	5	1	0	0	0	6	6
0	0	18	2	0	4	0	24	29.2	0	0	0	0	0	0	0	0	0	0	0	7	1	0	0	0	8	8	0	0	0	0	0	1	0	1	2.3
0	1	8	3	1	2	0	15	17.5	0	0	0	0	0	0	0	0	0	0	0	7	1	1	0	0	9	9.5	0	0	4	0	0	0	0	4	4
0	0	17	4	0	4	0	25	30.2	0	0	0	0	0	0	0	0	0	0	0	8	2	0	0	0	10	10	0	0	4	0	0	0	0	4	4
0	1	63	13	1	13	0	91	107.8	0	0	0	0	0	0	0	0	0	0	0	28	5	1	0	0	34	34.5	0	0	13	1	0	1	0	15	16.3
1	2	612	170	52	539	1	1377	2103	0	0	3	0	0	0	0	3	3	3	2	374	78	17	7	0	481	495	1	2	115	9	1	8	0	136	144.9

C => A									C => B									C => C									C => D								
P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU
0	2	38	9	1	1	1	52	53.6	0	0	17	0	2	0	0	19	20	0	0	1	0	0	0	0	1	1	0	0	1	1	0	0	0	2	2
1	0	49	10	3	0	0	63	63.7	0	0	16	5	0	1	0	22	23.3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
0	1	57	21	1	0	1	81	81.9	0	0	20	2	0	1	0	23	24.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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D => A									D => B									D => C									D => D								
P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU
0	0	4	1	0	0	0	5	5	0	0	1	0	0	0	0	1	1	0	0	3	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0
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0	1	16	4	1	0	0	22	21.9	0	0	6	0	1	2	0	9	12.1	0	0	6	2	0	0	1	9	10	0	0	0	0	0	0	0	0	0
0	0	4	0	0	0	0	4	4	0	0	2	0	0	0	0	2	2	0	0	6	0	0	0	1	7	8	0	0	0	0	0	0	0	0	0
0	0	6	0	0	0	0	6	6	0	0	3	2	0	0	0	5	5	0	0	2	1	0	0	0	3	3	0	0	0	0	0	0	0	0	0
0	0	3	0	0	0	0	3	3	0	0	2	1	0	1	0	4	5.3	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
0	0	2	0	0	0	0	2	2	0	0	1	0	0	0	0	1	1	0	0	4	1	0	0	0	5	5	0	0	0	0	0	0	0	0	0
0	0	15	0	0	0	0	15	15	0	0	8	3	0	1	0	12	13.3	0	0	13	2	0	0	1	16	17	0	0	0	0	0	0	0	0	0
0	1	2	1	0	0	0	4	3.4	0	0	4	1	0	1	0	6	7.3	0	0	2	0	0	0	1	3	4	0	0	0	0	0	0	0	0	0
0	0	4	0	0	0	0	4	4	0	0	3	1	0	0	0	4	4	0	0	1	1	0	0	0	2	2	0	0	0	0	0	0	0	0	0
0	0	3	0	0	0	0	3	3	0	0	3	0	1	0	0	4	4.5	0	0	2	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0
1	0	1	1	0	0	0	3	2.2	0	0	0	1	0	1	0	2	3.3	0	0	4	1	0	0	0	5	5	0	0	0	0	0	0	0	0	0
1	1	10	2	0	0	0	14	12.6	0	0	10	3	1	2	0	16	19.1	0	0	9	2	0	0	1	12	13	0	0	0	0	0	0	0	0	0
1	0	7	2	0	0	0	10	9.2	0	0	2	1	0	0	0	3	3	0	0	1	1	0	0	1	3	4	0	0	0	0	0	0	0	0	0
0	0	3	0	0	2	0	5	7.6	0	0	1	0	0	0	0	1	1	0	0	3	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0
0	0	9	0	0	0	0	9	9	0	0	2	0	0	0	0	2	2	0	0	4	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	1	1	0	0	4	0	0	0	0	4	4	0	0	6	1	0	0	0	7	7	0	0	0	0	0	0	0	0	0
1	0	20	2	0	2	0	25	26.8	0	0	9	1	0	0	0	10	10	0	0	14	2	0	0	1	17	18	0	0	0	0	0	0	0	0	0
5	3	231	34	9	6	1	289	296.5	0	0	115	16	10	6	1	148	161.8	0	2	151	22	2	0	10	187	196.8	0	0	0	0	1	0	0	1	1.5

APPENDIX 16-2

Existing N29 / Industrial Access Road Priority Junction - AM Peak Hour Flows

2023 AM Peak - Existing Flows

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	135	81	**216**
Industrial Access Rd	51	0	10	**61**
N29 (south)	20	10	0	**30**
Totals	**71**	**145**	**91**	**307**

AM Peak - Development flows

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	77	6	**83**
Industrial Access Rd	0	0	0	**0**
N29 (south)	6	0	0	**6**
Totals	**6**	**77**	**6**	**89**

2029 AM Peak - No Development (Flows + 11.81%)

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	151	91	**242**
Industrial Access Rd	57	0	11	**68**
N29 (south)	22	11	0	**34**
Totals	**79**	**162**	**102**	**343**

2029 AM Peak - With Development

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	228	97	**325**
Industrial Access Rd	57	0	11	**68**
N29 (south)	28	11	0	**40**
Totals	**85**	**239**	**108**	**432**

2034 AM Peak - No Development (Existing Flows + 22.79%)

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	166	99	**265**
Industrial Access Rd	63	0	12	**75**
N29 (south)	25	12	0	**37**
Totals	**87**	**178**	**112**	**377**

2034 AM Peak - With Development

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	243	105	**348**
Industrial Access Rd	63	0	12	**75**
N29 (south)	31	12	0	**43**
Totals	**93**	**255**	**118**	**466**

2044 AM Peak - No Development (Existing Flows + 28.65%)

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	174	104	**278**
Industrial Access Rd	66	0	13	**78**
N29 (south)	26	13	0	**39**
Totals	**91**	**187**	**117**	**395**

2044 AM Peak - With Development

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	251	110	**361**
Industrial Access Rd	66	0	13	**78**
N29 (south)	32	13	0	**45**
Totals	**97**	**264**	**123**	**484**

Existing N29 / Industrial Access Road Priority Junction - PM Peak Hour Flows

2023 PM Peak - Existing Flows

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	23	29	**52**
Industrial Access Rd	111	0	9	**120**
N29 (south)	122	9	0	**131**
Totals	**233**	**32**	**38**	**303**

PM Peak - Development flows

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	0	6	**6**
Industrial Access Rd	53	0	0	**53**
N29 (south)	6	0	0	**6**
Totals	**59**	**0**	**6**	**65**

2029 PM Peak - No Development (Flows + 11.81%)

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	26	32	**58**
Industrial Access Rd	124	0	10	**134**
N29 (south)	136	10	0	**146**
Totals	**261**	**36**	**42**	**339**

2029 PM Peak - With Development

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	26	38	**64**
Industrial Access Rd	177	0	10	**187**
N29 (south)	142	10	0	**152**
Totals	**320**	**36**	**48**	**404**

2034 PM Peak - No Development (Existing Flows + 22.79%)

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	28	36	**64**
Industrial Access Rd	136	0	11	**147**
N29 (south)	150	11	0	**161**
Totals	**286**	**39**	**47**	**372**

2034 PM Peak - With Development

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	28	42	**70**
Industrial Access Rd	189	0	11	**200**
N29 (south)	156	11	0	**167**
Totals	**345**	**39**	**53**	**437**

2044 PM Peak - No Development (Existing Flows + 28.65%)

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	30	37	**67**
Industrial Access Rd	143	0	12	**154**
N29 (south)	157	12	0	**169**
Totals	**300**	**41**	**49**	**390**

2044 PM Peak - With Development

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	30	43	**73**
Industrial Access Rd	196	0	12	**207**
N29 (south)	163	12	0	**175**
Totals	**359**	**41**	**55**	**455**

Existing N29 / L3412 / L7485 Crossroads Junction - AM Peak Hour Flows

2023 AM Peak - Existing Flows

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	2	198	192	**392**
L3412	4	0	3	4	**11**
N29 (west)	81	0	0	2	**83**
L7485	45	1	12	0	**58**
Totals	**130**	**3**	**213**	**198**	**544**

AM Peak - Development flows

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	0	6	0	**6**
L3412	0	0	0	0	**0**
N29 (west)	83	0	0	0	**83**
L7485	0	0	0	0	**0**
Totals	**83**	**0**	**6**	**0**	**89**

2029 AM Peak - No Development (Flows + 11.81%)

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	2	221	215	**438**
L3412	4	0	3	4	**12**
N29 (west)	91	0	0	2	**93**
L7485	50	1	13	0	**65**
Totals	**145**	**3**	**238**	**221**	**608**

2029 AM Peak - With Development

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	2	227	215	**444**
L3412	4	0	3	4	**12**
N29 (west)	174	0	0	2	**176**
L7485	50	1	13	0	**65**
Totals	**228**	**3**	**244**	**221**	**697**

2034 AM Peak - No Development (Existing Flows + 22.79%)

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	2	243	236	**481**
L3412	5	0	4	5	**14**
N29 (west)	99	0	0	2	**102**
L7485	55	1	15	0	**71**
Totals	**160**	**4**	**262**	**243**	**668**

2034 AM Peak - With Development

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	2	249	236	**487**
L3412	5	0	4	5	**14**
N29 (west)	182	0	0	2	**185**
L7485	55	1	15	0	**71**
Totals	**243**	**4**	**268**	**243**	**757**

2044 AM Peak - No Development (Existing Flows + 28.65%)

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	3	255	247	**504**
L3412	5	0	4	5	**14**
N29 (west)	104	0	0	3	**107**
L7485	58	1	15	0	**75**
Totals	**167**	**4**	**274**	**255**	**700**

2044 AM Peak - With Development

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	3	261	247	**510**
L3412	5	0	4	5	**14**
N29 (west)	187	0	0	3	**190**
L7485	58	1	15	0	**75**
Totals	**250**	**4**	**280**	**255**	**789**

Existing N29 / L3412 / L7485 Crossroads Junction - PM Peak Hour Flows

2023 PM Peak - Existing Flows

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	1	50	38	**89**
L3412	5	0	0	2	**7**
N29 (west)	208	0	0	19	**227**
L7485	123	12	4	0	**139**
Totals	**336**	**13**	**54**	**59**	**462**

PM Peak - Development flows

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	0	57	0	**57**
L3412	0	0	0	0	**0**
N29 (west)	6	0	0	0	**6**
L7485	0	0	0	0	**0**
Totals	**6**	**0**	**57**	**0**	**63**

2029 PM Peak - No Development (Flows + 11.81%)

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	1	56	42	**100**
L3412	6	0	0	2	**8**
N29 (west)	233	0	0	21	**254**
L7485	138	13	4	0	**155**
Totals	**376**	**15**	**60**	**66**	**517**

2029 PM Peak - With Development

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	1	113	42	**157**
L3412	6	0	0	2	**8**
N29 (west)	239	0	0	21	**260**
L7485	138	13	4	0	**155**
Totals	**382**	**15**	**117**	**66**	**580**

2034 PM Peak - No Development (Existing Flows + 22.79%)

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	1	61	47	**109**
L3412	6	0	0	2	**9**
N29 (west)	255	0	0	23	**279**
L7485	151	15	5	0	**171**
Totals	**413**	**16**	**66**	**72**	**567**

2034 PM Peak - With Development

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	1	118	47	**166**
L3412	6	0	0	2	**9**
N29 (west)	261	0	0	23	**285**
L7485	151	15	5	0	**171**
Totals	**419**	**16**	**123**	**72**	**630**

2044 PM Peak - No Development (Existing Flows + 28.65%)

	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	1	64	49	**114**
L3412	6	0	0	3	**9**
N29 (west)	268	0	0	24	**292**
L7485	158	15	5	0	**179**
Totals	**432**	**17**	**69**	**76**	**594**

2044 PM Peak - With Development

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	1	121	49	**171**
L3412	6	0	0	3	**9**
N29 (west)	274	0	0	24	**298**
L7485	158	15	5	0	**179**
Totals	**438**	**17**	**126**	**76**	**657**

Existing N29 Slieverue Roundabout - AM Peak Hour Flows

2023 AM Peak - Existing Flows

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	22	398	349	16	**785**
N29 (south)	99	0	50	2	**151**
R711	254	97	2	3	**356**
L3411	31	10	14	0	**55**
Totals	**406**	**505**	**415**	**21**	**1347**

AM Peak - Development flows

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	0	63	0	0	**63**
N29 (south)	6	0	0	0	**6**
R711	0	20	0	0	**20**
L3411	0	0	0	0	**0**
Totals	**6**	**83**	**0**	**0**	**89**

2029 AM Peak - No Development (Flows + 11.81%)

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	23	421	369	17	**830**
N29 (south)	105	0	53	2	**160**
R711	269	103	2	3	**376**
L3411	33	11	15	0	**58**
Totals	**429**	**534**	**439**	**22**	**1424**

2029 AM Peak - With Development

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	23	484	369	17	**893**
N29 (south)	111	0	53	2	**166**
R711	269	123	2	3	**396**
L3411	33	11	15	0	**58**
Totals	**435**	**617**	**439**	**22**	**1513**

2034 AM Peak - No Development (Existing Flows + 22.79%)

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	26	462	405	19	**911**
N29 (south)	115	0	58	2	**175**
R711	295	113	2	3	**413**
L3411	36	12	16	0	**64**
Totals	**471**	**586**	**482**	**24**	**1563**

2034 AM Peak - With Development

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	26	525	405	19	**974**
N29 (south)	121	0	58	2	**181**
R711	295	133	2	3	**433**
L3411	36	12	16	0	**64**
Totals	**477**	**669**	**482**	**24**	**1652**

2044 AM Peak - No Development (Existing Flows + 28.65%)

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	28	501	439	20	**988**
N29 (south)	125	0	63	3	**190**
R711	320	122	3	4	**448**
L3411	39	13	18	0	**69**
Totals	**511**	**636**	**523**	**26**	**1696**

2044 AM Peak - With Development

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	28	564	439	20	**1051**
N29 (south)	131	0	63	3	**196**
R711	320	142	3	4	**468**
L3411	39	13	18	0	**69**
Totals	**517**	**719**	**523**	**26**	**1785**

Existing N29 Slieverue Roundabout - PM Peak Hour Flows

2023 PM Peak - Existing Flows

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	24	60	297	35	**416**
N29 (south)	215	0	81	21	**317**
R711	401	34	0	21	**456**
L3411	14	16	12	0	**42**
Totals	**654**	**110**	**390**	**77**	**1231**

PM Peak - Development flows

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	0	6	0	0	**6**
N29 (south)	40	0	17	0	**57**
R711	0	0	0	0	**0**
L3411	0	0	0	0	**0**
Totals	**40**	**6**	**17**	**0**	**63**

2029 PM Peak - No Development (Flows + 11.81%)

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	25	63	314	37	**440**
N29 (south)	227	0	86	22	**335**
R711	424	36	0	22	**482**
L3411	15	17	13	0	**44**
Totals	**691**	**116**	**412**	**81**	**1302**

2029 PM Peak - With Development

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	25	69	314	37	**446**
N29 (south)	267	0	103	22	**392**
R711	424	36	0	22	**482**
L3411	15	17	13	0	**44**
Totals	**731**	**122**	**429**	**81**	**1365**

2034 PM Peak - No Development (Existing Flows + 22.79%)

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	28	70	345	41	**483**
N29 (south)	250	0	94	24	**368**
R711	465	39	0	24	**529**
L3411	16	19	14	0	**49**
Totals	**759**	**128**	**453**	**89**	**1429**

2034 PM Peak - With Development

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	28	76	345	41	**489**
N29 (south)	290	0	111	24	**425**
R711	465	39	0	24	**529**
L3411	16	19	14	0	**49**
Totals	**799**	**134**	**470**	**89**	**1492**

2044 PM Peak - No Development (Existing Flows + 28.65%)

	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	30	76	374	44	**524**
N29 (south)	271	0	102	26	**399**
R711	505	43	0	26	**574**
L3411	18	20	15	0	**53**
Totals	**824**	**139**	**491**	**97**	**1550**

2044 PM Peak - With Development

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	30	82	374	44	**530**
N29 (south)	311	0	119	26	**456**
R711	505	43	0	26	**574**
L3411	18	20	15	0	**53**
Totals	**864**	**145**	**508**	**97**	**1613**

Existing N29 / Industrial Access Road Priority Junction - AM Peak Hour Flows

2023 AM Peak - Existing Flows

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	135	81	**216**
Industrial Access Rd	51	0	10	**61**
N29 (south)	20	10	0	**30**
Totals	**71**	**145**	**91**	**307**

AM Peak - Construction Flows

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	36	0	**36**
Industrial Access Rd	9	0	0	**9**
N29 (south)	0	0	0	**0**
Totals	**9**	**36**	**0**	**45**

2027 AM Peak - No Construction (Existing Flows + 7.71%)

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	145	87	**233**
Industrial Access Rd	55	0	11	**66**
N29 (south)	22	11	0	**32**
Totals	**76**	**156**	**98**	**331**

2027 AM Peak - Construction Flows + Exisitng Flows

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	181	87	**269**
Industrial Access Rd	64	0	11	**75**
N29 (south)	22	11	0	**32**
Totals	**85**	**192**	**98**	**376**

Existing N29 / Industrial Access Road Priority Junction - PM Peak Hour Flows

2023 PM Peak - Existing Flows

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	23	29	**52**
Industrial Access Rd	111	0	9	**120**
N29 (south)	122	9	0	**131**
Totals	**233**	**32**	**38**	**303**

PM Peak - Construction Flows

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	9	0	**9**
Industrial Access Rd	36	0	0	**36**
N29 (south)	0	0	0	**0**
Totals	**36**	**9**	**0**	**45**

2027 PM Peak - No Construction (Existing Flows + 7.71%)

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	25	31	**56**
Industrial Access Rd	120	0	10	**129**
N29 (south)	131	10	0	**141**
Totals	**251**	**34**	**41**	**326**

2027 PM Peak - Construction Flows + Existing Flows

From / To	N29 (north)	Industrial Access Rd	N29 (south)	**Totals**
N29 (north)	0	34	31	**65**
Industrial Access Rd	156	0	10	**165**
N29 (south)	131	10	0	**141**
Totals	**287**	**43**	**41**	**371**

Existing N29 / L3412 / L7485 Crossroads Junction - AM Peak Hour Flows

2023 AM Peak - Existing Flows

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	2	198	192	**392**
L3412	4	0	3	4	**11**
N29 (west)	81	0	0	2	**83**
L7485	45	1	12	0	**58**
Totals	**130**	**3**	**213**	**198**	**544**

AM Peak - Construction Flows

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	0	9	0	**9**
L3412	0	0	0	0	**0**
N29 (west)	36	0	0	0	**36**
L7485	0	0	0	0	**0**
Totals	**36**	**0**	**9**	**0**	**45**

2027 AM Peak - No Construction (Existing Flows + 7.71%)

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	2	213	207	**422**
L3412	4	0	3	4	**12**
N29 (west)	87	0	0	2	**89**
L7485	48	1	13	0	**62**
Totals	**140**	**3**	**229**	**213**	**586**

2027 AM Peak - Construction Flows + Exisitng Flows

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	2	222	207	**431**
L3412	4	0	3	4	**12**
N29 (west)	123	0	0	2	**125**
L7485	48	1	13	0	**62**
Totals	**176**	**3**	**238**	**213**	**631**

Existing N29 / L3412 / L7485 Crossroads Junction - PM Peak Hour Flows

2023 PM Peak - Existing Flows

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	1	50	38	**89**
L3412	5	0	0	2	**7**
N29 (west)	208	0	0	19	**227**
L7485	123	12	4	0	**139**
Totals	**336**	**13**	**54**	**59**	**462**

PM Peak - Construction Flows

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	0	36	0	**36**
L3412	0	0	0	0	**0**
N29 (west)	9	0	0	0	**9**
L7485	0	0	0	0	**0**
Totals	**9**	**0**	**36**	**0**	**45**

2027 PM Peak - No Construction (Existing Flows + 7.71%)

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	1	54	41	**96**
L3412	5	0	0	2	**8**
N29 (west)	224	0	0	20	**245**
L7485	132	13	4	0	**150**
Totals	**362**	**14**	**58**	**64**	**498**

2027 PM Peak - Construction Flows + Existing Flows

From / To	N29 (east)	L3412	N29 (west)	L7485	**Totals**
N29 (east)	0	1	90	41	**132**
L3412	5	0	0	2	**8**
N29 (west)	233	0	0	20	**254**
L7485	132	13	4	0	**150**
Totals	**371**	**14**	**94**	**64**	**543**

Existing N29 Slieverue Roundabout - AM Peak Hour Flows

2023 AM Peak - Existing Flows

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	22	398	349	16	**785**
N29 (south)	99	0	50	2	**151**
R711	254	97	2	3	**356**
L3411	31	10	14	0	**55**
Totals	**406**	**505**	**415**	**21**	**1347**

AM Peak - Construction Flows

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	0	32	0	0	**32**
N29 (south)	9	0	0	0	**9**
R711	0	4	0	0	**4**
L3411	0	0	0	0	**0**
Totals	**9**	**36**	**0**	**0**	**45**

2027 AM Peak - No Construction (Existing Flows + 7.71%)

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	24	429	376	17	**846**
N29 (south)	107	0	54	2	**163**
R711	274	104	2	3	**383**
L3411	33	11	15	0	**59**
Totals	**437**	**544**	**447**	**23**	**1451**

2027 AM Peak - Construction Flows + Exisitng Flows

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	24	461	376	17	**878**
N29 (south)	116	0	54	2	**172**
R711	274	108	2	3	**387**
L3411	33	11	15	0	**59**
Totals	**446**	**580**	**447**	**23**	**1496**

Existing N29 Slieverue Roundabout - PM Peak Hour Flows

2023 PM Peak - Existing Flows

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	24	60	297	35	**416**
N29 (south)	215	0	81	21	**317**
R711	401	34	0	21	**456**
L3411	14	16	12	0	**42**
Totals	**654**	**110**	**390**	**77**	**1231**

PM Peak - Construction Flows

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	0	9	0	0	**9**
N29 (south)	30	0	6	0	**36**
R711	0	0	0	0	**0**
L3411	0	0	0	0	**0**
Totals	**30**	**9**	**6**	**0**	**45**

2027 PM Peak - No Construction (Existing Flows + 7.71%)

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	26	65	320	38	**448**
N29 (south)	232	0	87	23	**341**
R711	432	37	0	23	**491**
L3411	15	17	13	0	**45**
Totals	**704**	**118**	**420**	**83**	**1326**

2027 PM Peak - Construction Flows + Existing Flows

From / To	N29 (north)	N29 (south)	R711	L3411	**Totals**
N29 (north)	26	74	320	38	**457**
N29 (south)	262	0	93	23	**377**
R711	432	37	0	23	**491**
L3411	15	17	13	0	**45**
Totals	**734**	**127**	**426**	**83**	**1371**

APPENDIX 16-3

Junctions 9

PICADY 9 - Priority Intersection Module

Version: 9.5.2.1013
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Filename: N29- INDUSTRIAL ACCESS-ROAD PRIORITY JUNCTION-REV A.j9
Path: S:\Jobs\2023\23117 Belview Port Extension TIA\23117-01\Reports\Working\PICADY
Report generation date: 05/06/2025 11:58:25

»2023, AM
»2023, PM
»2027 no dev, AM
»2027 no dev, PM
»2027 construction phase, AM
»2027 construction phase, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (Veh)	Delay (s)	RFC	LOS	Set ID	Queue (Veh)	Delay (s)	RFC	LOS
	2023									
Stream B-C	D1	0.0	8.30	0.02	A	D2	0.0	8.78	0.02	A
Stream B-A		0.1	9.26	0.13	A		0.4	10.81	0.27	B
Stream C-AB		0.0	6.35	0.02	A		0.0	5.97	0.02	A
	2027 no dev									
Stream B-C	D3	0.0	8.36	0.03	A	D4	0.0	8.87	0.03	A
Stream B-A		0.2	9.43	0.14	A		0.4	11.21	0.29	B
Stream C-AB		0.0	6.40	0.02	A		0.0	5.99	0.02	A
	2027 construction phase									
Stream B-C	D5	0.0	8.56	0.03	A	D6	0.0	9.27	0.03	A
Stream B-A		0.2	9.73	0.16	A		0.6	12.79	0.38	B
Stream C-AB		0.0	6.49	0.02	A		0.0	6.01	0.02	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	26/01/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	ROADPLAN01\jbyrne
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	Veh	Veh	perHour	s	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75				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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓
D3	2027 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D4	2027 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D5	2027 construction phase	AM	ONE HOUR	06:45	08:15	15	✓
D6	2027 construction phase	PM	ONE HOUR	16:15	17:45	15	✓
D7	2029 no dev	AM	ONE HOUR	06:45	08:15	15	
D8	2029 no dev	PM	ONE HOUR	16:15	17:45	15	
D9	2029 with dev	AM	ONE HOUR	06:45	08:15	15	
D10	2029 with dev	PM	ONE HOUR	16:15	17:45	15	
D11	2034 no dev	AM	ONE HOUR	06:45	08:15	15	
D12	2034 no dev	PM	ONE HOUR	16:15	17:45	15	
D13	2034 with dev	AM	ONE HOUR	06:45	08:15	15	
D14	2034 with dev	PM	ONE HOUR	16:15	17:45	15	
D15	2044 no dev	AM	ONE HOUR	06:45	08:15	15	
D16	2044 no dev	PM	ONE HOUR	16:15	17:45	15	
D17	2044 with dev	AM	ONE HOUR	06:45	08:15	15	
D18	2044 with dev	PM	ONE HOUR	16:15	17:45	15	

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2023, 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		2.02	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N29 (west)		Major
B	Industrial Access Rd		Minor
C	N29 (east)		Major

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)
C	12.00		✓	3.00	100.0	✓	7.00

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	4.40	2.20	2.20	2.20	2.20		3.00	75	100

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	524	0.071	0.178	0.112	0.255
B-C	530	0.060	0.152	-	-
C-B	687	0.197	0.197	-	-

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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	216	100.000
B		ONE HOUR	✓	61	100.000
C		ONE HOUR	✓	30	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	135	81
	B	51	0	10
	C	20	10	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.02	8.30	0.0	A	9	14
B-A	0.13	9.26	0.1	A	47	70
C-AB	0.02	6.35	0.0	A	9	14
C-A					18	28
A-B					124	186
A-C					74	111

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	457	0.016	7	0.0	0.0	8.011	A
B-A	38	10	455	0.084	38	0.0	0.1	8.629	A
C-AB	8	2	592	0.013	7	0.0	0.0	6.153	A
C-A	15	4			15				
A-B	102	25			102				
A-C	61	15			61				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	452	0.020	9	0.0	0.0	8.130	A
B-A	46	11	451	0.102	46	0.1	0.1	8.888	A
C-AB	9	2	586	0.015	9	0.0	0.0	6.235	A
C-A	18	4			18				
A-B	121	30			121				
A-C	73	18			73				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	445	0.025	11	0.0	0.0	8.297	A
B-A	56	14	445	0.126	56	0.1	0.1	9.255	A
C-AB	11	3	578	0.019	11	0.0	0.0	6.352	A
C-A	22	6			22				
A-B	149	37			149				
A-C	89	22			89				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	445	0.025	11	0.0	0.0	8.298	A
B-A	56	14	445	0.126	56	0.1	0.1	9.260	A
C-AB	11	3	578	0.019	11	0.0	0.0	6.352	A
C-A	22	6			22				
A-B	149	37			149				
A-C	89	22			89				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	452	0.020	9	0.0	0.0	8.134	A
B-A	46	11	451	0.102	46	0.1	0.1	8.897	A
C-AB	9	2	586	0.015	9	0.0	0.0	6.238	A
C-A	18	4			18				
A-B	121	30			121				
A-C	73	18			73				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	457	0.016	8	0.0	0.0	8.017	A
B-A	38	10	455	0.084	38	0.1	0.1	8.646	A
C-AB	8	2	592	0.013	8	0.0	0.0	6.154	A
C-A	15	4			15				
A-B	102	25			102				
A-C	61	15			61				

2023, 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		4.40	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)	Run automatically
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	52	100.000
B		ONE HOUR	✓	120	100.000
C		ONE HOUR	✓	131	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	23	29
	B	111	0	9
	C	122	9	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.02	8.78	0.0	A	8	12
B-A	0.27	10.81	0.4	B	102	153
C-AB	0.02	5.97	0.0	A	8	12
C-A					112	168
A-B					21	32
A-C					27	40

