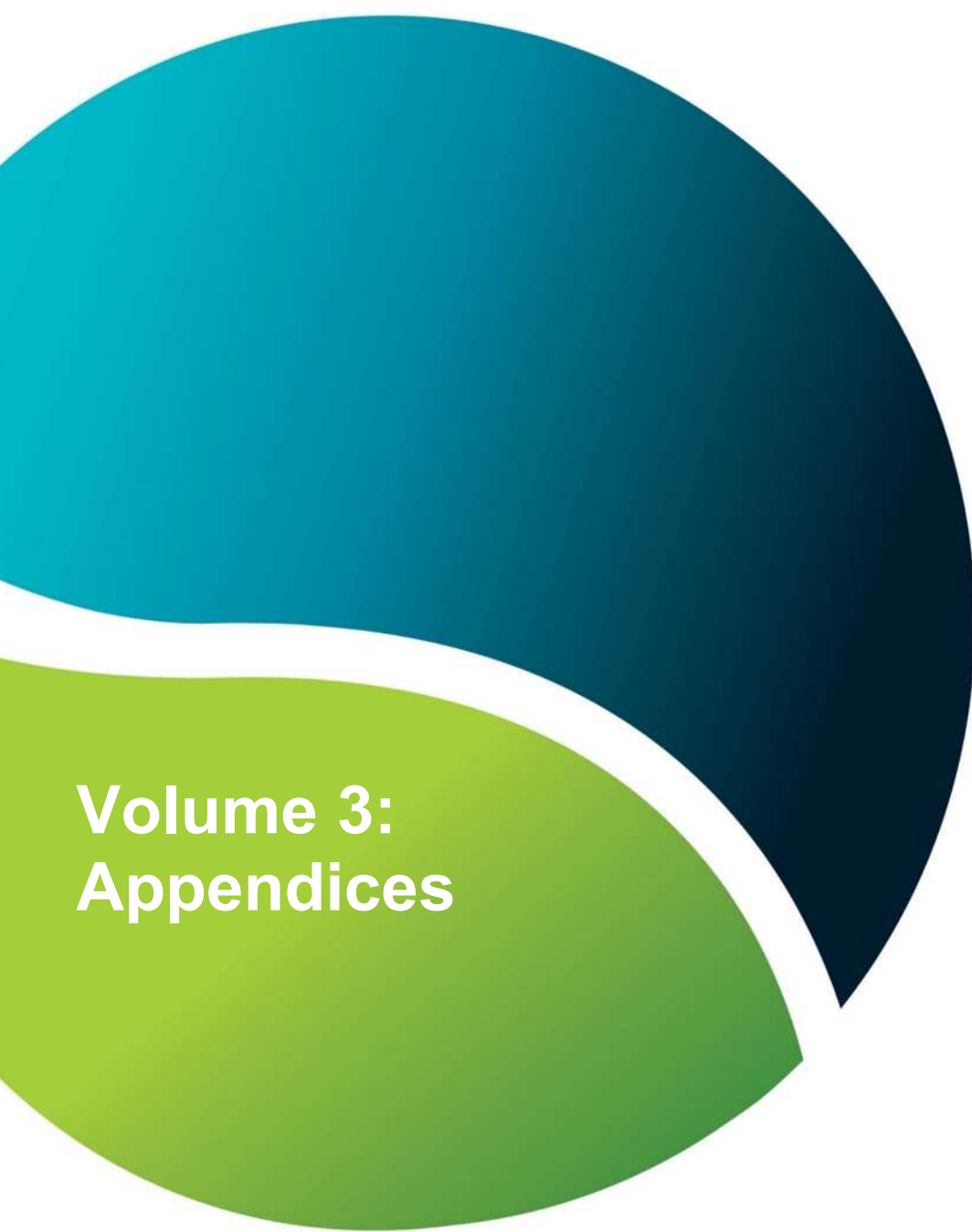




Volume 3: Appendices

PRESENTED TO

**Rathcool Flying Club
Townland of Rathcoole, Co. Cork**

DATE

February 2026

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Species name	Date of last record	Designation
Barn Owl (<i>Tyto alba</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Red List
Barn Swallow (<i>Hirundo rustica</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Black-headed Gull (<i>Larus ridibundus</i>)	29/02/1984	Wildlife Acts, Birds of Conservation Concern - Red List
Common Coot (<i>Fulica atra</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Common Kestrel (<i>Falco tinnunculus</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Common Kingfisher (<i>Alcedo atthis</i>)	31/12/2011	Wildlife Acts, Annex I Bird Species, Birds of Conservation Concern - Amber List
Common Linnet (<i>Carduelis cannabina</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Common Pheasant (<i>Phasianus colchicus</i>)	31/12/2011	Wildlife Acts
Common Sandpiper (<i>Actitis hypoleucos</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Common Snipe (<i>Gallinago gallinago</i>)	06/02/2019	Wildlife Acts, Birds of Conservation Concern - Amber List
Common Starling (<i>Sturnus vulgaris</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Common Swift (<i>Apus apus</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Common Wood Pigeon (<i>Columba palumbus</i>)	31/12/2011	Wildlife Acts
Corn Crane (<i>Crex crex</i>)	31/07/1972	Wildlife Acts, Annex I Bird Species, Birds of Conservation Concern - Red List
Eurasian Curlew (<i>Numenius arquata</i>)	29/02/1984	Wildlife Acts, Birds of Conservation Concern - Red List
Eurasian Teal (<i>Anas crecca</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Eurasian Woodcock (<i>Scolopax rusticola</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Great Cormorant (<i>Phalacrocorax carbo</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Hen Harrier (<i>Circus cyaneus</i>)	31/12/2011	Wildlife Acts, Annex I Bird Species, Birds of Conservation Concern - Amber List
House Martin (<i>Delichon urbicum</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
House Sparrow (<i>Passer domesticus</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Little Grebe (<i>Tachybaptus ruficollis</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Mallard (<i>Anas platyrhynchos</i>)	31/12/2011	Wildlife Acts
Mute Swan (<i>Cygnus olor</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Northern Lapwing (<i>Vanellus vanellus</i>)	29/02/1984	Wildlife Acts, Birds of Conservation Concern - Red List
Northern Wheatear (<i>Oenanthe oenanthe</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Rock Pigeon (<i>Columba livia</i>)	31/12/2011	Wildlife Acts
Sand Martin (<i>Riparia riparia</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List

Sky Lark (<i>Alauda arvensis</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Spotted Flycatcher (<i>Muscicapa striata</i>)	31/12/2011	Wildlife Acts, Birds of Conservation Concern - Amber List
Yellowhammer (<i>Emberiza citrinella</i>)	29/02/1984	Wildlife Acts, Birds of Conservation Concern - Red List
Canadian Waterweed (<i>Elodea canadensis</i>)	15/09/2009	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Japanese Knotweed (<i>Fallopia japonica</i>)	11/08/2017	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Sycamore (<i>Acer pseudoplatanus</i>)	15/09/2009	Medium Impact Invasive Species
Freshwater Pearl Mussel (<i>Margaritifera (Margaritifera) margaritifera</i>)	26/07/2006	Annex II, Annex V, Wildlife Acts
American Mink (<i>Mustela vison</i>)	27/09/2015	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Eurasian Badger (<i>Meles meles</i>)	31/12/2005	Wildlife Acts
European Otter (<i>Lutra lutra</i>)	05/09/2015	Annex II, Annex IV, Wildlife Acts
Sika Deer (<i>Cervus nippon</i>)	31/12/2008	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland), Wildlife Acts

Appendix 5-2

Natura Impact Statement

Development at Rathcoole Aerodrome

Co. Cork

Report prepared for Rathcool Flying Club

By Karen Banks MCIEEM

13th October 2025



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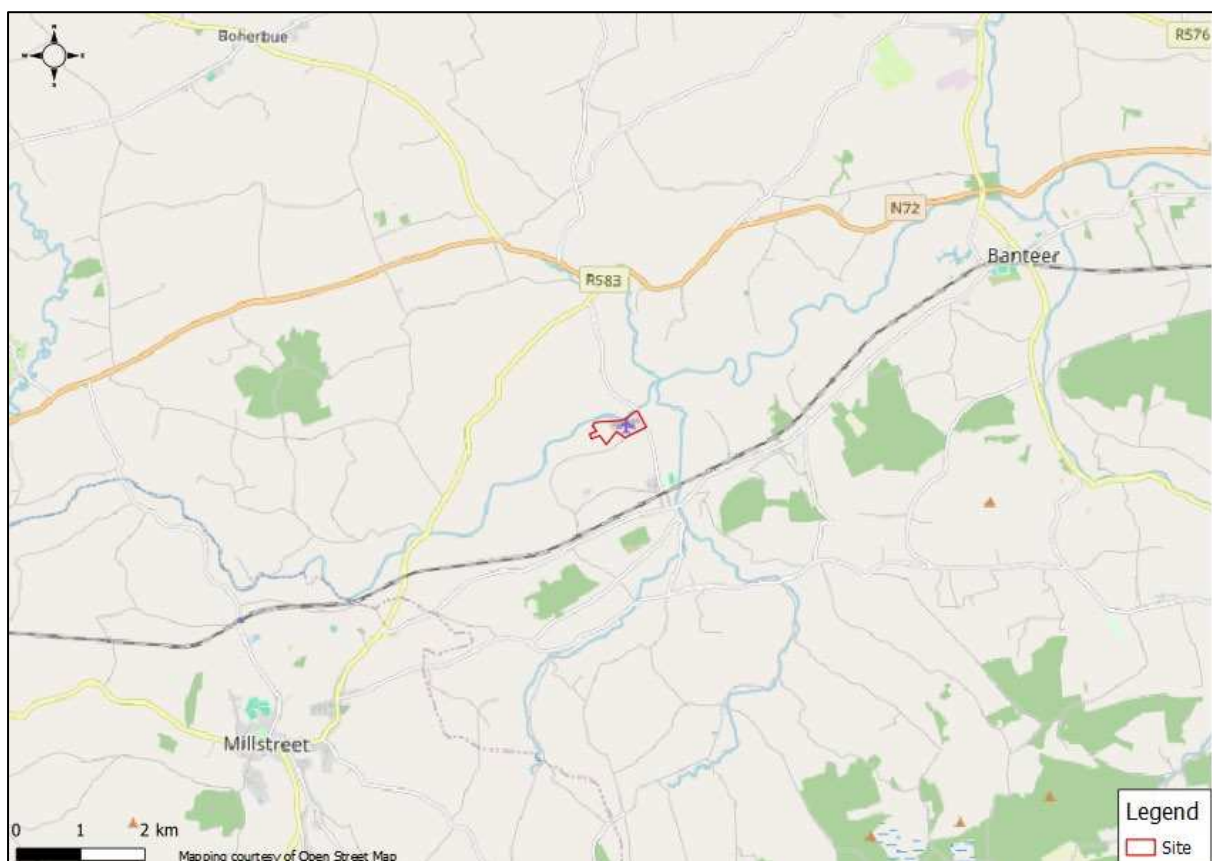
Appendix A	Appropriate Assessment Screening Report
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1 Introduction

This Natura Impact Statement (NIS) provides information in support of the Appropriate Assessment (AA), prepared by Greenleaf Ecology on behalf of Rathcoole Flying Club, in respect of the proposed Development at Rathcoole Aerodrome, Co. Cork (hereafter referred to as “the proposed development”). This report provides information and appraises the potential that the proposed development, alone or in combination with other plans and projects, will have an adverse effect on the integrity of European sites in view of best scientific knowledge and the conservation objectives of the sites. European sites are those identified as sites of European Community importance designated as Special Areas of Conservation under the Habitats Directive (92/43/EEC) or as Special Protection Areas under the Birds Directive (79/409/ECC as codified by Directive 2009/147/EC).

The proposed development is described in Section 1.2 of this report. The location of the proposed development is illustrated in Figure 1-1.

Figure 1-1: Site Location Map



1.1 Statement of Competence

This NIS has been prepared by Karen Banks. Karen is an ecologist with 18 years' experience in the field of ecological assessment. She holds a BSc (Hons) in Environment and Development from Durham University and is a full member of the Chartered Institute of Ecology and Environmental Management. Karen has extensive experience in ecological field survey and impact assessment. In her career as an ecologist Karen has completed reports to inform Appropriate Assessments (AA) covering the transport, energy and land use sectors, with work including assessment of Plans at the national, regional and local level, and numerous AAs of projects.

1.2 Description of the Project

The construction of a hard surfaced runway (740m in length) and taxiway (147.6m in length) with associated ground level lighting, associated interceptors, along with the demolition of an existing hangar to the east of the site and construction of a replacement hangar of approximately the same size and design to the west of the site; the demolition of the existing operations building and paramedic base building to the east of the site, and construction of a new operations and paramedic base building to the west of the site; and the demolition of an existing helipad to the east of the site, and construction of a new helipad to the west of the site, all associated with the HSE Air Ambulance. The development is to be served by a new proprietary waste water treatment system and includes the closure of an existing vehicular entrance onto the L-5215-0 road and its relocation further west along the same road, the upgrade of an existing entrance onto the L-5215-0 road, site landscaping and all other associated site development works. An Environmental Impact Assessment Report (EIAR) has been prepared and will be submitted to the Planning Authority with the application. The EIAR will be available for inspection or purchase at a fee not exceeding the reasonable cost of making a copy during office hours at the offices of the Planning Authority. A Natura Impact Statement will be submitted to the planning authority with the application. The Natura Impact Statement will be available for inspection or purchase at a fee not exceeding the reasonable cost of making a copy during office hours at the offices of the Planning Authority.

1.2.1 Surface Water

It is proposed to use nature-based, slow-draining solutions and on-site attenuation and infiltration of surface water. The following measures are proposed:

- Grass filter strips of a 5m width with a pea gravel spreader at the edge of the runway/taxiway
- Filter drains filled with stone/gravel at the foot of the filter strips
- Run-off water from the runway filter drains will be conveyed via hydrocarbon separators to attenuation/ soakaways systems

The run-off from the roofs of the re-located air ambulance base will pass through a silt trap to 1 no. soakaway.

Run-off from the concrete apron and heli-pad will drain to gullies and will be conveyed through a full-retention hydrocarbon separator to 1 no. soakaway to the north of the proposed hangar.

1.2.2 Foul Water

Foul water will be treated by a tertiary treatment system and infiltration/ treatment area. A Tri-cel secondary wastewater system and PuraFlo Tertiary 2 Module Filter on a 250 square metre gravel bed is proposed.

1.3 Study Area and Zone of Influence

The proposed development comprises development to an aerodrome at Rathcoole, Co. Cork (Refer to Figure 1-1).

Determination of this project's Zone of Influence (Zoi) was achieved by assessing all elements of the proposed project against the ecological receptors within the proposed project footprint, in addition to all ecological receptors that could be connected to and subsequently impacted by the proposed project through impact pathways. To this end, the zone of influence extends outside of the proposed aerodrome development works footprint to include ecological receptors connected to the project through overlap / intersection, proximity and connectivity through features such as watercourses.

The proposed site is located adjacent to the Blackwater (Munster) River and Blackwater River (Cork/Waterford) SAC (Site Code: 002170) (see Figure 3-1).