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	7	2	433	0.016	7	0.0	0.0	8.447	A
B-A	84	21	463	0.180	83	0.0	0.2	9.439	A
C-AB	7	2	617	0.011	7	0.0	0.0	5.901	A
C-A	92	23			92				
A-B	17	4			17				
A-C	22	5			22				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	428	0.019	8	0.0	0.0	8.583	A
B-A	100	25	460	0.217	100	0.2	0.3	9.986	A
C-AB	8	2	615	0.013	8	0.0	0.0	5.928	A
C-A	110	27			110				
A-B	21	5			21				
A-C	26	7			26				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	420	0.024	10	0.0	0.0	8.776	A
B-A	122	31	455	0.268	122	0.3	0.4	10.787	B
C-AB	10	2	613	0.016	10	0.0	0.0	5.966	A
C-A	134	34			134				
A-B	25	6			25				
A-C	32	8			32				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	420	0.024	10	0.0	0.0	8.778	A
B-A	122	31	455	0.268	122	0.4	0.4	10.810	B
C-AB	10	2	613	0.016	10	0.0	0.0	5.966	A
C-A	134	34			134				
A-B	25	6			25				
A-C	32	8			32				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	427	0.019	8	0.0	0.0	8.589	A
B-A	100	25	460	0.217	100	0.4	0.3	10.019	B
C-AB	8	2	615	0.013	8	0.0	0.0	5.931	A
C-A	110	27			110				
A-B	21	5			21				
A-C	26	7			26				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	7	2	433	0.016	7	0.0	0.0	8.458	A
B-A	84	21	463	0.180	84	0.3	0.2	9.496	A
C-AB	7	2	617	0.011	7	0.0	0.0	5.903	A
C-A	92	23			92				
A-B	17	4			17				
A-C	22	5			22				

2027 no 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		2.06	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)	Run automatically
D3	2027 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	232	100.000
B		ONE HOUR	✓	66	100.000
C		ONE HOUR	✓	33	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	145	87
	B	55	0	11
	C	22	11	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	8.36	0.0	A	10	15
B-A	0.14	9.43	0.2	A	50	76
C-AB	0.02	6.40	0.0	A	10	15
C-A					20	30
A-B					133	200
A-C					80	120

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	456	0.018	8	0.0	0.0	8.046	A
B-A	41	10	453	0.091	41	0.0	0.1	8.728	A
C-AB	8	2	590	0.014	8	0.0	0.0	6.186	A
C-A	17	4			17				
A-B	109	27			109				
A-C	65	16			65				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	450	0.022	10	0.0	0.0	8.177	A
B-A	49	12	449	0.110	49	0.1	0.1	9.016	A
C-AB	10	2	583	0.017	10	0.0	0.0	6.276	A
C-A	20	5			20				
A-B	130	33			130				
A-C	78	20			78				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	443	0.027	12	0.0	0.0	8.360	A
B-A	61	15	442	0.137	60	0.1	0.2	9.424	A
C-AB	12	3	574	0.021	12	0.0	0.0	6.403	A
C-A	24	6			24				
A-B	160	40			160				
A-C	96	24			96				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	443	0.027	12	0.0	0.0	8.361	A
B-A	61	15	442	0.137	61	0.2	0.2	9.430	A
C-AB	12	3	574	0.021	12	0.0	0.0	6.403	A
C-A	24	6			24				
A-B	160	40			160				
A-C	96	24			96				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	450	0.022	10	0.0	0.0	8.179	A
B-A	49	12	449	0.110	50	0.2	0.1	9.027	A
C-AB	10	2	583	0.017	10	0.0	0.0	6.276	A
C-A	20	5			20				
A-B	130	33			130				
A-C	78	20			78				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	455	0.018	8	0.0	0.0	8.053	A
B-A	41	10	453	0.091	42	0.1	0.1	8.748	A
C-AB	8	2	590	0.014	8	0.0	0.0	6.189	A
C-A	17	4			17				
A-B	109	27			109				
A-C	65	16			65				

2027 no 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)	Run automatically
D4	2027 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	56	100.000
B		ONE HOUR	✓	130	100.000
C		ONE HOUR	✓	141	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	25	31
	B	120	0	10
	C	131	10	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	8.87	0.0	A	9	14
B-A	0.29	11.21	0.4	B	110	165
C-AB	0.02	5.99	0.0	A	9	14
C-A					120	180
A-B					23	34
A-C					28	43

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	431	0.017	7	0.0	0.0	8.494	A
B-A	90	23	462	0.196	89	0.0	0.2	9.645	A
C-AB	8	2	616	0.012	7	0.0	0.0	5.914	A
C-A	99	25			99				
A-B	19	5			19				
A-C	23	6			23				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	425	0.021	9	0.0	0.0	8.644	A
B-A	108	27	458	0.235	108	0.2	0.3	10.263	B
C-AB	9	2	615	0.015	9	0.0	0.0	5.944	A
C-A	118	29			118				
A-B	22	6			22				
A-C	28	7			28				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	417	0.026	11	0.0	0.0	8.863	A
B-A	132	33	453	0.292	132	0.3	0.4	11.184	B
C-AB	11	3	612	0.018	11	0.0	0.0	5.986	A
C-A	144	36			144				
A-B	28	7			28				
A-C	34	9			34				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	417	0.026	11	0.0	0.0	8.866	A
B-A	132	33	453	0.292	132	0.4	0.4	11.213	B
C-AB	11	3	612	0.018	11	0.0	0.0	5.986	A
C-A	144	36			144				
A-B	28	7			28				
A-C	34	9			34				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	425	0.021	9	0.0	0.0	8.650	A
B-A	108	27	458	0.235	108	0.4	0.3	10.299	B
C-AB	9	2	615	0.015	9	0.0	0.0	5.946	A
C-A	118	29			118				
A-B	22	6			22				
A-C	28	7			28				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	431	0.017	8	0.0	0.0	8.505	A
B-A	90	23	462	0.196	91	0.3	0.2	9.707	A
C-AB	8	2	616	0.012	8	0.0	0.0	5.916	A
C-A	99	25			99				
A-B	19	5			19				
A-C	23	6			23				

2027 construction phase, 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		2.10	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)	Run automatically
D5	2027 construction phase	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	268	100.000
B		ONE HOUR	✓	75	100.000
C		ONE HOUR	✓	33	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	181	87
	B	64	0	11
	C	22	11	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	8.56	0.0	A	10	15
B-A	0.16	9.73	0.2	A	59	88
C-AB	0.02	6.49	0.0	A	10	15
C-A					20	30
A-B					166	249
A-C					80	120

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	447	0.019	8	0.0	0.0	8.203	A
B-A	48	12	452	0.107	48	0.0	0.1	8.895	A
C-AB	8	2	585	0.014	8	0.0	0.0	6.244	A
C-A	17	4			17				
A-B	136	34			136				
A-C	65	16			65				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	441	0.022	10	0.0	0.0	8.350	A
B-A	58	14	447	0.129	57	0.1	0.1	9.235	A
C-AB	10	2	577	0.017	10	0.0	0.0	6.346	A
C-A	20	5			20				
A-B	163	41			163				
A-C	78	20			78				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	433	0.028	12	0.0	0.0	8.558	A
B-A	70	18	440	0.160	70	0.1	0.2	9.726	A
C-AB	12	3	566	0.021	12	0.0	0.0	6.493	A
C-A	24	6			24				
A-B	199	50			199				
A-C	96	24			96				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	433	0.028	12	0.0	0.0	8.560	A
B-A	70	18	440	0.160	70	0.2	0.2	9.733	A
C-AB	12	3	566	0.021	12	0.0	0.0	6.493	A
C-A	24	6			24				
A-B	199	50			199				
A-C	96	24			96				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	441	0.022	10	0.0	0.0	8.353	A
B-A	58	14	447	0.129	58	0.2	0.1	9.250	A
C-AB	10	2	577	0.017	10	0.0	0.0	6.346	A
C-A	20	5			20				
A-B	163	41			163				
A-C	78	20			78				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	447	0.019	8	0.0	0.0	8.208	A
B-A	48	12	452	0.107	48	0.1	0.1	8.921	A
C-AB	8	2	585	0.014	8	0.0	0.0	6.246	A
C-A	17	4			17				
A-B	136	34			136				
A-C	65	16			65				

2027 construction phase, 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		5.77	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)	Run automatically
D6	2027 construction phase	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	65	100.000
B		ONE HOUR	✓	166	100.000
C		ONE HOUR	✓	141	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	34	31
	B	156	0	10
	C	131	10	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	9.27	0.0	A	9	14
B-A	0.38	12.79	0.6	B	143	215
C-AB	0.02	6.01	0.0	A	9	14
C-A					120	180
A-B					31	47
A-C					28	43

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	420	0.018	7	0.0	0.0	8.734	A
B-A	117	29	462	0.254	116	0.0	0.3	10.368	B
C-AB	8	2	615	0.012	7	0.0	0.0	5.927	A
C-A	99	25			99				
A-B	26	6			26				
A-C	23	6			23				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	412	0.022	9	0.0	0.0	8.939	A
B-A	140	35	458	0.306	140	0.3	0.4	11.289	B
C-AB	9	2	613	0.015	9	0.0	0.0	5.959	A
C-A	118	29			118				
A-B	31	8			31				
A-C	28	7			28				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	400	0.028	11	0.0	0.0	9.261	A
B-A	172	43	453	0.379	171	0.4	0.6	12.733	B
C-AB	11	3	610	0.018	11	0.0	0.0	6.005	A
C-A	144	36			144				
A-B	37	9			37				
A-C	34	9			34				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	399	0.028	11	0.0	0.0	9.267	A
B-A	172	43	453	0.379	172	0.6	0.6	12.790	B
C-AB	11	3	610	0.018	11	0.0	0.0	6.005	A
C-A	144	36			144				
A-B	37	9			37				
A-C	34	9			34				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	411	0.022	9	0.0	0.0	8.948	A
B-A	140	35	458	0.306	141	0.6	0.4	11.365	B
C-AB	9	2	613	0.015	9	0.0	0.0	5.960	A
C-A	118	29			118				
A-B	31	8			31				
A-C	28	7			28				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	419	0.018	8	0.0	0.0	8.748	A
B-A	117	29	462	0.254	118	0.4	0.3	10.475	B
C-AB	8	2	615	0.012	8	0.0	0.0	5.929	A
C-A	99	25			99				
A-B	26	6			26				
A-C	23	6			23				

Junctions 9

PICADY 9 - Priority Intersection Module

Version: 9.5.2.1013
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Filename: N29- L3412- L7482-CROSSROADS JUNCTION-REV A.j9
Path: S:\Jobs\2023\23117 Belview Port Extension TIA\23117-01\Reports\Working\PICADY
Report generation date: 05/06/2025 11:59:47

»2023, AM
»2023, PM
»2027 no dev, AM
»2027 no dev, PM
»2027 construction Phase, AM
»2027 construction Phase, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (Veh)	Delay (s)	RFC	LOS	Set ID	Queue (Veh)	Delay (s)	RFC	LOS
	2023									
Stream B-C D	D1	0.0	7.65	0.02	A	D2	0.0	7.61	0.00	A
Stream B-A		0.0	11.17	0.01	B		0.0	9.48	0.01	A
Stream AB-C D		0.9	8.77	0.43	A		0.1	6.75	0.08	A
Stream D-ABC		0.1	7.85	0.12	A		0.4	9.10	0.28	A
Stream CD-AB		0.0	6.39	0.00	A		0.0	5.81	0.02	A
	2027 no dev									
Stream B-C D	D3	0.0	7.74	0.02	A	D4	0.0	7.63	0.00	A
Stream B-A		0.0	11.38	0.01	B		0.0	9.59	0.01	A
Stream AB-C D		1.1	9.32	0.47	A		0.1	6.82	0.09	A
Stream D-ABC		0.2	8.03	0.13	A		0.4	9.45	0.30	A
Stream CD-AB		0.0	6.47	0.00	A		0.0	5.83	0.02	A
	2027 construction Phase									
Stream B-C D	D5	0.0	7.77	0.02	A	D6	0.0	7.73	0.00	A
Stream B-A		0.0	11.57	0.01	B		0.0	9.79	0.01	A
Stream AB-C D		1.2	9.53	0.48	A		0.1	6.56	0.09	A
Stream D-ABC		0.2	8.21	0.13	A		0.4	9.51	0.30	A
Stream CD-AB		0.0	6.49	0.00	A		0.0	5.91	0.02	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	26/01/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	ROADPLAN01\jbyrne
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	Veh	Veh	perHour	s	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75				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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓
D3	2027 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D4	2027 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D5	2027 construction Phase	AM	ONE HOUR	06:45	08:15	15	✓
D6	2027 construction Phase	PM	ONE HOUR	16:15	17:45	15	✓
D7	2029 no dev	AM	ONE HOUR	06:45	08:15	15	
D8	2029 no dev	PM	ONE HOUR	16:15	17:45	15	
D9	2029 with dev	AM	ONE HOUR	06:45	08:15	15	
D10	2029 with dev	PM	ONE HOUR	16:15	17:45	15	
D11	2034 no dev	AM	ONE HOUR	06:45	08:15	15	
D12	2034 no dev	PM	ONE HOUR	16:15	17:45	15	
D13	2034 with dev	AM	ONE HOUR	06:45	08:15	15	
D14	2034 with dev	PM	ONE HOUR	16:15	17:45	15	
D15	2044 no dev	AM	ONE HOUR	06:45	08:15	15	
D16	2044 no dev	PM	ONE HOUR	16:15	17:45	15	
D17	2044 with dev	AM	ONE HOUR	06:45	08:15	15	
D18	2044 with dev	PM	ONE HOUR	16:15	17:45	15	

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2023, 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	Left-Right Stagger	Two-way		2.73	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N29 (east)		Major
B	L3412		Minor
C	N29 (west)		Major
D	L7485		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	9.00				150.0	✓	0.00
C	12.00		✓	3.00	150.0	✓	15.00

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)	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		4.40	2.20	2.20	2.20	2.20		1.00	50	50
D	One lane	3.20								50	50

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for A-D	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
AB-D	661	-	-	-	-	-	0.223	0.223	0.223	-	-
B-A	446	0.060	0.152	0.152	-	-	0.095	0.217	-	0.095	0.217
B-CD	611	0.069	0.175	0.175	-	-	-	-	-	-	-
CD-B	718	0.206	0.206	0.206	-	-	-	-	-	-	-
D-AB	669	-	-	-	-	-	0.225	0.225	0.089	-	-
D-C	529	-	0.133	0.302	0.133	0.302	0.212	0.212	0.084	-	-

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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	392	100.000
B		ONE HOUR	✓	11	100.000
C		ONE HOUR	✓	83	100.000
D		ONE HOUR	✓	58	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	2	198	192
	B	4	0	3	4
	C	81	0	0	2
	D	45	1	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.02	7.65	0.0	A	6	10
B-A	0.01	11.17	0.0	B	4	6
A-B					2	3
A-C					182	273
A-D					176	264
AB-CD	0.43	8.77	0.9	A	247	370
AB-C					118	176
D-ABC	0.12	7.85	0.1	A	53	80
C-D					2	3
C-A					74	111
C-B					0	0
CD-AB	0.00	6.39	0.0	A	1	1
CD-A					116	173

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	503	0.010	5	0.0	0.0	7.235	A
B-A	3	0.75	351	0.009	3	0.0	0.0	10.330	B
A-B	2	0.38			2				
A-C	149	37			149				
A-D	145	36			145				
AB-CD	189	47	684	0.277	188	0.0	0.5	7.237	A
AB-C	109	27			109				
D-ABC	44	11	541	0.081	43	0.0	0.1	7.230	A
C-D	2	0.38			2				
C-A	61	15			61				
C-B	0	0			0				
CD-AB	0.75	0.19	592	0.001	0.74	0.0	0.0	6.084	A
CD-A	95	24			95				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	492	0.013	6	0.0	0.0	7.403	A
B-A	4	0.90	341	0.011	4	0.0	0.0	10.666	B
A-B	2	0.45			2				
A-C	178	44			178				
A-D	173	43			173				
AB-CD	238	59	701	0.340	237	0.5	0.6	7.775	A
AB-C	119	30			119				
D-ABC	52	13	533	0.098	52	0.1	0.1	7.483	A
C-D	2	0.45			2				
C-A	73	18			73				
C-B	0	0			0				
CD-AB	0.90	0.22	581	0.002	0.90	0.0	0.0	6.209	A
CD-A	113	28			113				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	478	0.016	8	0.0	0.0	7.648	A
B-A	4	1	327	0.013	4	0.0	0.0	11.171	B
A-B	2	0.55			2				
A-C	218	55			218				
A-D	211	53			211				
AB-CD	312	78	724	0.431	311	0.6	0.9	8.720	A
AB-C	125	31			125				
D-ABC	64	16	522	0.122	64	0.1	0.1	7.850	A
C-D	2	0.55			2				
C-A	89	22			89				
C-B	0	0			0				
CD-AB	1	0.27	564	0.002	1	0.0	0.0	6.391	A
CD-A	139	35			139				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	478	0.016	8	0.0	0.0	7.648	A
B-A	4	1	327	0.013	4	0.0	0.0	11.170	B
A-B	2	0.55			2				
A-C	218	55			218				
A-D	211	53			211				
AB-CD	312	78	724	0.431	312	0.9	0.9	8.772	A
AB-C	125	31			125				
D-ABC	64	16	522	0.122	64	0.1	0.1	7.855	A
C-D	2	0.55			2				
C-A	89	22			89				
C-B	0	0			0				
CD-AB	1	0.28	564	0.002	1	0.0	0.0	6.391	A
CD-A	139	35			139				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	492	0.013	6	0.0	0.0	7.407	A
B-A	4	0.90	341	0.011	4	0.0	0.0	10.667	B
A-B	2	0.45			2				
A-C	178	44			178				
A-D	173	43			173				
AB-CD	238	60	701	0.340	240	0.9	0.6	7.837	A
AB-C	118	30			118				
D-ABC	52	13	533	0.098	52	0.1	0.1	7.492	A
C-D	2	0.45			2				
C-A	73	18			73				
C-B	0	0			0				
CD-AB	0.90	0.23	581	0.002	0.90	0.0	0.0	6.212	A
CD-A	113	28			113				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	503	0.010	5	0.0	0.0	7.236	A
B-A	3	0.75	352	0.009	3	0.0	0.0	10.329	B
A-B	2	0.38			2				
A-C	149	37			149				
A-D	145	36			145				
AB-CD	190	48	684	0.278	191	0.6	0.5	7.312	A
AB-C	109	27			109				
D-ABC	44	11	541	0.081	44	0.1	0.1	7.248	A
C-D	2	0.38			2				
C-A	61	15			61				
C-B	0	0			0				
CD-AB	0.75	0.19	592	0.001	0.76	0.0	0.0	6.084	A
CD-A	95	24			95				

2023, 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	Left-Right Stagger	Two-way		1.89	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)	Run automatically
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	89	100.000
B		ONE HOUR	✓	7	100.000
C		ONE HOUR	✓	227	100.000
D		ONE HOUR	✓	139	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	1	50	38
	B	5	0	0	2
	C	208	0	0	19
	D	123	12	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.00	7.61	0.0	A	2	3
B-A	0.01	9.48	0.0	A	5	7
A-B					1	1
A-C					46	69
A-D					35	52
AB-CD	0.08	6.75	0.1	A	40	60
AB-C					43	64
D-ABC	0.28	9.10	0.4	A	128	191
C-D					17	26
C-A					191	286
C-B					0	0
CD-AB	0.02	5.81	0.0	A	11	16
CD-A					304	455

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	480	0.003	1	0.0	0.0	7.515	A
B-A	4	1	403	0.009	4	0.0	0.0	9.007	A
A-B	0.75	0.19			0.75				
A-C	38	9			38				
A-D	29	7			29				
AB-CD	32	8	587	0.055	32	0.0	0.1	6.477	A
AB-C	36	9			36				
D-ABC	105	26	566	0.185	104	0.0	0.2	7.774	A
C-D	14	4			14				
C-A	157	39			157				
C-B	0	0			0				
CD-AB	9	2	639	0.014	9	0.0	0.0	5.710	A
CD-A	248	62			248				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	478	0.004	2	0.0	0.0	7.557	A
B-A	4	1	396	0.011	4	0.0	0.0	9.201	A
A-B	0.90	0.22			0.90				
A-C	45	11			45				
A-D	34	9			34				
AB-CD	39	10	585	0.067	39	0.1	0.1	6.591	A
AB-C	42	10			42				
D-ABC	125	31	559	0.224	125	0.2	0.3	8.290	A
C-D	17	4			17				
C-A	187	47			187				
C-B	0	0			0				
CD-AB	11	3	637	0.017	11	0.0	0.0	5.751	A
CD-A	297	74			297				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	475	0.005	2	0.0	0.0	7.613	A
B-A	6	1	385	0.014	5	0.0	0.0	9.481	A
A-B	1	0.28			1				
A-C	55	14			55				
A-D	42	10			42				
AB-CD	49	12	582	0.084	49	0.1	0.1	6.751	A
AB-C	50	13			50				
D-ABC	153	38	549	0.279	153	0.3	0.4	9.079	A
C-D	21	5			21				
C-A	229	57			229				
C-B	0	0			0				
CD-AB	13	3	633	0.021	13	0.0	0.0	5.808	A
CD-A	364	91			364				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	475	0.005	2	0.0	0.0	7.613	A
B-A	6	1	385	0.014	6	0.0	0.0	9.482	A
A-B	1	0.28			1				
A-C	55	14			55				
A-D	42	10			42				
AB-CD	49	12	582	0.084	49	0.1	0.1	6.752	A
AB-C	50	13			50				
D-ABC	153	38	549	0.279	153	0.4	0.4	9.097	A
C-D	21	5			21				
C-A	229	57			229				
C-B	0	0			0				
CD-AB	13	3	633	0.021	13	0.0	0.0	5.808	A
CD-A	364	91			364				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	478	0.004	2	0.0	0.0	7.561	A
B-A	4	1	396	0.011	5	0.0	0.0	9.204	A
A-B	0.90	0.22			0.90				
A-C	45	11			45				
A-D	34	9			34				
AB-CD	39	10	585	0.067	39	0.1	0.1	6.597	A
AB-C	42	10			42				
D-ABC	125	31	559	0.224	125	0.4	0.3	8.314	A
C-D	17	4			17				
C-A	187	47			187				
C-B	0	0			0				
CD-AB	11	3	637	0.017	11	0.0	0.0	5.752	A
CD-A	298	74			298				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	480	0.003	2	0.0	0.0	7.520	A
B-A	4	1	403	0.009	4	0.0	0.0	9.013	A
A-B	0.75	0.19			0.75				
A-C	38	9			38				
A-D	29	7			29				
AB-CD	32	8	587	0.055	32	0.1	0.1	6.487	A
AB-C	36	9			36				
D-ABC	105	26	566	0.185	105	0.3	0.2	7.811	A
C-D	14	4			14				
C-A	157	39			157				
C-B	0	0			0				
CD-AB	9	2	639	0.014	9	0.0	0.0	5.711	A
CD-A	249	62			249				

2027 no 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	Left-Right Stagger	Two-way		2.93	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)	Run automatically
D3	2027 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	422	100.000
B		ONE HOUR	✓	11	100.000
C		ONE HOUR	✓	89	100.000
D		ONE HOUR	✓	62	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	2	213	207
	B	4	0	3	4
	C	87	0	0	2
	D	48	1	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.02	7.74	0.0	A	6	10
B-A	0.01	11.38	0.0	B	4	6
A-B					2	3
A-C					195	293
A-D					190	285
AB-CD	0.47	9.32	1.1	A	272	408
AB-C					120	180
D-ABC	0.13	8.03	0.2	A	57	85
C-D					2	3
C-A					80	120
C-B					0	0
CD-AB	0.00	6.47	0.0	A	1	1
CD-A					124	186

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	499	0.011	5	0.0	0.0	7.293	A
B-A	3	0.75	347	0.009	3	0.0	0.0	10.451	B
A-B	2	0.38			2				
A-C	160	40			160				
A-D	156	39			156				
AB-CD	208	52	690	0.301	206	0.0	0.5	7.411	A
AB-C	114	28			114				
D-ABC	47	12	537	0.087	46	0.0	0.1	7.327	A
C-D	2	0.38			2				
C-A	65	16			65				
C-B	0	0			0				
CD-AB	0.75	0.19	588	0.001	0.74	0.0	0.0	6.132	A
CD-A	101	25			101				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	488	0.013	6	0.0	0.0	7.476	A
B-A	4	0.90	336	0.011	4	0.0	0.0	10.822	B
A-B	2	0.45			2				
A-C	191	48			191				
A-D	186	47			186				
AB-CD	262	65	708	0.370	261	0.5	0.7	8.057	A
AB-C	122	30			122				
D-ABC	56	14	529	0.105	56	0.1	0.1	7.608	A
C-D	2	0.45			2				
C-A	78	20			78				
C-B	0	0			0				
CD-AB	0.90	0.22	575	0.002	0.90	0.0	0.0	6.269	A
CD-A	121	30			121				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	473	0.016	8	0.0	0.0	7.744	A
B-A	4	1	321	0.014	4	0.0	0.0	11.381	B
A-B	2	0.55			2				
A-C	235	59			235				
A-D	228	57			228				
AB-CD	345	86	733	0.471	343	0.7	1.1	9.244	A
AB-C	125	31			125				
D-ABC	68	17	517	0.132	68	0.1	0.2	8.020	A
C-D	2	0.55			2				
C-A	96	24			96				
C-B	0	0			0				
CD-AB	1	0.27	557	0.002	1	0.0	0.0	6.469	A
CD-A	149	37			149				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	473	0.016	8	0.0	0.0	7.744	A
B-A	4	1	321	0.014	4	0.0	0.0	11.380	B
A-B	2	0.55			2				
A-C	235	59			235				
A-D	228	57			228				
AB-CD	345	86	734	0.471	345	1.1	1.1	9.318	A
AB-C	125	31			125				
D-ABC	68	17	517	0.132	68	0.2	0.2	8.028	A
C-D	2	0.55			2				
C-A	96	24			96				
C-B	0	0			0				
CD-AB	1	0.28	557	0.002	1	0.0	0.0	6.469	A
CD-A	149	37			149				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	488	0.013	6	0.0	0.0	7.479	A
B-A	4	0.90	336	0.011	4	0.0	0.0	10.822	B
A-B	2	0.45			2				
A-C	191	48			191				
A-D	186	47			186				
AB-CD	263	66	709	0.370	264	1.1	0.7	8.141	A
AB-C	121	30			121				
D-ABC	56	14	529	0.105	56	0.2	0.1	7.616	A
C-D	2	0.45			2				
C-A	78	20			78				
C-B	0	0			0				
CD-AB	0.90	0.23	575	0.002	0.90	0.0	0.0	6.269	A
CD-A	121	30			121				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	499	0.011	5	0.0	0.0	7.294	A
B-A	3	0.75	348	0.009	3	0.0	0.0	10.451	B
A-B	2	0.38			2				
A-C	160	40			160				
A-D	156	39			156				
AB-CD	208	52	691	0.302	209	0.7	0.5	7.501	A
AB-C	113	28			113				
D-ABC	47	12	537	0.087	47	0.1	0.1	7.346	A
C-D	2	0.38			2				
C-A	65	16			65				
C-B	0	0			0				
CD-AB	0.75	0.19	588	0.001	0.76	0.0	0.0	6.135	A
CD-A	102	25			102				

2027 no 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	Left-Right Stagger	Two-way		1.94	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)	Run automatically
D4	2027 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	96	100.000
B		ONE HOUR	✓	7	100.000
C		ONE HOUR	✓	244	100.000
D		ONE HOUR	✓	149	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	1	54	41
	B	5	0	0	2
	C	224	0	0	20
	D	132	13	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.00	7.63	0.0	A	2	3
B-A	0.01	9.59	0.0	A	5	7
A-B					1	1
A-C					50	74
A-D					38	56
AB-CD	0.09	6.82	0.1	A	43	65
AB-C					46	69
D-ABC	0.30	9.45	0.4	A	137	205
C-D					18	28
C-A					206	308
C-B					0	0
CD-AB	0.02	5.83	0.0	A	12	18
CD-A					327	490

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	480	0.003	1	0.0	0.0	7.528	A
B-A	4	1	400	0.009	4	0.0	0.0	9.076	A
A-B	0.75	0.19			0.75				
A-C	41	10			41				
A-D	31	8			31				
AB-CD	35	9	587	0.059	34	0.0	0.1	6.517	A
AB-C	38	10			38				
D-ABC	112	28	564	0.199	111	0.0	0.2	7.944	A
C-D	15	4			15				
C-A	169	42			169				
C-B	0	0			0				
CD-AB	10	2	638	0.015	10	0.0	0.0	5.727	A
CD-A	267	67			267				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	477	0.004	2	0.0	0.0	7.572	A
B-A	4	1	392	0.011	4	0.0	0.0	9.287	A
A-B	0.90	0.22			0.90				
A-C	49	12			49				
A-D	37	9			37				
AB-CD	42	11	584	0.072	42	0.1	0.1	6.642	A
AB-C	45	11			45				
D-ABC	134	33	556	0.241	134	0.2	0.3	8.524	A
C-D	18	4			18				
C-A	201	50			201				
C-B	0	0			0				
CD-AB	12	3	635	0.018	12	0.0	0.0	5.771	A
CD-A	320	80			320				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	474	0.005	2	0.0	0.0	7.632	A
B-A	6	1	381	0.014	5	0.0	0.0	9.593	A
A-B	1	0.28			1				
A-C	59	15			59				
A-D	45	11			45				
AB-CD	53	13	581	0.091	53	0.1	0.1	6.817	A
AB-C	54	14			54				
D-ABC	164	41	545	0.301	164	0.3	0.4	9.428	A
C-D	22	6			22				
C-A	247	62			247				
C-B	0	0			0				
CD-AB	14	4	631	0.023	14	0.0	0.0	5.833	A
CD-A	392	98			392				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	474	0.005	2	0.0	0.0	7.633	A
B-A	6	1	381	0.014	6	0.0	0.0	9.594	A
A-B	1	0.28			1				
A-C	59	15			59				
A-D	45	11			45				
AB-CD	53	13	581	0.091	53	0.1	0.1	6.818	A
AB-C	54	14			54				
D-ABC	164	41	545	0.301	164	0.4	0.4	9.450	A
C-D	22	6			22				
C-A	247	62			247				
C-B	0	0			0				
CD-AB	14	4	631	0.023	14	0.0	0.0	5.833	A
CD-A	392	98			392				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	477	0.004	2	0.0	0.0	7.576	A
B-A	4	1	392	0.011	5	0.0	0.0	9.290	A
A-B	0.90	0.22			0.90				
A-C	49	12			49				
A-D	37	9			37				
AB-CD	42	11	584	0.072	42	0.1	0.1	6.648	A
AB-C	45	11			45				
D-ABC	134	33	556	0.241	134	0.4	0.3	8.553	A
C-D	18	4			18				
C-A	201	50			201				
C-B	0	0			0				
CD-AB	12	3	635	0.018	12	0.0	0.0	5.775	A
CD-A	320	80			320				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	479	0.003	2	0.0	0.0	7.533	A
B-A	4	1	400	0.009	4	0.0	0.0	9.080	A
A-B	0.75	0.19			0.75				
A-C	41	10			41				
A-D	31	8			31				
AB-CD	35	9	587	0.059	35	0.1	0.1	6.528	A
AB-C	38	10			38				
D-ABC	112	28	563	0.199	112	0.3	0.3	7.986	A
C-D	15	4			15				
C-A	169	42			169				
C-B	0	0			0				
CD-AB	10	2	638	0.015	10	0.0	0.0	5.730	A
CD-A	268	67			268				

2027 construction Phase, 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	Left-Right Stagger	Two-way		2.82	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)	Run automatically
D5	2027 construction Phase	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	431	100.000
B		ONE HOUR	✓	11	100.000
C		ONE HOUR	✓	125	100.000
D		ONE HOUR	✓	62	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	2	222	207
	B	4	0	3	4
	C	123	0	0	2
	D	48	1	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.02	7.77	0.0	A	6	10
B-A	0.01	11.57	0.0	B	4	6
A-B					2	3
A-C					204	306
A-D					190	285
AB-CD	0.48	9.53	1.2	A	277	415
AB-C					123	185
D-ABC	0.13	8.21	0.2	A	57	85
C-D					2	3
C-A					113	169
C-B					0	0
CD-AB	0.00	6.49	0.0	A	1	1
CD-A					157	235

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	498	0.011	5	0.0	0.0	7.311	A
B-A	3	0.75	344	0.009	3	0.0	0.0	10.561	B
A-B	2	0.38			2				
A-C	167	42			167				
A-D	156	39			156				
AB-CD	211	53	689	0.306	208	0.0	0.5	7.468	A
AB-C	118	29			118				
D-ABC	47	12	531	0.088	46	0.0	0.1	7.430	A
C-D	2	0.38			2				
C-A	93	23			93				
C-B	0	0			0				
CD-AB	0.75	0.19	586	0.001	0.74	0.0	0.0	6.147	A
CD-A	128	32			128				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	486	0.013	6	0.0	0.0	7.498	A
B-A	4	0.90	332	0.011	4	0.0	0.0	10.964	B
A-B	2	0.45			2				
A-C	200	50			200				
A-D	186	47			186				
AB-CD	266	67	707	0.377	266	0.5	0.7	8.157	A
AB-C	126	31			126				
D-ABC	56	14	521	0.107	56	0.1	0.1	7.733	A
C-D	2	0.45			2				
C-A	111	28			111				
C-B	0	0			0				
CD-AB	0.90	0.22	573	0.002	0.90	0.0	0.0	6.287	A
CD-A	154	38			154				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	471	0.016	8	0.0	0.0	7.773	A
B-A	4	1	315	0.014	4	0.0	0.0	11.575	B
A-B	2	0.55			2				
A-C	244	61			244				
A-D	228	57			228				
AB-CD	352	88	732	0.481	351	0.7	1.2	9.447	A
AB-C	128	32			128				
D-ABC	68	17	507	0.135	68	0.1	0.2	8.199	A
C-D	2	0.55			2				
C-A	135	34			135				
C-B	0	0			0				
CD-AB	1	0.27	555	0.002	1	0.0	0.0	6.493	A
CD-A	188	47			188				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	471	0.016	8	0.0	0.0	7.773	A
B-A	4	1	315	0.014	4	0.0	0.0	11.574	B
A-B	2	0.55			2				
A-C	244	61			244				
A-D	228	57			228				
AB-CD	353	88	733	0.482	353	1.2	1.2	9.530	A
AB-C	127	32			127				
D-ABC	68	17	507	0.135	68	0.2	0.2	8.207	A
C-D	2	0.55			2				
C-A	135	34			135				
C-B	0	0			0				
CD-AB	1	0.28	555	0.002	1	0.0	0.0	6.493	A
CD-A	188	47			188				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	486	0.013	6	0.0	0.0	7.502	A
B-A	4	0.90	332	0.011	4	0.0	0.0	10.962	B
A-B	2	0.45			2				
A-C	200	50			200				
A-D	186	47			186				
AB-CD	267	67	708	0.377	269	1.2	0.8	8.249	A
AB-C	125	31			125				
D-ABC	56	14	521	0.107	56	0.2	0.1	7.746	A
C-D	2	0.45			2				
C-A	111	28			111				
C-B	0	0			0				
CD-AB	0.90	0.23	573	0.002	0.90	0.0	0.0	6.290	A
CD-A	154	38			154				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	498	0.011	5	0.0	0.0	7.315	A
B-A	3	0.75	344	0.009	3	0.0	0.0	10.561	B
A-B	2	0.38			2				
A-C	167	42			167				
A-D	156	39			156				
AB-CD	211	53	690	0.306	212	0.8	0.6	7.565	A
AB-C	117	29			117				
D-ABC	47	12	531	0.088	47	0.1	0.1	7.442	A
C-D	2	0.38			2				
C-A	93	23			93				
C-B	0	0			0				
CD-AB	0.75	0.19	586	0.001	0.76	0.0	0.0	6.147	A
CD-A	129	32			129				

2027 construction Phase, 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	Left-Right Stagger	Two-way		1.79	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)	Run automatically
D6	2027 construction Phase	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	132	100.000
B		ONE HOUR	✓	7	100.000
C		ONE HOUR	✓	253	100.000
D		ONE HOUR	✓	149	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	1	90	41
	B	5	0	0	2
	C	233	0	0	20
	D	132	13	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.00	7.73	0.0	A	2	3
B-A	0.01	9.79	0.0	A	5	7
A-B					1	1
A-C					83	124
A-D					38	56
AB-CD	0.09	6.56	0.1	A	46	69
AB-C					76	114
D-ABC	0.30	9.51	0.4	A	137	205
C-D					18	28
C-A					214	321
C-B					0	0
CD-AB	0.02	5.91	0.0	A	12	18
CD-A					335	502

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	475	0.003	1	0.0	0.0	7.595	A
B-A	4	1	395	0.010	4	0.0	0.0	9.196	A
A-B	0.75	0.19			0.75				
A-C	68	17			68				
A-D	31	8			31				
AB-CD	36	9	603	0.060	36	0.0	0.1	6.348	A
AB-C	64	16			64				
D-ABC	112	28	562	0.200	111	0.0	0.2	7.971	A
C-D	15	4			15				
C-A	175	44			175				
C-B	0	0			0				
CD-AB	10	2	633	0.015	10	0.0	0.0	5.778	A
CD-A	274	68			274				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	472	0.004	2	0.0	0.0	7.653	A
B-A	4	1	386	0.012	4	0.0	0.0	9.438	A
A-B	0.90	0.22			0.90				
A-C	81	20			81				
A-D	37	9			37				
AB-CD	45	11	604	0.074	45	0.1	0.1	6.437	A
AB-C	75	19			75				
D-ABC	134	33	554	0.242	134	0.2	0.3	8.566	A
C-D	18	4			18				
C-A	209	52			209				
C-B	0	0			0				
CD-AB	12	3	629	0.019	12	0.0	0.0	5.834	A
CD-A	328	82			328				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	468	0.005	2	0.0	0.0	7.734	A
B-A	6	1	373	0.015	5	0.0	0.0	9.791	A
A-B	1	0.28			1				
A-C	99	25			99				
A-D	45	11			45				
AB-CD	57	14	605	0.094	57	0.1	0.1	6.561	A
AB-C	90	22			90				
D-ABC	164	41	542	0.302	164	0.3	0.4	9.490	A
C-D	22	6			22				
C-A	257	64			257				
C-B	0	0			0				
CD-AB	14	4	623	0.023	14	0.0	0.0	5.911	A
CD-A	401	100			401				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	468	0.005	2	0.0	0.0	7.735	A
B-A	6	1	373	0.015	6	0.0	0.0	9.792	A
A-B	1	0.28			1				
A-C	99	25			99				
A-D	45	11			45				
AB-CD	57	14	605	0.094	57	0.1	0.1	6.563	A
AB-C	90	22			90				
D-ABC	164	41	542	0.302	164	0.4	0.4	9.512	A
C-D	22	6			22				
C-A	257	64			257				
C-B	0	0			0				
CD-AB	14	4	623	0.023	14	0.0	0.0	5.912	A
CD-A	402	100			402				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	472	0.004	2	0.0	0.0	7.654	A
B-A	4	1	386	0.012	5	0.0	0.0	9.441	A
A-B	0.90	0.22			0.90				
A-C	81	20			81				
A-D	37	9			37				
AB-CD	45	11	604	0.074	45	0.1	0.1	6.441	A
AB-C	75	19			75				
D-ABC	134	33	554	0.242	134	0.4	0.3	8.595	A
C-D	18	4			18				
C-A	209	52			209				
C-B	0	0			0				
CD-AB	12	3	629	0.019	12	0.0	0.0	5.837	A
CD-A	329	82			329				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	475	0.003	2	0.0	0.0	7.600	A
B-A	4	1	395	0.010	4	0.0	0.0	9.202	A
A-B	0.75	0.19			0.75				
A-C	68	17			68				
A-D	31	8			31				
AB-CD	37	9	603	0.061	37	0.1	0.1	6.356	A
AB-C	64	16			64				
D-ABC	112	28	562	0.200	112	0.3	0.3	8.018	A
C-D	15	4			15				
C-A	175	44			175				
C-B	0	0			0				
CD-AB	10	2	633	0.016	10	0.0	0.0	5.782	A
CD-A	275	69			275				

Junctions 9

PICADY 9 - Priority Intersection Module

Version: 9.5.2.1013
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Filename: N29- INDUSTRIAL ACCESS-ROAD PRIORITY JUNCTION-REV A.j9
Path: S:\Jobs\2023\23117 Belview Port Extension TIA\23117-01\Reports\Working\PICADY
Report generation date: 05/06/2025 12:15:14

»2023, AM
»2023, PM
»2029 no dev, AM
»2029 no dev, PM
»2029 with dev, AM
»2029 with dev, PM
»2034 no dev, AM
»2034 no dev, PM
»2034 with dev, AM
»2034 with dev, PM
»2044 no dev, AM
»2044 no dev, PM
»2044 with dev, AM
»2044 with dev, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (Veh)	Delay (s)	RFC	LOS	Set ID	Queue (Veh)	Delay (s)	RFC	LOS
	2023									
Stream B-C	D1	0.0	8.30	0.02	A	D2	0.0	8.78	0.02	A
Stream B-A		0.1	9.26	0.13	A		0.4	10.81	0.27	B
Stream C-AB		0.0	6.35	0.02	A		0.0	5.97	0.02	A
	2029 no dev									
Stream B-C	D7	0.0	8.42	0.03	A	D8	0.0	8.91	0.03	A
Stream B-A		0.2	9.51	0.14	A		0.4	11.40	0.30	B
Stream C-AB		0.0	6.43	0.02	A		0.0	5.99	0.02	A
	2029 with dev									
Stream B-C	D9	0.0	8.50	0.03	A	D10	0.0	9.18	0.03	A
Stream B-A		0.2	9.65	0.14	A		0.6	12.45	0.36	B
Stream C-AB		0.0	6.56	0.02	A		0.0	6.00	0.02	A
	2034 no dev									
Stream B-C	D11	0.0	8.53	0.03	A	D12	0.0	9.05	0.03	A
Stream B-A		0.2	9.77	0.16	A		0.5	12.01	0.33	B
Stream C-AB		0.0	6.50	0.02	A		0.0	6.01	0.02	A
	2034 with dev									
Stream B-C	D13	0.0	8.62	0.03	A	D14	0.0	9.34	0.03	A
Stream B-A		0.2	9.92	0.16	A		0.6	13.19	0.39	B
Stream C-AB		0.0	6.64	0.02	A		0.0	6.03	0.02	A
	2044 no dev									
Stream B-C	D15	0.0	8.58	0.03	A	D16	0.0	9.13	0.03	A
Stream B-A		0.2	9.92	0.17	A		0.5	12.40	0.35	B
Stream C-AB		0.0	6.54	0.03	A		0.0	6.03	0.02	A
	2044 with dev									
Stream B-C	D17	0.0	8.66	0.03	A	D18	0.0	9.44	0.03	A
Stream B-A		0.2	10.07	0.17	B		0.7	13.66	0.41	B
Stream C-AB		0.0	6.68	0.03	A		0.0	6.04	0.02	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	26/01/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	ROADPLAN01\jbyrne
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	Veh	Veh	perHour	s	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75				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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓
D3	2027 no dev	AM	ONE HOUR	06:45	08:15	15	
D4	2027 no dev	PM	ONE HOUR	16:15	17:45	15	
D5	2027 construction phase	AM	ONE HOUR	06:45	08:15	15	
D6	2027 construction phase	PM	ONE HOUR	16:15	17:45	15	
D7	2029 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D8	2029 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D9	2029 with dev	AM	ONE HOUR	06:45	08:15	15	✓
D10	2029 with dev	PM	ONE HOUR	16:15	17:45	15	✓
D11	2034 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D12	2034 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D13	2034 with dev	AM	ONE HOUR	06:45	08:15	15	✓
D14	2034 with dev	PM	ONE HOUR	16:15	17:45	15	✓
D15	2044 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D16	2044 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D17	2044 with dev	AM	ONE HOUR	06:45	08:15	15	✓
D18	2044 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2023, 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		2.02	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N29 (west)		Major
B	Industrial Access Rd		Minor
C	N29 (east)		Major

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)
C	12.00		✓	3.00	100.0	✓	7.00

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	4.40	2.20	2.20	2.20	2.20		3.00	75	100

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	524	0.071	0.178	0.112	0.255
B-C	530	0.060	0.152	-	-
C-B	687	0.197	0.197	-	-

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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	216	100.000
B		ONE HOUR	✓	61	100.000
C		ONE HOUR	✓	30	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	135	81
	B	51	0	10
	C	20	10	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.02	8.30	0.0	A	9	14
B-A	0.13	9.26	0.1	A	47	70
C-AB	0.02	6.35	0.0	A	9	14
C-A					18	28
A-B					124	186
A-C					74	111

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	457	0.016	7	0.0	0.0	8.011	A
B-A	38	10	455	0.084	38	0.0	0.1	8.629	A
C-AB	8	2	592	0.013	7	0.0	0.0	6.153	A
C-A	15	4			15				
A-B	102	25			102				
A-C	61	15			61				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	452	0.020	9	0.0	0.0	8.130	A
B-A	46	11	451	0.102	46	0.1	0.1	8.888	A
C-AB	9	2	586	0.015	9	0.0	0.0	6.235	A
C-A	18	4			18				
A-B	121	30			121				
A-C	73	18			73				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	445	0.025	11	0.0	0.0	8.297	A
B-A	56	14	445	0.126	56	0.1	0.1	9.255	A
C-AB	11	3	578	0.019	11	0.0	0.0	6.352	A
C-A	22	6			22				
A-B	149	37			149				
A-C	89	22			89				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	445	0.025	11	0.0	0.0	8.298	A
B-A	56	14	445	0.126	56	0.1	0.1	9.260	A
C-AB	11	3	578	0.019	11	0.0	0.0	6.352	A
C-A	22	6			22				
A-B	149	37			149				
A-C	89	22			89				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	452	0.020	9	0.0	0.0	8.134	A
B-A	46	11	451	0.102	46	0.1	0.1	8.897	A
C-AB	9	2	586	0.015	9	0.0	0.0	6.238	A
C-A	18	4			18				
A-B	121	30			121				
A-C	73	18			73				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	457	0.016	8	0.0	0.0	8.017	A
B-A	38	10	455	0.084	38	0.1	0.1	8.646	A
C-AB	8	2	592	0.013	8	0.0	0.0	6.154	A
C-A	15	4			15				
A-B	102	25			102				
A-C	61	15			61				

2023, 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		4.40	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)	Run automatically
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	52	100.000
B		ONE HOUR	✓	120	100.000
C		ONE HOUR	✓	131	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	23	29
	B	111	0	9
	C	122	9	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.02	8.78	0.0	A	8	12
B-A	0.27	10.81	0.4	B	102	153
C-AB	0.02	5.97	0.0	A	8	12
C-A					112	168
A-B					21	32
A-C					27	40

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	7	2	433	0.016	7	0.0	0.0	8.447	A
B-A	84	21	463	0.180	83	0.0	0.2	9.439	A
C-AB	7	2	617	0.011	7	0.0	0.0	5.901	A
C-A	92	23			92				
A-B	17	4			17				
A-C	22	5			22				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	428	0.019	8	0.0	0.0	8.583	A
B-A	100	25	460	0.217	100	0.2	0.3	9.986	A
C-AB	8	2	615	0.013	8	0.0	0.0	5.928	A
C-A	110	27			110				
A-B	21	5			21				
A-C	26	7			26				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	420	0.024	10	0.0	0.0	8.776	A
B-A	122	31	455	0.268	122	0.3	0.4	10.787	B
C-AB	10	2	613	0.016	10	0.0	0.0	5.966	A
C-A	134	34			134				
A-B	25	6			25				
A-C	32	8			32				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	420	0.024	10	0.0	0.0	8.778	A
B-A	122	31	455	0.268	122	0.4	0.4	10.810	B
C-AB	10	2	613	0.016	10	0.0	0.0	5.966	A
C-A	134	34			134				
A-B	25	6			25				
A-C	32	8			32				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	427	0.019	8	0.0	0.0	8.589	A
B-A	100	25	460	0.217	100	0.4	0.3	10.019	B
C-AB	8	2	615	0.013	8	0.0	0.0	5.931	A
C-A	110	27			110				
A-B	21	5			21				
A-C	26	7			26				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	7	2	433	0.016	7	0.0	0.0	8.458	A
B-A	84	21	463	0.180	84	0.3	0.2	9.496	A
C-AB	7	2	617	0.011	7	0.0	0.0	5.903	A
C-A	92	23			92				
A-B	17	4			17				
A-C	22	5			22				

2029 no 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		2.06	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)	Run automatically
D7	2029 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	242	100.000
B		ONE HOUR	✓	68	100.000
C		ONE HOUR	✓	33	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	151	91
	B	57	0	11
	C	22	11	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	8.42	0.0	A	10	15
B-A	0.14	9.51	0.2	A	52	78
C-AB	0.02	6.43	0.0	A	10	15
C-A					20	30
A-B					139	208
A-C					84	125

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	453	0.018	8	0.0	0.0	8.089	A
B-A	43	11	452	0.095	42	0.0	0.1	8.773	A
C-AB	8	2	589	0.014	8	0.0	0.0	6.202	A
C-A	17	4			17				
A-B	114	28			114				
A-C	69	17			69				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	448	0.022	10	0.0	0.0	8.225	A
B-A	51	13	448	0.114	51	0.1	0.1	9.075	A
C-AB	10	2	582	0.017	10	0.0	0.0	6.295	A
C-A	20	5			20				
A-B	136	34			136				
A-C	82	20			82				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	440	0.028	12	0.0	0.0	8.416	A
B-A	63	16	441	0.142	63	0.1	0.2	9.501	A
C-AB	12	3	572	0.021	12	0.0	0.0	6.428	A
C-A	24	6			24				
A-B	166	42			166				
A-C	100	25			100				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	440	0.028	12	0.0	0.0	8.417	A
B-A	63	16	441	0.142	63	0.2	0.2	9.511	A
C-AB	12	3	572	0.021	12	0.0	0.0	6.428	A
C-A	24	6			24				
A-B	166	42			166				
A-C	100	25			100				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	447	0.022	10	0.0	0.0	8.228	A
B-A	51	13	448	0.114	51	0.2	0.1	9.087	A
C-AB	10	2	582	0.017	10	0.0	0.0	6.295	A
C-A	20	5			20				
A-B	136	34			136				
A-C	82	20			82				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	453	0.018	8	0.0	0.0	8.095	A
B-A	43	11	452	0.095	43	0.1	0.1	8.794	A
C-AB	8	2	589	0.014	8	0.0	0.0	6.205	A
C-A	17	4			17				
A-B	114	28			114				
A-C	69	17			69				

2029 no 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		4.62	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)	Run automatically
D8	2029 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	58	100.000
B		ONE HOUR	✓	134	100.000
C		ONE HOUR	✓	146	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	26	32
	B	124	0	10
	C	136	10	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	8.91	0.0	A	9	14
B-A	0.30	11.40	0.4	B	114	171
C-AB	0.02	5.99	0.0	A	9	14
C-A					125	187
A-B					24	36
A-C					29	44

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	430	0.018	7	0.0	0.0	8.525	A
B-A	93	23	461	0.202	92	0.0	0.3	9.733	A
C-AB	8	2	616	0.012	7	0.0	0.0	5.917	A
C-A	102	26			102				
A-B	20	5			20				
A-C	24	6			24				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	424	0.021	9	0.0	0.0	8.681	A
B-A	111	28	458	0.244	111	0.3	0.3	10.386	B
C-AB	9	2	614	0.015	9	0.0	0.0	5.947	A
C-A	122	31			122				
A-B	23	6			23				
A-C	29	7			29				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	415	0.027	11	0.0	0.0	8.911	A
B-A	137	34	452	0.302	136	0.3	0.4	11.366	B
C-AB	11	3	612	0.018	11	0.0	0.0	5.990	A
C-A	150	37			150				
A-B	29	7			29				
A-C	35	9			35				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	415	0.027	11	0.0	0.0	8.914	A
B-A	137	34	452	0.302	137	0.4	0.4	11.398	B
C-AB	11	3	612	0.018	11	0.0	0.0	5.990	A
C-A	150	37			150				
A-B	29	7			29				
A-C	35	9			35				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	423	0.021	9	0.0	0.0	8.687	A
B-A	111	28	458	0.244	112	0.4	0.3	10.429	B
C-AB	9	2	614	0.015	9	0.0	0.0	5.948	A
C-A	122	31			122				
A-B	23	6			23				
A-C	29	7			29				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	429	0.018	8	0.0	0.0	8.536	A
B-A	93	23	461	0.202	94	0.3	0.3	9.800	A
C-AB	8	2	616	0.012	8	0.0	0.0	5.919	A
C-A	102	26			102				
A-B	20	5			20				
A-C	24	6			24				

2029 with 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		1.78	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)	Run automatically
D9	2029 with dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	295	100.000
B		ONE HOUR	✓	68	100.000
C		ONE HOUR	✓	39	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	198	97
	B	57	0	11
	C	28	11	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	8.50	0.0	A	10	15
B-A	0.14	9.65	0.2	A	52	78
C-AB	0.02	6.56	0.0	A	10	15
C-A					26	39
A-B					182	273
A-C					89	134

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	450	0.018	8	0.0	0.0	8.141	A
B-A	43	11	449	0.096	42	0.0	0.1	8.855	A
C-AB	8	2	581	0.014	8	0.0	0.0	6.287	A
C-A	21	5			21				
A-B	149	37			149				
A-C	73	18			73				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	444	0.022	10	0.0	0.0	8.290	A
B-A	51	13	443	0.116	51	0.1	0.1	9.181	A
C-AB	10	2	572	0.017	10	0.0	0.0	6.400	A
C-A	25	6			25				
A-B	178	44			178				
A-C	87	22			87				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	436	0.028	12	0.0	0.0	8.499	A
B-A	63	16	436	0.144	63	0.1	0.2	9.646	A
C-AB	12	3	561	0.022	12	0.0	0.0	6.563	A
C-A	31	8			31				
A-B	218	55			218				
A-C	107	27			107				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	436	0.028	12	0.0	0.0	8.500	A
B-A	63	16	436	0.144	63	0.2	0.2	9.653	A
C-AB	12	3	561	0.022	12	0.0	0.0	6.563	A
C-A	31	8			31				
A-B	218	55			218				
A-C	107	27			107				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	444	0.022	10	0.0	0.0	8.292	A
B-A	51	13	443	0.116	51	0.2	0.1	9.191	A
C-AB	10	2	572	0.017	10	0.0	0.0	6.403	A
C-A	25	6			25				
A-B	178	44			178				
A-C	87	22			87				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	450	0.018	8	0.0	0.0	8.148	A
B-A	43	11	449	0.096	43	0.1	0.1	8.879	A
C-AB	8	2	581	0.014	8	0.0	0.0	6.287	A
C-A	21	5			21				
A-B	149	37			149				
A-C	73	18			73				

2029 with 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		5.31	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)	Run automatically
D10	2029 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	64	100.000
B		ONE HOUR	✓	157	100.000
C		ONE HOUR	✓	152	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	26	38
	B	147	0	10
	C	142	10	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	9.18	0.0	A	9	14
B-A	0.36	12.45	0.6	B	135	202
C-AB	0.02	6.00	0.0	A	9	14
C-A					130	195
A-B					24	36
A-C					35	52

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	422	0.018	7	0.0	0.0	8.688	A
B-A	111	28	460	0.240	109	0.0	0.3	10.222	B
C-AB	8	2	615	0.012	7	0.0	0.0	5.925	A
C-A	107	27			107				
A-B	20	5			20				
A-C	29	7			29				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	414	0.022	9	0.0	0.0	8.882	A
B-A	132	33	456	0.290	132	0.3	0.4	11.078	B
C-AB	9	2	613	0.015	9	0.0	0.0	5.958	A
C-A	128	32			128				
A-B	23	6			23				
A-C	34	9			34				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	403	0.027	11	0.0	0.0	9.179	A
B-A	162	40	451	0.359	161	0.4	0.5	12.404	B
C-AB	11	3	611	0.018	11	0.0	0.0	6.003	A
C-A	156	39			156				
A-B	29	7			29				
A-C	42	10			42				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	403	0.027	11	0.0	0.0	9.184	A
B-A	162	40	451	0.359	162	0.5	0.6	12.452	B
C-AB	11	3	611	0.018	11	0.0	0.0	6.003	A
C-A	156	39			156				
A-B	29	7			29				
A-C	42	10			42				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	414	0.022	9	0.0	0.0	8.890	A
B-A	132	33	456	0.290	133	0.6	0.4	11.141	B
C-AB	9	2	613	0.015	9	0.0	0.0	5.960	A
C-A	128	32			128				
A-B	23	6			23				
A-C	34	9			34				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	421	0.018	8	0.0	0.0	8.701	A
B-A	111	28	460	0.240	111	0.4	0.3	10.317	B
C-AB	8	2	615	0.012	8	0.0	0.0	5.926	A
C-A	107	27			107				
A-B	20	5			20				
A-C	29	7			29				

2034 no 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		2.11	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)	Run automatically
D11	2034 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	265	100.000
B		ONE HOUR	✓	75	100.000
C		ONE HOUR	✓	37	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	166	99
	B	63	0	12
	C	25	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	8.53	0.0	A	11	17
B-A	0.16	9.77	0.2	A	58	87
C-AB	0.02	6.50	0.0	A	11	17
C-A					23	34
A-B					152	228
A-C					91	136