1.4 Findings of the Screening for Appropriate Assessment

The proposed development will require site clearance and excavation works for construction of the runway, taxiway, drainage trenches and new air ambulance base. There is potential for run-off of deleterious substances from these works to the surrounding environment. Potential conduits to the Blackwater (Munster) River and Blackwater River (Cork/Waterford) SAC include the drainage ditch at the proposed site, which drains into the Rathcool River c.0.4km to the east of the proposed site, the Rathcool River then flows into the Blackwater (Munster) River a further 0.3km downstream (i.e. a total of 0.6km downstream of the proposed site; there is also potential for overland flow of surface water from the proposed works into the Blackwater (Munster) River. There is potential for likely significant effects on semi-aquatic and aquatic QI species as a result of disturbance and degradation of water quality within Blackwater River (Cork/Waterford) during the construction phase.

1.5 NIS Objectives

This NIS considers impacts to Blackwater River (Cork/ Waterford) SAC. The study focuses on the suitability and importance of the study area for aquatic and semi-aquatic species such as otter, salmon freshwater pearl mussel and lamprey designated as part of this European Site. Potential impacts, such as the release of water borne pollutants to Blackwater River (Cork/ Waterford) SAC are considered in this assessment.

2 Methodology

2.1 Legislative Background for Appropriate Assessment

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, better known as “The Habitats Directive”, provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of sites known as Natura 2000. As defined under the Habitats Directive (Article 3(1)) Natura 2000 is a European ecological network composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range.

In Ireland, these sites are designated as European sites and include SPAs, established under the EU Birds Directive (79/409/EEC, as codified by 2009/147/EC) for birds and SACs, established under the Habitats Directive 92/43/EEC for habitats and species.

The Habitats Directive has been transposed into Irish law by Part XAB of the Planning and Development Act (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011) as amended.

Articles 6(3) and 6(4) of the Habitats Directive sets out the decision-making tests for plans and projects likely to have a significant effect on or to adversely affect the integrity of European sites. Article 6(3) establishes the requirement for Appropriate Assessment (AA):

Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

Both EU and national guidance exists in relation to Member States fulfilling their requirements under the EU Habitats Directive, with particular reference to Article 6(3) and 6(4) of that Directive. The methodology followed in this report to inform the assessment has had regard to the following legislation and guidance listed in Section 2.2:

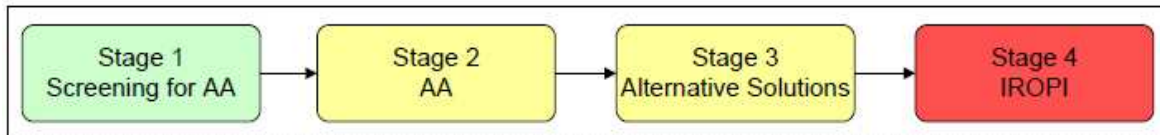
- Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (also known as the ‘Habitats Directive’);
- Council Directive 2009/147/EC on the conservation of wild birds, codified version, (also known as the ‘Birds Directive’);
- The European Communities (Birds and Natural Habitats) Regulations 2011 to 2015; and
- The Planning and Development Act (as amended).

2.2 Stages of Appropriate Assessment

Article 6(3) & (4) of the Habitats Directive defines a stepwise procedure where plans or projects are considered. The Department of the Environment, Heritage and Local Government guidelines (DoELHG, 2009, rev 2010) outlines the European Commission's methodological guidance (EC, 2002) promoting a four-stage process to complete the AA and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

The four stages are summarised diagrammatically in Figure 2-1. Stages 1-2 deal with the main requirements for assessment under Article 6(3). Stage 3 may be part of the Article 6(3) Assessment or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

Figure 2-1: Four stages of appropriate assessment¹



Stage 1 Appropriate Assessment

Stage 1 AA comprises the Screening process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3) as follows:

- i. whether a plan or project (in this instance the proposed project) is directly connected to or necessary for the management of the European sites, and
- ii. whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on the European sites in view of their conservation objectives.

If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA).

Stage 2: Appropriate Assessment

The aim of the stage 2 AA process is to identify any adverse impacts that the plan or project might have on the integrity of relevant European sites. As part of the assessment, a key consideration is 'in combination' effects with other plans or projects. Where adverse impacts are identified, mitigation measures can be proposed that would avoid, reduce or remedy any such negative impacts and the plan or project can be amended and / or conditions and restrictions imposed. If it is considered that mitigation measures will not be able to satisfactorily reduce potential adverse impact on a Natura 2000 site then an assessment of alternative solutions is considered in Stage 3. This is then followed by Stage 4 in the event that adverse impacts remain and the proposed activity or development is deemed to be of Imperative Reasons of Overriding Public Interest (IROPI), allowing an assessment of compensatory measures to be considered.

This NIS informs Stage 2 of the AA process and determines if the project is likely to affect the integrity (structure and function) of European sites. As the screening process identified that potential impacts to the Blackwater River (Cork/Waterford) SAC are unknown, uncertain or cannot be ruled out without further assessment, then an AA is required.

The NIS represents a detailed, targeted assessment of the nature and potential significance of direct and indirect impacts arising from the proposed project. An assessment of cumulative impacts (both from the project objectives, and other policies, plans and programmes) is also completed as part of the NIS. The NIS also incorporates best practice and mitigation measures to eliminate potential adverse impacts.

This NIS has been prepared having regard to the following guidance and legislation:

¹ IROPI – Imperative Reasons for Overriding Public Interest

Guidance

- Atkinson, S., Magee, M., Moorkens, E.A. & Heavey, M. (2023). Supplementary Guidance on Assessment and Construction Management in Margaritifera Catchments in Ireland: Blackwater River (Cork/Waterford) SAC (<https://e-mussels.eu/europe/conservation-guidelines>).
- Department of the Environment, Heritage and Local Government (DoEHLG) (2009, rev 2010a), Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities.
- Department of the Environment, Heritage and Local Government (DoEHLG, 2010b), Department of Environment Heritage and Local Government Circular NPWS 1/10 and PSSP 2/10 on Appropriate Assessment under Article 6 of the Habitats Directive – Guidance for Planning Authorities.
- EPA (2013) Integrated Biodiversity Impact Assessment – Streamlining AA, SEA and EIA Processes: Practitioners Manual. Environmental Protection Agency.
- European Commission (2018), Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg.
- European Commission (2000a), Communication from the Commission on the Precautionary Principle, Office for Official Publications of the European Communities, Luxembourg.
- European Commission Notice Brussels C (2021) 6913 final 'Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC' (EC, 2021).
- European Commission (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the Commission. Office for Official Publications of the European Communities, Luxembourg.
- European Commission (2013), Interpretation Manual of European Union Habitats. Version EUR 28.
- European Commission (2006), Nature and biodiversity cases: Ruling of the European Court of Justice. Office for Official Publications of the European Communities.

3 European Sites within Project Zone of Influence

One European site, namely the Blackwater River (Cork/Waterford) SAC, is located within the likely zone of influence (Zoi) of the proposed development.

Table 3-1 details this European site and its proximity and connectivity to the proposed development. Figure 3-1 provides an illustration of the location of the proposed development in relation to the Blackwater River (Cork/Waterford) SAC.

Table 3-1: Connectivity of European sites within the zone of influence of the proposed development

European Site	Distance from Proposed Site (km) ²	Connectivity
Blackwater River (Cork/Waterford) (Site Code: 002170)	0 (directly adjacent)	Potential connectivity due to proximity and hydrological connectivity via a drainage ditch. The proposed site and this SAC are both within the Rathmore West Ground Waterbody. GW and SW connectivity exists.



Figure 3-1: European sites within the likely zone of influence of the proposed development

² Distance measured "as the crow flies"

3.1 Summary of European Sites Relevant to the Stage 2 Appropriate Assessment

3.1.1 Blackwater River (Cork/Waterford) SAC (Site Code: 002170)

The Standard Data Form ([N2K IE0002170 dataforms \(europa.eu\)](#)) describes the River Blackwater is one of the largest rivers in Ireland, draining a major part of Co. Cork and parts of counties Kerry, Limerick, Tipperary and Waterford. The site consists of most of the freshwater stretches of the system as well as the estuarine component at Youghal. Tidal influence extends almost to Cappoquin. The Blackwater rises in the east Kerry uplands where Namurian grits and shales build the low heather-covered plateaux. In the lowlands in the Mallow district it passes over limestone and later cuts through ridges of Old Red Sandstone to the south of Cappoquin. Main tributaries include the Rivers Lickey, Bride, Allow and Awbeg. A wide range of habitats associated with the rivers are included within the site, including substantial areas of woodland (deciduous, mixed), scrub, wet grassland, swamp and marsh vegetation, bog, salt marshes and intertidal sand and mud flats. Areas of improved grassland, arable land and coniferous plantations are included in the site for water quality reasons.

The site supports important examples of a range of Annex I habitats, notably estuaries, intertidal mudflats and sandflats, perennial vegetation of stony banks, salt meadows, floating river vegetation, alluvial forests and oak woodlands. Most of these are of good quality and extensive in area. The Blackwater system is an important salmonid fishery and is of high conservation value for *Salmo salar*. Also supports important populations of *Lampetra planeri*, *L. fluviatilis*, *Petromyzon marinus* and *Alosa fallax fallax*. Substantial populations of *Margaritifera margaritifera* occur, while *Austropotamobius pallipes* is found in the Awbeg River. *Lutra lutra* is widespread throughout the site and has been subject to detailed surveys. *Trichomanes speciosum* occurs at one location. Annex I bird species present in the site include breeding *Egretta garzetta*, *Alcedo atthis* and *Falco peregrinus* and wintering *Cygnus cygnus* and *Pluvialis apricaria*. A good diversity of other winter waterfowl species also occurs.

3.1.1.1 Qualifying Interests

The importance of a site designated under the Habitats Directive is defined by its qualifying features or interests. Qualifying interests for any European site are listed on a pro forma, called the Natura 2000 standard data form, which forms the basis of the rationale behind designation, and informs the Conservation Management Plan for targeted management and monitoring of key species and habitats.

Qualifying interests for the Blackwater River (Cork/Waterford) SAC are given in Table 3-2, along with the conservation status and specific sensitivities and main threats relevant to each feature. Information on the conservation status for each habitat within the SAC was extracted from the Natura 2000 Standard Data Form on the Natura 2000 map viewer at [N2K IE0002170 dataforms \(europa.eu\)](#). This information provides specific details on the conservation status of each habitat within the SAC. The environmental sensitivities have been derived from The Status of EU Protected Habitats and Species in Ireland³.

³ NPWS (2019a) The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitats Assessments. Unpublished Report, National Parks and Wildlife Service and NPWS (2019b) The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished Report, National Parks and Wildlife Service.

Table 3-2: Conservation Status and Main Threats to the Qualifying Interests of Blackwater River (Cork/ Waterford) SAC

Annex I Habitat	Conservation Status at Blackwater River (Cork/ Waterford) SAC⁴	Environmental Sensitivity/ Main Threats (Ranked High to Medium)
[1130] Estuaries	B= Good conservation status.	F20 Residential or recreational activities and structures generating marine pollution (excl. marine macro- and micro- particular pollution) (H) A28 Agricultural activities generation marine pollution (H) G16 Marine aquaculture generating marine pollution (H) I02 Other invasive alien species (other than species of Union concern) (H) XU Unknown pressure (M)
[1140] Mudflats and sandflats not covered by seawater at low tide	B= Good conservation status.	F20 Residential or recreational activities and structures generating marine pollution (excl. marine macro- and micro- particular pollution) (H) A28 Agricultural activities generation marine pollution (H) G16 Marine aquaculture generating marine pollution (H)
[1220] Perennial vegetation of stony banks	A= Excellent conservation status.	F08 Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational infrastructure and areas (including sea defence or coast protection works and infrastructures) (H) C01 Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) (M) E01 Roads, paths, railroads and related infrastructure (e.g. bridges, viaducts, tunnels) (M) F07 Sports, tourism and leisure activities (M) F09 Deposition and treatment of waste/garbage from household/recreational facilities (M) I02 Other invasive alien species (other than species of Union concern) (M)
[1310] <i>Salicornia</i> and other annuals colonising mud and sand	B= Good conservation status.	I02 Other invasive alien species (other than species of Union concern) (M) A09 Intensive grazing or overgrazing by livestock (M)
[1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)	B= Good conservation status.	A09 Intensive grazing or overgrazing by livestock (H) F07 Sports, tourism and leisure activities (H) A33 Modification of hydrological flow or physical alternation of water bodies for agriculture (excluding development and operation of dams) (M) A36 Agriculture activities not referred to above (M) F08 Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational

⁴ Natura 2000 Standard Data Forms version date September 2017

		infrastructure and areas (including sea defence or coast protection works and infrastructures) (M) I02 Other invasive alien species (other than species of Union concern) (M)
[1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>)	B= Good conservation status.	A09 Intensive grazing or overgrazing by livestock (H) A33 Modification of hydrological flow or physical alternation of water bodies for agriculture (excluding development and operation of dams) (M) A36 Agriculture activities not referred to above (M) A10 Extensive grazing or undergrazing by livestock (M)
[3260] Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation	A= Excellent conservation status.	A26 Agricultural activities generating diffuse pollution to surface or ground waters (H) A25 Agricultural activities generating point source pollution to surface or ground waters (H) K04 Modification of hydrological flow (H) K05 Physical alteration of water bodies (H) F12 Discharge of urban waste water (excluding storm overflows and/or urban run-offs) generating pollution to surface or ground water (H) B23 Forestry activities generating pollution to surface or ground waters (M) F11 Pollution to surface or ground water due to urban run-offs (M) C05 Peat extraction (M) F13 Plants, contaminated or abandoned industrial sites generating pollution to surface or ground water (M) K01 Abstraction from groundwater, surface water or mixed water (M)
[91A0] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	C= Average or reduced conservation status.	I02 Other invasive alien species (other than species of Union concern) (H) A09 Intensive grazing or overgrazing by livestock (H) I04 Problematic native species (M) B09 Clear-cutting, removal of all trees (M) M07 Storm, cyclone (M)
[91E0] *Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, <i>Alnus incanae</i>, <i>Salix alba</i>)	A= Excellent conservation status.	I02 Other invasive alien species (other than species of Union concern) (H) I04 Problematic native species (M) B09 Clear-cutting, removal of all trees (M) I05 Plant and animal diseases, pathogens and pests (M)
Annex II Species		
[1029] Freshwater Pearl Mussel <i>Margaritifera margaritifera</i>	B= Good conservation status.	A31 Drainage for use as agricultural land (H) B27 Modification of hydrological conditions, or physical alteration of water bodies and drainage for forestry (including dams) (H) F31 Other modification of hydrological conditions for residential or recreational development (H)