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	450	0.020	9	0.0	0.0	8.162	A
B-A	47	12	450	0.105	47	0.0	0.1	8.918	A
C-AB	9	2	585	0.015	9	0.0	0.0	6.247	A
C-A	19	5			19				
A-B	125	31			125				
A-C	75	19			75				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	444	0.024	11	0.0	0.0	8.314	A
B-A	57	14	445	0.127	57	0.1	0.1	9.263	A
C-AB	11	3	578	0.019	11	0.0	0.0	6.350	A
C-A	22	6			22				
A-B	149	37			149				
A-C	89	22			89				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	435	0.030	13	0.0	0.0	8.529	A
B-A	69	17	438	0.158	69	0.1	0.2	9.760	A
C-AB	13	3	567	0.023	13	0.0	0.0	6.499	A
C-A	28	7			28				
A-B	183	46			183				
A-C	109	27			109				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	435	0.030	13	0.0	0.0	8.530	A
B-A	69	17	438	0.158	69	0.2	0.2	9.767	A
C-AB	13	3	567	0.023	13	0.0	0.0	6.499	A
C-A	28	7			28				
A-B	183	46			183				
A-C	109	27			109				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	444	0.024	11	0.0	0.0	8.317	A
B-A	57	14	445	0.127	57	0.2	0.1	9.278	A
C-AB	11	3	578	0.019	11	0.0	0.0	6.351	A
C-A	22	6			22				
A-B	149	37			149				
A-C	89	22			89				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	450	0.020	9	0.0	0.0	8.170	A
B-A	47	12	450	0.105	48	0.1	0.1	8.945	A
C-AB	9	2	585	0.015	9	0.0	0.0	6.250	A
C-A	19	5			19				
A-B	125	31			125				
A-C	75	19			75				

2034 no 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		4.84	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)	Run automatically
D12	2034 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	64	100.000
B		ONE HOUR	✓	147	100.000
C		ONE HOUR	✓	161	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	28	36
	B	136	0	11
	C	150	11	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	9.05	0.0	A	10	15
B-A	0.33	12.01	0.5	B	125	187
C-AB	0.02	6.01	0.0	A	10	15
C-A					138	206
A-B					26	39
A-C					33	50

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	427	0.019	8	0.0	0.0	8.599	A
B-A	102	26	459	0.223	101	0.0	0.3	10.027	B
C-AB	8	2	615	0.013	8	0.0	0.0	5.933	A
C-A	113	28			113				
A-B	21	5			21				
A-C	27	7			27				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	420	0.024	10	0.0	0.0	8.778	A
B-A	122	31	455	0.269	122	0.3	0.4	10.794	B
C-AB	10	2	613	0.016	10	0.0	0.0	5.967	A
C-A	135	34			135				
A-B	25	6			25				
A-C	32	8			32				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	410	0.030	12	0.0	0.0	9.048	A
B-A	150	37	449	0.333	149	0.4	0.5	11.971	B
C-AB	12	3	611	0.020	12	0.0	0.0	6.014	A
C-A	165	41			165				
A-B	31	8			31				
A-C	40	10			40				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	410	0.030	12	0.0	0.0	9.052	A
B-A	150	37	449	0.333	150	0.5	0.5	12.011	B
C-AB	12	3	611	0.020	12	0.0	0.0	6.014	A
C-A	165	41			165				
A-B	31	8			31				
A-C	40	10			40				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	420	0.024	10	0.0	0.0	8.785	A
B-A	122	31	455	0.269	123	0.5	0.4	10.848	B
C-AB	10	2	613	0.016	10	0.0	0.0	5.969	A
C-A	135	34			135				
A-B	25	6			25				
A-C	32	8			32				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	426	0.019	8	0.0	0.0	8.610	A
B-A	102	26	459	0.223	103	0.4	0.3	10.109	B
C-AB	8	2	615	0.013	8	0.0	0.0	5.933	A
C-A	113	28			113				
A-B	21	5			21				
A-C	27	7			27				

2034 with 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		1.85	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)	Run automatically
D13	2034 with dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	318	100.000
B		ONE HOUR	✓	75	100.000
C		ONE HOUR	✓	43	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	213	105
	B	63	0	12
	C	31	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	8.62	0.0	A	11	17
B-A	0.16	9.92	0.2	A	58	87
C-AB	0.02	6.64	0.0	A	11	17
C-A					28	43
A-B					195	293
A-C					96	145

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	447	0.020	9	0.0	0.0	8.216	A
B-A	47	12	446	0.106	47	0.0	0.1	9.006	A
C-AB	9	2	577	0.016	9	0.0	0.0	6.333	A
C-A	23	6			23				
A-B	160	40			160				
A-C	79	20			79				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	440	0.025	11	0.0	0.0	8.380	A
B-A	57	14	440	0.129	57	0.1	0.1	9.372	A
C-AB	11	3	568	0.019	11	0.0	0.0	6.457	A
C-A	28	7			28				
A-B	191	48			191				
A-C	94	24			94				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	431	0.031	13	0.0	0.0	8.614	A
B-A	69	17	432	0.160	69	0.1	0.2	9.909	A
C-AB	13	3	556	0.024	13	0.0	0.0	6.636	A
C-A	34	9			34				
A-B	235	59			235				
A-C	116	29			116				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	431	0.031	13	0.0	0.0	8.616	A
B-A	69	17	432	0.160	69	0.2	0.2	9.917	A
C-AB	13	3	556	0.024	13	0.0	0.0	6.636	A
C-A	34	9			34				
A-B	235	59			235				
A-C	116	29			116				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	440	0.025	11	0.0	0.0	8.385	A
B-A	57	14	440	0.129	57	0.2	0.1	9.386	A
C-AB	11	3	568	0.019	11	0.0	0.0	6.460	A
C-A	28	7			28				
A-B	191	48			191				
A-C	94	24			94				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	447	0.020	9	0.0	0.0	8.223	A
B-A	47	12	446	0.106	48	0.1	0.1	9.030	A
C-AB	9	2	577	0.016	9	0.0	0.0	6.333	A
C-A	23	6			23				
A-B	160	40			160				
A-C	79	20			79				

2034 with 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		5.57	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)	Run automatically
D14	2034 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	70	100.000
B		ONE HOUR	✓	170	100.000
C		ONE HOUR	✓	167	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	28	42
	B	159	0	11
	C	156	11	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	9.34	0.0	A	10	15
B-A	0.39	13.19	0.6	B	146	219
C-AB	0.02	6.03	0.0	A	10	15
C-A					143	215
A-B					26	39
A-C					39	58

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	419	0.020	8	0.0	0.0	8.764	A
B-A	120	30	458	0.261	118	0.0	0.3	10.545	B
C-AB	8	2	614	0.013	8	0.0	0.0	5.941	A
C-A	117	29			117				
A-B	21	5			21				
A-C	32	8			32				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	411	0.024	10	0.0	0.0	8.984	A
B-A	143	36	454	0.315	143	0.3	0.5	11.543	B
C-AB	10	2	612	0.016	10	0.0	0.0	5.977	A
C-A	140	35			140				
A-B	25	6			25				
A-C	38	9			38				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	398	0.030	12	0.0	0.0	9.337	A
B-A	175	44	448	0.391	174	0.5	0.6	13.126	B
C-AB	12	3	609	0.020	12	0.0	0.0	6.027	A
C-A	172	43			172				
A-B	31	8			31				
A-C	46	12			46				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	397	0.030	12	0.0	0.0	9.344	A
B-A	175	44	448	0.391	175	0.6	0.6	13.189	B
C-AB	12	3	609	0.020	12	0.0	0.0	6.027	A
C-A	172	43			172				
A-B	31	8			31				
A-C	46	12			46				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	410	0.024	10	0.0	0.0	8.996	A
B-A	143	36	454	0.315	144	0.6	0.5	11.628	B
C-AB	10	2	612	0.016	10	0.0	0.0	5.980	A
C-A	140	35			140				
A-B	25	6			25				
A-C	38	9			38				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	418	0.020	8	0.0	0.0	8.778	A
B-A	120	30	458	0.261	120	0.5	0.4	10.659	B
C-AB	8	2	614	0.013	8	0.0	0.0	5.944	A
C-A	117	29			117				
A-B	21	5			21				
A-C	32	8			32				

2044 no 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		2.15	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)	Run automatically
D15	2044 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	278	100.000
B		ONE HOUR	✓	79	100.000
C		ONE HOUR	✓	39	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	174	104
	B	66	0	13
	C	26	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	8.58	0.0	A	12	18
B-A	0.17	9.92	0.2	A	61	91
C-AB	0.03	6.54	0.0	A	12	18
C-A					24	36
A-B					160	239
A-C					95	143

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	450	0.022	10	0.0	0.0	8.181	A
B-A	50	12	449	0.111	49	0.0	0.1	9.002	A
C-AB	10	2	583	0.017	10	0.0	0.0	6.276	A
C-A	20	5			20				
A-B	131	33			131				
A-C	78	20			78				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	443	0.026	12	0.0	0.0	8.345	A
B-A	59	15	443	0.134	59	0.1	0.2	9.372	A
C-AB	12	3	575	0.020	12	0.0	0.0	6.386	A
C-A	23	6			23				
A-B	156	39			156				
A-C	93	23			93				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	14	4	434	0.033	14	0.0	0.0	8.575	A
B-A	73	18	436	0.167	72	0.2	0.2	9.905	A
C-AB	14	4	564	0.025	14	0.0	0.0	6.545	A
C-A	29	7			29				
A-B	192	48			192				
A-C	115	29			115				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	14	4	434	0.033	14	0.0	0.0	8.576	A
B-A	73	18	436	0.167	73	0.2	0.2	9.915	A
C-AB	14	4	564	0.025	14	0.0	0.0	6.545	A
C-A	29	7			29				
A-B	192	48			192				
A-C	115	29			115				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	443	0.026	12	0.0	0.0	8.348	A
B-A	59	15	443	0.134	60	0.2	0.2	9.388	A
C-AB	12	3	575	0.020	12	0.0	0.0	6.387	A
C-A	23	6			23				
A-B	156	39			156				
A-C	93	23			93				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	449	0.022	10	0.0	0.0	8.191	A
B-A	50	12	449	0.111	50	0.2	0.1	9.031	A
C-AB	10	2	583	0.017	10	0.0	0.0	6.279	A
C-A	20	5			20				
A-B	131	33			131				
A-C	78	20			78				

2044 no 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		5.00	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)	Run automatically
D16	2044 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	67	100.000
B		ONE HOUR	✓	155	100.000
C		ONE HOUR	✓	169	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	30	37
	B	143	0	12
	C	157	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	9.13	0.0	A	11	17
B-A	0.35	12.40	0.5	B	131	197
C-AB	0.02	6.03	0.0	A	11	17
C-A					144	216
A-B					28	41
A-C					34	51

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	426	0.021	9	0.0	0.0	8.632	A
B-A	108	27	458	0.235	106	0.0	0.3	10.204	B
C-AB	9	2	615	0.015	9	0.0	0.0	5.944	A
C-A	118	30			118				
A-B	23	6			23				
A-C	28	7			28				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	418	0.026	11	0.0	0.0	8.829	A
B-A	129	32	454	0.283	128	0.3	0.4	11.046	B
C-AB	11	3	613	0.018	11	0.0	0.0	5.981	A
C-A	141	35			141				
A-B	27	7			27				
A-C	33	8			33				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	408	0.032	13	0.0	0.0	9.127	A
B-A	157	39	448	0.352	157	0.4	0.5	12.351	B
C-AB	13	3	610	0.022	13	0.0	0.0	6.032	A
C-A	173	43			173				
A-B	33	8			33				
A-C	41	10			41				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	407	0.032	13	0.0	0.0	9.132	A
B-A	157	39	448	0.352	157	0.5	0.5	12.397	B
C-AB	13	3	610	0.022	13	0.0	0.0	6.032	A
C-A	173	43			173				
A-B	33	8			33				
A-C	41	10			41				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	418	0.026	11	0.0	0.0	8.839	A
B-A	129	32	454	0.283	129	0.5	0.4	11.109	B
C-AB	11	3	613	0.018	11	0.0	0.0	5.981	A
C-A	141	35			141				
A-B	27	7			27				
A-C	33	8			33				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	425	0.021	9	0.0	0.0	8.647	A
B-A	108	27	458	0.235	108	0.4	0.3	10.294	B
C-AB	9	2	615	0.015	9	0.0	0.0	5.945	A
C-A	118	30			118				
A-B	23	6			23				
A-C	28	7			28				

2044 with 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		1.90	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)	Run automatically
D17	2044 with dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	331	100.000
B		ONE HOUR	✓	79	100.000
C		ONE HOUR	✓	45	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	221	110
	B	66	0	13
	C	32	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	8.66	0.0	A	12	18
B-A	0.17	10.07	0.2	B	61	91
C-AB	0.03	6.68	0.0	A	12	18
C-A					29	44
A-B					203	304
A-C					101	151

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	447	0.022	10	0.0	0.0	8.234	A
B-A	50	12	445	0.112	49	0.0	0.1	9.089	A
C-AB	10	2	575	0.017	10	0.0	0.0	6.363	A
C-A	24	6			24				
A-B	166	42			166				
A-C	83	21			83				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	440	0.027	12	0.0	0.0	8.412	A
B-A	59	15	439	0.135	59	0.1	0.2	9.484	A
C-AB	12	3	566	0.021	12	0.0	0.0	6.494	A
C-A	29	7			29				
A-B	199	50			199				
A-C	99	25			99				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	14	4	430	0.033	14	0.0	0.0	8.661	A
B-A	73	18	430	0.169	72	0.2	0.2	10.060	B
C-AB	14	4	553	0.026	14	0.0	0.0	6.684	A
C-A	35	9			35				
A-B	243	61			243				
A-C	121	30			121				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	14	4	430	0.033	14	0.0	0.0	8.663	A
B-A	73	18	430	0.169	73	0.2	0.2	10.070	B
C-AB	14	4	553	0.026	14	0.0	0.0	6.684	A
C-A	35	9			35				
A-B	243	61			243				
A-C	121	30			121				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	440	0.027	12	0.0	0.0	8.415	A
B-A	59	15	439	0.135	60	0.2	0.2	9.500	A
C-AB	12	3	566	0.021	12	0.0	0.0	6.495	A
C-A	29	7			29				
A-B	199	50			199				
A-C	99	25			99				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	447	0.022	10	0.0	0.0	8.244	A
B-A	50	12	445	0.112	50	0.2	0.1	9.116	A
C-AB	10	2	575	0.017	10	0.0	0.0	6.363	A
C-A	24	6			24				
A-B	166	42			166				
A-C	83	21			83				

2044 with 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		5.76	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)	Run automatically
D18	2044 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	73	100.000
B		ONE HOUR	✓	178	100.000
C		ONE HOUR	✓	175	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	30	43
	B	166	0	12
	C	163	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	10	10	10
	B	10	10	10
	C	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	9.44	0.0	A	11	17
B-A	0.41	13.66	0.7	B	152	228
C-AB	0.02	6.04	0.0	A	11	17
C-A					150	224
A-B					28	41
A-C					39	59

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	418	0.022	9	0.0	0.0	8.799	A
B-A	125	31	457	0.273	123	0.0	0.4	10.743	B
C-AB	9	2	614	0.015	9	0.0	0.0	5.953	A
C-A	123	31			123				
A-B	23	6			23				
A-C	32	8			32				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	409	0.026	11	0.0	0.0	9.041	A
B-A	149	37	453	0.330	149	0.4	0.5	11.832	B
C-AB	11	3	612	0.018	11	0.0	0.0	5.991	A
C-A	147	37			147				
A-B	27	7			27				
A-C	39	10			39				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	395	0.033	13	0.0	0.0	9.433	A
B-A	183	46	446	0.410	182	0.5	0.7	13.583	B
C-AB	13	3	609	0.022	13	0.0	0.0	6.045	A
C-A	179	45			179				
A-B	33	8			33				
A-C	47	12			47				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	394	0.033	13	0.0	0.0	9.441	A
B-A	183	46	446	0.410	183	0.7	0.7	13.658	B
C-AB	13	3	609	0.022	13	0.0	0.0	6.045	A
C-A	179	45			179				
A-B	33	8			33				
A-C	47	12			47				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	408	0.026	11	0.0	0.0	9.053	A
B-A	149	37	453	0.330	150	0.7	0.5	11.925	B
C-AB	11	3	612	0.018	11	0.0	0.0	5.994	A
C-A	147	37			147				
A-B	27	7			27				
A-C	39	10			39				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	9	2	417	0.022	9	0.0	0.0	8.817	A
B-A	125	31	457	0.273	125	0.5	0.4	10.868	B
C-AB	9	2	614	0.015	9	0.0	0.0	5.953	A
C-A	123	31			123				
A-B	23	6			23				
A-C	32	8			32				

Junctions 9

PICADY 9 - Priority Intersection Module

Version: 9.5.2.1013
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Filename: N29- L3412- L7482-CROSSROADS JUNCTION-REV A.j9
Path: S:\Jobs\2023\23117 Belview Port Extension TIA\23117-01\Reports\Working\PICADY
Report generation date: 05/06/2025 12:16:57

»2023, AM
»2023, PM
»2029 no dev, AM
»2029 no dev, PM
»2029 with dev, AM
»2029 with dev, PM
»2034 no dev, AM
»2034 no dev, PM
»2034 with dev, AM
»2034 with dev, PM
»2044 no dev, AM
»2044 no dev, PM
»2044 with dev, AM
»2044 with dev, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (Veh)	Delay (s)	RFC	LOS	Set ID	Queue (Veh)	Delay (s)	RFC	LOS
	2023									
Stream B-C-D	D1	0.0	7.65	0.02	A	D2	0.0	7.61	0.00	A
Stream B-A		0.0	11.17	0.01	B		0.0	9.48	0.01	A
Stream A-B-C-D		0.9	8.77	0.43	A		0.1	6.75	0.08	A
Stream D-A-B-C		0.1	7.85	0.12	A		0.4	9.10	0.28	A
Stream C-D-A-B		0.0	6.39	0.00	A		0.0	5.81	0.02	A
	2029 no dev									
Stream B-C-D	D7	0.0	7.80	0.02	A	D8	0.0	7.80	0.00	A
Stream B-A		0.0	11.50	0.01	B		0.0	9.65	0.02	A
Stream A-B-C-D		1.2	9.66	0.49	A		0.1	6.85	0.09	A
Stream D-A-B-C		0.2	8.08	0.14	A		0.5	9.67	0.31	A
Stream C-D-A-B		0.0	6.51	0.00	A		0.0	5.84	0.02	A
	2029 with dev									
Stream B-C-D	D9	0.0	7.82	0.02	A	D10	0.0	7.87	0.00	A
Stream B-A		0.0	11.75	0.01	B		0.0	9.80	0.02	A
Stream A-B-C-D		1.3	10.03	0.51	B		0.1	6.65	0.10	A
Stream D-A-B-C		0.2	8.34	0.14	A		0.5	9.72	0.32	A
Stream C-D-A-B		0.0	6.53	0.00	A		0.0	5.90	0.02	A
	2034 no dev									
Stream B-C-D	D11	0.0	7.98	0.02	A	D12	0.0	7.83	0.00	A
Stream B-A		0.0	11.91	0.02	B		0.0	9.82	0.02	A
Stream A-B-C-D		1.6	10.80	0.55	B		0.1	6.97	0.11	A
Stream D-A-B-C		0.2	8.41	0.15	A		0.5	10.34	0.35	B
Stream C-D-A-B		0.0	6.63	0.00	A		0.0	5.88	0.03	A
	2034 with dev									
Stream B-C-D	D13	0.0	8.00	0.02	A	D14	0.0	7.90	0.00	A
Stream B-A		0.0	12.17	0.02	B		0.0	9.97	0.02	A
Stream A-B-C-D		1.7	11.31	0.57	B		0.1	6.77	0.11	A
Stream D-A-B-C		0.2	8.69	0.16	A		0.5	10.39	0.35	B
Stream C-D-A-B		0.0	6.64	0.00	A		0.0	5.94	0.03	A
	2044 no dev									
Stream B-C-D	D15	0.0	8.06	0.02	A	D16	0.0	7.52	0.01	A
Stream B-A		0.0	12.10	0.02	B		0.0	9.98	0.02	A
Stream A-B-C-D		1.8	11.56	0.59	B		0.1	7.04	0.11	A
Stream D-A-B-C		0.2	8.50	0.16	A		0.6	10.67	0.37	B
Stream C-D-A-B		0.0	6.70	0.00	A		0.0	5.89	0.03	A
	2044 with dev									
Stream B-C-D	D17	0.0	8.08	0.02	A	D18	0.0	7.59	0.01	A
Stream B-A		0.0	12.37	0.02	B		0.0	10.14	0.02	B
Stream A-B-C-D		2.0	12.16	0.60	B		0.2	6.84	0.12	A
Stream D-A-B-C		0.2	8.79	0.17	A		0.6	10.73	0.37	B
Stream C-D-A-B		0.0	6.71	0.00	A		0.0	5.95	0.03	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	26/01/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	ROADPLAN01\jbyrne
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	Veh	Veh	perHour	s	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75				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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓
D3	2027 no dev	AM	ONE HOUR	06:45	08:15	15	
D4	2027 no dev	PM	ONE HOUR	16:15	17:45	15	
D5	2027 construction Phase	AM	ONE HOUR	06:45	08:15	15	
D6	2027 construction Phase	PM	ONE HOUR	16:15	17:45	15	
D7	2029 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D8	2029 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D9	2029 with dev	AM	ONE HOUR	06:45	08:15	15	✓
D10	2029 with dev	PM	ONE HOUR	16:15	17:45	15	✓
D11	2034 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D12	2034 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D13	2034 with dev	AM	ONE HOUR	06:45	08:15	15	✓
D14	2034 with dev	PM	ONE HOUR	16:15	17:45	15	✓
D15	2044 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D16	2044 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D17	2044 with dev	AM	ONE HOUR	06:45	08:15	15	✓
D18	2044 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2023, 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	Left-Right Stagger	Two-way		2.73	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N29 (east)		Major
B	L3412		Minor
C	N29 (west)		Major
D	L7485		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	9.00				150.0	✓	0.00
C	12.00		✓	3.00	150.0	✓	15.00

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)	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		4.40	2.20	2.20	2.20	2.20		1.00	50	50
D	One lane	3.20								50	50

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for A-D	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
AB-D	661	-	-	-	-	-	0.223	0.223	0.223	-	-
B-A	446	0.060	0.152	0.152	-	-	0.095	0.217	-	0.095	0.217
B-CD	611	0.069	0.175	0.175	-	-	-	-	-	-	-
CD-B	718	0.206	0.206	0.206	-	-	-	-	-	-	-
D-AB	669	-	-	-	-	-	0.225	0.225	0.089	-	-
D-C	529	-	0.133	0.302	0.133	0.302	0.212	0.212	0.084	-	-

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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	392	100.000
B		ONE HOUR	✓	11	100.000
C		ONE HOUR	✓	83	100.000
D		ONE HOUR	✓	58	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	2	198	192
	B	4	0	3	4
	C	81	0	0	2
	D	45	1	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.02	7.65	0.0	A	6	10
B-A	0.01	11.17	0.0	B	4	6
A-B					2	3
A-C					182	273
A-D					176	264
AB-CD	0.43	8.77	0.9	A	247	370
AB-C					118	176
D-ABC	0.12	7.85	0.1	A	53	80
C-D					2	3
C-A					74	111
C-B					0	0
CD-AB	0.00	6.39	0.0	A	1	1
CD-A					116	173

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	503	0.010	5	0.0	0.0	7.235	A
B-A	3	0.75	351	0.009	3	0.0	0.0	10.330	B
A-B	2	0.38			2				
A-C	149	37			149				
A-D	145	36			145				
AB-CD	189	47	684	0.277	188	0.0	0.5	7.237	A
AB-C	109	27			109				
D-ABC	44	11	541	0.081	43	0.0	0.1	7.230	A
C-D	2	0.38			2				
C-A	61	15			61				
C-B	0	0			0				
CD-AB	0.75	0.19	592	0.001	0.74	0.0	0.0	6.084	A
CD-A	95	24			95				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	492	0.013	6	0.0	0.0	7.403	A
B-A	4	0.90	341	0.011	4	0.0	0.0	10.666	B
A-B	2	0.45			2				
A-C	178	44			178				
A-D	173	43			173				
AB-CD	238	59	701	0.340	237	0.5	0.6	7.775	A
AB-C	119	30			119				
D-ABC	52	13	533	0.098	52	0.1	0.1	7.483	A
C-D	2	0.45			2				
C-A	73	18			73				
C-B	0	0			0				
CD-AB	0.90	0.22	581	0.002	0.90	0.0	0.0	6.209	A
CD-A	113	28			113				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	478	0.016	8	0.0	0.0	7.648	A
B-A	4	1	327	0.013	4	0.0	0.0	11.171	B
A-B	2	0.55			2				
A-C	218	55			218				
A-D	211	53			211				
AB-CD	312	78	724	0.431	311	0.6	0.9	8.720	A
AB-C	125	31			125				
D-ABC	64	16	522	0.122	64	0.1	0.1	7.850	A
C-D	2	0.55			2				
C-A	89	22			89				
C-B	0	0			0				
CD-AB	1	0.27	564	0.002	1	0.0	0.0	6.391	A
CD-A	139	35			139				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	478	0.016	8	0.0	0.0	7.648	A
B-A	4	1	327	0.013	4	0.0	0.0	11.170	B
A-B	2	0.55			2				
A-C	218	55			218				
A-D	211	53			211				
AB-CD	312	78	724	0.431	312	0.9	0.9	8.772	A
AB-C	125	31			125				
D-ABC	64	16	522	0.122	64	0.1	0.1	7.855	A
C-D	2	0.55			2				
C-A	89	22			89				
C-B	0	0			0				
CD-AB	1	0.28	564	0.002	1	0.0	0.0	6.391	A
CD-A	139	35			139				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	492	0.013	6	0.0	0.0	7.407	A
B-A	4	0.90	341	0.011	4	0.0	0.0	10.667	B
A-B	2	0.45			2				
A-C	178	44			178				
A-D	173	43			173				
AB-CD	238	60	701	0.340	240	0.9	0.6	7.837	A
AB-C	118	30			118				
D-ABC	52	13	533	0.098	52	0.1	0.1	7.492	A
C-D	2	0.45			2				
C-A	73	18			73				
C-B	0	0			0				
CD-AB	0.90	0.23	581	0.002	0.90	0.0	0.0	6.212	A
CD-A	113	28			113				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	503	0.010	5	0.0	0.0	7.236	A
B-A	3	0.75	352	0.009	3	0.0	0.0	10.329	B
A-B	2	0.38			2				
A-C	149	37			149				
A-D	145	36			145				
AB-CD	190	48	684	0.278	191	0.6	0.5	7.312	A
AB-C	109	27			109				
D-ABC	44	11	541	0.081	44	0.1	0.1	7.248	A
C-D	2	0.38			2				
C-A	61	15			61				
C-B	0	0			0				
CD-AB	0.75	0.19	592	0.001	0.76	0.0	0.0	6.084	A
CD-A	95	24			95				

2023, 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	Left-Right Stagger	Two-way		1.89	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)	Run automatically
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	89	100.000
B		ONE HOUR	✓	7	100.000
C		ONE HOUR	✓	227	100.000
D		ONE HOUR	✓	139	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	1	50	38
	B	5	0	0	2
	C	208	0	0	19
	D	123	12	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.00	7.61	0.0	A	2	3
B-A	0.01	9.48	0.0	A	5	7
A-B					1	1
A-C					46	69
A-D					35	52
AB-CD	0.08	6.75	0.1	A	40	60
AB-C					43	64
D-ABC	0.28	9.10	0.4	A	128	191
C-D					17	26
C-A					191	286
C-B					0	0
CD-AB	0.02	5.81	0.0	A	11	16
CD-A					304	455

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	480	0.003	1	0.0	0.0	7.515	A
B-A	4	1	403	0.009	4	0.0	0.0	9.007	A
A-B	0.75	0.19			0.75				
A-C	38	9			38				
A-D	29	7			29				
AB-CD	32	8	587	0.055	32	0.0	0.1	6.477	A
AB-C	36	9			36				
D-ABC	105	26	566	0.185	104	0.0	0.2	7.774	A
C-D	14	4			14				
C-A	157	39			157				
C-B	0	0			0				
CD-AB	9	2	639	0.014	9	0.0	0.0	5.710	A
CD-A	248	62			248				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	478	0.004	2	0.0	0.0	7.557	A
B-A	4	1	396	0.011	4	0.0	0.0	9.201	A
A-B	0.90	0.22			0.90				
A-C	45	11			45				
A-D	34	9			34				
AB-CD	39	10	585	0.067	39	0.1	0.1	6.591	A
AB-C	42	10			42				
D-ABC	125	31	559	0.224	125	0.2	0.3	8.290	A
C-D	17	4			17				
C-A	187	47			187				
C-B	0	0			0				
CD-AB	11	3	637	0.017	11	0.0	0.0	5.751	A
CD-A	297	74			297				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	475	0.005	2	0.0	0.0	7.613	A
B-A	6	1	385	0.014	5	0.0	0.0	9.481	A
A-B	1	0.28			1				
A-C	55	14			55				
A-D	42	10			42				
AB-CD	49	12	582	0.084	49	0.1	0.1	6.751	A
AB-C	50	13			50				
D-ABC	153	38	549	0.279	153	0.3	0.4	9.079	A
C-D	21	5			21				
C-A	229	57			229				
C-B	0	0			0				
CD-AB	13	3	633	0.021	13	0.0	0.0	5.808	A
CD-A	364	91			364				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	475	0.005	2	0.0	0.0	7.613	A
B-A	6	1	385	0.014	6	0.0	0.0	9.482	A
A-B	1	0.28			1				
A-C	55	14			55				
A-D	42	10			42				
AB-CD	49	12	582	0.084	49	0.1	0.1	6.752	A
AB-C	50	13			50				
D-ABC	153	38	549	0.279	153	0.4	0.4	9.097	A
C-D	21	5			21				
C-A	229	57			229				
C-B	0	0			0				
CD-AB	13	3	633	0.021	13	0.0	0.0	5.808	A
CD-A	364	91			364				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	478	0.004	2	0.0	0.0	7.561	A
B-A	4	1	396	0.011	5	0.0	0.0	9.204	A
A-B	0.90	0.22			0.90				
A-C	45	11			45				
A-D	34	9			34				
AB-CD	39	10	585	0.067	39	0.1	0.1	6.597	A
AB-C	42	10			42				
D-ABC	125	31	559	0.224	125	0.4	0.3	8.314	A
C-D	17	4			17				
C-A	187	47			187				
C-B	0	0			0				
CD-AB	11	3	637	0.017	11	0.0	0.0	5.752	A
CD-A	298	74			298				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	480	0.003	2	0.0	0.0	7.520	A
B-A	4	1	403	0.009	4	0.0	0.0	9.013	A
A-B	0.75	0.19			0.75				
A-C	38	9			38				
A-D	29	7			29				
AB-CD	32	8	587	0.055	32	0.1	0.1	6.487	A
AB-C	36	9			36				
D-ABC	105	26	566	0.185	105	0.3	0.2	7.811	A
C-D	14	4			14				
C-A	157	39			157				
C-B	0	0			0				
CD-AB	9	2	639	0.014	9	0.0	0.0	5.711	A
CD-A	249	62			249				

2029 no 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	Left-Right Stagger	Two-way		3.05	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)	Run automatically
D7	2029 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	438	100.000
B		ONE HOUR	✓	11	100.000
C		ONE HOUR	✓	93	100.000
D		ONE HOUR	✓	64	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	2	221	215
	B	4	0	3	4
	C	91	0	0	2
	D	50	1	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.02	7.80	0.0	A	6	10
B-A	0.01	11.50	0.0	B	4	6
A-B					2	3
A-C					203	304
A-D					197	296
AB-CD	0.49	9.66	1.2	A	286	429
AB-C					121	181
D-ABC	0.14	8.08	0.2	A	59	88
C-D					2	3
C-A					84	125
C-B					0	0
CD-AB	0.00	6.51	0.0	A	1	1
CD-A					129	194

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	497	0.011	5	0.0	0.0	7.325	A
B-A	3	0.75	345	0.009	3	0.0	0.0	10.520	B
A-B	2	0.38			2				
A-C	166	42			166				
A-D	162	40			162				
AB-CD	218	54	693	0.314	216	0.0	0.6	7.510	A
AB-C	116	29			116				
D-ABC	48	12	537	0.090	48	0.0	0.1	7.344	A
C-D	2	0.38			2				
C-A	69	17			69				
C-B	0	0			0				
CD-AB	0.75	0.19	585	0.001	0.74	0.0	0.0	6.158	A
CD-A	106	26			106				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	485	0.013	6	0.0	0.0	7.515	A
B-A	4	0.90	334	0.011	4	0.0	0.0	10.910	B
A-B	2	0.45			2				
A-C	199	50			199				
A-D	193	48			193				
AB-CD	275	69	712	0.386	274	0.6	0.8	8.226	A
AB-C	123	31			123				
D-ABC	58	14	528	0.109	57	0.1	0.1	7.640	A
C-D	2	0.45			2				
C-A	82	20			82				
C-B	0	0			0				
CD-AB	0.90	0.22	572	0.002	0.90	0.0	0.0	6.302	A
CD-A	127	32			127				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	469	0.016	8	0.0	0.0	7.795	A
B-A	4	1	317	0.014	4	0.0	0.0	11.501	B
A-B	2	0.55			2				
A-C	243	61			243				
A-D	237	59			237				
AB-CD	363	91	738	0.492	362	0.8	1.2	9.572	A
AB-C	124	31			124				
D-ABC	70	18	516	0.137	70	0.1	0.2	8.074	A
C-D	2	0.55			2				
C-A	100	25			100				
C-B	0	0			0				
CD-AB	1	0.27	554	0.002	1	0.0	0.0	6.511	A
CD-A	155	39			155				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	469	0.016	8	0.0	0.0	7.796	A
B-A	4	1	317	0.014	4	0.0	0.0	11.500	B
A-B	2	0.55			2				
A-C	243	61			243				
A-D	237	59			237				
AB-CD	364	91	739	0.493	364	1.2	1.2	9.660	A
AB-C	124	31			124				
D-ABC	70	18	516	0.137	70	0.2	0.2	8.082	A
C-D	2	0.55			2				
C-A	100	25			100				
C-B	0	0			0				
CD-AB	1	0.28	554	0.002	1	0.0	0.0	6.511	A
CD-A	155	39			155				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	485	0.013	6	0.0	0.0	7.516	A
B-A	4	0.90	334	0.011	4	0.0	0.0	10.909	B
A-B	2	0.45			2				
A-C	199	50			199				
A-D	193	48			193				
AB-CD	276	69	713	0.387	278	1.2	0.8	8.325	A
AB-C	122	31			122				
D-ABC	58	14	528	0.109	58	0.2	0.1	7.654	A
C-D	2	0.45			2				
C-A	82	20			82				
C-B	0	0			0				
CD-AB	0.90	0.23	572	0.002	0.90	0.0	0.0	6.302	A
CD-A	127	32			127				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	497	0.011	5	0.0	0.0	7.326	A
B-A	3	0.75	345	0.009	3	0.0	0.0	10.518	B
A-B	2	0.38			2				
A-C	166	42			166				
A-D	162	40			162				
AB-CD	219	55	694	0.315	220	0.8	0.6	7.613	A
AB-C	115	29			115				
D-ABC	48	12	537	0.090	48	0.1	0.1	7.367	A
C-D	2	0.38			2				
C-A	69	17			69				
C-B	0	0			0				
CD-AB	0.75	0.19	585	0.001	0.76	0.0	0.0	6.158	A
CD-A	106	27			106				

2029 no 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	Left-Right Stagger	Two-way		1.98	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)	Run automatically
D8	2029 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	99	100.000
B		ONE HOUR	✓	8	100.000
C		ONE HOUR	✓	254	100.000
D		ONE HOUR	✓	155	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	1	56	42
	B	6	0	0	2
	C	233	0	0	21
	D	138	13	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.00	7.80	0.0	A	2	3
B-A	0.02	9.65	0.0	A	6	8
A-B					1	1
A-C					51	77
A-D					39	58
AB-CD	0.09	6.85	0.1	A	44	67
AB-C					47	71
D-ABC	0.31	9.67	0.5	A	142	213
C-D					19	29
C-A					214	321
C-B					0	0
CD-AB	0.02	5.84	0.0	A	12	18
CD-A					340	510

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	470	0.003	1	0.0	0.0	7.685	A
B-A	5	1	400	0.011	4	0.0	0.0	9.096	A
A-B	0.75	0.19			0.75				
A-C	42	11			42				
A-D	32	8			32				
AB-CD	36	9	586	0.061	35	0.0	0.1	6.536	A
AB-C	40	10			40				
D-ABC	117	29	562	0.208	116	0.0	0.3	8.046	A
C-D	16	4			16				
C-A	175	44			175				
C-B	0	0			0				
CD-AB	10	2	638	0.015	10	0.0	0.0	5.731	A
CD-A	278	70			278				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	467	0.004	2	0.0	0.0	7.732	A
B-A	5	1	392	0.014	5	0.0	0.0	9.322	A
A-B	0.90	0.22			0.90				
A-C	50	13			50				
A-D	38	9			38				
AB-CD	43	11	583	0.074	43	0.1	0.1	6.665	A
AB-C	47	12			47				
D-ABC	139	35	554	0.252	139	0.3	0.3	8.669	A
C-D	19	5			19				
C-A	209	52			209				
C-B	0	0			0				
CD-AB	12	3	635	0.018	12	0.0	0.0	5.777	A
CD-A	333	83			333				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	464	0.005	2	0.0	0.0	7.796	A
B-A	7	2	380	0.017	7	0.0	0.0	9.647	A
A-B	1	0.28			1				
A-C	62	15			62				
A-D	46	12			46				
AB-CD	54	14	580	0.094	54	0.1	0.1	6.847	A
AB-C	56	14			56				
D-ABC	171	43	543	0.314	170	0.3	0.5	9.648	A
C-D	23	6			23				
C-A	257	64			257				
C-B	0	0			0				
CD-AB	14	4	631	0.023	14	0.0	0.0	5.840	A
CD-A	408	102			408				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	464	0.005	2	0.0	0.0	7.797	A
B-A	7	2	380	0.017	7	0.0	0.0	9.648	A
A-B	1	0.28			1				
A-C	62	15			62				
A-D	46	12			46				
AB-CD	54	14	580	0.094	54	0.1	0.1	6.849	A
AB-C	56	14			56				
D-ABC	171	43	543	0.314	171	0.5	0.5	9.672	A
C-D	23	6			23				
C-A	257	64			257				
C-B	0	0			0				
CD-AB	14	4	631	0.023	14	0.0	0.0	5.840	A
CD-A	408	102			408				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	467	0.004	2	0.0	0.0	7.735	A
B-A	5	1	391	0.014	5	0.0	0.0	9.325	A
A-B	0.90	0.22			0.90				
A-C	50	13			50				
A-D	38	9			38				
AB-CD	43	11	583	0.074	43	0.1	0.1	6.671	A
AB-C	47	12			47				
D-ABC	139	35	554	0.252	140	0.5	0.3	8.702	A
C-D	19	5			19				
C-A	209	52			209				
C-B	0	0			0				
CD-AB	12	3	635	0.018	12	0.0	0.0	5.780	A
CD-A	334	83			334				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	470	0.003	2	0.0	0.0	7.687	A
B-A	5	1	400	0.011	5	0.0	0.0	9.102	A
A-B	0.75	0.19			0.75				
A-C	42	11			42				
A-D	32	8			32				
AB-CD	36	9	586	0.061	36	0.1	0.1	6.543	A
AB-C	40	10			40				
D-ABC	117	29	562	0.208	117	0.3	0.3	8.093	A
C-D	16	4			16				
C-A	175	44			175				
C-B	0	0			0				
CD-AB	10	2	638	0.015	10	0.0	0.0	5.732	A
CD-A	280	70			280				

2029 with 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	Left-Right Stagger	Two-way		2.91	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)	Run automatically
D9	2029 with dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	444	100.000
B		ONE HOUR	✓	11	100.000
C		ONE HOUR	✓	146	100.000
D		ONE HOUR	✓	64	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	2	227	215
	B	4	0	3	4
	C	144	0	0	2
	D	50	1	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.02	7.82	0.0	A	6	10
B-A	0.01	11.75	0.0	B	4	6
A-B					2	3
A-C					208	312
A-D					197	296
AB-CD	0.51	10.03	1.3	B	290	435
AB-C					122	183
D-ABC	0.14	8.34	0.2	A	59	88
C-D					2	3
C-A					132	198
C-B					0	0
CD-AB	0.00	6.53	0.0	A	1	1
CD-A					178	267

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	496	0.011	5	0.0	0.0	7.337	A
B-A	3	0.75	341	0.009	3	0.0	0.0	10.659	B
A-B	2	0.38			2				
A-C	171	43			171				
A-D	162	40			162				
AB-CD	220	55	688	0.320	218	0.0	0.6	7.630	A
AB-C	118	29			118				
D-ABC	48	12	528	0.091	48	0.0	0.1	7.491	A
C-D	2	0.38			2				
C-A	108	27			108				
C-B	0	0			0				
CD-AB	0.75	0.19	584	0.001	0.74	0.0	0.0	6.168	A
CD-A	146	36			146				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	484	0.013	6	0.0	0.0	7.530	A
B-A	4	0.90	328	0.011	4	0.0	0.0	11.090	B
A-B	2	0.45			2				
A-C	204	51			204				
A-D	193	48			193				
AB-CD	279	70	706	0.395	278	0.6	0.8	8.412	A
AB-C	125	31			125				
D-ABC	58	14	517	0.111	57	0.1	0.1	7.827	A
C-D	2	0.45			2				
C-A	129	32			129				
C-B	0	0			0				
CD-AB	0.90	0.22	571	0.002	0.90	0.0	0.0	6.314	A
CD-A	174	44			174				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	468	0.016	8	0.0	0.0	7.815	A
B-A	4	1	311	0.014	4	0.0	0.0	11.748	B
A-B	2	0.55			2				
A-C	250	62			250				
A-D	237	59			237				
AB-CD	370	93	731	0.506	368	0.8	1.3	9.923	A
AB-C	124	31			124				
D-ABC	70	18	502	0.140	70	0.1	0.2	8.335	A
C-D	2	0.55			2				
C-A	159	40			159				
C-B	0	0			0				
CD-AB	1	0.27	553	0.002	1	0.0	0.0	6.527	A
CD-A	213	53			213				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	468	0.016	8	0.0	0.0	7.816	A
B-A	4	1	311	0.014	4	0.0	0.0	11.747	B
A-B	2	0.55			2				
A-C	250	62			250				
A-D	237	59			237				
AB-CD	371	93	732	0.507	371	1.3	1.3	10.028	B
AB-C	123	31			123				
D-ABC	70	18	502	0.140	70	0.2	0.2	8.343	A
C-D	2	0.55			2				
C-A	159	40			159				
C-B	0	0			0				
CD-AB	1	0.28	553	0.002	1	0.0	0.0	6.527	A
CD-A	214	53			214				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	6	2	484	0.013	6	0.0	0.0	7.531	A
B-A	4	0.90	328	0.011	4	0.0	0.0	11.089	B
A-B	2	0.45			2				
A-C	204	51			204				
A-D	193	48			193				
AB-CD	280	70	707	0.396	282	1.3	0.8	8.524	A
AB-C	124	31			124				
D-ABC	58	14	517	0.111	58	0.2	0.1	7.840	A
C-D	2	0.45			2				
C-A	129	32			129				
C-B	0	0			0				
CD-AB	0.90	0.23	571	0.002	0.90	0.0	0.0	6.314	A
CD-A	175	44			175				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	5	1	496	0.011	5	0.0	0.0	7.338	A
B-A	3	0.75	341	0.009	3	0.0	0.0	10.657	B
A-B	2	0.38			2				
A-C	171	43			171				
A-D	162	40			162				
AB-CD	221	55	689	0.321	222	0.8	0.6	7.741	A
AB-C	117	29			117				
D-ABC	48	12	528	0.091	48	0.1	0.1	7.514	A
C-D	2	0.38			2				
C-A	108	27			108				
C-B	0	0			0				
CD-AB	0.75	0.19	584	0.001	0.76	0.0	0.0	6.170	A
CD-A	146	37			146				

2029 with 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	Left-Right Stagger	Two-way		1.87	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)	Run automatically
D10	2029 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	126	100.000
B		ONE HOUR	✓	8	100.000
C		ONE HOUR	✓	260	100.000
D		ONE HOUR	✓	155	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	1	83	42
	B	6	0	0	2
	C	239	0	0	21
	D	138	13	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.00	7.87	0.0	A	2	3
B-A	0.02	9.80	0.0	A	6	8
A-B					1	1
A-C					76	114
A-D					39	58
AB-CD	0.10	6.65	0.1	A	46	70
AB-C					70	105
D-ABC	0.32	9.72	0.5	A	142	213
C-D					19	29
C-A					219	329
C-B					0	0
CD-AB	0.02	5.90	0.0	A	12	18
CD-A					346	519

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	467	0.003	1	0.0	0.0	7.736	A
B-A	5	1	396	0.011	4	0.0	0.0	9.186	A
A-B	0.75	0.19			0.75				
A-C	62	16			62				
A-D	32	8			32				
AB-CD	37	9	598	0.062	37	0.0	0.1	6.406	A
AB-C	59	15			59				
D-ABC	117	29	561	0.208	116	0.0	0.3	8.066	A
C-D	16	4			16				
C-A	180	45			180				
C-B	0	0			0				
CD-AB	10	2	634	0.015	10	0.0	0.0	5.769	A
CD-A	283	71			283				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	464	0.004	2	0.0	0.0	7.794	A
B-A	5	1	387	0.014	5	0.0	0.0	9.434	A
A-B	0.90	0.22			0.90				
A-C	75	19			75				
A-D	38	9			38				
AB-CD	45	11	598	0.076	45	0.1	0.1	6.507	A
AB-C	69	17			69				
D-ABC	139	35	553	0.252	139	0.3	0.3	8.698	A
C-D	19	5			19				
C-A	215	54			215				
C-B	0	0			0				
CD-AB	12	3	630	0.019	12	0.0	0.0	5.823	A
CD-A	339	85			339				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	459	0.005	2	0.0	0.0	7.874	A
B-A	7	2	374	0.018	7	0.0	0.0	9.795	A
A-B	1	0.28			1				
A-C	91	23			91				
A-D	46	12			46				
AB-CD	57	14	598	0.096	57	0.1	0.1	6.650	A
AB-C	83	21			83				
D-ABC	171	43	541	0.315	170	0.3	0.5	9.691	A
C-D	23	6			23				
C-A	263	66			263				
C-B	0	0			0				
CD-AB	14	4	625	0.023	14	0.0	0.0	5.898	A
CD-A	415	104			415				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	459	0.005	2	0.0	0.0	7.874	A
B-A	7	2	374	0.018	7	0.0	0.0	9.796	A
A-B	1	0.28			1				
A-C	91	23			91				
A-D	46	12			46				
AB-CD	57	14	598	0.096	57	0.1	0.1	6.655	A
AB-C	83	21			83				
D-ABC	171	43	541	0.315	171	0.5	0.5	9.716	A
C-D	23	6			23				
C-A	263	66			263				
C-B	0	0			0				
CD-AB	14	4	625	0.023	14	0.0	0.0	5.898	A
CD-A	415	104			415				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	464	0.004	2	0.0	0.0	7.797	A
B-A	5	1	387	0.014	5	0.0	0.0	9.437	A
A-B	0.90	0.22			0.90				
A-C	75	19			75				
A-D	38	9			38				
AB-CD	45	11	598	0.076	45	0.1	0.1	6.514	A
AB-C	69	17			69				
D-ABC	139	35	553	0.252	140	0.5	0.3	8.729	A
C-D	19	5			19				
C-A	215	54			215				
C-B	0	0			0				
CD-AB	12	3	630	0.019	12	0.0	0.0	5.824	A
CD-A	339	85			339				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	467	0.003	2	0.0	0.0	7.738	A
B-A	5	1	396	0.011	5	0.0	0.0	9.193	A
A-B	0.75	0.19			0.75				
A-C	62	16			62				
A-D	32	8			32				
AB-CD	37	9	598	0.062	37	0.1	0.1	6.417	A
AB-C	59	15			59				
D-ABC	117	29	561	0.208	117	0.3	0.3	8.114	A
C-D	16	4			16				
C-A	180	45			180				
C-B	0	0			0				
CD-AB	10	2	634	0.015	10	0.0	0.0	5.771	A
CD-A	284	71			284				

2034 no 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	Left-Right Stagger	Two-way		3.49	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)	Run automatically
D11	2034 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	481	100.000
B		ONE HOUR	✓	14	100.000
C		ONE HOUR	✓	101	100.000
D		ONE HOUR	✓	71	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	2	243	236
	B	5	0	4	5
	C	99	0	0	2
	D	55	1	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.02	7.98	0.0	A	8	12
B-A	0.02	11.91	0.0	B	5	7
A-B					2	3
A-C					223	334
A-D					217	325
AB-CD	0.55	10.80	1.6	B	326	489
AB-C					122	182
D-ABC	0.15	8.41	0.2	A	65	98
C-D					2	3
C-A					91	136
C-B					0	0
CD-AB	0.00	6.63	0.0	A	1	1
CD-A					141	212

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	7	2	491	0.014	7	0.0	0.0	7.433	A
B-A	4	1	338	0.011	4	0.0	0.0	10.763	B
A-B	2	0.38			2				
A-C	183	46			183				
A-D	178	44			178				
AB-CD	247	62	703	0.351	244	0.0	0.7	7.809	A
AB-C	121	30			121				
D-ABC	53	13	531	0.101	53	0.0	0.1	7.526	A
C-D	2	0.38			2				
C-A	75	19			75				
C-B	0	0			0				
CD-AB	0.75	0.19	579	0.001	0.74	0.0	0.0	6.229	A
CD-A	116	29			116				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	478	0.017	8	0.0	0.0	7.653	A
B-A	4	1	325	0.014	4	0.0	0.0	11.215	B
A-B	2	0.45			2				
A-C	218	55			218				
A-D	212	53			212				
AB-CD	313	78	724	0.433	312	0.7	0.9	8.744	A
AB-C	125	31			125				
D-ABC	64	16	521	0.123	64	0.1	0.1	7.872	A
C-D	2	0.45			2				
C-A	89	22			89				
C-B	0	0			0				
CD-AB	0.90	0.22	564	0.002	0.90	0.0	0.0	6.391	A
CD-A	138	35			138				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	10	2	461	0.021	10	0.0	0.0	7.979	A
B-A	6	1	308	0.018	5	0.0	0.0	11.908	B
A-B	2	0.55			2				
A-C	268	67			268				
A-D	260	65			260				
AB-CD	417	104	753	0.554	415	0.9	1.6	10.648	B
AB-C	120	30			120				
D-ABC	78	20	507	0.154	78	0.1	0.2	8.396	A
C-D	2	0.55			2				
C-A	109	27			109				
C-B	0	0			0				
CD-AB	1	0.27	544	0.002	1	0.0	0.0	6.628	A
CD-A	169	42			169				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	10	2	461	0.021	10	0.0	0.0	7.979	A
B-A	6	1	308	0.018	6	0.0	0.0	11.907	B
A-B	2	0.55			2				
A-C	268	67			268				
A-D	260	65			260				
AB-CD	418	105	754	0.555	418	1.6	1.6	10.802	B
AB-C	119	30			119				
D-ABC	78	20	506	0.154	78	0.2	0.2	8.408	A
C-D	2	0.55			2				
C-A	109	27			109				
C-B	0	0			0				
CD-AB	1	0.28	544	0.002	1	0.0	0.0	6.628	A
CD-A	170	42			170				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	478	0.017	8	0.0	0.0	7.654	A
B-A	4	1	326	0.014	5	0.0	0.0	11.214	B
A-B	2	0.45			2				
A-C	218	55			218				
A-D	212	53			212				
AB-CD	314	79	725	0.434	317	1.6	1.0	8.901	A
AB-C	124	31			124				
D-ABC	64	16	521	0.123	64	0.2	0.1	7.888	A
C-D	2	0.45			2				
C-A	89	22			89				
C-B	0	0			0				
CD-AB	0.90	0.23	564	0.002	0.90	0.0	0.0	6.391	A
CD-A	139	35			139				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	7	2	491	0.014	7	0.0	0.0	7.437	A
B-A	4	1	338	0.011	4	0.0	0.0	10.763	B
A-B	2	0.38			2				
A-C	183	46			183				
A-D	178	44			178				
AB-CD	248	62	704	0.352	249	1.0	0.7	7.947	A
AB-C	120	30			120				
D-ABC	53	13	531	0.101	54	0.1	0.1	7.547	A
C-D	2	0.38			2				
C-A	75	19			75				
C-B	0	0			0				
CD-AB	0.75	0.19	579	0.001	0.76	0.0	0.0	6.229	A
CD-A	116	29			116				

2034 no 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	Left-Right Stagger	Two-way		2.11	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)	Run automatically
D12	2034 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	109	100.000
B		ONE HOUR	✓	8	100.000
C		ONE HOUR	✓	278	100.000
D		ONE HOUR	✓	171	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	1	61	47
	B	6	0	0	2
	C	255	0	0	23
	D	151	15	5	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.00	7.83	0.0	A	2	3
B-A	0.02	9.82	0.0	A	6	8
A-B					1	1
A-C					56	84
A-D					43	65
AB-CD	0.11	6.97	0.1	A	50	75
AB-C					51	76
D-ABC	0.35	10.34	0.5	B	157	235
C-D					21	32
C-A					234	351
C-B					0	0
CD-AB	0.03	5.88	0.0	A	14	21
CD-A					372	559

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	469	0.003	1	0.0	0.0	7.704	A
B-A	5	1	396	0.011	4	0.0	0.0	9.198	A
A-B	0.75	0.19			0.75				
A-C	46	11			46				
A-D	35	9			35				
AB-CD	40	10	585	0.068	40	0.0	0.1	6.605	A
AB-C	43	11			43				
D-ABC	129	32	558	0.231	128	0.0	0.3	8.351	A
C-D	17	4			17				
C-A	192	48			192				
C-B	0	0			0				
CD-AB	11	3	636	0.018	11	0.0	0.0	5.759	A
CD-A	305	76			305				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	466	0.004	2	0.0	0.0	7.755	A
B-A	5	1	386	0.014	5	0.0	0.0	9.450	A
A-B	0.90	0.22			0.90				
A-C	55	14			55				
A-D	42	11			42				
AB-CD	49	12	582	0.084	49	0.1	0.1	6.752	A
AB-C	50	13			50				
D-ABC	154	38	549	0.280	153	0.3	0.4	9.099	A
C-D	21	5			21				
C-A	229	57			229				
C-B	0	0			0				
CD-AB	13	3	633	0.021	13	0.0	0.0	5.810	A
CD-A	365	91			365				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	462	0.005	2	0.0	0.0	7.825	A
B-A	7	2	373	0.018	7	0.0	0.0	9.815	A
A-B	1	0.28			1				
A-C	67	17			67				
A-D	52	13			52				
AB-CD	61	15	578	0.106	61	0.1	0.1	6.964	A
AB-C	60	15			60				
D-ABC	188	47	536	0.351	188	0.4	0.5	10.307	B
C-D	25	6			25				
C-A	281	70			281				
C-B	0	0			0				
CD-AB	16	4	628	0.026	16	0.0	0.0	5.882	A
CD-A	446	112			446				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	462	0.005	2	0.0	0.0	7.826	A
B-A	7	2	373	0.018	7	0.0	0.0	9.817	A
A-B	1	0.28			1				
A-C	67	17			67				
A-D	52	13			52				
AB-CD	61	15	578	0.106	61	0.1	0.1	6.968	A
AB-C	60	15			60				
D-ABC	188	47	536	0.351	188	0.5	0.5	10.339	B
C-D	25	6			25				
C-A	281	70			281				
C-B	0	0			0				
CD-AB	17	4	628	0.026	17	0.0	0.0	5.883	A
CD-A	447	112			447				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	466	0.004	2	0.0	0.0	7.758	A
B-A	5	1	386	0.014	5	0.0	0.0	9.453	A
A-B	0.90	0.22			0.90				
A-C	55	14			55				
A-D	42	11			42				
AB-CD	49	12	582	0.084	49	0.1	0.1	6.759	A
AB-C	50	13			50				
D-ABC	154	38	549	0.280	154	0.5	0.4	9.143	A
C-D	21	5			21				
C-A	229	57			229				
C-B	0	0			0				
CD-AB	14	3	633	0.021	14	0.0	0.0	5.812	A
CD-A	365	91			365				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	469	0.003	2	0.0	0.0	7.708	A
B-A	5	1	396	0.011	5	0.0	0.0	9.206	A
A-B	0.75	0.19			0.75				
A-C	46	11			46				
A-D	35	9			35				
AB-CD	40	10	585	0.069	40	0.1	0.1	6.616	A
AB-C	43	11			43				
D-ABC	129	32	558	0.231	129	0.4	0.3	8.410	A
C-D	17	4			17				
C-A	192	48			192				
C-B	0	0			0				
CD-AB	11	3	636	0.018	11	0.0	0.0	5.763	A
CD-A	306	76			306				

2034 with 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	Left-Right Stagger	Two-way		3.39	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)	Run automatically
D13	2034 with dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	487	100.000
B		ONE HOUR	✓	14	100.000
C		ONE HOUR	✓	154	100.000
D		ONE HOUR	✓	71	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	2	249	236
	B	5	0	4	5
	C	152	0	0	2
	D	55	1	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.02	8.00	0.0	A	8	12
B-A	0.02	12.17	0.0	B	5	7
A-B					2	3
A-C					228	343
A-D					217	325
AB-CD	0.57	11.31	1.7	B	331	497
AB-C					122	183
D-ABC	0.16	8.69	0.2	A	65	98
C-D					2	3
C-A					139	209
C-B					0	0
CD-AB	0.00	6.64	0.0	A	1	1
CD-A					190	285