		A26 Agricultural activities generating diffuse pollution to surface or ground waters (H) B23 Forestry activities generating pollution to surface or ground waters (H) F12 Discharge of urban wastewater (excluding storm overflows and/or urban run-offs) generating pollution to surface or ground water (M) C05 Peat extraction (M) F28 Modification of flooding regimes, flood protection for residential or recreational development (M) D02 Hydropower (dams, weirs, run-off-the-river), including infrastructure (M) F33 Abstraction of ground and surface waters (including marine) for public water supply and recreational use (M)
[1095] Sea Lamprey <i>Petromyzon marinus</i>	A= Excellent conservation status.	D02 Hydropower (dams, weirs, run-off-the-river), including infrastructure (H) N03 Increases or changes in precipitation due to climate change (H) A19 Application of natural fertilisers on agricultural land (M) A20 Application of synthetic (mineral) fertilisers on agricultural land (M) A31 Drainage for use as agricultural land (M) G01 Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations (M) Xo Threats and pressures from outside the Member State (M) N01 Temperature changes (e.g. rise of temperature & extremes) due to climate change (M) N02 Droughts and decreases in precipitation due to climate change (M)
[1096] Brook Lamprey <i>Lampetra planeri</i>	A= Excellent conservation status.	A19 Application of natural fertilisers on agricultural land (M) A20 Application of synthetic (mineral) fertilisers on agricultural land (M) A31 Drainage for use as agricultural land (M) B09 Clear-cutting, removal of all trees (M) D02 Hydropower (dams, weirs, run-off-the-river), including infrastructure (H) F11 Pollution to surface or ground water due to urban run-offs (M) F12 Discharge of urban wastewater (excluding storm overflows and/or urban run-offs) generating pollution to surface or ground water (M) N01 Temperature changes (e.g. rise of temperature & extremes) due to climate change (M)

		N02 Droughts and decreases in precipitation due to climate change (M)
[1099] River Lamprey <i>Lampetra fluviatilis</i>	B= Good conservation status.	D02 Hydropower (dams, weirs, run-off-the-river), including infrastructure (H) N03 Increases or changes in precipitation due to climate change (H) A19 Application of natural fertilisers on agricultural land (M) A20 Application of synthetic (mineral) fertilisers on agricultural land (M) A31 Drainage for use as agricultural land (M) E03 Shipping lanes, ferry lanes and anchorage infrastructure (e.g. canalisation, dredging) (M) N01 Temperature changes (e.g. rise of temperature & extremes) due to climate change (M) N02 Droughts and decreases in precipitation due to climate change (M)
[1106] Atlantic Salmon <i>Salmo salar</i> (only in fresh water)	B= Good conservation status.	A26 Agricultural activities generating diffuse pollution to surface or ground waters (H) G19 Other impacts from marine aquaculture, including infrastructure (H) K05 Physical alteration of water bodies (H) N01 Temperature changes (e.g. rise of temperature & extremes) due to climate change (H) A25 Agricultural activities generating point source pollution to surface or ground waters (M) B23 Forestry activities generating pollution to surface or ground waters (M) F12 Discharge of urban wastewater (excluding storm overflows and/or urban run-offs) generating pollution to surface or ground water (M) F28 Modification of flooding regimes, flood protection for residential or recreational development (M) G11 Illegal harvesting, collecting and taking (M) I02 Other invasive species (other than species of Union concern) (M) J01 Mixed source pollution to surface and ground waters (limnic and terrestrial) (H) J01 Mixed source pollution to surface and ground waters (limnic and terrestrial) (H) G20 Abstraction of water, flow diversion, dams and other modifications of hydrological conditions for freshwater aquaculture (M) L06 Interspecific relations (competition, predation, parasitism, pathogens) (M)
[1092] <i>Austropotamobius pallipes</i> (White-clawed Crayfish)	C= Average or reduced conservation status.	D02 Hydropower (dams, weirs, run-off-the-river), including infrastructure (H) N03 Increases or changes in precipitation due to climate change (H)

		A19 Application of natural fertilisers on agricultural land (M) A20 Application of synthetic (mineral) fertilisers on agricultural land (M) A31 Drainage for use as agricultural land (M) G01 Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations(M) Xo Threats and pressures from outside the Member State (M) N01 Temperature changes (e.g. rise of temperature & extremes) due to climate change (M) N02 Droughts and decreases in precipitation due to climate change (M)
[1103] <i>Alosa fallax fallax</i> (Twaite Shad)	B= Good conservation status.	A19 Application of Natural fertilisers on agricultural land (H) A20 Application of synthetic (mineral) fertilisers on agricultural land (H) D02 Hydropower (dams, weirs, run-off-the-river), including infrastructure (M) E03 Shipping lanes, ferry lanes and anchorage infrastructure (e.g. canalisation, dredging) (M) G01 Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations (M) G06 Freshwater fish and shellfish harvesting (recreational) (M) G12 Bycatch and incidental killing (due to fishing and hunting activities) (H) I02 Other invasive alien species (other than species of Union concern) (M) N01 Temperature changes (e.g. rise of temperature & extremes) due to climate change (M) N03 Increases or changes in precipitation due to climate change (H)
[1421] <i>Trichomanes speciosum</i> (Killarney Fern)	B= Good conservation status.	No pressures or threats noted
[1355] Otter <i>Lutra lutra</i>	A= Excellent conservation status.	No pressures or threats noted

3.2 Conservation Objectives of European Site

Article 6.3 of the Habitats Directive and Part XAB of the Planning and Development Act (as amended) require that the impact of the project (either alone or in combination with other projects or plans) on the integrity of the European site is considered with respect to the conservation objectives of the site and to its structure and function. The European Commission guidance on Natura 2000 (MN2000) states that:

“The integrity of the site involves its constitutive characteristics and ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the habitats and species for which the site has been designated and the site’s conservation objectives” (MN2000, Section 4.6.4).”

The maintenance of favourable condition of qualifying interests at the site level will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. Favourable conservation status of habitats and species is described in the Guidance as follows:

- **Favourable conservation status of a habitat** can be described as being achieved when: *“its natural range, and the area it covers within that range, is stable or increasing, and the ecological factors that are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and the conservation status of its typical species is favourable”*.
- **Favourable conservation status of a species** can be described as being achieved when: *“population data on the species concerned indicate that it is maintaining itself, and the natural range of the species is neither being reduced or likely to be reduced for the foreseeable future, and there is, and will probably continue to be, sufficiently large habitat to maintain its populations on a long term basis”*.

Site-specific conservation objectives aim to define favourable conservation conditions for the qualifying interests, i.e. Annex I habitat and Annex II species, as applicable. The conservation objectives are presented as a list of attributes against which targets have been set. All of the attributes in relation to each relevant feature have been considered in relation to the potential impacts associated with the proposed aerodrome development. Site specific conservation objectives (SSCOs) for the qualifying interests of Blackwater River (Cork/Waterford) SAC are detailed in Table 3-3 and Table 3-4 below.

Table 3-3: Site Specific Conservation Objectives, Attributes and Targets for Qualifying Habitats of Blackwater River (Cork/Waterford) SAC (NPWS, 2012, available at: [Site_specific_cons_obj\(npws.ie\)](http://Site_specific_cons_obj(npws.ie)))

Conservation Objectives of Blackwater (Cork/Waterford) SAC (Site_specific_cons_obj(npws.ie))		
Attribute	Measure	Target
Estuaries [1130]		
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes.
Community extent	Hectares	Maintain the extent of the <i>Mytilus edulis</i> dominated community, subject to natural processes.
Community structure: <i>Mytilus edulis</i> density	Individuals/m ²	Conserve the high quality of the <i>Mytilus edulis</i> dominated community, subject to natural processes.
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal estuarine sandy mud community complex; Subtidal estuarine fine sand with <i>Bathyporeia</i> spp. community complex; Sand and mixed sediment with polychaetes and crustacean’s community complex; Coarse sediment community complex.

Mudflats and sandflats not covered by seawater at low tide [1140]		
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes.
Community extent	Hectares	Maintain the extent of the <i>Zostera</i> and <i>Mytilus edulis</i> dominated communities, subject to natural processes.
Community structure: <i>Zostera</i> shoot density	Shoots/m ²	Conserve the high quality of the <i>Zostera</i> dominated community, subject to natural processes.
Community structure: <i>Mytilus edulis</i> density	Individuals/m ²	Conserve the high quality of the <i>Mytilus edulis</i> -dominated community, subject to natural processes.
Community distribution	Hectares	The following community types should be conserved in a natural condition: Intertidal estuarine sandy mud community complex and Sand and mixed sediment with polychaetes and crustacean's community complex.
Perennial vegetation of stony banks [1220]		
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession.
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes.
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions.
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.
Vegetation composition: typical species and subcommunities	Percentage cover at a representative sample of monitoring stops	Maintain the typical vegetated shingle flora including the range of subcommunities within the different zones.
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover.
<i>Salicornia</i> and other annuals colonizing mud and sand [1310]		
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession.
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes.
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions.
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession.
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime.
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.
Vegetation structure: height	Centimetres	Maintain structural variation within sward.

Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated.
Vegetation composition: typical species and sub- communities	Percentage cover	Maintain the presence of species-poor communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009).
Vegetation structure: negative indicator species: <i>Spartina anglica</i>	Hectares	No significant expansion of common cordgrass (<i>Spartina anglica</i>), with an annual spread of less than 1%.
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330]		
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession.
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes.
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions.
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession.
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime.
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward.
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% area outside creeks vegetated.
Vegetation composition: typical species and subcommunities	Percentage cover at a representative sample of monitoring stops	Maintain range of subcommunities with typical species listed in SMP (McCorry and Ryle, 2009).
Vegetation structure: negative indicator species – <i>Spartina anglica</i>	Hectares	No significant expansion of common cordgrass (<i>Spartina anglica</i>), with an annual spread of less than 1%.
Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]		
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession.
Habitat distribution	Occurrence	No decline, subject to natural processes.
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession.
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime.

Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitats including transitional zones, subject to natural processes including erosion and succession.
Vegetation structure: vegetation height	Centimetres	Maintain structural variation in the sward.
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated.
Vegetation composition: typical species and subcommunities	Percentage cover at a representative sample of monitoring stops	Maintain range of subcommunities with characteristic species listed in SMP (McCorry and Ryle, 2009).
Vegetation structure: negative indicator species – <i>Spartina anglica</i>	Hectares	No significant expansion of common cordgrass (<i>Spartina anglica</i>), with an annual spread of less than 1%.
Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260]		
Habitat area	Kilometres	Area stable or increasing, subject to natural processes.
Habitat distribution	Occurrence	No decline, subject to natural processes.
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes.
Hydrological regime: tidal influence	Daily water level fluctuations - metres	Maintain natural tidal regime.
Hydrological regime: freshwater seepages	Metres per second	Maintain appropriate freshwater seepage regimes.
Substratum composition: particle size range	Millimetres	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles).
Water quality: nutrients	Milligrams per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition.
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition.
Floodplain connectivity	Hectares	The area of active floodplain at and upstream of the habitat should be maintained.
Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]		
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 263.7ha for sub-sites surveyed.
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 7 of the conservation objectives.
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size.
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with

		semimature trees and shrubs; and well-developed herb layer.
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types.
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy.
Woodland structure: dead wood	m ³ per hectare; number per hectare	At least 30m ³ /ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter.
Woodland structure: veteran trees	Number per hectare	No decline.
Woodland structure: indicators of local distinctiveness	Occurrence	No decline.
Vegetation composition: native tree cover	Percentage	No decline. Native tree covers not less than 95%.
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including sessile oak (<i>Quercus petraea</i>) and birch (<i>Betula pubescens</i>) .
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control.
*Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) [91E0]		
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 19.2ha for sites surveyed.
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 7 of the conservation objectives.
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size.
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semimature trees and shrubs; and well-developed herb layer.
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types.
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy.
Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation.
Woodland structure: dead wood	m ³ per hectare; number per hectare	At least 30m ³ /ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder).

Woodland structure: veteran trees	Number per hectare	No decline.
Woodland structure: indicators of local distinctiveness	Occurrence	No decline.
Vegetation composition: native tree cover	Percentage	No decline. Native tree covers not less than 95%.
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including alder (<i>Alnus glutinosa</i>), willows (<i>Salix</i> spp) and, locally, oak (<i>Quercus robur</i>) and ash (<i>Fraxinus excelsior</i>).
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control.
*<i>Taxus baccata</i> woods of the British Isles [91J0]		
The status of <i>Taxus baccata</i> woods of the British Isles as a qualifying Annex I habitat for the Blackwater River (Cork/Waterford) SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this habitat.		

Table 3-4: Site Specific Conservation Objectives, Attributes and Target for Qualifying Species of Blackwater River (Cork/Waterford) SAC (NPWS, 2012, available at: [Site specific cons obj \(npws.ie\)](http://www.npws.ie/site-specific-cons-obj))

Conservation Objectives Blackwater River (Cork/Waterford) SAC (Site specific cons obj (npws.ie))			
Attribute	Measure	Target	Notes
Freshwater Pearl Mussel <i>Margaritifera margaritifera</i> [1029]			
Distribution	Kilometres	Maintain at 161km. See map 8.	The freshwater pearl mussel is known from the main Blackwater River, two tributaries (Owentaraglin and Allow) and the Licky River, which discharges to the Upper Blackwater Estuary. 168km encompasses the length of channel from the most upstream records of the freshwater pearl mussel to the most downstream records of live mussels, and contained within the freshwater pearl mussel catchment boundaries displayed on map 8 of the conservation objectives.
Population size	Number of adult mussels	Restore to 35,000 adult mussels	The SAC has three populations listed on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations of 2009 (Government of Ireland, 2009b): Munster Blackwater, Allow (Munster Blackwater) and Licky.
Population structure: recruitment	Percentage per size class	Restore to least 20% of population no more than 65mm in length; and at least 5% of	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult

		population no more than 30mm in length	mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. The Blackwater population is believed to be composed entirely of aged adults, with no evidence of recruitment for at least 20 years (DEHLG, 2010a). No juvenile mussels were found in the Allow and 8.3% of the population was no more than 65mm in length in 2009 (DEHLG, 2010b). No young or juvenile mussels were recorded in the Licky during monitoring in 2005 or 2009 and there was no evidence that recruitment had occurred in at least 12 years, with the smallest mussel in 2009 measuring 85.3mm (Ross, 2005; DEHLG 2010c)
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses. The Allow passed the target for live adults but failed that for dead shells in 2009 (DEHLG, 2010b). The Blackwater and Licky failed both targets in 2009 (DEHLG, 2010a, 2010c)
Habitat extent	Kilometres	Restore suitable habitat in more than 35km (see map 8) and any additional stretches necessary for salmonid spawning	The species' habitat covers stretches of very large, high energy, lowland rivers (Blackwater) and a short coastal river (Licky); and is a combination of 1) the area of habitat adult and juvenile mussels can occupy and 2) the area of spawning and nursery habitats the host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent to mussel habitat but may lie upstream of the generalised mussel distribution. Only those salmonid spawning areas that could regularly contribute juvenile fish to the areas occupied by adult mussels should be considered. The availability of mussel habitat

			and fish spawning and nursery habitats are determined by flow and substratum conditions. The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles. The target is based on the stretches of river identified, from a combination of dedicated survey and incidental records, as having suitable habitat for the species. As there has been no full baseline survey, the quality of the data from the Blackwater and its tributaries is poor.
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93	These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions).
Substratum quality: filamentous algae (macroalgae), macrophytes (rooted higher plants)	Percentage	Restore substratum quality filamentous algae: absent or trace (<5%); macrophytes: absent or trace (<5%)	Significant growth of macrophytes was found at some sites in all three populations sampled during 2009 for the Sub-basin Management Plans (DEHLG, 2010a, 2010b, 2010c). Filamentous algae were below the target at all sites sampled in the Allow, however significant growths were detected at some sampling sites in the Blackwater and Licky (DEHLG, 2010a, 2010b, 2010c). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate.
Substratum quality: sediment	Occurrence	Restore substratum quality stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The habitat for the species is currently unsuitable for the recruitment of juveniles owing to sedimentation of the substratum. In some locations, it is also unsuitable for the survival of adult mussels, notably stretches of the Licky (DEHLG, 2010c). Significant sedimentation has been recorded during all recent mussel monitoring surveys, particularly in the Licky and Allow (DEHLG, 2010a, 2010b, 2010c). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate.

Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels.
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval form of the freshwater pearl mussel and, thus, they are essential to the completion of the life cycle. 0+ and 1+ fish are typically used, both because of the habitat overlaps and the development of immunity with age in the fish. Fish presence is considered sufficient, as higher densities and biomass of fish are indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for pearl mussels and a lack of pearl mussel recruitment, while significantly lower densities and biomass of host fish were associated with high numbers of juvenile mussels. Fish movement patterns must be such that 0+ fish in the vicinity of the mussel habitat remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid

			balance or residency time. The Allow and Licky freshwater pearl mussel populations appear to favour native brown trout (<i>Salmo trutta</i>), therefore, it is particularly important that these are not outcompeted by stocked fish (DEHLG, 2010b, 2010c). No data on fish preferences are available for the Blackwater.
White-clawed Crayfish <i>Austropotamobius pallipes</i> [1092]			
Distribution	Occurrence	No reduction from baseline (see map 9)	Within the Blackwater River system, white-clawed crayfish is present only on the Awbeg River. However, there have been two recent records from other parts of the river system. One was downstream of the confluence of the Awbeg and Blackwater and may simply represent a specimen moving out of the Awbeg. The second was upstream of Mallow and this may represent a new population or an introduction.
Population structure: recruitment	Percentage occurrence of juveniles and females with eggs	Juveniles and/or females with eggs in at least 50% of positive samples	
Negative indicator species	Occurrence	No alien crayfish species	Alien crayfish species are identified as major direct threat to this species and as disease vector.
Disease	Occurrence	No instances of disease	Disease is identified as major threat and has occurred in Ireland even in the absence of alien vectors.
Water quality	EPA Q value	At least Q3-4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the EPA
Habitat quality: heterogeneity	Occurrence of positive habitat features	No decline in heterogeneity or habitat quality	Crayfish need high habitat heterogeneity. Larger crayfish must have stones to hide under, or an earthen bank in which to burrow. Hatchlings shelter in vegetation, gravel and among fine tree-roots. Smaller crayfish are typically found among weed and debris in shallow water. Larger juveniles in particular may also be found among cobbles and detritus such as leaf litter. These conditions must be available on the whole length of occupied habitat.

Sea Lamprey <i>Petromyzon marinus</i> [1095]			
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas.
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	
Juvenile density in fine sediment	Juveniles/m ²	Juvenile density at least 1/m ²	Juveniles burrow in areas of fine sediment in still water.
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	Lampreys spawn in clean gravels.
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	Despite observed spawning activity, sampling for ammocoetes consistently fails to find these in many sampling stations and never in any great numbers
Brook Lamprey <i>Lampetra planeri</i> [1096]			
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to brook lampreys' migration, both up- and downstream, thereby possibly limiting the species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	It is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m ²	Mean catchment juvenile density of brook/river lamprey at least 2/m ²	Juveniles burrow in areas of fine sediment in still water
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	Spawning site and redd attributes established by IFI (Rooney et al., in press)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of

			50% of sites would be 'reasonable' for the Irish catchments examined to date (King et al., unpublished data)
River Lamprey <i>Lampetra fluviatilis</i> [1099]			
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to river lampreys' migration, both up- and downstream, thereby possibly limiting the species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	It is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m ²	Mean catchment juvenile density of brook/river lamprey at least 2/m ²	Juveniles burrow in areas of fine sediment in still water.
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	Spawning site and redd attributes established by IFI (Rooney et al., in press)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King et al., unpublished data)
Twaite Shad <i>Alosa fallax</i> [1103]			
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	In some catchments, artificial barriers block twaite shads' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. Major weirs on the Blackwater prevent potential exploitation of adult spawning grounds
Population structure: age classes	Number of age classes	More than one age class present	Regular breeding has been confirmed in the River Blackwater in recent years (King and Linnane, 2004; King and Roche, 2008)

Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning habitats	
Water quality: oxygen levels	Milligrams per litre	No lower than 5mg/l	
Spawning habitat quality: Filamentous algae; macrophytes; sediment	Occurrence	Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plant) growth	
Atlantic Salmon <i>Salmo salar</i> (only in fresh water) [1106]			
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmon's upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. The large hydro-electric station at Ardnacrusha and the Parteen regulating weir present considerable obstructions to upstream passage of salmon on the Shannon main channel. While both have fish passes installed, upstream migration of salmon is still problematical. Further weirs upstream on the Shannon also restrict access to spawning habitat. No such obstacles, causing significant fish passage issues for salmon are present on the Feale and Mulkear rivers
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	A conservation limit is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The salmon stocks in the Shannon above the impoundments are significantly below their Conservation Limits. Salmon stocks in the Feale and Mulkear rivers are above CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17	Target is threshold value for rivers currently exceeding their conservation limit (CL). The abundance of salmon fry at monitored sites on the Shannon main channel, above the hydro-

		salmon fry/5 min sampling	electric station, is significantly below this target
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (<i>Lepeophtheirus salmonis</i>). On the Shannon main channel, salmon smolt abundance may be significantly affected by mortality passing through hydroelectric turbines
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. Artificial barriers are currently preventing salmon from accessing suitable spawning habitat on the Shannon main channel
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)
Otter <i>Lutra lutra</i> [1355]			
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique.
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 596.8ha above high-water mark (HWM); 958.9ha along riverbanks/ around ponds	No field surveys. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along riverbanks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 4,461.6ha	No field surveys. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 500.1km	No field surveys. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 125.6ha	No field surveys. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)

Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston et al., 1999)
Barriers to connectivity	Number	No significant increase. For guidance, see map 10	Otters will regularly commute across stretches of open water up to 500m e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed
Killarney Fern <i>Trichomanes speciosum</i> [1421]			
Distribution	Location	No decline. Two locations known within the SAC. See map 10.	
Population size	Number	Maintain size and extent of existing colonies, including sporophyte frond counts and number of gametophyte patches	
Habitat extent	m ²	No loss of suitable habitat, such as shaded rock crevices, caves or gullies in, or near to, known colonies. No loss of woodland canopy at or near to known locations	
Hydrological conditions: visible water	Occurrence	Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations	
Hydrological conditions: humidity	Number of desiccated fronds	No increase. Presence of desiccated sporophyte fronds or gametophyte mats indicates conditions are unsuitable	
Light levels: shading	Percentage	No changes due to anthropogenic impacts	
Invasive species	Occurrence	Absent or under control	

4 Existing Environment

Ecology surveys of the proposed site were undertaken by ecologist Ms. Karen Banks between March and August 2024. The surveys assessed the potential for Qualifying Interests (QIs) of European sites within the likely ZOI of the proposed development.

This chapter provides a summary of habitats and species present at the proposed site and describes the results of the desktop study and field surveys undertaken for qualifying interests of the Blackwater River (Cork/Waterford) SAC.

4.1 Habitats

The proposed site supports semi-improved grassland (Fossitt code GS2), improved agricultural grassland (GA1), a small area of arable crops (BC1) and buildings and artificial surfaces (BL3). Fields within the site are bound by linear features including earth banks (BL2), hedgerows (WL1) and treelines (WL2); an active drainage ditch (FW4) is also present.

The Blackwater (Munster) River (FW2) is not located within the proposed site boundary but is adjacent to part of the northern site boundary. Waterbodies are further described in Section 4.3.1 of this report.

No invasive plant species were recorded within the proposed site and its immediate environs.

No Annex I habitats were recorded within the proposed site.

Full details of the existing habitats and species recorded at the proposed site are enclosed within the Biodiversity Chapter of the EIAR accompanying the planning application.

4.2 Species

Fauna were surveyed through observation of field signs such as direct observation, tracks, feeding signs and droppings. Habitats were assessed for their potential for use, or confirmed use, by protected species of fauna during the ecology surveys undertaken between March and August 2024.

The habitats at the proposed site are of low suitability for amphibians and no evidence of common frog or smooth newt was recorded during site surveys.

A total of twenty-two bird species were recorded during breeding bird surveys conducted in May and July 2024, including breeding Starling and Swallow. Of the bird species recorded at the proposed site and its environs, one BoCCI Red List (Highest Conservation Concern) species was recorded (Grey Wagtail) and five Amber List species (Moderate Conservation Concern) were recorded (Linnet, Mallard, Starling, Swallow and Willow Warbler); the remaining species are on the Green List (Least Conservation Concern).

The Blackwater River, hedgerows and treelines at the proposed site provide foraging and commuting habitat for seven species of bat.

No evidence of badger was recorded within the proposed site. However, it is likely that badger forage throughout the proposed site.

4.2.1 Otter

Otter surveys were undertaken along the length of the Blackwater River adjacent to the proposed site and within accessible areas 200m up and down-stream of the proposed site on 25th March 2024 and 31st July 2024.

The National Biodiversity Data Centre (NBDC) database hold records of otter from Colthurst Bridge, last recorded in 2015. No otter holts were recorded within or adjacent to the site during the site surveys, however otter prints were recorded in soft mud at the west of the site during a site survey in March 2024.

4.3 Surface Water

4.3.1 Water Bodies

The proposed site is located within the Blackwater (Munster)_070 sub basin. The Blackwater (Munster) River is a 5th order watercourse is located adjacent to the northern boundary of the proposed site where it forms part of Blackwater River (Cork/Waterford) SAC. The Blackwater flows in an easterly direction and eventually discharges into Youghal Harbour approximately 105km downstream.

The northern portion of the proposed site overlies the Rathmore West Ground Waterbody (GWB) and the southern portion of the site overlies the Banteer GWB.

EPA codes for these water bodies are shown below in Table 4-1.

Table 4-1: EPA water body codes

EPA water body name	Water body type	EPA Code	EPA water body code
Blackwater (Munster)_070	River	18B02	IE_SW_18B020900
Rathmore West	Groundwater	n/a	IE_SW_G_070
Banteer	Groundwater	n/a	IE_SW_G_018

4.3.2 Surface Water Quality and Risk Characterisation

Macroinvertebrate sampling for Q-value determination was conducted within the Blackwater River as part of EPA's Water Framework Directive monitoring. The nearest sampling point is located within the Blackwater River adjacent to the north-eastern corner of the proposed site at Colthurst Bridge. In 2021 (the latest score available) the Q value score was 4, 'Good'. The Blackwater (Munster)_070 is classified as 'At risk' and has been assigned a 'Good' status under the WFD 2016-2021 round. Rathmore West ground waterbody and Banteer ground waterbody were both considered 'Not at risk' and 'Good' under the WFD.

A summary of the WFD and risk status⁵ is shown below in Table 4-2.

Table 4-2: Summary of WFD status for waterbodies at the site and its environs

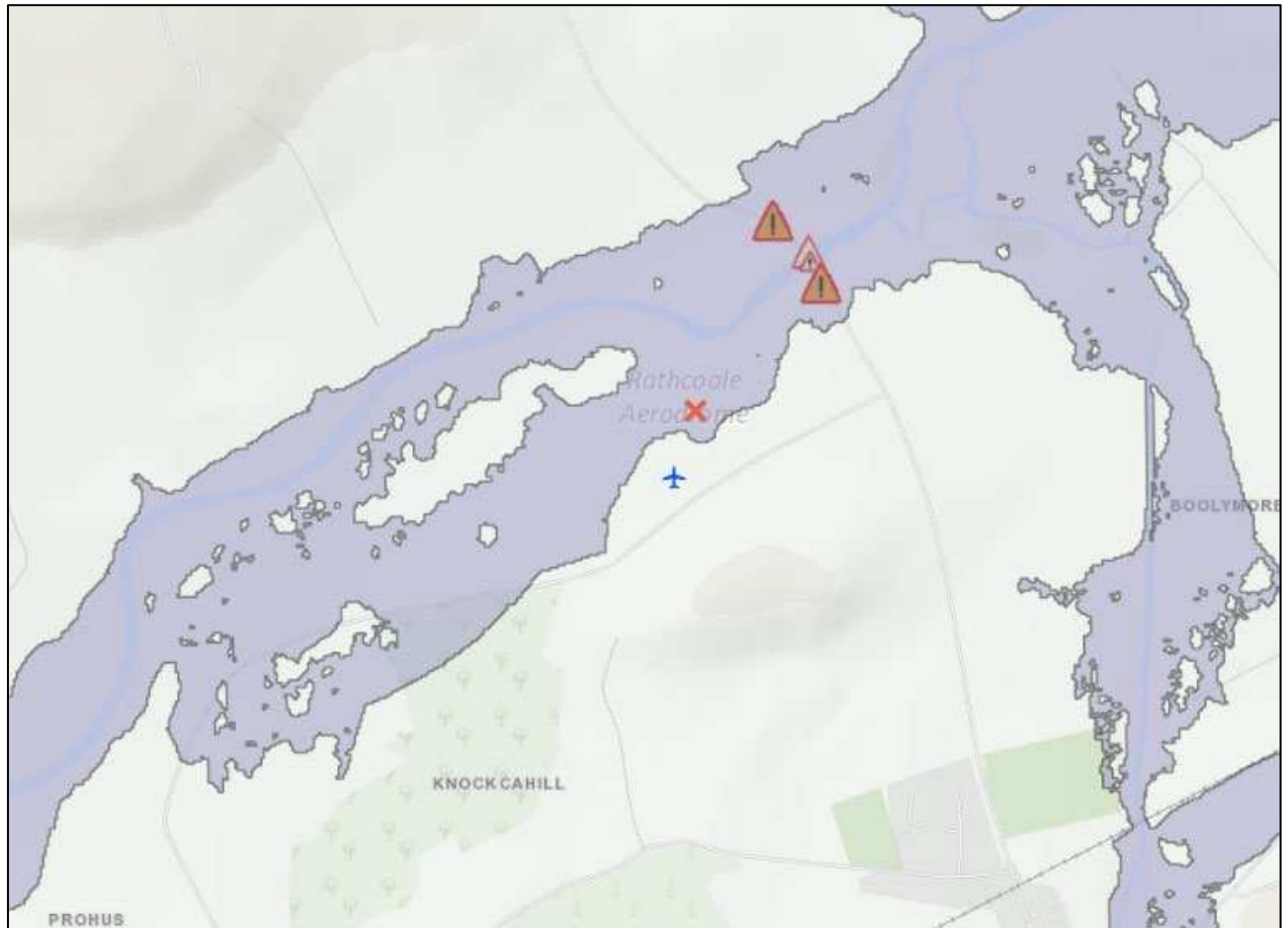
EPA Waterbody Name	Code	Risk	WFD Status 2016-2021
Blackwater (Munster)_070	IE_SW_18B020900	At Risk	Good
Rathmore West	IE_SW_G_070	Not at risk	Good
Banteer	IE_SW_G_018	Not at risk	Good

⁵ <https://www.catchments.ie/maps/>

4.4 Flooding

The Office of Public Works (OPW) flood mapping (<http://www.floodinfo.ie/map/floodmaps/>) indicates the flood extents for the Blackwater River. As indicated in Figure 4-1, the flood extents overlap the proposed site.