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	7	2	490	0.014	7	0.0	0.0	7.445	A
B-A	4	1	334	0.011	4	0.0	0.0	10.909	B
A-B	2	0.38			2				
A-C	187	47			187				
A-D	178	44			178				
AB-CD	249	62	698	0.357	247	0.0	0.7	7.941	A
AB-C	122	31			122				
D-ABC	53	13	522	0.102	53	0.0	0.1	7.675	A
C-D	2	0.38			2				
C-A	114	29			114				
C-B	0	0			0				
CD-AB	0.75	0.19	578	0.001	0.74	0.0	0.0	6.239	A
CD-A	155	39			155				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	477	0.017	8	0.0	0.0	7.668	A
B-A	4	1	320	0.014	4	0.0	0.0	11.405	B
A-B	2	0.45			2				
A-C	224	56			224				
A-D	212	53			212				
AB-CD	318	80	719	0.443	317	0.7	1.0	8.966	A
AB-C	126	32			126				
D-ABC	64	16	510	0.125	64	0.1	0.1	8.071	A
C-D	2	0.45			2				
C-A	137	34			137				
C-B	0	0			0				
CD-AB	0.90	0.22	563	0.002	0.90	0.0	0.0	6.403	A
CD-A	186	46			186				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	10	2	460	0.022	10	0.0	0.0	8.000	A
B-A	6	1	301	0.018	5	0.0	0.0	12.171	B
A-B	2	0.55			2				
A-C	274	69			274				
A-D	260	65			260				
AB-CD	425	106	747	0.570	423	1.0	1.7	11.117	B
AB-C	119	30			119				
D-ABC	78	20	493	0.159	78	0.1	0.2	8.681	A
C-D	2	0.55			2				
C-A	167	42			167				
C-B	0	0			0				
CD-AB	1	0.27	543	0.002	1	0.0	0.0	6.645	A
CD-A	228	57			228				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	10	2	460	0.022	10	0.0	0.0	8.001	A
B-A	6	1	301	0.018	6	0.0	0.0	12.170	B
A-B	2	0.55			2				
A-C	274	69			274				
A-D	260	65			260				
AB-CD	426	107	747	0.570	426	1.7	1.7	11.305	B
AB-C	118	29			118				
D-ABC	78	20	492	0.159	78	0.2	0.2	8.694	A
C-D	2	0.55			2				
C-A	167	42			167				
C-B	0	0			0				
CD-AB	1	0.28	543	0.002	1	0.0	0.0	6.645	A
CD-A	228	57			228				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	477	0.017	8	0.0	0.0	7.670	A
B-A	4	1	320	0.014	5	0.0	0.0	11.403	B
A-B	2	0.45			2				
A-C	224	56			224				
A-D	212	53			212				
AB-CD	319	80	720	0.443	322	1.7	1.0	9.147	A
AB-C	125	31			125				
D-ABC	64	16	509	0.125	64	0.2	0.1	8.088	A
C-D	2	0.45			2				
C-A	137	34			137				
C-B	0	0			0				
CD-AB	0.90	0.23	563	0.002	0.90	0.0	0.0	6.406	A
CD-A	186	47			186				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	7	2	490	0.014	7	0.0	0.0	7.450	A
B-A	4	1	334	0.011	4	0.0	0.0	10.907	B
A-B	2	0.38			2				
A-C	187	47			187				
A-D	178	44			178				
AB-CD	251	63	699	0.358	252	1.0	0.7	8.089	A
AB-C	121	30			121				
D-ABC	53	13	521	0.103	54	0.1	0.1	7.701	A
C-D	2	0.38			2				
C-A	114	29			114				
C-B	0	0			0				
CD-AB	0.75	0.19	578	0.001	0.76	0.0	0.0	6.239	A
CD-A	156	39			156				

2034 with 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	Left-Right Stagger	Two-way		2.00	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)	Run automatically
D14	2034 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	136	100.000
B		ONE HOUR	✓	8	100.000
C		ONE HOUR	✓	284	100.000
D		ONE HOUR	✓	171	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	1	88	47
	B	6	0	0	2
	C	261	0	0	23
	D	151	15	5	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.00	7.90	0.0	A	2	3
B-A	0.02	9.97	0.0	A	6	8
A-B					1	1
A-C					81	121
A-D					43	65
AB-CD	0.11	6.77	0.1	A	52	78
AB-C					73	110
D-ABC	0.35	10.39	0.5	B	157	235
C-D					21	32
C-A					239	359
C-B					0	0
CD-AB	0.03	5.94	0.0	A	14	21
CD-A					378	567

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	466	0.003	1	0.0	0.0	7.755	A
B-A	5	1	392	0.012	4	0.0	0.0	9.289	A
A-B	0.75	0.19			0.75				
A-C	66	17			66				
A-D	35	9			35				
AB-CD	41	10	597	0.069	41	0.0	0.1	6.474	A
AB-C	62	15			62				
D-ABC	129	32	556	0.231	128	0.0	0.3	8.370	A
C-D	17	4			17				
C-A	196	49			196				
C-B	0	0			0				
CD-AB	11	3	632	0.018	11	0.0	0.0	5.798	A
CD-A	309	77			309				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	462	0.004	2	0.0	0.0	7.817	A
B-A	5	1	382	0.014	5	0.0	0.0	9.565	A
A-B	0.90	0.22			0.90				
A-C	79	20			79				
A-D	42	11			42				
AB-CD	51	13	597	0.085	51	0.1	0.1	6.593	A
AB-C	72	18			72				
D-ABC	154	38	547	0.281	153	0.3	0.4	9.131	A
C-D	21	5			21				
C-A	235	59			235				
C-B	0	0			0				
CD-AB	13	3	628	0.021	13	0.0	0.0	5.858	A
CD-A	370	93			370				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	458	0.005	2	0.0	0.0	7.903	A
B-A	7	2	368	0.018	7	0.0	0.0	9.969	A
A-B	1	0.28			1				
A-C	97	24			97				
A-D	52	13			52				
AB-CD	64	16	597	0.108	64	0.1	0.1	6.764	A
AB-C	86	22			86				
D-ABC	188	47	535	0.352	188	0.4	0.5	10.359	B
C-D	25	6			25				
C-A	287	72			287				
C-B	0	0			0				
CD-AB	16	4	622	0.026	16	0.0	0.0	5.941	A
CD-A	453	113			453				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.55	458	0.005	2	0.0	0.0	7.904	A
B-A	7	2	368	0.018	7	0.0	0.0	9.970	A
A-B	1	0.28			1				
A-C	97	24			97				
A-D	52	13			52				
AB-CD	65	16	597	0.108	64	0.1	0.1	6.769	A
AB-C	86	22			86				
D-ABC	188	47	535	0.352	188	0.5	0.5	10.390	B
C-D	25	6			25				
C-A	287	72			287				
C-B	0	0			0				
CD-AB	17	4	622	0.027	17	0.0	0.0	5.942	A
CD-A	454	113			454				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.45	462	0.004	2	0.0	0.0	7.820	A
B-A	5	1	382	0.014	5	0.0	0.0	9.571	A
A-B	0.90	0.22			0.90				
A-C	79	20			79				
A-D	42	11			42				
AB-CD	51	13	597	0.085	51	0.1	0.1	6.598	A
AB-C	72	18			72				
D-ABC	154	38	547	0.281	154	0.5	0.4	9.174	A
C-D	21	5			21				
C-A	235	59			235				
C-B	0	0			0				
CD-AB	14	3	628	0.022	14	0.0	0.0	5.859	A
CD-A	371	93			371				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.38	466	0.003	2	0.0	0.0	7.759	A
B-A	5	1	392	0.012	5	0.0	0.0	9.298	A
A-B	0.75	0.19			0.75				
A-C	66	17			66				
A-D	35	9			35				
AB-CD	42	10	597	0.070	42	0.1	0.1	6.483	A
AB-C	62	15			62				
D-ABC	129	32	556	0.231	129	0.4	0.3	8.434	A
C-D	17	4			17				
C-A	196	49			196				
C-B	0	0			0				
CD-AB	11	3	632	0.018	11	0.0	0.0	5.802	A
CD-A	310	78			310				

2044 no 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	Left-Right Stagger	Two-way		3.75	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)	Run automatically
D15	2044 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	505	100.000
B		ONE HOUR	✓	14	100.000
C		ONE HOUR	✓	107	100.000
D		ONE HOUR	✓	74	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	3	255	247
	B	5	0	4	5
	C	104	0	0	3
	D	58	1	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.02	8.06	0.0	A	8	12
B-A	0.02	12.10	0.0	B	5	7
A-B					3	4
A-C					234	351
A-D					227	340
AB-CD	0.59	11.56	1.8	B	348	522
AB-C					121	182
D-ABC	0.16	8.50	0.2	A	68	102
C-D					3	4
C-A					95	143
C-B					0	0
CD-AB	0.00	6.70	0.0	A	1	1
CD-A					149	223

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	7	2	488	0.014	7	0.0	0.0	7.480	A
B-A	4	1	335	0.011	4	0.0	0.0	10.868	B
A-B	2	0.56			2				
A-C	192	48			192				
A-D	186	46			186				
AB-CD	262	65	708	0.369	259	0.0	0.7	7.979	A
AB-C	123	31			123				
D-ABC	56	14	531	0.105	55	0.0	0.1	7.564	A
C-D	2	0.56			2				
C-A	78	20			78				
C-B	0	0			0				
CD-AB	0.75	0.19	575	0.001	0.74	0.0	0.0	6.269	A
CD-A	122	30			122				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	475	0.017	8	0.0	0.0	7.714	A
B-A	4	1	322	0.014	4	0.0	0.0	11.351	B
A-B	3	0.67			3				
A-C	229	57			229				
A-D	222	56			222				
AB-CD	334	83	730	0.457	332	0.7	1.0	9.056	A
AB-C	126	31			126				
D-ABC	67	17	520	0.128	66	0.1	0.1	7.929	A
C-D	3	0.67			3				
C-A	93	23			93				
C-B	0	0			0				
CD-AB	0.90	0.22	560	0.002	0.90	0.0	0.0	6.441	A
CD-A	146	36			146				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	10	2	457	0.022	10	0.0	0.0	8.060	A
B-A	6	1	303	0.018	5	0.0	0.0	12.097	B
A-B	3	0.83			3				
A-C	281	70			281				
A-D	272	68			272				
AB-CD	446	112	760	0.587	443	1.0	1.8	11.350	B
AB-C	117	29			117				
D-ABC	81	20	505	0.161	81	0.1	0.2	8.485	A
C-D	3	0.83			3				
C-A	115	29			115				
C-B	0	0			0				
CD-AB	1	0.27	539	0.002	1	0.0	0.0	6.695	A
CD-A	178	45			178				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	10	2	457	0.022	10	0.0	0.0	8.060	A
B-A	6	1	303	0.018	6	0.0	0.0	12.096	B
A-B	3	0.83			3				
A-C	281	70			281				
A-D	272	68			272				
AB-CD	447	112	761	0.587	447	1.8	1.8	11.559	B
AB-C	115	29			115				
D-ABC	81	20	505	0.161	81	0.2	0.2	8.498	A
C-D	3	0.83			3				
C-A	115	29			115				
C-B	0	0			0				
CD-AB	1	0.28	539	0.002	1	0.0	0.0	6.695	A
CD-A	178	45			178				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	475	0.017	8	0.0	0.0	7.715	A
B-A	4	1	322	0.014	5	0.0	0.0	11.353	B
A-B	3	0.67			3				
A-C	229	57			229				
A-D	222	56			222				
AB-CD	335	84	732	0.458	338	1.8	1.1	9.256	A
AB-C	124	31			124				
D-ABC	67	17	520	0.128	67	0.2	0.1	7.945	A
C-D	3	0.67			3				
C-A	93	23			93				
C-B	0	0			0				
CD-AB	0.90	0.23	560	0.002	0.90	0.0	0.0	6.441	A
CD-A	146	36			146				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	7	2	488	0.014	7	0.0	0.0	7.485	A
B-A	4	1	335	0.011	4	0.0	0.0	10.868	B
A-B	2	0.56			2				
A-C	192	48			192				
A-D	186	46			186				
AB-CD	263	66	709	0.371	264	1.1	0.7	8.138	A
AB-C	122	30			122				
D-ABC	56	14	530	0.105	56	0.1	0.1	7.590	A
C-D	2	0.56			2				
C-A	78	20			78				
C-B	0	0			0				
CD-AB	0.75	0.19	575	0.001	0.76	0.0	0.0	6.269	A
CD-A	122	31			122				

2044 no 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	Left-Right Stagger	Two-way		2.16	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)	Run automatically
D16	2044 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	114	100.000
B		ONE HOUR	✓	9	100.000
C		ONE HOUR	✓	292	100.000
D		ONE HOUR	✓	178	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	1	64	49
	B	6	0	0	3
	C	268	0	0	24
	D	158	15	5	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.01	7.52	0.0	A	3	4
B-A	0.02	9.98	0.0	A	6	8
A-B					1	1
A-C					59	88
A-D					45	67
AB-CD	0.11	7.04	0.1	A	53	80
AB-C					53	80
D-ABC	0.37	10.67	0.6	B	163	245
C-D					22	33
C-A					246	369
C-B					0	0
CD-AB	0.03	5.89	0.0	A	14	21
CD-A					391	586

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	489	0.005	2	0.0	0.0	7.389	A
B-A	5	1	391	0.012	4	0.0	0.0	9.323	A
A-B	0.75	0.19			0.75				
A-C	48	12			48				
A-D	37	9			37				
AB-CD	43	11	584	0.073	42	0.0	0.1	6.647	A
AB-C	45	11			45				
D-ABC	134	34	555	0.241	133	0.0	0.3	8.495	A
C-D	18	5			18				
C-A	202	50			202				
C-B	0	0			0				
CD-AB	11	3	635	0.018	11	0.0	0.0	5.766	A
CD-A	320	80			320				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	486	0.006	3	0.0	0.0	7.442	A
B-A	5	1	381	0.014	5	0.0	0.0	9.591	A
A-B	0.90	0.22			0.90				
A-C	58	14			58				
A-D	44	11			44				
AB-CD	52	13	581	0.089	52	0.1	0.1	6.805	A
AB-C	52	13			52				
D-ABC	160	40	546	0.293	160	0.3	0.4	9.306	A
C-D	22	5			22				
C-A	241	60			241				
C-B	0	0			0				
CD-AB	13	3	632	0.021	13	0.0	0.0	5.819	A
CD-A	383	96			383				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	482	0.007	3	0.0	0.0	7.515	A
B-A	7	2	367	0.018	7	0.0	0.0	9.982	A
A-B	1	0.28			1				
A-C	70	18			70				
A-D	54	13			54				
AB-CD	65	16	577	0.113	65	0.1	0.1	7.035	A
AB-C	62	16			62				
D-ABC	196	49	533	0.368	195	0.4	0.6	10.633	B
C-D	26	7			26				
C-A	295	74			295				
C-B	0	0			0				
CD-AB	16	4	627	0.026	16	0.0	0.0	5.893	A
CD-A	468	117			468				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	482	0.007	3	0.0	0.0	7.516	A
B-A	7	2	367	0.018	7	0.0	0.0	9.984	A
A-B	1	0.28			1				
A-C	70	18			70				
A-D	54	13			54				
AB-CD	65	16	577	0.113	65	0.1	0.1	7.040	A
AB-C	62	16			62				
D-ABC	196	49	533	0.368	196	0.6	0.6	10.673	B
C-D	26	7			26				
C-A	295	74			295				
C-B	0	0			0				
CD-AB	17	4	627	0.026	17	0.0	0.0	5.893	A
CD-A	469	117			469				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	486	0.006	3	0.0	0.0	7.444	A
B-A	5	1	381	0.014	5	0.0	0.0	9.597	A
A-B	0.90	0.22			0.90				
A-C	58	14			58				
A-D	44	11			44				
AB-CD	52	13	581	0.089	52	0.1	0.1	6.813	A
AB-C	52	13			52				
D-ABC	160	40	546	0.293	161	0.6	0.4	9.356	A
C-D	22	5			22				
C-A	241	60			241				
C-B	0	0			0				
CD-AB	14	3	632	0.021	14	0.0	0.0	5.820	A
CD-A	384	96			384				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	489	0.005	2	0.0	0.0	7.395	A
B-A	5	1	390	0.012	5	0.0	0.0	9.332	A
A-B	0.75	0.19			0.75				
A-C	48	12			48				
A-D	37	9			37				
AB-CD	43	11	584	0.073	43	0.1	0.1	6.658	A
AB-C	45	11			45				
D-ABC	134	34	555	0.241	134	0.4	0.3	8.560	A
C-D	18	5			18				
C-A	202	50			202				
C-B	0	0			0				
CD-AB	11	3	635	0.018	11	0.0	0.0	5.770	A
CD-A	321	80			321				

2044 with 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	Left-Right Stagger	Two-way		3.67	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)	Run automatically
D17	2044 with dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	511	100.000
B		ONE HOUR	✓	14	100.000
C		ONE HOUR	✓	160	100.000
D		ONE HOUR	✓	74	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	3	261	247
	B	5	0	4	5
	C	157	0	0	3
	D	58	1	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.02	8.08	0.0	A	8	12
B-A	0.02	12.37	0.0	B	5	7
A-B					3	4
A-C					239	359
A-D					227	340
AB-CD	0.60	12.16	2.0	B	353	530
AB-C					121	181
D-ABC	0.17	8.79	0.2	A	68	102
C-D					3	4
C-A					144	216
C-B					0	0
CD-AB	0.00	6.71	0.0	A	1	1
CD-A					197	296

Main Results for each time segment

06:45 - 07:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	7	2	487	0.014	7	0.0	0.0	7.493	A
B-A	4	1	330	0.011	4	0.0	0.0	11.017	B
A-B	2	0.56			2				
A-C	196	49			196				
A-D	186	46			186				
AB-CD	265	66	703	0.376	262	0.0	0.7	8.119	A
AB-C	124	31			124				
D-ABC	56	14	521	0.107	55	0.0	0.1	7.714	A
C-D	2	0.56			2				
C-A	118	30			118				
C-B	0	0			0				
CD-AB	0.75	0.19	574	0.001	0.74	0.0	0.0	6.279	A
CD-A	161	40			161				

07:00 - 07:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	474	0.017	8	0.0	0.0	7.730	A
B-A	4	1	316	0.014	4	0.0	0.0	11.546	B
A-B	3	0.67			3				
A-C	235	59			235				
A-D	222	56			222				
AB-CD	339	85	725	0.467	337	0.7	1.1	9.301	A
AB-C	126	32			126				
D-ABC	67	17	509	0.131	66	0.1	0.1	8.131	A
C-D	3	0.67			3				
C-A	141	35			141				
C-B	0	0			0				
CD-AB	0.90	0.22	559	0.002	0.90	0.0	0.0	6.454	A
CD-A	193	48			193				

07:15 - 07:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	10	2	455	0.022	10	0.0	0.0	8.082	A
B-A	6	1	297	0.019	5	0.0	0.0	12.369	B
A-B	3	0.83			3				
A-C	287	72			287				
A-D	272	68			272				
AB-CD	455	114	754	0.603	452	1.1	1.9	11.905	B
AB-C	114	29			114				
D-ABC	81	20	491	0.166	81	0.1	0.2	8.778	A
C-D	3	0.83			3				
C-A	173	43			173				
C-B	0	0			0				
CD-AB	1	0.27	537	0.002	1	0.0	0.0	6.712	A
CD-A	237	59			237				

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	10	2	455	0.022	10	0.0	0.0	8.082	A
B-A	6	1	297	0.019	6	0.0	0.0	12.368	B
A-B	3	0.83			3				
A-C	287	72			287				
A-D	272	68			272				
AB-CD	456	114	755	0.604	456	1.9	2.0	12.165	B
AB-C	113	28			113				
D-ABC	81	20	491	0.166	81	0.2	0.2	8.792	A
C-D	3	0.83			3				
C-A	173	43			173				
C-B	0	0			0				
CD-AB	1	0.28	537	0.002	1	0.0	0.0	6.712	A
CD-A	237	59			237				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	8	2	474	0.017	8	0.0	0.0	7.733	A
B-A	4	1	316	0.014	5	0.0	0.0	11.547	B
A-B	3	0.67			3				
A-C	235	59			235				
A-D	222	56			222				
AB-CD	340	85	726	0.468	343	2.0	1.2	9.532	A
AB-C	125	31			125				
D-ABC	67	17	509	0.131	67	0.2	0.2	8.150	A
C-D	3	0.67			3				
C-A	141	35			141				
C-B	0	0			0				
CD-AB	0.90	0.23	559	0.002	0.90	0.0	0.0	6.457	A
CD-A	193	48			193				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	7	2	487	0.014	7	0.0	0.0	7.497	A
B-A	4	1	331	0.011	4	0.0	0.0	11.015	B
A-B	2	0.56			2				
A-C	196	49			196				
A-D	186	46			186				
AB-CD	266	67	704	0.378	268	1.2	0.8	8.293	A
AB-C	123	31			123				
D-ABC	56	14	521	0.107	56	0.2	0.1	7.743	A
C-D	2	0.56			2				
C-A	118	30			118				
C-B	0	0			0				
CD-AB	0.75	0.19	574	0.001	0.76	0.0	0.0	6.280	A
CD-A	162	40			162				

2044 with 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	Left-Right Stagger	Two-way		2.05	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)	Run automatically
D18	2044 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		ONE HOUR	✓	141	100.000
B		ONE HOUR	✓	9	100.000
C		ONE HOUR	✓	298	100.000
D		ONE HOUR	✓	178	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		A	B	C	D
From	A	0	1	91	49
	B	6	0	0	3
	C	274	0	0	24
	D	158	15	5	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A	B	C	D
From	A	10	10	10	10
	B	10	10	10	10
	C	10	10	10	10
	D	10	10	10	10

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-CD	0.01	7.59	0.0	A	3	4
B-A	0.02	10.14	0.0	B	6	8
A-B					1	1
A-C					84	125
A-D					45	67
AB-CD	0.12	6.84	0.2	A	56	84
AB-C					75	113
D-ABC	0.37	10.73	0.6	B	163	245
C-D					22	33
C-A					251	377
C-B					0	0
CD-AB	0.03	5.95	0.0	A	14	21
CD-A					396	594

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	486	0.005	2	0.0	0.0	7.438	A
B-A	5	1	387	0.012	4	0.0	0.0	9.416	A
A-B	0.75	0.19			0.75				
A-C	69	17			69				
A-D	37	9			37				
AB-CD	44	11	596	0.074	44	0.0	0.1	6.515	A
AB-C	63	16			63				
D-ABC	134	34	554	0.242	133	0.0	0.3	8.516	A
C-D	18	5			18				
C-A	206	52			206				
C-B	0	0			0				
CD-AB	11	3	631	0.018	11	0.0	0.0	5.805	A
CD-A	324	81			324				

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	482	0.006	3	0.0	0.0	7.502	A
B-A	5	1	376	0.014	5	0.0	0.0	9.709	A
A-B	0.90	0.22			0.90				
A-C	82	20			82				
A-D	44	11			44				
AB-CD	54	14	596	0.091	54	0.1	0.1	6.645	A
AB-C	74	19			74				
D-ABC	160	40	545	0.294	160	0.3	0.4	9.339	A
C-D	22	5			22				
C-A	246	62			246				
C-B	0	0			0				
CD-AB	13	3	627	0.021	13	0.0	0.0	5.866	A
CD-A	388	97			388				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	477	0.007	3	0.0	0.0	7.591	A
B-A	7	2	362	0.018	7	0.0	0.0	10.139	B
A-B	1	0.28			1				
A-C	100	25			100				
A-D	54	13			54				
AB-CD	69	17	596	0.116	69	0.1	0.2	6.833	A
AB-C	89	22			89				
D-ABC	196	49	531	0.369	195	0.4	0.6	10.687	B
C-D	26	7			26				
C-A	302	75			302				
C-B	0	0			0				
CD-AB	16	4	621	0.027	16	0.0	0.0	5.953	A
CD-A	475	119			475				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	477	0.007	3	0.0	0.0	7.591	A
B-A	7	2	362	0.018	7	0.0	0.0	10.141	B
A-B	1	0.28			1				
A-C	100	25			100				
A-D	54	13			54				
AB-CD	69	17	596	0.116	69	0.2	0.2	6.839	A
AB-C	89	22			89				
D-ABC	196	49	531	0.369	196	0.6	0.6	10.727	B
C-D	26	7			26				
C-A	302	75			302				
C-B	0	0			0				
CD-AB	17	4	621	0.027	17	0.0	0.0	5.953	A
CD-A	476	119			476				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	482	0.006	3	0.0	0.0	7.507	A
B-A	5	1	376	0.014	5	0.0	0.0	9.715	A
A-B	0.90	0.22			0.90				
A-C	82	20			82				
A-D	44	11			44				
AB-CD	54	14	596	0.091	54	0.2	0.1	6.650	A
AB-C	74	19			74				
D-ABC	160	40	545	0.294	161	0.6	0.4	9.390	A
C-D	22	5			22				
C-A	246	62			246				
C-B	0	0			0				
CD-AB	14	3	627	0.022	14	0.0	0.0	5.868	A
CD-A	389	97			389				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	486	0.005	2	0.0	0.0	7.441	A
B-A	5	1	387	0.012	5	0.0	0.0	9.423	A
A-B	0.75	0.19			0.75				
A-C	69	17			69				
A-D	37	9			37				
AB-CD	44	11	596	0.074	44	0.1	0.1	6.527	A
AB-C	63	16			63				
D-ABC	134	34	554	0.242	134	0.4	0.3	8.584	A
C-D	18	5			18				
C-A	206	52			206				
C-B	0	0			0				
CD-AB	11	3	631	0.018	11	0.0	0.0	5.809	A
CD-A	326	81			326				

APPENDIX 16-4

Junctions 9

ARCADY 9 - Roundabout Module

Version: 9.5.2.1013
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Filename: Roundabout Junction REV A.j9
Path: S:\Jobs\2023\23117 Belview Port Extension TIA\23117-01\Reports\Working\ARCADY
Report generation date: 05/06/2025 12:00:55

»2023, AM
»2023, PM
»2027 no dev, AM
»2027 no dev, PM
»2027 construction phase, AM
»2027 construction phase, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (Veh)	Delay (s)	RFC	LOS	Set ID	Queue (Veh)	Delay (s)	RFC	LOS
	2023									
Arm 1	D1	0.7	2.81	0.40	A	D2	0.3	2.09	0.21	A
Arm 2		0.1	2.72	0.11	A		0.3	3.11	0.23	A
Arm 3		0.4	3.44	0.27	A		0.6	4.19	0.37	A
Arm 4		0.1	4.19	0.07	A		0.1	4.57	0.06	A
	2027 no dev									
Arm 1	D3	0.8	2.98	0.44	A	D4	0.3	2.14	0.23	A
Arm 2		0.1	2.78	0.12	A		0.3	3.22	0.25	A
Arm 3		0.4	3.56	0.29	A		0.7	4.45	0.40	A
Arm 4		0.1	4.29	0.07	A		0.1	4.72	0.06	A
	2027 construction phase									
Arm 1	D5	0.8	3.08	0.45	A	D6	0.3	2.15	0.23	A
Arm 2		0.1	2.80	0.13	A		0.4	3.34	0.28	A
Arm 3		0.4	3.59	0.30	A		0.7	4.54	0.41	A
Arm 4		0.1	4.32	0.07	A		0.1	4.80	0.06	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	23/07/2024
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	ROADPLAN01\jbyrne
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	Veh	Veh	perHour	s	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75				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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓
D3	2027 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D4	2027 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D5	2027 construction phase	AM	ONE HOUR	06:45	08:15	15	✓
D6	2027 construction phase	PM	ONE HOUR	16:15	17:45	15	✓
D7	2029 no dev	AM	ONE HOUR	06:45	08:15	15	
D8	2029 no dev	PM	ONE HOUR	16:15	17:45	15	
D9	2029 with dev	AM	ONE HOUR	06:45	08:15	15	
D10	2029 with dev	PM	ONE HOUR	16:15	17:45	15	
D11	2034 no dev	AM	ONE HOUR	06:45	08:15	15	
D12	2034 no dev	PM	ONE HOUR	16:15	17:45	15	
D13	2034 with dev	AM	ONE HOUR	06:45	08:15	15	
D14	2034 with dev	PM	ONE HOUR	16:15	17:45	15	
D15	2044 no dev	AM	ONE HOUR	06:45	08:15	15	
D16	2044 no dev	PM	ONE HOUR	16:15	17:45	15	
D17	2044 with dev	AM	ONE HOUR	06:45	08:15	15	
D18	2044 with dev	PM	ONE HOUR	16:15	17:45	15	