Figure 4-1: OPW Flood Risk Mapping of the Study Area



A Site Specific Flood Risk Assessment (SSFRA) completed by IE Consulting (2024) found that:

- The primary potential flood risk to the proposed development site can be attributed to an extreme fluvial event in the River Blackwater. The site is not at risk of pluvial or groundwater flooding.
- In the context of the 'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009' the assessment and analysis undertaken as part of this Site Specific Flood Risk Assessment indicates that the area of the site where the new runway and new taxiway are proposed falls within a delineated fluvial Flood Zone 'A' and Flood Zone 'B'.
- The area of the site where the new HSE Air Ambulance hanger, paramedic prefab base, crew prefab base and new proprietary wastewater treatment system are proposed falls within Flood Zone 'C'.
- The proposed runway and taxiway and associated infrastructure shall be constructed at existing ground levels and shall not involve any significant infilling or ground level raising.
- The proposed runway and taxiway shall therefore have no adverse impact on overland flow conveyance paths or the existing hydrological regime of fluvial flood waters associated with the River Blackwater.

- In addition, surface water runoff from the hard-standing runway shall be collected and attenuated on site in an underground infiltration system and will not result in an increased fluvial or pluvial flood risk elsewhere.
- In summary, and in consideration of the findings of the Site Specific Flood Risk Assessment and the incorporation of the recommendations presented within the SSFRA, the development as proposed is not expected to result in an adverse impact to the existing hydrological regime of the area or increase flood risk elsewhere and is therefore considered to be appropriate from a flood risk perspective.

4.5 Soil, Geology and Hydrogeology

The Geological Survey of Ireland (GSI) online database (www.gsi.ie) was consulted for available edaphic, geological and hydrological information of the site and its environs. The site is overlaid by AminDW, Deep well drained mineral (Mainly acidic) and Alluvial (mineral) soils adjacent to the Blackwater River. In terms of bedrock geology, the Dinantian formation, composed of limestone underlies the site to the south and Grey shale, thin siltstone and sandstone underlie the site to the north.

The bedrock units which underlie the site are mapped by the GSI as part of the same Regionally Important Karstified Aquifer to the south and Poor Aquifer to the north of the site. Groundwater vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease at which groundwater may be contaminated. The study area is of '*Moderate*' groundwater vulnerability.

5 Impact Assessment

Impacts can be direct and indirect and the impacts that could potentially occur through the construction and operation of the proposed development are as follows:

- Changes in key indicators of conservation value such as decrease in water quality within the Blackwater River (Cork/Waterford) SAC.
- Disturbance to the QI species otter during the construction phase.

The assessment of impacts identifies the potential construction and operational phase impacts on the Blackwater River (Cork/Waterford) SAC in the absence of mitigation.

5.1 Direct Impacts

The proposed development is not located within lands designated for nature conservation, including the Blackwater River (Cork/Waterford) SAC. Further, there are no resource requirements (e.g. excavation or abstraction) from European sites for the proposed development. Consequently, none of the lands designated as part of European sites will be directly impacted or removed as a result of the proposed development. Therefore, there will be no direct impacts to European sites in this regard.

5.2 Indirect Impacts

5.2.1 Overview of Potential Impact Sources and Pathways

Pollutant washout to surface waters during the construction phase

Potential impacts resulting from construction phase works near watercourses are primarily related to three sources of possible water borne pollutants: suspended solids (sediment washout), concrete and hydrocarbons.

The pathways for these pollutants to enter nearby surface waters are via existing drainage ditches and preferential overland flow paths.

- **Suspended Solids:** The principal source of potentially negative impact on aquatic receptors arises from the escape of excessive amounts of suspended solids / sediment during the construction phase. Sediment export can arise from earthworks and/or erosion of soil stockpiles and excavated areas relating to, e.g., excavation for the runway, taxi-way, drainage trenches and new air ambulance base, material stockpiles and hydrocarbon interceptor excavation; it is also proposed to extend the existing runway culvert by approximately 30m to facilitate the new runway alignment. Escaped solids can settle in watercourses, smothering plants and macroinvertebrates, causing fish to abandon the area at least in the short-term. This can result in reduced recruitment of young fish from affected reaches as a result of egg and fry mortalities and displacement of juveniles from nursery areas.
- Elevated concentrations of suspended solids and resulting turbidity within the water column can also potentially damage the gills, physiology and behaviour of fish (e.g., respiration, migration) and/or benthic macroinvertebrates (e.g., respiration, drift responses).
- Similar to salmonids, lampreys also depend on clean gravels for spawning, and although lamprey nursery areas depend on marginal sediments, excessive amounts of sediment deposition within a short time period could cause smothering of ammocoetes through loss of oxygen exchange.
- Freshwater pearl mussel is a species that is demanding of pristine water quality conditions and is very sensitive to a range of pollutants. Toxic pollution can have very serious and long-term effects on *Margaritifera* which, being benthic suspension feeders, are exposed to

pollutants in surface water, sediment, interstitial water and through ingestion of filtered particles with sorbed contaminants.⁶

- **Cement:** Owing to its highly alkaline and corrosive nature, cement is potentially toxic to instream fauna and can cause fish and invertebrate kills downstream. Any concrete spills that did enter drains could be transported to the Rathcool River and/or Blackwater River which can result in localised mortality of fish, bivalves and invertebrates if quantities were large enough. Best practice in construction site layout and management means that the risk of wet concrete loss to surface waters is usually very low.
- **Hydrocarbons:** Hydrocarbons from construction sites can emanate from poorly maintained and leaky construction vehicles, mobile plant and cranes and stationery plant such as pumps and generators. Leakage from poorly secured or non-bunded fuel storage areas including spills during re-fuelling of plant and equipment can also occur. Hydrocarbon spills and leakages can result in oil slicks and tainting of fish, or (if large enough) localised fish and invertebrate kills. Loss of hydrocarbons during the construction phase can be prevented / avoided through best practice in construction management.

As described above, run-off of water-borne pollutants, if severe, could potentially impact on water quality, which could also impact on fish stocks. In turn, a reduction in fish stocks may potentially impact on populations of Otter (*Lutra lutra*).

5.2.2 Construction Phase

The Blackwater (Munster) River is a 5th order watercourse is located adjacent to the northern boundary of the proposed site where it forms part of Blackwater River (Cork/Waterford) SAC.

The following freshwater aquatic/ semi aquatic species and habitats are listed as QI species for Blackwater River (Cork/Waterford) SAC:

- *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029]
- *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Alosa fallax fallax* (Twaite Shad) [1103]
- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation [3260]

Freshwater habitat within the proposed site is limited to an active drainage ditch which in periods of high rainfall supports flowing water but supports low levels of standing water/ water with a sluggish flow in summer months. The drainage ditch is not of fisheries value and does not provide supporting habitat for aquatic QI species for Blackwater River (Cork/Waterford) SAC.

Freshwater pearl mussel: The results from presence/absence and total count surveys for freshwater pearl mussel show that the Munster Blackwater has a scattered population of mussels over a very

⁶ Atkinson, S., Magee, M., Moorkens, E.A. & Heavey, M. (2024). Guidance on Assessment and Construction Management in Margaritifera Catchments in Ireland. <https://e-mussels.eu/europe/conservation-guidelines>

wide area from upstream at Knocknagree to as far downstream as Lismore⁷. Conservation Objective mapping for Blackwater River (Cork/ Waterford) SAC⁸ indicates that the stretch of the Blackwater River adjacent to the site is located within the known distribution range for freshwater pearl mussel.

White-clawed crayfish: Within the Blackwater River system, white-clawed crayfish is present only on the Awbeg River, which flows through limestone geology. The main Blackwater is considered chemically unsuitable for the crayfish.

Lamprey species: lamprey have been recorded upstream of the proposed site at Nohoval⁹ and downstream of the site near Banteer.

Twaite shad: limited records of adult shad are listed for the Blackwater, up to Clondulane weir (downstream of Fermoy), but in a survey carried out in summer 2013, no juvenile shad were caught in the Blackwater.

Atlantic salmon: The Blackwater River is a salmonid river and is included within the S.I. 293: European Communities (Quality of Salmonid Waters) Regulations, 1988. Salmon (both 0+ and 1+ and older salmon) have been recorded upstream and downstream of the proposed site during surveys conducted by IFI in 2022.¹⁰

Otter: the National Biodiversity Data Centre (NBDC) database hold records of otter from Colthurst Bridge, last recorded in 2015. No otter holts or couches were recorded within or adjacent to the site during the site surveys, however otter prints were recorded in soft mud at the west of the site during a site survey in March 2024.

Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation: Water-crowfoot (*Ranunculus* spp) was recorded within the Blackwater River adjacent to the site during site surveys. However, it is noted that p. 36 of the site-specific conservation objectives for the Blackwater River (Cork/Waterford) SAC states that: “*rooted macrophytes should be absent or trace (< 5% cover) in freshwater pearl mussel (*Margaritifera margaritifera*) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in this SAC, because the mussel requires environmental conditions closer to natural background levels*”.

In summary, the aquatic and semi-aquatic QI species and habitats that are present, or are potentially present, in the Blackwater River in the environs of the site are freshwater pearl mussel, lamprey species, Atlantic salmon and otter (as noted above, the presence of freshwater pearl mussel takes precedence over floating vegetation habitat).

Elevated levels of turbidity in association with earthworks during the construction phase or release of deleterious substances such as cement or hydrocarbons could temporarily affect the Blackwater River, which may impact on freshwater pearl mussel, lamprey species and Atlantic salmon as a result of degradation of water quality.

A reduction in water quality may result in a reduction in prey species available for otter that forage along the Blackwater River. However, as noted in the report to inform screening for Appropriate

⁷ Atkinson, S., Magee, M., Moorkens, E.A. & Heavey, M. (2023). Supplementary Guidance on Assessment and Construction Management in *Margaritifera* Catchments in Ireland: Blackwater River (Cork/Waterford) SAC <https://e-mussels.eu/europe/conservation-guidelines>

⁸ [Site specific cons obj \(npws.ie\)](https://www.npws.ie/en/conservation/objectives/site-specific)

⁹ Inland Fisheries Ireland (2023) Fish in Rivers Factsheet: Blackwater (Munster) River Catchment Factsheet 2023/06.

¹⁰ As Ref 7.

Assessment, any reduction in water quality is likely to be temporary and localised. The high mobility and large foraging ranges of otter means that they are likely to be able to accommodate such localised changes in prey distribution and abundance.

There is potential for temporary visual and noise disturbance to otters foraging in the Blackwater River in the vicinity of the site during construction. No evidence of otter holts was recorded at the proposed site and its environs, however there is suitable habitat for this species in the environs of the site.

5.2.3 Operational Phase

Hydrology

The Conservation Objectives for the Blackwater River (Cork/Waterford) SAC state that the availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle.

As detailed in the Flood Risk Assessment report accompanying the planning application (IE Consulting, 2024), the proposed new location of the Irish Community Air Ambulance hanger, paramedic prefab base, crew prefab base and new proprietary wastewater treatment system do not fall within Flood Zone 'A' or Flood Zone 'B', and therefore fall within Flood Zone 'C'. The proposed finished floor level of the buildings is above the estimated 0.1% AEP flood level of 82.1m OD in the River Blackwater.

The proposed runway and taxiway will be constructed at existing ground levels and will not involve any significant infilling or ground level raising. The proposed runway and taxiway will therefore have no adverse impact on overland flow conveyance paths or the existing hydrological regime of fluvial flood waters associated with the River Blackwater. In addition, surface water runoff from the hard-standing runway shall be collected and attenuated on site in an underground infiltration system and will not result in an increased fluvial or pluvial flood risk elsewhere.

It is proposed to extend the existing culvert under the existing runway by approximately 30m to accommodate the proposed runway alignment. It is also proposed to construct a 900mm pipe culvert under the proposed runway along the field drain in the western area of the site. The proposed culverts fall within an OPW NIFM 1% AEP (1 in 100 year – Flood Zone 'A') and a 0.1% AEP (1 in 1000 year – Flood Zone 'B') associated with the River Blackwater. These culvert structures shall be constructed below existing ground levels and are therefore unlikely to result in any adverse impact to the exiting hydrological regime of the area during the occurrence of an extreme fluvial event in the River Blackwater.

In summary, the proposed runway and taxiway will have no adverse effect on overland flow conveyance paths or the existing hydrological regime of fluvial flood waters associated with the River Blackwater; and the proposed development will not result in increased fluvial or pluvial flood risk elsewhere.

Water Quality

During the operational phase, surface water run-off from the runway will be managed by filter strips, filter drains and conveyance of storm water to attenuation systems via hydrocarbon separators. Run-off from the air-ambulance base will pass through a silt trap to a soakaway and run-off from the concrete apron and heli-pad will pass through a full retention hydrocarbon separator to a soakaway.

Foul water will be treated by a tertiary treatment system and infiltration/ treatment area. There will be no increase in wastewater production as a result of the proposed development.

In view of the proposed surface water management features, no adverse effects on surface or groundwater quality are anticipated during the operational phase.

Disturbance to Aquatic and Semi-aquatic QI Species

No otter holts were recorded at the proposed site and its immediate environs, therefore there will be no disturbance to otter breeding or resting sites during the operational phase.

The navigation light corridor proposed for the development will increase light levels within the proposed development area. Artificial lighting at night may have an adverse effect on otter foraging and commuting along the Blackwater River and aquatic species within the river. The proposed lighting of the runway is limited to 18 no. runway edge lights plus threshold lights at each end of the runway, all of which are designed to mark the runway but not the area around the runway. The lux measurement at a distance of 10m from the runway will be 0.65lux, which is within the range of lux levels to be expected during a night with a clear full moon. As such, there will be no significant light spill on to important otter and aquatic QI habitat within the Blackwater River, located c.35m from the proposed runway at its closest point. The helipad will be lit by 12 no. green lights and the taxiways will both be lit by 8 no. blue lights; the helipad and taxiways are located to the south of the proposed runway and will not result in light spill onto the Blackwater River. Further, air ambulance services do not operate after the hours of darkness. The proposed development would facilitate the air ambulance service to land after the hours of darkness at Rathcool when required, however it is projected that the number of times that lighting will be used to facilitate a helicopter landing will be limited to 4 to 6 times a year. No nighttime flying will be undertaken by Rathcool Flying Club. In view of these factors, no significant adverse effects on otter or other aquatic species as a result of artificial lighting at night are expected.

No likely adverse impacts on Blackwater River (Cork/Waterford) SAC have been identified during the operational phase.