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2023, 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	3.02	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	untitled	
2	untitled	
3	untitled	
4	untitled	

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	7.00	9.00	10.0	24.0	88.0	38.0	
2	3.75	8.50	26.0	21.0	88.0	56.0	
3	3.00	6.80	27.0	15.0	88.0	33.0	
4	3.20	5.00	7.5	13.0	88.0	33.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.560	2442
2	0.463	1865
3	0.447	1657
4	0.384	1231

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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	785	100.000
2		ONE HOUR	✓	151	100.000
3		ONE HOUR	✓	356	100.000
4		ONE HOUR	✓	55	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	22	398	349	16
	2	99	0	50	2
	3	254	97	2	3
	4	31	10	14	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.40	2.81	0.7	A	720	1080
2	0.11	2.72	0.1	A	139	208
3	0.27	3.44	0.4	A	327	490
4	0.07	4.19	0.1	A	50	76

Main Results for each time segment

06:45 - 07:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	591	148	92	2168	0.273	589	305	0.0	0.4	2.278	A
2	114	28	303	1555	0.073	113	379	0.0	0.1	2.496	A
3	268	67	104	1460	0.184	267	312	0.0	0.2	3.016	A
4	41	10	356	983	0.042	41	16	0.0	0.0	3.823	A

07:00 - 07:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	706	176	110	2158	0.327	705	365	0.4	0.5	2.478	A
2	136	34	362	1528	0.089	136	454	0.1	0.1	2.585	A
3	320	80	125	1451	0.221	320	373	0.2	0.3	3.182	A
4	49	12	426	956	0.052	49	19	0.0	0.1	3.971	A

07:15 - 07:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	864	216	135	2144	0.403	864	447	0.5	0.7	2.810	A
2	166	42	443	1490	0.112	166	556	0.1	0.1	2.718	A
3	392	98	153	1438	0.273	392	457	0.3	0.4	3.439	A
4	61	15	521	919	0.066	60	23	0.1	0.1	4.192	A

07:30 - 07:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	864	216	135	2144	0.403	864	447	0.7	0.7	2.812	A
2	166	42	444	1490	0.112	166	556	0.1	0.1	2.719	A
3	392	98	153	1438	0.273	392	457	0.4	0.4	3.439	A
4	61	15	522	919	0.066	61	23	0.1	0.1	4.193	A

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	706	176	111	2158	0.327	706	365	0.7	0.5	2.483	A
2	136	34	363	1527	0.089	136	454	0.1	0.1	2.588	A
3	320	80	125	1451	0.221	320	373	0.4	0.3	3.187	A
4	49	12	427	956	0.052	50	19	0.1	0.1	3.974	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	591	148	93	2168	0.273	591	306	0.5	0.4	2.283	A
2	114	28	304	1555	0.073	114	380	0.1	0.1	2.499	A
3	268	67	105	1460	0.184	268	313	0.3	0.2	3.020	A
4	41	10	357	982	0.042	41	16	0.1	0.0	3.828	A

2023, 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	3.21	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)	Run automatically
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	416	100.000
2		ONE HOUR	✓	317	100.000
3		ONE HOUR	✓	456	100.000
4		ONE HOUR	✓	42	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	24	60	297	35
	2	215	0	81	21
	3	401	34	0	21
	4	14	16	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.21	2.09	0.3	A	382	573
2	0.23	3.11	0.3	A	291	436
3	0.37	4.19	0.6	A	418	628
4	0.06	4.57	0.1	A	39	58

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	313	78	46	2194	0.143	313	491	0.0	0.2	1.913	A
2	239	60	276	1567	0.152	238	83	0.0	0.2	2.706	A
3	343	86	221	1408	0.244	342	293	0.0	0.3	3.373	A
4	32	8	506	925	0.034	31	58	0.0	0.0	4.028	A

16:30 - 16:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	374	93	56	2189	0.171	374	587	0.2	0.2	1.983	A
2	285	71	331	1542	0.185	285	99	0.2	0.2	2.862	A
3	410	102	265	1388	0.295	410	350	0.3	0.4	3.675	A
4	38	9	605	887	0.043	38	69	0.0	0.0	4.238	A

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	458	115	68	2182	0.210	458	719	0.2	0.3	2.088	A
2	349	87	405	1508	0.231	349	121	0.2	0.3	3.105	A
3	502	126	325	1362	0.369	501	429	0.4	0.6	4.182	A
4	46	12	741	835	0.055	46	85	0.0	0.1	4.564	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	458	115	68	2181	0.210	458	720	0.3	0.3	2.088	A
2	349	87	405	1508	0.231	349	121	0.3	0.3	3.106	A
3	502	126	325	1362	0.369	502	429	0.6	0.6	4.187	A
4	46	12	742	835	0.055	46	85	0.1	0.1	4.566	A

17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	374	93	56	2188	0.171	374	589	0.3	0.2	1.984	A
2	285	71	331	1542	0.185	285	99	0.3	0.2	2.866	A
3	410	102	265	1388	0.295	411	351	0.6	0.4	3.684	A
4	38	9	607	886	0.043	38	69	0.1	0.0	4.243	A

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	313	78	47	2194	0.143	313	493	0.2	0.2	1.916	A
2	239	60	277	1567	0.152	239	83	0.2	0.2	2.712	A
3	343	86	222	1407	0.244	344	294	0.4	0.3	3.387	A
4	32	8	508	924	0.034	32	58	0.0	0.0	4.032	A

2027 no 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	3.16	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)	Run automatically
D3	2027 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	846	100.000
2		ONE HOUR	✓	163	100.000
3		ONE HOUR	✓	383	100.000
4		ONE HOUR	✓	59	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	24	429	376	17
	2	107	0	54	2
	3	274	104	2	3
	4	33	11	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.44	2.98	0.8	A	776	1164
2	0.12	2.78	0.1	A	150	224
3	0.29	3.56	0.4	A	351	527
4	0.07	4.29	0.1	A	54	81

Main Results for each time segment

06:45 - 07:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	637	159	99	2164	0.294	635	329	0.0	0.4	2.352	A
2	123	31	326	1544	0.079	122	408	0.0	0.1	2.531	A
3	288	72	113	1456	0.198	287	336	0.0	0.2	3.076	A
4	44	11	383	972	0.046	44	17	0.0	0.0	3.878	A

07:00 - 07:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	761	190	119	2153	0.353	760	393	0.4	0.5	2.584	A
2	147	37	390	1515	0.097	146	489	0.1	0.1	2.630	A
3	344	86	135	1447	0.238	344	402	0.2	0.3	3.265	A
4	53	13	459	943	0.056	53	20	0.0	0.1	4.044	A

07:15 - 07:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	931	233	145	2138	0.436	931	482	0.5	0.8	2.979	A
2	179	45	477	1474	0.122	179	598	0.1	0.1	2.779	A
3	422	105	165	1433	0.294	421	492	0.3	0.4	3.556	A
4	65	16	562	904	0.072	65	24	0.1	0.1	4.292	A

07:30 - 07:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	931	233	145	2138	0.436	931	482	0.8	0.8	2.982	A
2	179	45	478	1474	0.122	179	599	0.1	0.1	2.780	A
3	422	105	165	1433	0.294	422	492	0.4	0.4	3.558	A
4	65	16	563	903	0.072	65	24	0.1	0.1	4.293	A

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	761	190	119	2153	0.353	761	394	0.8	0.5	2.587	A
2	147	37	391	1514	0.097	147	490	0.1	0.1	2.633	A
3	344	86	135	1446	0.238	345	402	0.4	0.3	3.270	A
4	53	13	460	943	0.056	53	20	0.1	0.1	4.048	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	637	159	99	2164	0.294	637	330	0.5	0.4	2.358	A
2	123	31	327	1544	0.079	123	410	0.1	0.1	2.534	A
3	288	72	113	1456	0.198	289	337	0.3	0.2	3.085	A
4	44	11	385	971	0.046	44	17	0.1	0.0	3.884	A

2027 no 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	3.36	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)	Run automatically
D4	2027 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	449	100.000
2		ONE HOUR	✓	342	100.000
3		ONE HOUR	✓	492	100.000
4		ONE HOUR	✓	45	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	26	65	320	38
	2	232	0	87	23
	3	432	37	0	23
	4	15	17	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.23	2.14	0.3	A	412	618
2	0.25	3.22	0.3	A	314	471
3	0.40	4.45	0.7	A	451	677
4	0.06	4.72	0.1	A	41	62

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	338	85	50	2192	0.154	337	529	0.0	0.2	1.940	A
2	257	64	298	1557	0.165	257	89	0.0	0.2	2.766	A
3	370	93	239	1400	0.265	369	315	0.0	0.4	3.488	A
4	34	8	545	910	0.037	34	63	0.0	0.0	4.108	A

16:30 - 16:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	404	101	60	2186	0.185	403	633	0.2	0.2	2.019	A
2	307	77	357	1530	0.201	307	107	0.2	0.3	2.943	A
3	442	111	287	1379	0.321	442	377	0.4	0.5	3.841	A
4	40	10	653	869	0.047	40	75	0.0	0.0	4.346	A

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	494	124	74	2178	0.227	494	775	0.2	0.3	2.137	A
2	377	94	437	1493	0.252	376	131	0.3	0.3	3.223	A
3	542	135	351	1350	0.401	541	462	0.5	0.7	4.446	A
4	50	12	799	813	0.061	49	92	0.0	0.1	4.717	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	494	124	74	2178	0.227	494	776	0.3	0.3	2.137	A
2	377	94	437	1493	0.252	377	131	0.3	0.3	3.223	A
3	542	135	351	1350	0.401	542	462	0.7	0.7	4.454	A
4	50	12	800	812	0.061	50	92	0.1	0.1	4.720	A

17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	404	101	60	2186	0.185	404	635	0.3	0.2	2.020	A
2	307	77	357	1530	0.201	308	107	0.3	0.3	2.945	A
3	442	111	287	1379	0.321	443	378	0.7	0.5	3.852	A
4	40	10	655	868	0.047	41	76	0.1	0.0	4.349	A

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	338	85	51	2191	0.154	338	531	0.2	0.2	1.942	A
2	257	64	299	1557	0.165	258	90	0.3	0.2	2.770	A
3	370	93	240	1399	0.265	371	316	0.5	0.4	3.500	A
4	34	8	548	909	0.037	34	63	0.0	0.0	4.113	A

2027 construction phase, 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	3.23	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)	Run automatically
D5	2027 construction phase	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	878	100.000
2		ONE HOUR	✓	172	100.000
3		ONE HOUR	✓	387	100.000
4		ONE HOUR	✓	59	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	24	461	376	17
	2	116	0	54	2
	3	274	108	2	3
	4	33	11	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.45	3.08	0.8	A	806	1209
2	0.13	2.80	0.1	A	158	237
3	0.30	3.59	0.4	A	355	533
4	0.07	4.32	0.1	A	54	81

Main Results for each time segment

06:45 - 07:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	661	165	102	2163	0.306	659	335	0.0	0.4	2.393	A
2	129	32	326	1544	0.084	129	435	0.0	0.1	2.543	A
3	291	73	119	1453	0.200	290	336	0.0	0.2	3.092	A
4	44	11	393	968	0.046	44	17	0.0	0.0	3.894	A

07:00 - 07:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	789	197	122	2151	0.367	789	402	0.4	0.6	2.640	A
2	155	39	390	1515	0.102	155	521	0.1	0.1	2.646	A
3	348	87	143	1443	0.241	348	402	0.2	0.3	3.286	A
4	53	13	471	939	0.057	53	20	0.0	0.1	4.064	A

07:15 - 07:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	967	242	150	2136	0.453	966	492	0.6	0.8	3.073	A
2	189	47	477	1474	0.128	189	638	0.1	0.1	2.801	A
3	426	107	175	1429	0.298	426	492	0.3	0.4	3.587	A
4	65	16	576	898	0.072	65	24	0.1	0.1	4.320	A

07:30 - 07:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	967	242	150	2136	0.453	967	492	0.8	0.8	3.078	A
2	189	47	478	1474	0.128	189	639	0.1	0.1	2.801	A
3	426	107	175	1429	0.298	426	492	0.4	0.4	3.590	A
4	65	16	577	898	0.072	65	24	0.1	0.1	4.321	A

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	789	197	122	2151	0.367	790	402	0.8	0.6	2.646	A
2	155	39	391	1514	0.102	155	522	0.1	0.1	2.647	A
3	348	87	143	1443	0.241	348	402	0.4	0.3	3.289	A
4	53	13	472	938	0.057	53	20	0.1	0.1	4.068	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	661	165	102	2162	0.306	662	337	0.6	0.4	2.399	A
2	129	32	327	1544	0.084	130	437	0.1	0.1	2.547	A
3	291	73	120	1453	0.200	292	337	0.3	0.3	3.099	A
4	44	11	395	968	0.046	44	17	0.1	0.0	3.900	A

2027 construction phase, 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	3.42	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)	Run automatically
D6	2027 construction phase	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	458	100.000
2		ONE HOUR	✓	378	100.000
3		ONE HOUR	✓	492	100.000
4		ONE HOUR	✓	45	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	26	74	320	38
	2	262	0	93	23
	3	432	37	0	23
	4	15	17	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.23	2.15	0.3	A	420	630
2	0.28	3.34	0.4	A	347	520
3	0.41	4.54	0.7	A	451	677
4	0.06	4.80	0.1	A	41	62

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	345	86	50	2192	0.157	344	551	0.0	0.2	1.947	A
2	285	71	298	1557	0.183	284	96	0.0	0.2	2.825	A
3	370	93	262	1390	0.267	369	320	0.0	0.4	3.522	A
4	34	8	568	901	0.038	34	63	0.0	0.0	4.149	A

16:30 - 16:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	412	103	60	2186	0.188	412	660	0.2	0.2	2.028	A
2	340	85	357	1530	0.222	340	115	0.2	0.3	3.023	A
3	442	111	314	1367	0.324	442	383	0.4	0.5	3.891	A
4	40	10	680	858	0.047	40	75	0.0	0.0	4.401	A

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	504	126	74	2178	0.231	504	808	0.2	0.3	2.149	A
2	416	104	437	1493	0.279	416	141	0.3	0.4	3.342	A
3	542	135	384	1335	0.406	541	469	0.5	0.7	4.527	A
4	50	12	832	800	0.062	49	92	0.0	0.1	4.797	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	504	126	74	2178	0.231	504	809	0.3	0.3	2.150	A
2	416	104	437	1493	0.279	416	141	0.4	0.4	3.342	A
3	542	135	384	1335	0.406	542	469	0.7	0.7	4.536	A
4	50	12	833	799	0.062	50	92	0.1	0.1	4.800	A

17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	412	103	60	2186	0.188	412	662	0.3	0.2	2.029	A
2	340	85	357	1530	0.222	340	115	0.4	0.3	3.028	A
3	442	111	314	1366	0.324	443	383	0.7	0.5	3.903	A
4	40	10	682	858	0.047	41	76	0.1	0.0	4.406	A

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	345	86	51	2191	0.157	345	554	0.2	0.2	1.949	A
2	285	71	299	1557	0.183	285	96	0.3	0.2	2.832	A
3	370	93	263	1389	0.267	371	321	0.5	0.4	3.535	A
4	34	8	571	900	0.038	34	63	0.0	0.0	4.154	A

Junctions 9

ARCADY 9 - Roundabout Module

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Filename: Roundabout Junction REV A.j9
Path: S:\Jobs\2023\23117 Belview Port Extension TIA\23117-01\Reports\Working\ARCADY
Report generation date: 05/06/2025 12:23:33

»2023, AM
»2023, PM
»2029 no dev, AM
»2029 no dev, PM
»2029 with dev, AM
»2029 with dev, PM
»2034 no dev, AM
»2034 no dev, PM
»2034 with dev, AM
»2034 with dev, PM
»2044 no dev, AM
»2044 no dev, PM
»2044 with dev, AM
»2044 with dev, PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (Veh)	Delay (s)	RFC	LOS	Set ID	Queue (Veh)	Delay (s)	RFC	LOS
	2023									
Arm 1	D1	0.7	2.81	0.40	A	D2	0.3	2.09	0.21	A
Arm 2		0.1	2.72	0.11	A		0.3	3.11	0.23	A
Arm 3		0.4	3.44	0.27	A		0.6	4.19	0.37	A
Arm 4		0.1	4.19	0.07	A		0.1	4.57	0.06	A
	2029 no dev									
Arm 1	D7	0.7	2.94	0.43	A	D8	0.3	2.12	0.22	A
Arm 2		0.1	2.76	0.12	A		0.3	3.19	0.25	A
Arm 3		0.4	3.53	0.29	A		0.6	4.37	0.39	A
Arm 4		0.1	4.27	0.07	A		0.1	4.68	0.06	A
	2029 with dev									
Arm 1	D9	0.8	3.07	0.45	A	D10	0.3	2.13	0.22	A
Arm 2		0.1	2.78	0.12	A		0.4	3.28	0.27	A
Arm 3		0.4	3.58	0.30	A		0.6	4.43	0.39	A
Arm 4		0.1	4.31	0.07	A		0.1	4.73	0.06	A
	2034 no dev									
Arm 1	D11	0.9	3.19	0.47	A	D12	0.3	2.19	0.24	A
Arm 2		0.2	2.85	0.13	A		0.4	3.36	0.27	A
Arm 3		0.5	3.70	0.32	A		0.8	4.76	0.43	A
Arm 4		0.1	4.41	0.08	A		0.1	4.90	0.07	A
	2034 with dev									
Arm 1	D13	1.0	3.35	0.49	A	D14	0.3	2.20	0.25	A
Arm 2		0.2	2.86	0.14	A		0.4	3.45	0.29	A
Arm 3		0.5	3.75	0.33	A		0.8	4.82	0.44	A
Arm 4		0.1	4.45	0.08	A		0.1	4.95	0.07	A
	2044 no dev									
Arm 1	D15	1.0	3.47	0.51	A	D16	0.4	2.26	0.27	A
Arm 2		0.2	2.94	0.15	A		0.4	3.53	0.30	A
Arm 3		0.5	3.89	0.35	A		0.9	5.20	0.48	A
Arm 4		0.1	4.56	0.09	A		0.1	5.13	0.08	A
	2044 with dev									
Arm 1	D17	1.2	3.66	0.54	A	D18	0.4	2.27	0.27	A
Arm 2		0.2	2.95	0.15	A		0.5	3.63	0.32	A
Arm 3		0.6	3.95	0.36	A		0.9	5.27	0.48	A
Arm 4		0.1	4.60	0.09	A		0.1	5.19	0.08	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	23/07/2024
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	ROADPLAN01\jbyrne
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	Veh	Veh	perHour	s	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75				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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓
D3	2027 no dev	AM	ONE HOUR	06:45	08:15	15	
D4	2027 no dev	PM	ONE HOUR	16:15	17:45	15	
D5	2027 construction phase	AM	ONE HOUR	06:45	08:15	15	
D6	2027 construction phase	PM	ONE HOUR	16:15	17:45	15	
D7	2029 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D8	2029 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D9	2029 with dev	AM	ONE HOUR	06:45	08:15	15	✓
D10	2029 with dev	PM	ONE HOUR	16:15	17:45	15	✓
D11	2034 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D12	2034 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D13	2034 with dev	AM	ONE HOUR	06:45	08:15	15	✓
D14	2034 with dev	PM	ONE HOUR	16:15	17:45	15	✓
D15	2044 no dev	AM	ONE HOUR	06:45	08:15	15	✓
D16	2044 no dev	PM	ONE HOUR	16:15	17:45	15	✓
D17	2044 with dev	AM	ONE HOUR	06:45	08:15	15	✓
D18	2044 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2023, 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	3.02	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	untitled	
2	untitled	
3	untitled	
4	untitled	

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	7.00	9.00	10.0	24.0	88.0	38.0	
2	3.75	8.50	26.0	21.0	88.0	56.0	
3	3.00	6.80	27.0	15.0	88.0	33.0	
4	3.20	5.00	7.5	13.0	88.0	33.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.560	2442
2	0.463	1865
3	0.447	1657
4	0.384	1231

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)	Run automatically
D1	2023	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	785	100.000
2		ONE HOUR	✓	151	100.000
3		ONE HOUR	✓	356	100.000
4		ONE HOUR	✓	55	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	22	398	349	16
	2	99	0	50	2
	3	254	97	2	3
	4	31	10	14	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.40	2.81	0.7	A	720	1080
2	0.11	2.72	0.1	A	139	208
3	0.27	3.44	0.4	A	327	490
4	0.07	4.19	0.1	A	50	76

Main Results for each time segment

06:45 - 07:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	591	148	92	2168	0.273	589	305	0.0	0.4	2.278	A
2	114	28	303	1555	0.073	113	379	0.0	0.1	2.496	A
3	268	67	104	1460	0.184	267	312	0.0	0.2	3.016	A
4	41	10	356	983	0.042	41	16	0.0	0.0	3.823	A

07:00 - 07:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	706	176	110	2158	0.327	705	365	0.4	0.5	2.478	A
2	136	34	362	1528	0.089	136	454	0.1	0.1	2.585	A
3	320	80	125	1451	0.221	320	373	0.2	0.3	3.182	A
4	49	12	426	956	0.052	49	19	0.0	0.1	3.971	A

07:15 - 07:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	864	216	135	2144	0.403	864	447	0.5	0.7	2.810	A
2	166	42	443	1490	0.112	166	556	0.1	0.1	2.718	A
3	392	98	153	1438	0.273	392	457	0.3	0.4	3.439	A
4	61	15	521	919	0.066	60	23	0.1	0.1	4.192	A

07:30 - 07:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	864	216	135	2144	0.403	864	447	0.7	0.7	2.812	A
2	166	42	444	1490	0.112	166	556	0.1	0.1	2.719	A
3	392	98	153	1438	0.273	392	457	0.4	0.4	3.439	A
4	61	15	522	919	0.066	61	23	0.1	0.1	4.193	A

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	706	176	111	2158	0.327	706	365	0.7	0.5	2.483	A
2	136	34	363	1527	0.089	136	454	0.1	0.1	2.588	A
3	320	80	125	1451	0.221	320	373	0.4	0.3	3.187	A
4	49	12	427	956	0.052	50	19	0.1	0.1	3.974	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	591	148	93	2168	0.273	591	306	0.5	0.4	2.283	A
2	114	28	304	1555	0.073	114	380	0.1	0.1	2.499	A
3	268	67	105	1460	0.184	268	313	0.3	0.2	3.020	A
4	41	10	357	982	0.042	41	16	0.1	0.0	3.828	A

2023, 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	3.21	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)	Run automatically
D2	2023	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	416	100.000
2		ONE HOUR	✓	317	100.000
3		ONE HOUR	✓	456	100.000
4		ONE HOUR	✓	42	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	24	60	297	35
	2	215	0	81	21
	3	401	34	0	21
	4	14	16	12	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.21	2.09	0.3	A	382	573
2	0.23	3.11	0.3	A	291	436
3	0.37	4.19	0.6	A	418	628
4	0.06	4.57	0.1	A	39	58

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	313	78	46	2194	0.143	313	491	0.0	0.2	1.913	A
2	239	60	276	1567	0.152	238	83	0.0	0.2	2.706	A
3	343	86	221	1408	0.244	342	293	0.0	0.3	3.373	A
4	32	8	506	925	0.034	31	58	0.0	0.0	4.028	A

16:30 - 16:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	374	93	56	2189	0.171	374	587	0.2	0.2	1.983	A
2	285	71	331	1542	0.185	285	99	0.2	0.2	2.862	A
3	410	102	265	1388	0.295	410	350	0.3	0.4	3.675	A
4	38	9	605	887	0.043	38	69	0.0	0.0	4.238	A

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	458	115	68	2182	0.210	458	719	0.2	0.3	2.088	A
2	349	87	405	1508	0.231	349	121	0.2	0.3	3.105	A
3	502	126	325	1362	0.369	501	429	0.4	0.6	4.182	A
4	46	12	741	835	0.055	46	85	0.0	0.1	4.564	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	458	115	68	2181	0.210	458	720	0.3	0.3	2.088	A
2	349	87	405	1508	0.231	349	121	0.3	0.3	3.106	A
3	502	126	325	1362	0.369	502	429	0.6	0.6	4.187	A
4	46	12	742	835	0.055	46	85	0.1	0.1	4.566	A

17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	374	93	56	2188	0.171	374	589	0.3	0.2	1.984	A
2	285	71	331	1542	0.185	285	99	0.3	0.2	2.866	A
3	410	102	265	1388	0.295	411	351	0.6	0.4	3.684	A
4	38	9	607	886	0.043	38	69	0.1	0.0	4.243	A

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	313	78	47	2194	0.143	313	493	0.2	0.2	1.916	A
2	239	60	277	1567	0.152	239	83	0.2	0.2	2.712	A
3	343	86	222	1407	0.244	344	294	0.4	0.3	3.387	A
4	32	8	508	924	0.034	32	58	0.0	0.0	4.032	A

2029 no 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	3.13	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)	Run automatically
D7	2029 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	830	100.000
2		ONE HOUR	✓	160	100.000
3		ONE HOUR	✓	377	100.000
4		ONE HOUR	✓	59	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	23	421	369	17
	2	105	0	53	2
	3	269	103	2	3
	4	33	11	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.43	2.94	0.7	A	762	1142
2	0.12	2.76	0.1	A	147	220
3	0.29	3.53	0.4	A	346	519
4	0.07	4.27	0.1	A	54	81

Main Results for each time segment

06:45 - 07:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	625	156	98	2165	0.289	623	323	0.0	0.4	2.333	A
2	120	30	320	1547	0.078	120	402	0.0	0.1	2.522	A
3	284	71	110	1457	0.195	283	330	0.0	0.2	3.061	A
4	44	11	377	975	0.046	44	17	0.0	0.0	3.868	A

07:00 - 07:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	746	187	118	2154	0.346	746	386	0.4	0.5	2.556	A
2	144	36	383	1518	0.095	144	481	0.1	0.1	2.619	A
3	339	85	132	1448	0.234	339	394	0.2	0.3	3.245	A
4	53	13	451	946	0.056	53	20	0.0	0.1	4.030	A

07:15 - 07:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	914	228	144	2139	0.427	913	473	0.5	0.7	2.935	A
2	176	44	469	1478	0.119	176	588	0.1	0.1	2.763	A
3	415	104	162	1434	0.289	415	483	0.3	0.4	3.527	A
4	65	16	552	907	0.072	65	24	0.1	0.1	4.273	A

07:30 - 07:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	914	228	144	2139	0.427	914	473	0.7	0.7	2.937	A
2	176	44	469	1478	0.119	176	589	0.1	0.1	2.764	A
3	415	104	162	1434	0.289	415	483	0.4	0.4	3.530	A
4	65	16	553	907	0.072	65	24	0.1	0.1	4.274	A

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	746	187	118	2154	0.346	747	387	0.7	0.5	2.560	A
2	144	36	383	1518	0.095	144	482	0.1	0.1	2.622	A
3	339	85	132	1448	0.234	339	395	0.4	0.3	3.251	A
4	53	13	452	946	0.056	53	20	0.1	0.1	4.032	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	625	156	99	2164	0.289	625	324	0.5	0.4	2.341	A
2	120	30	321	1547	0.078	121	403	0.1	0.1	2.523	A
3	284	71	111	1457	0.195	284	331	0.3	0.2	3.070	A
4	44	11	378	974	0.046	44	17	0.1	0.0	3.873	A

2029 no 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	3.32	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)	Run automatically
D8	2029 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	439	100.000
2		ONE HOUR	✓	335	100.000
3		ONE HOUR	✓	482	100.000
4		ONE HOUR	✓	45	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	25	63	314	37
	2	227	0	86	22
	3	424	36	0	22
	4	15	17	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.22	2.12	0.3	A	403	604
2	0.25	3.19	0.3	A	307	461
3	0.39	4.37	0.6	A	442	663
4	0.06	4.68	0.1	A	41	62

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	331	83	49	2192	0.151	330	518	0.0	0.2	1.933	A
2	252	63	292	1560	0.162	251	87	0.0	0.2	2.749	A
3	363	91	233	1402	0.259	361	310	0.0	0.3	3.453	A
4	34	8	534	914	0.037	34	61	0.0	0.0	4.088	A

16:30 - 16:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	395	99	59	2187	0.180	394	621	0.2	0.2	2.008	A
2	301	75	350	1533	0.196	301	104	0.2	0.2	2.920	A
3	433	108	279	1382	0.314	433	371	0.3	0.5	3.791	A
4	40	10	640	874	0.046	40	73	0.0	0.0	4.319	A

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	483	121	73	2179	0.222	483	760	0.2	0.3	2.122	A
2	369	92	428	1497	0.246	369	128	0.2	0.3	3.189	A
3	531	133	342	1354	0.392	530	454	0.5	0.6	4.365	A
4	50	12	783	819	0.061	49	89	0.0	0.1	4.679	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	483	121	73	2179	0.222	483	761	0.3	0.3	2.122	A
2	369	92	428	1497	0.246	369	128	0.3	0.3	3.190	A
3	531	133	342	1354	0.392	531	455	0.6	0.6	4.373	A
4	50	12	784	818	0.061	50	89	0.1	0.1	4.681	A

17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	395	99	59	2186	0.181	395	622	0.3	0.2	2.009	A
2	301	75	350	1533	0.196	301	104	0.3	0.2	2.922	A
3	433	108	280	1382	0.314	434	372	0.6	0.5	3.800	A
4	40	10	641	873	0.046	41	73	0.1	0.0	4.324	A

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	331	83	50	2192	0.151	331	521	0.2	0.2	1.934	A
2	252	63	293	1560	0.162	252	87	0.2	0.2	2.755	A
3	363	91	234	1402	0.259	363	311	0.5	0.4	3.468	A
4	34	8	537	913	0.037	34	61	0.0	0.0	4.093	A

2029 with 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	3.22	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)	Run automatically
D9	2029 with dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	873	100.000
2		ONE HOUR	✓	166	100.000
3		ONE HOUR	✓	387	100.000
4		ONE HOUR	✓	59	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	23	464	369	17
	2	111	0	53	2
	3	269	113	2	3
	4	33	11	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.45	3.07	0.8	A	801	1202
2	0.12	2.78	0.1	A	152	228
3	0.30	3.58	0.4	A	355	533
4	0.07	4.31	0.1	A	54	81

Main Results for each time segment

06:45 - 07:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	657	164	106	2160	0.304	655	327	0.0	0.4	2.390	A
2	125	31	320	1547	0.081	125	441	0.0	0.1	2.530	A
3	291	73	115	1455	0.200	290	330	0.0	0.2	3.087	A
4	44	11	389	970	0.046	44	17	0.0	0.0	3.887	A

07:00 - 07:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	785	196	127	2149	0.365	784	392	0.4	0.6	2.636	A
2	149	37	383	1518	0.098	149	528	0.1	0.1	2.629	A
3	348	87	137	1445	0.241	348	394	0.2	0.3	3.279	A
4	53	13	465	941	0.056	53	20	0.0	0.1	4.055	A

07:15 - 07:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	961	240	155	2133	0.451	960	480	0.6	0.8	3.067	A
2	183	46	469	1478	0.124	183	647	0.1	0.1	2.778	A
3	426	107	168	1432	0.298	426	483	0.3	0.4	3.576	A
4	65	16	570	901	0.072	65	24	0.1	0.1	4.307	A

07:30 - 07:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	961	240	155	2133	0.451	961	480	0.8	0.8	3.072	A
2	183	46	469	1478	0.124	183	647	0.1	0.1	2.778	A
3	426	107	168	1431	0.298	426	483	0.4	0.4	3.579	A
4	65	16	570	900	0.072	65	24	0.1	0.1	4.308	A

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	785	196	127	2149	0.365	786	392	0.8	0.6	2.644	A
2	149	37	383	1518	0.098	149	529	0.1	0.1	2.632	A
3	348	87	138	1445	0.241	348	395	0.4	0.3	3.284	A
4	53	13	466	940	0.056	53	20	0.1	0.1	4.059	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	657	164	106	2160	0.304	658	329	0.6	0.4	2.398	A
2	125	31	321	1547	0.081	125	443	0.1	0.1	2.531	A
3	291	73	115	1455	0.200	292	331	0.3	0.3	3.093	A
4	44	11	390	969	0.046	44	17	0.1	0.0	3.893	A

2029 with 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	3.36	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)	Run automatically
D10	2029 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	445	100.000
2		ONE HOUR	✓	362	100.000
3		ONE HOUR	✓	482	100.000
4		ONE HOUR	✓	45	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	25	69	314	37
	2	247	0	93	22
	3	424	36	0	22
	4	15	17	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.22	2.13	0.3	A	408	613
2	0.27	3.28	0.4	A	332	498
3	0.39	4.43	0.6	A	442	663
4	0.06	4.73	0.1	A	41	62

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	335	84	49	2192	0.153	334	533	0.0	0.2	1.938	A
2	273	68	292	1560	0.175	272	92	0.0	0.2	2.793	A
3	363	91	248	1396	0.260	361	315	0.0	0.3	3.476	A
4	34	8	549	909	0.037	34	61	0.0	0.0	4.115	A

16:30 - 16:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	400	100	59	2187	0.183	400	639	0.2	0.2	2.014	A
2	325	81	350	1533	0.212	325	110	0.2	0.3	2.979	A
3	433	108	297	1374	0.315	433	377	0.3	0.5	3.823	A
4	40	10	657	867	0.047	40	73	0.0	0.0	4.355	A

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	490	122	73	2179	0.225	490	782	0.2	0.3	2.130	A
2	399	100	428	1497	0.266	398	134	0.3	0.4	3.276	A
3	531	133	364	1344	0.395	530	462	0.5	0.6	4.418	A
4	50	12	805	810	0.061	49	89	0.0	0.1	4.731	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	490	122	73	2179	0.225	490	783	0.3	0.3	2.131	A
2	399	100	428	1497	0.266	399	134	0.4	0.4	3.276	A
3	531	133	364	1344	0.395	531	462	0.6	0.6	4.426	A
4	50	12	806	810	0.061	50	89	0.1	0.1	4.733	A

17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	400	100	59	2186	0.183	400	640	0.3	0.2	2.015	A
2	325	81	350	1533	0.212	326	110	0.4	0.3	2.981	A
3	433	108	298	1374	0.315	434	378	0.6	0.5	3.836	A
4	40	10	659	866	0.047	41	73	0.1	0.0	4.359	A

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	335	84	50	2192	0.153	335	536	0.2	0.2	1.940	A
2	273	68	293	1560	0.175	273	92	0.3	0.2	2.799	A
3	363	91	249	1395	0.260	363	316	0.5	0.4	3.491	A
4	34	8	552	908	0.037	34	61	0.0	0.0	4.120	A

2034 no 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	3.34	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)	Run automatically
D11	2034 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	912	100.000
2		ONE HOUR	✓	175	100.000
3		ONE HOUR	✓	413	100.000
4		ONE HOUR	✓	64	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	26	462	405	19
	2	115	0	58	2
	3	295	113	2	3
	4	36	12	16	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.47	3.19	0.9	A	837	1255
2	0.13	2.85	0.2	A	161	241
3	0.32	3.70	0.5	A	379	568
4	0.08	4.41	0.1	A	59	88

Main Results for each time segment

06:45 - 07:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	687	172	107	2160	0.318	685	354	0.0	0.5	2.437	A
2	132	33	351	1533	0.086	131	441	0.0	0.1	2.569	A
3	311	78	122	1452	0.214	310	361	0.0	0.3	3.148	A
4	48	12	413	961	0.050	48	18	0.0	0.1	3.943	A

07:00 - 07:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	820	205	128	2148	0.382	819	424	0.5	0.6	2.708	A
2	157	39	420	1501	0.105	157	527	0.1	0.1	2.679	A
3	371	93	146	1442	0.258	371	432	0.3	0.3	3.362	A
4	58	14	495	929	0.062	57	22	0.1	0.1	4.129	A

07:15 - 07:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1004	251	157	2132	0.471	1003	519	0.6	0.9	3.187	A
2	193	48	515	1457	0.132	193	646	0.1	0.2	2.846	A
3	455	114	178	1427	0.319	454	529	0.3	0.5	3.698	A
4	70	18	606	887	0.079	70	26	0.1	0.1	4.410	A

07:30 - 07:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1004	251	157	2132	0.471	1004	520	0.9	0.9	3.192	A
2	193	48	515	1457	0.132	193	646	0.2	0.2	2.847	A
3	455	114	178	1427	0.319	455	530	0.5	0.5	3.701	A
4	70	18	607	886	0.079	70	26	0.1	0.1	4.411	A

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	820	205	129	2148	0.382	821	425	0.9	0.6	2.717	A
2	157	39	421	1500	0.105	157	528	0.2	0.1	2.682	A
3	371	93	146	1442	0.258	372	433	0.5	0.3	3.368	A
4	58	14	496	929	0.062	58	22	0.1	0.1	4.131	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	687	172	108	2159	0.318	687	356	0.6	0.5	2.445	A
2	132	33	353	1532	0.086	132	442	0.1	0.1	2.570	A
3	311	78	122	1452	0.214	311	362	0.3	0.3	3.157	A
4	48	12	415	960	0.050	48	18	0.1	0.1	3.950	A

2034 no 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	3.53	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)	Run automatically
D12	2034 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	484	100.000
2		ONE HOUR	✓	368	100.000
3		ONE HOUR	✓	528	100.000
4		ONE HOUR	✓	49	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	28	70	345	41
	2	250	0	94	24
	3	465	39	0	24
	4	16	19	14	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.24	2.19	0.3	A	444	666
2	0.27	3.36	0.4	A	338	507
3	0.43	4.76	0.8	A	485	727
4	0.07	4.90	0.1	A	45	67

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	364	91	54	2189	0.166	364	569	0.0	0.2	1.970	A
2	277	69	321	1546	0.179	276	96	0.0	0.2	2.833	A
3	398	99	257	1392	0.286	396	340	0.0	0.4	3.608	A
4	37	9	587	894	0.041	37	67	0.0	0.0	4.197	A

16:30 - 16:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	435	109	65	2183	0.199	435	682	0.2	0.2	2.058	A
2	331	83	385	1517	0.218	331	115	0.2	0.3	3.033	A
3	475	119	308	1369	0.347	474	407	0.4	0.5	4.019	A
4	44	11	702	850	0.052	44	80	0.0	0.1	4.467	A

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	533	133	79	2175	0.245	533	835	0.2	0.3	2.191	A
2	405	101	471	1477	0.274	405	141	0.3	0.4	3.357	A
3	581	145	377	1338	0.434	580	498	0.5	0.8	4.744	A
4	54	13	860	789	0.068	54	98	0.1	0.1	4.894	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	533	133	79	2175	0.245	533	836	0.3	0.3	2.191	A
2	405	101	471	1477	0.274	405	141	0.4	0.4	3.357	A
3	581	145	378	1338	0.434	581	499	0.8	0.8	4.756	A
4	54	13	861	789	0.068	54	98	0.1	0.1	4.897	A

17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	435	109	65	2183	0.199	435	683	0.3	0.2	2.061	A
2	331	83	385	1517	0.218	331	115	0.4	0.3	3.038	A
3	475	119	309	1369	0.347	476	408	0.8	0.5	4.033	A
4	44	11	704	849	0.052	44	80	0.1	0.1	4.472	A

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	364	91	54	2189	0.166	365	572	0.2	0.2	1.974	A
2	277	69	322	1546	0.179	277	96	0.3	0.2	2.839	A
3	398	99	258	1391	0.286	398	341	0.5	0.4	3.625	A
4	37	9	589	893	0.041	37	67	0.1	0.0	4.206	A

2034 with 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	3.44	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)	Run automatically
D13	2034 with dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	955	100.000
2		ONE HOUR	✓	181	100.000
3		ONE HOUR	✓	423	100.000
4		ONE HOUR	✓	64	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	26	505	405	19
	2	121	0	58	2
	3	295	123	2	3
	4	36	12	16	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.49	3.35	1.0	A	876	1314
2	0.14	2.86	0.2	A	166	249
3	0.33	3.75	0.5	A	388	582
4	0.08	4.45	0.1	A	59	88

Main Results for each time segment

06:45 - 07:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	719	180	115	2155	0.334	717	359	0.0	0.5	2.499	A
2	136	34	351	1533	0.089	136	480	0.0	0.1	2.577	A
3	318	80	126	1450	0.220	317	361	0.0	0.3	3.174	A
4	48	12	425	956	0.050	48	18	0.0	0.1	3.963	A

07:00 - 07:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	859	215	137	2143	0.401	858	429	0.5	0.7	2.800	A
2	163	41	420	1501	0.108	163	575	0.1	0.1	2.690	A
3	380	95	151	1439	0.264	380	432	0.3	0.4	3.398	A
4	58	14	509	924	0.062	57	22	0.1	0.1	4.155	A

07:15 - 07:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1051	263	168	2125	0.495	1050	526	0.7	1.0	3.345	A
2	199	50	515	1457	0.137	199	704	0.1	0.2	2.861	A
3	466	116	185	1424	0.327	465	529	0.4	0.5	3.752	A
4	70	18	624	880	0.080	70	26	0.1	0.1	4.446	A

07:30 - 07:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1051	263	168	2125	0.495	1051	526	1.0	1.0	3.351	A
2	199	50	515	1457	0.137	199	705	0.2	0.2	2.862	A
3	466	116	185	1424	0.327	466	530	0.5	0.5	3.755	A
4	70	18	624	880	0.080	70	26	0.1	0.1	4.448	A

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	859	215	138	2143	0.401	860	430	1.0	0.7	2.808	A
2	163	41	421	1500	0.108	163	576	0.2	0.1	2.693	A
3	380	95	151	1439	0.264	381	433	0.5	0.4	3.402	A
4	58	14	510	923	0.062	58	22	0.1	0.1	4.159	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	719	180	115	2155	0.334	720	360	0.7	0.5	2.510	A
2	136	34	353	1532	0.089	136	482	0.1	0.1	2.579	A
3	318	80	127	1450	0.220	319	362	0.4	0.3	3.184	A
4	48	12	427	955	0.050	48	18	0.1	0.1	3.968	A

2034 with 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	3.58	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)	Run automatically
D14	2034 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	490	100.000
2		ONE HOUR	✓	395	100.000
3		ONE HOUR	✓	528	100.000
4		ONE HOUR	✓	49	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	28	76	345	41
	2	270	0	101	24
	3	465	39	0	24
	4	16	19	14	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.25	2.20	0.3	A	450	674
2	0.29	3.45	0.4	A	362	544
3	0.44	4.82	0.8	A	485	727
4	0.07	4.95	0.1	A	45	67

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	369	92	54	2189	0.168	368	584	0.0	0.2	1.975	A
2	297	74	321	1546	0.192	296	101	0.0	0.2	2.879	A
3	398	99	272	1385	0.287	396	345	0.0	0.4	3.633	A
4	37	9	602	888	0.042	37	67	0.0	0.0	4.225	A

16:30 - 16:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	440	110	65	2184	0.202	440	700	0.2	0.3	2.065	A
2	355	89	385	1517	0.234	355	120	0.2	0.3	3.096	A
3	475	119	326	1361	0.349	474	413	0.4	0.5	4.056	A
4	44	11	720	843	0.052	44	80	0.0	0.1	4.506	A

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	540	135	79	2175	0.248	539	857	0.3	0.3	2.200	A
2	435	109	471	1477	0.294	434	147	0.3	0.4	3.450	A
3	581	145	399	1328	0.438	580	506	0.5	0.8	4.807	A
4	54	13	882	781	0.069	54	98	0.1	0.1	4.951	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	540	135	79	2175	0.248	539	858	0.3	0.3	2.200	A
2	435	109	471	1477	0.294	435	148	0.4	0.4	3.453	A
3	581	145	400	1328	0.438	581	506	0.8	0.8	4.819	A
4	54	13	883	780	0.069	54	98	0.1	0.1	4.954	A

17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	440	110	65	2183	0.202	441	701	0.3	0.3	2.067	A
2	355	89	385	1517	0.234	356	121	0.4	0.3	3.099	A
3	475	119	327	1361	0.349	476	414	0.8	0.5	4.072	A
4	44	11	722	842	0.052	44	80	0.1	0.1	4.512	A

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	369	92	54	2189	0.169	369	587	0.3	0.2	1.979	A
2	297	74	322	1546	0.192	298	101	0.3	0.2	2.883	A
3	398	99	274	1385	0.287	398	347	0.5	0.4	3.650	A
4	37	9	604	887	0.042	37	67	0.1	0.0	4.235	A

2044 no 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	3.57	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)	Run automatically
D15	2044 no dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	988	100.000
2		ONE HOUR	✓	191	100.000
3		ONE HOUR	✓	449	100.000
4		ONE HOUR	✓	70	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	28	501	439	20
	2	125	0	63	3
	3	320	122	3	4
	4	39	13	18	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.51	3.47	1.0	A	907	1360
2	0.15	2.94	0.2	A	175	263
3	0.35	3.89	0.5	A	412	618
4	0.09	4.56	0.1	A	64	96

Main Results for each time segment

06:45 - 07:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	744	186	117	2154	0.345	742	384	0.0	0.5	2.546	A
2	144	36	381	1519	0.095	143	477	0.0	0.1	2.617	A
3	338	85	132	1448	0.233	337	393	0.0	0.3	3.238	A
4	53	13	449	947	0.056	52	20	0.0	0.1	4.023	A

07:00 - 07:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	888	222	140	2141	0.415	887	460	0.5	0.7	2.870	A
2	172	43	456	1484	0.116	172	571	0.1	0.1	2.742	A
3	404	101	158	1436	0.281	403	470	0.3	0.4	3.485	A
4	63	16	537	913	0.069	63	24	0.1	0.1	4.233	A

07:15 - 07:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1088	272	172	2124	0.512	1086	563	0.7	1.0	3.466	A
2	210	53	559	1437	0.146	210	699	0.1	0.2	2.934	A
3	494	124	194	1420	0.348	494	575	0.4	0.5	3.883	A
4	77	19	658	867	0.089	77	30	0.1	0.1	4.557	A

07:30 - 07:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1088	272	172	2124	0.512	1088	564	1.0	1.0	3.474	A
2	210	53	559	1436	0.146	210	700	0.2	0.2	2.935	A
3	494	124	194	1420	0.348	494	576	0.5	0.5	3.888	A
4	77	19	658	867	0.089	77	30	0.1	0.1	4.559	A

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	888	222	140	2141	0.415	890	461	1.0	0.7	2.881	A
2	172	43	457	1484	0.116	172	573	0.2	0.1	2.744	A
3	404	101	158	1436	0.281	404	471	0.5	0.4	3.490	A
4	63	16	538	913	0.069	63	24	0.1	0.1	4.238	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	744	186	118	2154	0.345	745	386	0.7	0.5	2.555	A
2	144	36	383	1518	0.095	144	479	0.1	0.1	2.621	A
3	338	85	133	1447	0.234	338	394	0.4	0.3	3.248	A
4	53	13	451	946	0.056	53	20	0.1	0.1	4.030	A

2044 no 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	3.77	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)	Run automatically
D16	2044 no dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	524	100.000
2		ONE HOUR	✓	399	100.000
3		ONE HOUR	✓	574	100.000
4		ONE HOUR	✓	53	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	30	76	374	44
	2	271	0	102	26
	3	505	43	0	26
	4	18	20	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.27	2.26	0.4	A	481	721
2	0.30	3.53	0.4	A	366	549
3	0.48	5.20	0.9	A	527	790
4	0.08	5.13	0.1	A	49	73

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	394	99	58	2187	0.180	394	618	0.0	0.2	2.006	A
2	300	75	348	1534	0.196	299	104	0.0	0.2	2.911	A
3	432	108	278	1382	0.313	430	369	0.0	0.5	3.775	A
4	40	10	637	875	0.046	40	72	0.0	0.0	4.309	A

16:30 - 16:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	471	118	70	2180	0.216	471	740	0.2	0.3	2.105	A
2	359	90	416	1503	0.239	358	125	0.2	0.3	3.146	A
3	516	129	333	1358	0.380	515	441	0.5	0.6	4.270	A
4	48	12	762	827	0.058	48	86	0.0	0.1	4.620	A

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	577	144	86	2172	0.266	577	906	0.3	0.4	2.257	A
2	439	110	509	1459	0.301	439	153	0.3	0.4	3.525	A
3	632	158	408	1324	0.477	631	540	0.6	0.9	5.181	A
4	58	15	933	761	0.077	58	106	0.1	0.1	5.121	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	577	144	86	2172	0.266	577	907	0.4	0.4	2.257	A
2	439	110	510	1459	0.301	439	153	0.4	0.4	3.528	A
3	632	158	408	1324	0.477	632	541	0.9	0.9	5.199	A
4	58	15	935	761	0.077	58	106	0.1	0.1	5.125	A

17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	471	118	70	2180	0.216	471	742	0.4	0.3	2.108	A
2	359	90	417	1502	0.239	359	125	0.4	0.3	3.149	A
3	516	129	334	1358	0.380	517	442	0.9	0.6	4.289	A
4	48	12	765	826	0.058	48	86	0.1	0.1	4.628	A

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	394	99	59	2187	0.180	395	621	0.3	0.2	2.008	A
2	300	75	349	1534	0.196	301	105	0.3	0.2	2.921	A
3	432	108	280	1382	0.313	433	370	0.6	0.5	3.797	A
4	40	10	640	874	0.046	40	72	0.1	0.0	4.319	A

2044 with 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	3.70	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)	Run automatically
D17	2044 with dev	AM	ONE HOUR	06:45	08:15	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1031	100.000
2		ONE HOUR	✓	197	100.000
3		ONE HOUR	✓	459	100.000
4		ONE HOUR	✓	70	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	28	544	439	20
	2	131	0	63	3
	3	320	132	3	4
	4	39	13	18	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.54	3.66	1.2	A	946	1419
2	0.15	2.95	0.2	A	181	271
3	0.36	3.95	0.6	A	421	632
4	0.09	4.60	0.1	A	64	96

Main Results for each time segment

06:45 - 07:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	776	194	125	2150	0.361	774	389	0.0	0.6	2.611	A
2	148	37	381	1519	0.098	148	517	0.0	0.1	2.626	A
3	346	86	137	1446	0.239	344	393	0.0	0.3	3.266	A
4	53	13	461	942	0.056	52	20	0.0	0.1	4.044	A

07:00 - 07:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	927	232	149	2136	0.434	926	465	0.6	0.8	2.973	A
2	177	44	456	1484	0.119	177	619	0.1	0.1	2.753	A
3	413	103	164	1434	0.288	412	470	0.3	0.4	3.524	A
4	63	16	552	908	0.069	63	24	0.1	0.1	4.261	A

07:15 - 07:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1135	284	183	2117	0.536	1134	570	0.8	1.1	3.652	A
2	217	54	559	1437	0.151	217	758	0.1	0.2	2.950	A
3	505	126	200	1417	0.357	505	575	0.4	0.6	3.942	A
4	77	19	675	860	0.090	77	30	0.1	0.1	4.596	A

07:30 - 07:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1135	284	183	2117	0.536	1135	570	1.1	1.2	3.664	A
2	217	54	559	1436	0.151	217	759	0.2	0.2	2.951	A
3	505	126	200	1417	0.357	505	576	0.6	0.6	3.947	A
4	77	19	676	860	0.090	77	30	0.1	0.1	4.598	A

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	927	232	149	2136	0.434	928	466	1.2	0.8	2.984	A
2	177	44	457	1484	0.119	177	620	0.2	0.1	2.757	A
3	413	103	164	1434	0.288	413	471	0.6	0.4	3.532	A
4	63	16	553	907	0.069	63	24	0.1	0.1	4.266	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	776	194	125	2150	0.361	777	390	0.8	0.6	2.625	A
2	148	37	383	1518	0.098	148	519	0.1	0.1	2.628	A
3	346	86	137	1445	0.239	346	394	0.4	0.3	3.274	A
4	53	13	463	942	0.056	53	20	0.1	0.1	4.049	A

2044 with 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	3.82	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)	Run automatically
D18	2044 with dev	PM	ONE HOUR	16:15	17:45	15	✓

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		ONE HOUR	✓	530	100.000
2		ONE HOUR	✓	426	100.000
3		ONE HOUR	✓	574	100.000
4		ONE HOUR	✓	53	100.000

Origin-Destination Data

Demand (Veh/hr)

		To			
		1	2	3	4
From	1	30	82	374	44
	2	291	0	109	26
	3	505	43	0	26
	4	18	20	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	10	10	10	10
	2	10	10	10	10
	3	10	10	10	10
	4	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
1	0.27	2.27	0.4	A	486	730
2	0.32	3.63	0.5	A	391	586
3	0.48	5.27	0.9	A	527	790
4	0.08	5.19	0.1	A	49	73

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	399	100	58	2187	0.182	398	633	0.0	0.2	2.011	A
2	321	80	348	1534	0.209	320	109	0.0	0.3	2.961	A
3	432	108	293	1376	0.314	430	374	0.0	0.5	3.802	A
4	40	10	652	869	0.046	40	72	0.0	0.0	4.339	A

16:30 - 16:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	476	119	70	2180	0.219	476	758	0.2	0.3	2.112	A
2	383	96	416	1503	0.255	383	130	0.3	0.3	3.214	A
3	516	129	351	1350	0.382	515	447	0.5	0.6	4.311	A
4	48	12	780	820	0.058	48	86	0.0	0.1	4.661	A

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	584	146	86	2172	0.269	583	928	0.3	0.4	2.266	A
2	469	117	509	1459	0.321	469	159	0.3	0.5	3.631	A
3	632	158	430	1315	0.481	631	548	0.6	0.9	5.254	A
4	58	15	955	753	0.078	58	106	0.1	0.1	5.183	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	584	146	86	2172	0.269	584	929	0.4	0.4	2.266	A
2	469	117	510	1459	0.321	469	160	0.5	0.5	3.634	A
3	632	158	430	1314	0.481	632	548	0.9	0.9	5.274	A
4	58	15	957	752	0.078	58	106	0.1	0.1	5.188	A

17:15 - 17:30

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	476	119	70	2180	0.219	477	760	0.4	0.3	2.114	A
2	383	96	417	1502	0.255	383	131	0.5	0.3	3.217	A
3	516	129	352	1350	0.382	517	448	0.9	0.6	4.332	A
4	48	12	783	819	0.058	48	86	0.1	0.1	4.669	A

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	399	100	59	2187	0.182	399	636	0.3	0.2	2.013	A
2	321	80	349	1534	0.209	321	109	0.3	0.3	2.970	A
3	432	108	295	1375	0.314	433	375	0.6	0.5	3.824	A
4	40	10	655	868	0.046	40	72	0.1	0.0	4.348	A

APPENDIX 17

APPENDIX 17-1

Calafort Phort Láirge
Port of Waterford

Environmental Policy

Port of Waterford is committed to reducing the impact of its activities on the environment
To this end, Port of Waterford has implemented an environmental management system to continually improve its environmental performance.
In order to meet this commitment Port of Waterford will pursue the following objectives:

- To ensure compliance with all applicable national and European environmental legislation and regulations
- To reduce emissions, prevent pollution and to improve waste management practices
- To reduce consumption of natural resources and to use energy responsibly and efficiently
- To minimise noise and other nuisances
- To assist in the management of ecology and promote biodiversity wherever possible.
- To give due consideration to the impact of climate change to our operations and activities.
- To continuously assess our environmental performance
- To continually improve by setting and reviewing environmental objective and targets
- To work continuously to improve the environmental aspects of any task(s), including influencing our stakeholders to adopt environmentally conscious design of projects, and use of environmental assessment tools.
- To ensure a thorough investigation of environmental incidents which occur on PoW sites.
- To ensure that all POW personnel are aware of their responsibilities.
- To make its environmental information available to interested parties

The necessary personnel and financial resources will be allocated to assist Port of Waterford in meeting its environmental objectives and targets that will be reviewed as appropriate. In addition, Port of Waterford will continue to raise the levels of environmental awareness throughout its workforce and to promote this awareness to all its stakeholders.

Port of Waterford is committed to operating its Environmental Management System in a manner that attains and sustains compliance to the international Environmental Management Standard ISO 14001:2015.

Signed _____ *Date* 13.8.24

David Sinnott *Chief Executive*

APPENDIX 18

APPENDIX 18-1

CONFIRMATION OF FEASIBILITY

Eimear Sharkey

3-4 Canada Street
Waterford

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Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

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28 May 2025

Our Ref: CDS24006776 Pre-Connection Enquiry
Site at, Belview Port Slieverue, Kilkenny

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Multi/Mixed Use Development of 4 unit(s) at Site at, Belview Port Slieverue, Kilkenny, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible without infrastructure upgrade by Uisce Éireann
- **Wastewater Connection** - Feasible without infrastructure upgrade by Uisce Éireann

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

Where can you find more information?

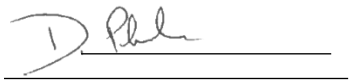
- **Section A -** What is important to know?

Stiúrthóirí / Directors: Niall Gleeson (POF / CEO), Jerry Grant (Cathaoirleach / Chairperson), Gerard Britchfield, Liz Joyce, Michael Nolan, Patricia King, Eileen Maher, Cathy Mannion, Paul Reid, Michael Walsh.
Oifig Chláraithe / Registered Office: Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin, Ireland D01NP86
Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Uisce Éireann is a designated activity company, limited by shares.
Cláraithe in Éirinn Uimh.: 530363 / Registered in Ireland No.: 530363.

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

For any further information, visit **www.water.ie/connections**, **email** **newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



Dermot Phelan
Connections Delivery Manager

Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)