Invasive Species

No invasive plant species were recorded within the proposed site and its immediate environs. Therefore, no significant adverse effects on Blackwater River (Cork/Waterford) SAC are expected to occur due to the spread of invasive plant species.

5.3 Assessment of Habitats and Species of Conservation Interest

The site-specific Conservation Objectives for Blackwater River (Cork/ Waterford) SAC are presented in Section 3.2. This section assesses the likelihood of the proposed development impacting the site-specific conservation objectives assigned for Blackwater River (Cork/ Waterford) SAC.

The Blackwater River (Cork/ Waterford) SAC is designated for 10 no. Annex I habitats. Attributes and proposed targets to maintain favourable conservation condition for these habitats, in addition to potential impacts are presented in Table 5-1 below.

Blackwater River (Cork/ Waterford) SAC supports 9 no. Annex II species. Attributes and proposed targets to maintain favourable conservation condition for these species, in addition to potential impacts are presented in Table 5-2 below.

Table 5-1: Potential Impacts on the Specific Conservation Objectives for the Qualifying Habitats of Blackwater River (Cork/Waterford) SAC (NPWS, 2012)

Conservation Objectives of Blackwater River (Cork/ Waterford) SAC			
Attribute	Measure	Target	Potential Impact
Estuaries [1130]			
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes.	No: saline habitat located far downstream of the proposed development with little/no potential for adverse effects, and no changes to the conservation status of this habitat.
Community extent	Hectares	Maintain the extent of the Mytilus edulis dominated community, subject to natural processes.	
Community structure: Mytilus edulis density	Individuals/m ²	Conserve the high quality of the Mytilus edulis dominated community, subject to natural processes	
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal estuarine sandy mud community complex; Subtidal estuarine fine sand with Bathyporeia spp. community complex; Sand and mixed sediment with polychaetes and crustacean's community complex; Coarse sediment community complex.	
Mudflats and sandflats not covered by seawater at low tide [1140]			
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes.	No: located far downstream of the proposed development with little/no potential for adverse effects, and no changes to the conservation status of this habitat.
Community extent	Hectares	Maintain the extent of the Zostera and Mytilus edulis dominated communities, subject to natural processes.	
Community structure: Zostera shoot density	Shoots/m ²	Conserve the high quality of the Zostera dominated community, subject to natural processes	
Community structure:	Individuals/m ²	Conserve the high quality of the Mytilus edulis-dominated	

Mytilus edulis density		community, subject to natural processes	
Community distribution	Hectares	The following community types should be conserved in a natural condition: Intertidal estuarine sandy mud community complex and Sand and mixed sediment with polychaetes and crustaceans community complex.	
Perennial vegetation of stony banks [1220]			
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession	No: this habitat is located far downstream; the attributes of this Annex I habitat will not be impacted by the proposed development due to the distance and remote and tenuous connectivity between the project and this coastal habitat.
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes.	
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	
Vegetation composition: typical species and subcommunities	Percentage cover at a representative sample of monitoring stops	Maintain the typical vegetated shingle flora including the range of subcommunities within the different zones	
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	
Salicornia and other annuals colonizing mud and sand [1310]			
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession.	No: this habitat is located far downstream; the attributes of this Annex I habitat will not be impacted by the proposed development due to the distance and remote and tenuous connectivity between the project and this coastal habitat.
Habitat distribution	Occurrence	No decline, or change in habitat distribution,	

		subject to natural processes.	
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	
Vegetation structure: height	Centimetres	Maintain structural variation within sward	
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	
Vegetation composition: typical species and sub-communities	Percentage cover	Maintain the presence of species-poor communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	
Vegetation structure: negative indicator species: Spartina anglica	Hectares	No significant expansion of common cordgrass (Spartina anglica), with an annual spread of less than 1%	
Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]			
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession.	No: this habitat is located far downstream; the attributes of this Annex I habitat will not be impacted by the proposed development due to the distance and remote and tenuous connectivity between the project and the location of Atlantic salt meadows within Blackwater River (Cork/ Waterford) SAC (see conservation objective available
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes.	

Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	mapping at: Blackwater River (Cork/Waterford) SAC National Parks & Wildlife Service (npws.ie)
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% area outside creeks vegetated	
Vegetation composition: typical species and subcommunities	Percentage cover at a representative sample of monitoring stops	Maintain range of subcommunities with typical species listed in SMP (McCorry and Ryle, 2009)	
Vegetation structure: negative indicator species – Spartina anglica	Hectares	No significant expansion of common cordgrass (Spartina anglica), with an annual spread of less than 1%	
Mediterranean salt meadows (Juncetalia maritimi) [1410]			
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession.	No: this habitat is located far downstream; the attributes of this Annex I habitat will not be impacted by the proposed development due to the distance and remote and tenuous connectivity between the project and the location of Atlantic salt meadows within Blackwater River (Cork/ Waterford) SAC (see conservation objective available mapping at: Blackwater River (Cork/Waterford) SAC National Parks & Wildlife Service (npws.ie))
Habitat distribution	Occurrence	No decline, subject to natural processes.	
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter,	

		without any physical obstructions	
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitats including transitional zones, subject to natural processes including erosion and succession	
Vegetation structure: vegetation height	Centimetres	Maintain structural variation in the sward	
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	
Vegetation composition: typical species and subcommunities	Percentage cover at a representative sample of monitoring stops	Maintain range of subcommunities with characteristic species listed in SMP (McCorry and Ryle, 2009)	
Vegetation structure: negative indicator species – <i>Spartina anglica</i>	Hectares	No significant expansion of common cordgrass (<i>Spartina anglica</i>), with an annual spread of less than 1%	
Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260]			
Habitat area	Kilometres	Area stable or increasing, subject to natural processes.	No: in view of the nature and scale of the proposed development, the proposed development is not expected to affect the habitat area.
Habitat distribution	Occurrence	No decline, subject to natural processes.	No: in view of the nature and scale of the proposed development, the proposed development is not expected to affect the habitat distribution.
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	No: the proposed development will not affect the hydrological regime.

Hydrological regime: tidal influence	Daily water level fluctuations - metres	Maintain natural tidal regime	No: the proposed development will not affect the hydrological regime.
Hydrological regime: freshwater seepages	Metres per second	Maintain appropriate freshwater seepage regimes	No: the proposed development will not affect the hydrological regime.
Substratum composition: particle size range	Millimetres	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles)	No: in view of the nature and scale of the proposed development, the proposed development is not expected to affect the substratum composition within the Blackwater River SAC.
Water quality: nutrients	Milligrams per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	No: in view of the nature, scale and location of the proposed development, the proposed development is not expected to affect the level of nutrients within the Blackwater River SAC.
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	No: in view of the nature and scale of the proposed development, the proposed development is not expected to affect the species composition of this habitat with Blackwater River SAC.
Floodplain connectivity	Hectares	The area of active floodplain at and upstream of the habitat should be maintained	No: the proposed development will not affect the area of available flood plain.
Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]			
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 263.7ha for sub-sites surveyed.	No: the attributes of this Annex I habitat will not be impacted by the proposed development due to the lack of connectivity between the project and the location of Oak woodland within Blackwater River (Cork/Waterford) SAC (see conservation objective available mapping at: Blackwater River (Cork/Waterford) SAC National Parks & Wildlife Service (npws.ie)).
Habitat distribution	Occurrence	No decline.	
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semimature trees and shrubs; and well-developed herb layer	

Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	
Woodland structure: dead wood	m ³ per hectare; number per hectare	At least 30m ³ /ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	
Woodland structure: veteran trees	Number per hectare	No decline	
Woodland structure: indicators of local distinctiveness	Occurrence	No decline	
Vegetation composition: native tree cover	Percentage	No decline. Native tree covers not less than 95%	
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including sessile oak (Quercus petraea) and birch (Betula pubescens)	
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	
*Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]			
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 19.2ha for sites surveyed.	No: the attributes of this Annex I habitat will not be impacted by the proposed development due to the lack of connectivity between the project and the location of Alluvial woodland within Blackwater River (Cork/ Waterford) SAC (see conservation objective available mapping at: Blackwater River (Cork/Waterford) SAC National Parks & Wildlife Service (npws.ie)).
Habitat distribution	Occurrence	No decline.	
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods	

		at least 25ha in size and “small” woods at least 3ha in size	
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semimature trees and shrubs; and well-developed herb layer	
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	
Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	
Woodland structure: dead wood	m ³ per hectare; number per hectare	At least 30m ³ /ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	
Woodland structure: veteran trees	Number per hectare	No decline	
Woodland structure: indicators of local distinctiveness	Occurrence	No decline	
Vegetation composition: native tree cover	Percentage	No decline. Native tree covers not less than 95%	
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including alder (<i>Alnus glutinosa</i>), willows (<i>Salix</i> spp) and, locally, oak (<i>Quercus</i>	

		robur) and ash (Fraxinus excelsior)	
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	
*Taxus baccata woods of the British Isles [91J0]			
The status of Taxus baccata woods of the British Isles as a qualifying Annex I habitat for the Blackwater River (Cork/Waterford) SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this habitat.			No: this habitat was not recorded at the site or its environs. As such, no impacts on this habitat would be expected to arise as a result of the proposed development.

Table 5-2: Potential Impacts on the Specific Conservation Objectives for the Qualifying Species of Blackwater River (Cork/Waterford) SAC (NPWS, 2012)

Conservation Objectives of Blackwater River (Cork/ Waterford) SAC			
Attribute	Measure	Target	Potential Impact
Freshwater Pearl Mussel Margaritifera margaritifera [1029]			
Distribution	Kilometres	Maintain at 161km.	Yes: Applying the precautionary principle, there is potential for habitat deterioration as a result of degradation of water quality during the construction phase to affect the distribution of FPM.
Population size	Number of adult mussels	Restore to 35,000 adult mussels	Yes: Applying the precautionary principle, there is potential for habitat deterioration as a result of degradation of water quality during the construction phase to affect the population size, structure and adult mortality of FPM.
Population structure: recruitment	Percentage per size class	Restore to least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length	The project will not result in an increase in humans, animals or any equipment entering the river.
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	
Habitat extent	Kilometres	Restore suitable habitat in more than 35km (see map 8) and any additional stretches necessary for salmonid spawning	Yes: Applying the precautionary principle, there is potential for habitat deterioration as a result of degradation of water quality during the construction phase to affect the restoration of suitable habitat.
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality macroinvertebrates: EQR greater than 0.90;	Yes: The proposed development will not require any new outfalls to the river

		phytobenthos: EQR greater than 0.93	and will not increase nutrient loading to the river. The grassland at the site is not fertilised and no pesticides are used.
Substratum quality: filamentous algae (macroalgae), macrophytes (rooted higher plants)	Percentage	Restore substratum quality filamentous algae: absent or trace (<5%); macrophytes: absent or trace (<5%)	There will be no increase in wastewater production during the operational phase.
Substratum quality: sediment	Occurrence	Restore substratum quality stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	However, applying the precautionary principle, there is potential for degradation of water quality during the construction phase to affect the water quality and restoration of substratum quality.
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	No: the Site-specific flood risk assessment concluded that the proposed development will not interfere with the function of the naturally occurring floodplain. No abstraction is required and no instream works or works to the riverbank are proposed.
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Yes: Applying the precautionary principle, there is potential for habitat deterioration as a result of degradation of water quality during the construction phase to affect the maintenance of sufficient juvenile salmonids.
White-clawed Crayfish <i>Austropotamobius pallipes</i> [1092]			
Distribution	Occurrence	No reduction from baseline	No: in the environs of the proposed site, the Blackwater River is not considered to be within the distribution range of white-clawed crayfish (see conservation objective available mapping at: <u>Blackwater River (Cork/Waterford) SAC National Parks & Wildlife Service (npws.ie)</u>).
Population structure: recruitment	Percentage occurrence of juveniles and females with eggs	Juveniles and/or females with eggs in at least 50% of positive samples	
Negative indicator species	Occurrence	No alien crayfish species	
Disease	Occurrence	No instances of disease	
Water quality	EPA Q value	At least Q3-4 at all sites sampled by EPA	
Habitat quality: heterogeneity	Occurrence of positive habitat features	No decline in heterogeneity or habitat quality	
Sea Lamprey <i>Petromyzon marinus</i> [1095]			

Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	No: no alteration in the accessibility of the river is expected to arise from the proposals
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	No: no alteration in the population structure of juveniles is expected to arise from the proposals
Juvenile density in fine sediment	Juveniles/m ²	Juvenile density at least 1/m ²	Yes, applying the precautionary principle and in the absence of mitigation, there is potential for adverse impacts on juvenile lamprey as a result of excessive sedimentation or the mobilisation of contaminants within surface water run-off during the construction phase.
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	Yes, applying the precautionary principle and in the absence of mitigation, there is potential for adverse impacts on lamprey spawning habitat as a result of excessive sedimentation or the mobilisation of contaminants within surface water run-off during the construction phase.
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	Yes, applying the precautionary principle and in the absence of mitigation, there is potential for adverse impacts on lamprey juvenile habitat as a result of excessive sedimentation or the mobilisation of contaminants within surface water run-off during the construction phase.
Brook Lamprey <i>Lampetra planeri</i> [1096]			
Distribution	% of river accessible	Access to all water courses down to first order streams	No: no alteration in the accessibility of the river is expected to arise from the proposals
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	No: no alteration in the population structure of juveniles is expected to arise from the proposals
Juvenile density in fine sediment	Juveniles/m ²	Mean catchment juvenile density of brook/river lamprey at least 2/m ²	Yes, applying the precautionary principle and in the absence of mitigation, there is potential for adverse impacts on juvenile lamprey as a result of excessive sedimentation or the

			mobilisation of contaminants within surface water run-off during the construction phase.
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	Yes, applying the precautionary principle and in the absence of mitigation, there is potential for adverse impacts on lamprey spawning habitat as a result of excessive sedimentation or the mobilisation of contaminants within surface water run-off during the construction phase.
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Yes, applying the precautionary principle and in the absence of mitigation, there is potential for adverse impacts on lamprey juvenile habitat as a result of excessive sedimentation or the mobilisation of contaminants within surface water run-off during the construction phase.
River Lamprey <i>Lampetra fluviatilis</i> [1099]			
Distribution	% of river accessible	Access to all water courses down to first order streams	No: no alteration in the accessibility of the river is expected to arise from the proposals
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	No: no alteration in the population structure of juveniles is expected to arise from the proposals
Juvenile density in fine sediment	Juveniles/m ²	Mean catchment juvenile density of brook/river lamprey at least 2/m ²	Yes, applying the precautionary principle and in the absence of mitigation, there is potential for adverse impacts on juvenile lamprey as a result of excessive sedimentation or the mobilisation of contaminants within surface water run-off during the construction phase.
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	Yes, applying the precautionary principle and in the absence of mitigation, there is potential for adverse impacts on lamprey spawning habitat as a result of excessive sedimentation or the mobilisation of contaminants within surface water run-off during the construction phase.
Availability of juvenile habitat	Number of positive sites in	More than 50% of sample sites positive	Yes, applying the precautionary principle and in

	2nd order channels (and greater), downstream of spawning areas		the absence of mitigation, there is potential for adverse impacts on lamprey juvenile habitat as a result of excessive sedimentation or the mobilisation of contaminants within surface water run-off during the construction phase.
Twaite Shad <i>Alosa fallax</i> [1103]			
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	No: There will be no reduction in the % river accessible during construction or operation of the proposed works.
Population structure: age classes	Number of age classes	More than one age class present	No: as noted by Sweeney (2019), limited records of adult shad are listed for the Blackwater, up to Clondulane weir (downstream of Fermoy), but in a survey carried out in summer 2013, no juvenile shad were caught in the Blackwater. In view of the nature, scale and location of the proposed development, there is no potential for adverse impacts on population structure during the construction or operational phase.
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning habitats	No: as noted by Sweeney (2019), limited records of adult shad are listed for the Blackwater, up to Clondulane weir (downstream of Fermoy), but in a survey carried out in summer 2013, no juvenile shad were caught in the Blackwater. In view of the nature, scale and location of the proposed development, there is no potential for adverse impacts on spawning habitat during the construction or operational phase.
Water quality: oxygen levels	Milligrams per litre	No lower than 5mg/l	No: as noted by Sweeney (2019), limited records of adult shad are listed for the Blackwater, up to Clondulane weir (downstream of Fermoy), but in a survey carried out in summer 2013, no juvenile shad were caught in the Blackwater. In view of the nature, scale and location of the proposed development, there is no potential for adverse impacts on spawning habitat during the construction or operational phase.

			no potential for adverse impacts on Twaite Shad as a result of a reduction in oxygen levels during the construction or operational phase.
Spawning habitat quality: Filamentous algae; macrophytes; sediment	Occurrence	Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plant) growth	No: as noted by Sweeney (2019), limited records of adult shad are listed for the Blackwater, up to Clondulane weir (downstream of Fermoy), but in a survey carried out in summer 2013, no juvenile shad were caught in the Blackwater. In view of the nature, scale and location of the proposed development, there is no potential for adverse impacts on spawning habitat during the construction or operational phase.
Atlantic Salmon <i>Salmo salar</i> (only in fresh water) [1106]			
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	No: the proposed works will not result in a change in the accessibility of rivers.
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	Yes, applying the precautionary principle and in the absence of mitigation, there is potential for adverse impacts on adult salmon as a result of excessive sedimentation or the mobilisation of contaminants within surface water run-off during the construction phase.
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	Yes, applying the precautionary principle and in the absence of mitigation, there is potential for adverse impacts on salmon fry as a result of excessive sedimentation or the mobilisation of contaminants within surface water run-off during the construction phase.
Out-migrating smolt abundance	Number	No significant decline	No: the proposed works would not be expected to have an adverse impact on out-migrating smolt
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Yes: applying the precautionary principle and in the absence of mitigation, there is potential for impacts on the number and distribution of redds in the Blackwater River as a result of

			excessive sedimentation within surface water run-off during the construction phase.
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Yes: applying the precautionary principle and in the absence of mitigation, there is potential for a reduction in Q value in the Blackwater River as a result of mobilisation of contaminants and excessive sedimentation within surface water run-off during the construction phase.
Otter <i>Lutra lutra</i> [1355]			
Distribution	Percentage positive survey sites	No significant decline	Yes: a reduction in water quality may result in a reduction in prey species available for otter that forage along the Blackwater River. However, any reduction in water quality is likely to be temporary and localised. The high mobility and large foraging ranges of otter means that they are likely to be able to accommodate such localised changes in prey distribution and abundance. No evidence of otter breeding or resting places was recorded in the environs of the site. However, otters are mobile animals that create new holts regularly. Applying the precautionary principle, there is potential for temporary visual and noise disturbance to otters utilising the Blackwater River during construction.
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 596.8ha above high-water mark (HWM); 958.9ha along riverbanks/ around ponds	
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 4,461.6ha	
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 500.1km	
Extent of freshwater (lake/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 125.6ha	
Couching sites and holts	Number	No significant decline	
Fish biomass available	Kilograms	No significant decline	
Barriers to connectivity	Number	No significant increase.	
Killarney Fern <i>Trichomanes speciosum</i> [1421]			
Distribution	Location	No decline. Two locations known within the SAC.	No: the attributes of this Annex II species will not be impacted by the proposed development due to the distance and lack of connectivity between the project and the location of this species within Blackwater River (Cork/ Waterford) SAC (see conservation objective available mapping at: <u>Blackwater River (Cork/Waterford) SAC</u>
Population size	Number	Maintain size and extent of existing colonies, including sporophyte frond counts and number of gametophyte patches	
Habitat extent	m ²	No loss of suitable habitat, such as shaded rock crevices, caves or gullies in, or near to, known colonies. No loss of woodland canopy at or near to known locations	

Hydrological conditions: visible water	Occurrence	Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations	<u>National Parks & Wildlife Service (npws.ie)</u> .
Hydrological conditions: humidity	Number of desiccated fronds	No increase. Presence of desiccated sporophyte fronds or gametophyte mats indicates conditions are unsuitable	
Light levels: shading	Percentage	No changes due to anthropogenic impacts	
Invasive species	Occurrence	Absent or under control	

5.4 In-combination Impacts

It is a requirement of Appropriate Assessment that the in-combination effects of the proposed development together with other Plans or projects are assessed. In-combination impacts can result from the successive, incremental, and/or combined effects of a development (plan, project or activity) when added to other existing, planned, and/or reasonably anticipated developments.

A search of the Cork County Council planning enquiry system¹¹ was conducted for developments that may have in-combination effects on European sites with the proposed aerodrome development. The search included developments that are proximal to the proposed site and those that may have an adverse cumulative or in-combination impact with the proposals on the water quality of Blackwater River (Cork/Waterford) SAC.

Plans relevant to the area were searched in order to identify any elements of the Plans that may act cumulatively or in-combination with the proposed development.

A list of those projects and Plans which may potentially contribute to cumulative or in-combination impacts with the proposed aerodrome development was generated for as listed in Table 5-3 below.

Table 5-3: List of Potential Plans which may Contribute to Cumulative Impacts

Name of Plan	Key Issues Directly Linked to Relevant European Sites	Potential Cumulative or In-Combination Impacts on Relevant European Sites
Cork County Development Plan 2022	The Cork County Development Plan includes the following Objectives of relevance to this report: BE 15-2: Protect sites, habitats and species: a) Protect all natural heritage sites which are designated or proposed for designation under European legislation, National legislation and International Agreements. Maintain and where possible enhance appropriate ecological linkages between these. This includes Special Areas of Conservation, Special Protection Areas, Marine Protected Areas, Natural Heritage Areas, proposed	Policies and objectives of the Cork County Development Plan 2022 ensure that local planning applications comply with proper planning and sustainability and with the requirements of relevant EU Directives and environmental considerations, there is no potential for adverse in-combination effects on European Sites.

¹¹ [ArcGIS Web Application](#)

	Natural Heritage Areas, Statutory Nature Reserves, Refuges for Fauna and Ramsar Sites. These sites are listed in Volume 2 of the Plan. b) Provide protection to species listed in the Flora Protection Order 2015, to Annexes of the Habitats and Birds Directives, and to animal species protected under the Wildlife Acts in accordance with relevant legal requirements. These species are listed in Volume 2 of the Plan. c) Protect and where possible enhance areas of local biodiversity value, ecological corridors and habitats that are features of the County's ecological network. This includes rivers, lakes, streams and ponds, peatland and other wetland habitats, woodlands, hedgerows, tree lines, veteran trees, natural and semi-natural grasslands as well as coastal and marine habitats. It particularly includes habitats of special conservation significance in Cork as listed in Volume 2 of the Plan. d) Recognise the value of protecting geological heritage sites of local and national interest, as they become notified to the local authority, and protect them from inappropriate development e) Encourage, pursuant to Article 10 of the Habitats Directive, the protection and enhancement of features of the landscape, such as traditional field boundaries, important for the ecological coherence of the Natura 2000 network and essential for the migration, dispersal and genetic exchange of wild species. BE 15-6: Biodiversity and New Development: Provide for the protection and enhancement of biodiversity in the development management process and when licensing or permitting other activities by: a) Providing ongoing support and guidance to developers on incorporating biodiversity considerations into new development through preplanning communications and the Council's guidance document 'Biodiversity and the Planning Process – guidance for developments on the management of biodiversity issues during the planning process' and any updated versions of this advice; b) Encouraging the retention and integration of existing trees, hedgerows and other features of high natural value within new developments; c) Requiring the incorporation of primarily native tree and other plant species, particularly pollinator friendly species in the landscaping of new developments; d) Fulfilling Appropriate Assessment and Environmental Impact Assessment obligations and carrying out Ecological Impact Assessment in	
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	relation to development and activities, as appropriate; e) Ensuring that an appropriate level of assessment is completed in relation to wetland habitats subject to proposals which would involve drainage or reclamation. This includes lakes and ponds, watercourses, springs and swamps, marshes, heath, peatlands, some woodlands as well as some coastal and marine habitats; f) Ensuring that the implementation of appropriate mitigation (including habitat enhancement, new planting or other habitat creation initiatives) is incorporated into new development, where the implementation of such development would result in unavoidable impacts on biodiversity - supporting the principle of biodiversity net gain.	
Water Action Management Plan 2024	The Water Action Plan includes targeted measures for all water bodies, with the objective of either protecting water bodies at good or high status or restoring water bodies to at least good status. Where further specific measures are needed in addition to those set in this plan, integrated catchment planning approaches will be used to identify and decide on further specific measures for each water body. This will be reported in 46 Catchment Management Work Plans. These will be used to locate measures within each catchment. The list of water bodies and their associated status, significant pressures/issues and targeted measures, which are to be included in the Catchment Management Work Plans, will include targets for the third-cycle, along with Key Performance Indicators to monitor progress and outcomes.	The implementation and compliance with key environmental policies, issues and objectives of this management plan will result in positive in-combination effects to European sites. The implementation of this plan will have a positive impact for the biodiversity. It will not contribute to in-combination effects with the proposed development.
WWTP discharges	Millstreet and Environs Banteer and Environs	Discharges from municipal WWTPs are required to meet water quality standards. Irish Water Capital Investment Plan 2020-2024 proposes to upgrade water treatment services countrywide. The long-term in-combination impact is predicted to be negligible.
IPPC Programme	ALPS Electric (Ireland) Ltd (P0835), located c.7.9km to the south-west of the site	Discharges from these facilities are governed by strict limits to ensure compliance with quality standards. The long-term in-combination impact is predicted to be negligible.
Local Planning Applications	A search was conducted of planning applications (projects) within the vicinity of the proposed development, using the Cork County Council	Adherence to the overarching policies and objectives of the Cork County Development Plan 2022 - 2028 ensure that local

Under consideration ¹²	planning portal map viewer ¹³ . The search was limited to the five -year period preceding the date of issue of this report, and excluded retention applications (i.e. typically local-scale residential or commercial developments where an impact has already occurred), incomplete, withdrawn, and refused applications. Local planning applications in proximity and within the zone of influence of the proposed development are limited to a GAA sports facility (Ref: 236233), extension to dwelling (Ref: 235624), dwelling house (Ref: 245380 & 196001) and small agricultural development (Ref: 204802).	planning applications and subsequent grant of planning comply with the core strategy of proper planning and sustainability and with the requirements of relevant EU Directives and environmental considerations, there is no potential for adverse in combination effects on European Sites.
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No aspects of the projects or Plans summarised in Table 5-3 are anticipated to have a significant adverse effect upon the European Sites in combination with the proposed aerodrome development.

5.5 Conclusion of Impact Assessment

The proposed site is located adjacent to the Blackwater River (Cork/Waterford) SAC. In the absence of mitigation, there is potential for run-off of deleterious substances within surface water to reach the Blackwater River via the drainage ditch within the site and overland flow and impact on the aquatic QI species freshwater pearl mussel, lamprey species and Atlantic salmon. Applying the precautionary principle, there is also potential for disturbance to otter during the construction phase.

The site-specific flood risk assessment completed for the development found that the proposed development will not affect natural hydrological processes within the Blackwater River. No potential for adverse impacts as a result of degradation of water quality during the operational phase has been identified.

Rathcoole and its environs support a low number of small-scale local developments that have been granted planning permission. These developments have been granted planning permission on the basis that, where relevant, targeted and site-specific mitigation is completed to minimise potential impacts to the Blackwater River SAC. Assuming that best practice construction methods and mitigation measures are effectively implemented for all other developments, then no significant negative cumulative and in-combination impacts on the water quality of the Blackwater River SAC with the proposed development are expected.

All possible sources of effects from the proposed development, in combination with all other sources in the existing environment and any other effects likely to arise from other proposed plans or projects have been identified.

Robust and effective mitigation measures to avoid and or ameliorate these impacts are provided in Section 6.

¹² Planning applications granted within the past five years that may contribute to potential cumulative impacts on the European sites of concern. Search undertaken on 26/08/2024

¹³ [Amharcóir Pleanála - Planning Viewer \(arcgis.com\)](https://amharcoir.pleanala-planning-viewer.arcgis.com)

6 Mitigation

As stated in MN2000:

“Mitigation measures may be proposed by the plan or project proponent and/or required by the competent national authorities in order to avoid the potential impacts identified in the appropriate assessment or reduce them to a level where they will no longer adversely affect the site’s integrity” (Section 4.6.6).

Potential impacts identified in the above chapters primarily relate to the deterioration in the water quality of the Blackwater (Munster) River, which forms part of the Blackwater (Cork/Waterford) SAC, during the construction phase of the proposed aerodrome development. Mitigation measures to avoid or reduce the potential impacts on the Blackwater (Cork/Waterford) SAC are provided in the following sections.

6.1 Construction Phase

6.1.1 General

The control measures for the proposed development comply with the following current best practice guidelines:

- H. Masters-Williams et al (2001) Control of water pollution from construction sites. Guidance for consultants and contractors (C532). CIRIA;
- Guidelines on protection of fisheries during construction works in and adjacent to waters (IFI, 2016); and
- Murnane *et al* (2002) Control of Water Pollution from Construction Sites- Guide to Good Practice. SP156.

6.1.1.1 Construction Phase Mitigation

The Contractor, appointed by Rathcool Flying Club, shall be required to comply with and implement the requirements and mitigation measures as set out here and incorporated in full in the CEMP and any conditions or restrictions imposed as part of the granted planning approval.

Supervision

- Rathcool Flying Club shall appoint a suitably qualified person(s), to the role of Environmental Clerk of Works (EnCoW). The role of the EnCoW will be to monitor the construction works, appoint the relevant specialists required and to ensure compliance with relevant legislation and planning conditions, and to ensure the implementation of the mitigation measures in the planning approval as may be granted;
- The EnCoW shall have the authority to advise the Contractors and all site staff on the contract/project requirements, decide on elements that require direct supervision and instruct action, as appropriate, including the authority to require the temporary cessation of works, where necessary and to ensure the implementation of the mitigation measures in the planning approval as may be granted; and
- The EnCoW shall have the authority to advise the Contractors and all site staff to ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required, and the Contractor is required to prepare a contingency plan for before and after such events.

Table 6-1 details the mitigation measures that shall be implemented to prevent adverse impacts upon the following QI (as detailed in Section 5):

- Freshwater Pearl Mussel *Margaritifera margaritifera* [1029]
- Sea Lamprey *Petromyzon marinus* [1095]
- Brook Lamprey *Lampetra planeri* [1096]
- River Lamprey *Lampetra fluviatilis* [1099]
- Atlantic Salmon *Salmo salar* [1106]
- Otter *Lutra lutra* [1355]

Table 6-1: Table of Construction Phase Mitigation Measures

Objective(s)	Measure	Details of Mitigation
Control of Sediment Loss	Best Practice during Construction (Specific Silt Control Measures)	Any surface vegetation and spoil removed during site clearance shall be retained in an area over 20m away from any watercourse or active drainage ditch. The spoil must be surrounded by a silt fence and preferably placed on a well vegetated area. In very heavy rain, provision for covering of the stockpile with geotextile should be made. Surplus soil should be removed or re-used on site and immediately re-seeded.
Control of Sediment Loss	Best Practice during Construction (Specific Silt Control Measures)	No vegetation clearance shall take place within 10 meters of the riparian corridor with the Blackwater River. There shall be no instream works and no machinery shall be permitted to enter the Blackwater River at any point during the proposed project.
Control of Sediment Loss	Best Practice during Construction (Specific Silt Control Measures - Drains)	Culverting of the drainage ditches under the new runway shall be undertaken during a period of low flow. The drainage ditches shall have a series of temporary check-dams installed in advance of construction works to slow run-off velocity and prevent excessive sediment run-off from the site. These shall be a series of stake & geotextile dams backed up with gravels. A careful site drainage audit shall be carried out to identify any shallow drains / depressions and preferential flow paths from the works area towards the Blackwater River or active drainage ditches. Depressions/ preferential flow paths shall be fitted with e.g., cut-off drains/structures, geotextile and stake and/or staked down strawbale silt traps that will intercept and slow water velocity, encourage dispersal of flows and settlement of silt prior to meeting the interface with the river or check-dams in the drainage ditch. Any sediment/silt-traps, and check dams necessary to control run-off will be regularly checked, maintained, cleaned and/or replaced, if necessary, during the construction phase.
Avoid loss of contaminated material or leachate to the Blackwater River	Best Practice during Construction (Contaminated Materials)	Prior to undertaking any works on site, a silt fence will be erected adjacent to the bank of the Blackwater River (as illustrated in the CEMP) to intercept any silt and contamination laden runoff from excavated areas that may arise during heavy rainfall. The silt fence shall be maintained until excavation has been completed

		and vegetation is well established on topsoiled areas and the risk of silt laden runoff entering the river is minimised. The extent of the silt fence is shown within the CEMP included as part of the planning application. The efficacy of the silt fence shall be monitored daily and a second silt fence erected as required to avoid or reduce mobilisation of sediment into the river.
Control of Sediment Loss	Best Practice during Construction – Sediment	There must be no discharge of suspended solids or any other deleterious matter to the drainage channels within the site or the Blackwater River during the construction phase. Any silt contaminated water from the works area must be treated prior to discharge. If dewatering is required after heavy rain from e.g., excavated areas, contaminated water must be treated prior to discharge. The Contractor shall employ best practice settling systems to ensure maximum removal of suspended solids prior to discharge of any surface water or groundwater from excavations to receiving waterbodies. This may include treatment via settlement tanks; settlement tanks shall be used in preference to settlement ponds to avoid the risk of affecting natural flow regimes. There must be no direct pumping of silt/sediment laden water from the works area to drains or an active watercourse at any time.
Avoid Hydrocarbon Loss to Water	Best Practice during Construction (Hydrocarbons)	Temporary parking and refuelling areas shall be within a designated area within and adjacent to the construction compound. As illustrated within the CEMP accompanying the planning application, these areas are at the south of the site and are over 150m away from watercourses and drains. Best practice for hydrocarbon use and storage will be followed as set out in Section 4.2.2 of the CEMP.
Avoid loss of concrete to water	Best Practice during Construction (Concrete)	Best practice for concrete use, disposal and wash down will be followed as set out in Section 4.2.4 of the CEMP.
Avoid disturbance to otter	Pre-construction survey	Pre-construction otter surveys shall be undertaken prior to the commencement of any works in order to identify any changes in otter activity and holt locations since surveys for this report were completed to address possible impacts on otters. It is also important to ensure that no new holts have been created in the intervening period. This shall be conducted by a suitably qualified ecologist In the event that otter holts are recorded at the site, the removal of otters from affected holts, and the subsequent destruction of these holts, can only be conducted under a Section 25 derogation under the 1997 Habitats Regulations. Derogations are also required for any works likely to cause disturbance to active breeding holts (when present within c.150m of a scheme). Derogations are required for any works likely to cause disturbance to active breeding holts (when present within c.150m of a scheme). The removal of otters

		from affected holts, and the subsequent destruction of these holts, must be conducted under a Section 25 derogation under the 1997 Habitats Regulations. The National Parks and Wildlife Service (NPWS), of the Department of the Environment, Heritage and Local Government, is responsible for processing these licenses. An application for a Section 25 derogation shall be submitted to the NPWS along with the relevant ecological information from otter surveys. Closure of holts requires a monitoring period to ensure that there is no current otter activity at the holt. Derogations may not be provided by the NPWS for the closure of holts containing a breeding female or young otters. In the event of otter holts being identified within proximity to the proposed works area, the following mitigation measures shall take place to ensure no disturbance of the local otter population during the construction phase of the proposed works (NRA 2008): ▪ No works shall be undertaken within 150m of any holts at which breeding females or cubs are present. Following consultation with NPWS, works closer to such breeding holts may take place – provided a derogation licence and appropriate mitigation measures are in place, e.g. screening and/or restricted working hours on site. ▪ No wheeled or tracked vehicles (of any kind) shall be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance shall not take place within 15m of such holts, except under licence. ▪ The prohibited working area associated with otter holts will be fenced with temporary fencing prior to any possibly invasive works. Appropriate awareness of the purpose of the enclosure shall be conveyed through notification to site staff and sufficient signage shall be placed on each exclusion fence. All contractors or operators on site shall be made fully aware of the procedures pertaining to each affected holt.
Invasive Species	Best Practice (Invasive Plant Species)	No invasive species were identified on site during the site walkovers. However, in line with best practice, the following measures shall be undertaken: ▪ Undertake further invasive species survey prior to the commencement of construction. ▪ In the event that any such species are identified an Invasive Species Management Plan shall be prepared and implemented by the Contractor. This shall include plant specific control measures for any invasive species identified. ▪ Biosecurity measures shall be undertaken to prevent the importation of invasive species from contaminated areas into the study area.

		▪ For any material entering the site, the supplier shall provide an assurance that it is free of invasive species. ▪ Machinery or plant to be inspected upon arrival and departure from site and cleaned when necessary. ▪ Ensure all site users are aware of invasive species management plan and treatment methodologies. This can be achieved through “toolbox talks” before works begin on the site. ▪ Adequate site hygiene signage shall be erected in relation to the management of non-native invasive species material.
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6.2 Operational Phase Mitigation

No potential for likely significant effects on European sites has been identified during the operational phase, therefore no specific mitigation measures are required.

6.3 Likely Success of Mitigation

The mitigation provided in Section 6.1 is based on best practice measures provided in current best practice pollution prevention guidelines. With the effective implementation of these measures, there is a high level of confidence in their likely success.

6.4 Monitoring

The aim of monitoring is to alert personnel to any increase in threat to aquatic QI species and, in particular, freshwater pearl mussel so that timely mitigation may be deployed as appropriate, and to assess the effectiveness of mitigation already in place. Monitoring shall include inspection and photographic records of potential pathways for pollutants to reach and impact on freshwater pearl mussel populations. Effective monitoring with well documented results will aid in auditing and revising emergency response plans.

A water quality monitoring system will be put in place on the Blackwater River and the drainage ditch within the proposed site. As a minimum the monitoring system will measure turbidity, suspended solids, phosphorus, BOD/ dissolved oxygen & pH on the Blackwater River upstream and downstream of the area of the proposed site situated adjacent to the Blackwater River (Monitoring Sites A and B, Figure 6-1) and within the drainage ditch upstream and downstream of the location of the new runway (Monitoring Sites C & D, Figure 6-1).

The details of the monitoring system, including duration, frequency of sampling, monitoring locations, and parameters to be monitored will be agreed in advance with Inland Fisheries Ireland and the National Parks & Wildlife Service. Chemical analysis will be carried out only at laboratories that have been accredited by EPA for the analyses to be carried out.

Figure 6-1: Water quality monitoring sites



7 Analysis and Conclusions

7.1 Integrity of the European Site

From “Managing Natura 2000 sites: The provisions of Article 6 of the ‘Habitats’ Directive 92/43/EEC” (EC, 2018), the meaning of integrity is described as follows:

‘The integrity of the site involves its constitutive characteristics and ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the habitats and species for which the site has been designated and the site’s conservation objectives.’ (MN2000, Section 4.6.4)’.

7.2 Integrity of the Blackwater River (Cork/Waterford) SAC

Site specific Conservation Objectives were published for Blackwater River (Cork/ Waterford) SAC in July 2012. This document provides specific attributes and targets by which the maintenance of favourable conservation conditions of qualifying interests within the Blackwater River (Cork/ Waterford) SAC are measured. The overarching conservation objective for this European Site is as follows:

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (see **Section 3**).

Potential exists for impacts to the qualifying interests of Blackwater River (Cork/ Waterford) SAC during the construction phase of the proposed aerodrome development at Rathcoole; however, these can be readily mitigated through the implementation of mitigation as outlined in **Section 6**.

From the information gathered and the predictions made about the changes that are likely to result from the construction stage of the project and the mitigation measures proposed to avoid impacts to the SAC, the ‘Integrity of Site’ checklist is completed for Blackwater River (Cork/ Waterford) SAC in Table 7-1 below.

Table 7-1: Integrity of Site Checklist for Blackwater River (Cork/ Waterford) SAC

Conservation Objectives		
Does the project have the potential to:	Yes or No	Comment
Cause delays in progress towards achieving the conservation objectives of the site?	No	The Proposed Development will not cause delays in achieving the conservation objectives of the site. Potential impacts in the form of water quality deterioration to the Blackwater (Munster) River and Blackwater River (Cork/ Waterford) SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Interrupt progress towards achieving the conservation objectives of the site?	No	The Proposed Development will not interrupt progress towards achieving the conservation objectives of the site. Potential impacts in the form of water quality deterioration to the Blackwater (Munster) River and Blackwater River (Cork/ Waterford) SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Disrupt those factors that help to maintain the favourable conditions of the site?	No	The Proposed Development will not disrupt factors that help to maintain the favourable conditions of the site. Potential impacts in the form of water quality deterioration to the Blackwater (Munster) River and Blackwater River (Cork/ Waterford) SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Interfere with the balance, distribution and density of key species that are the	No	The Proposed Development will not interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site. Potential

indicators of the favourable condition of the site?		impacts in the form of water quality deterioration to the Blackwater (Munster) River and Blackwater River (Cork/ Waterford) SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Other Indicators		
Does the project or plan have the potential to:		
Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem?	No	Potential impacts in the form of water quality deterioration to the Blackwater (Munster) River and Blackwater River (Cork/ Waterford) SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	No	Potential impacts in the form of water quality deterioration to the Blackwater (Munster) River and Blackwater River (Cork/ Waterford) SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No	Potential impacts in the form of water quality deterioration to the Blackwater (Munster) River and Blackwater River (Cork/ Waterford) SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Reduce the area of key habitats?	No	There will be no direct loss of key habitats within Blackwater River (Cork/ Waterford) SAC. Potential indirect impacts may occur as a result of contaminated surface water run-off during the construction phase, but this can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Reduce the population of key species?	No	There will be no direct reduction of key species within Blackwater River (Cork/ Waterford) SAC. Potential indirect impacts may occur as a result of contaminated surface water run-off during the construction phase, but this can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Change the balance between key species?	No	The Proposed Development will not change the balance between key species associated with Blackwater River (Cork/ Waterford) SAC. Mitigation measures are prescribed to safeguard the Blackwater (Munster) River and the Blackwater River SAC. Required mitigation measures are outlined in Section 6 .
Reduce diversity of the site?	No	The Proposed Development will not reduce the diversity of Blackwater River (Cork/ Waterford) SAC. Potential impacts through the deterioration of water quality in the Blackwater (Munster) River and Blackwater River (Cork/ Waterford) SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Result in disturbance that could affect population size or density or the balance between key species?	No	No impacts have been identified that would result in disturbance that could affect population size or density or balance between key species associated with Blackwater River (Cork/ Waterford) SAC.

Result in fragmentation?	No	No impacts have been identified that would result in fragmentation of habitats for which Blackwater River (Cork/ Waterford) SAC has been designated.
Result in loss or reduction of key features (e.g. tree cover, tidal exposure, annual flooding, etc.)?	No	No key features associated with the Blackwater River (Cork/ Waterford) SAC will be lost as a result of construction or operation of the proposed development.

7.3 Conclusions

This NIS has been prepared following the Department of the Environment, Heritage and Local Government guidance ‘*Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*’ (DoEHLG, 2010a). The assessment for the proposed Development at Rathcoole Aerodrome, Co. Cork investigates the potential adverse effects on the qualifying interests of European sites arising from the proposals. The assessment considers whether the proposed development works and operation, alone or in combination with other projects or plans, will have adverse effects on the integrity of a European site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects.

Provided that the mitigation measures recommended in Section 6 are implemented in full, it can be objectively concluded that the proposed development at Rathcoole Aerodrome will not adversely affect the integrity of the Blackwater River (Cork/Waterford) SAC in view of the sites conservation objectives and that the conservation status of the qualifying interests will not be compromised by the proposed development directly, indirectly or cumulatively.

The key considerations that have contributed towards this conclusion are summarised as follows:

- The Proposed Development is not within the Blackwater River (Cork/Waterford) SAC. There are no resource requirements (e.g. excavation or abstraction) from European sites for the Proposed Development and no QI habitats or species have been recorded within the proposed site. Consequently, none of the lands designated as part of European sites will be directly impacted or removed as a result of the proposed development.
- No indirect impacts on the water quality of the Blackwater River (Cork/Waterford) SAC are expected in relation to sediment or pollution laden surface water run-off during the construction phase of the Proposed Development due to the requirement for the proposed construction works to adhere to best practice construction guidelines and the specific mitigation measures provided in Section 6.
- No potential for likely significant effects on Blackwater River (Cork/Waterford) SAC during the operational phase has been identified.

The conclusion of this NIS is that with the implementation of best practice there will be no potential for direct, indirect or cumulative impacts arising from the proposed Development at Rathcoole Aerodrome, Co. Cork either alone or in combination with any other plans or projects. The integrity of the Blackwater River (Cork/Waterford) SAC will not be adversely affected. No reasonable scientific doubt remains as to the absence of such adverse effects.

8 References

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Appendix A: Appropriate Assessment Screening Report

Report to Inform Screening for Appropriate Assessment

Development at Rathcoole Aerodrome

Co. Cork

Report prepared for Rathcool Flying Club

By Karen Banks MCIEEM

18th March 2025



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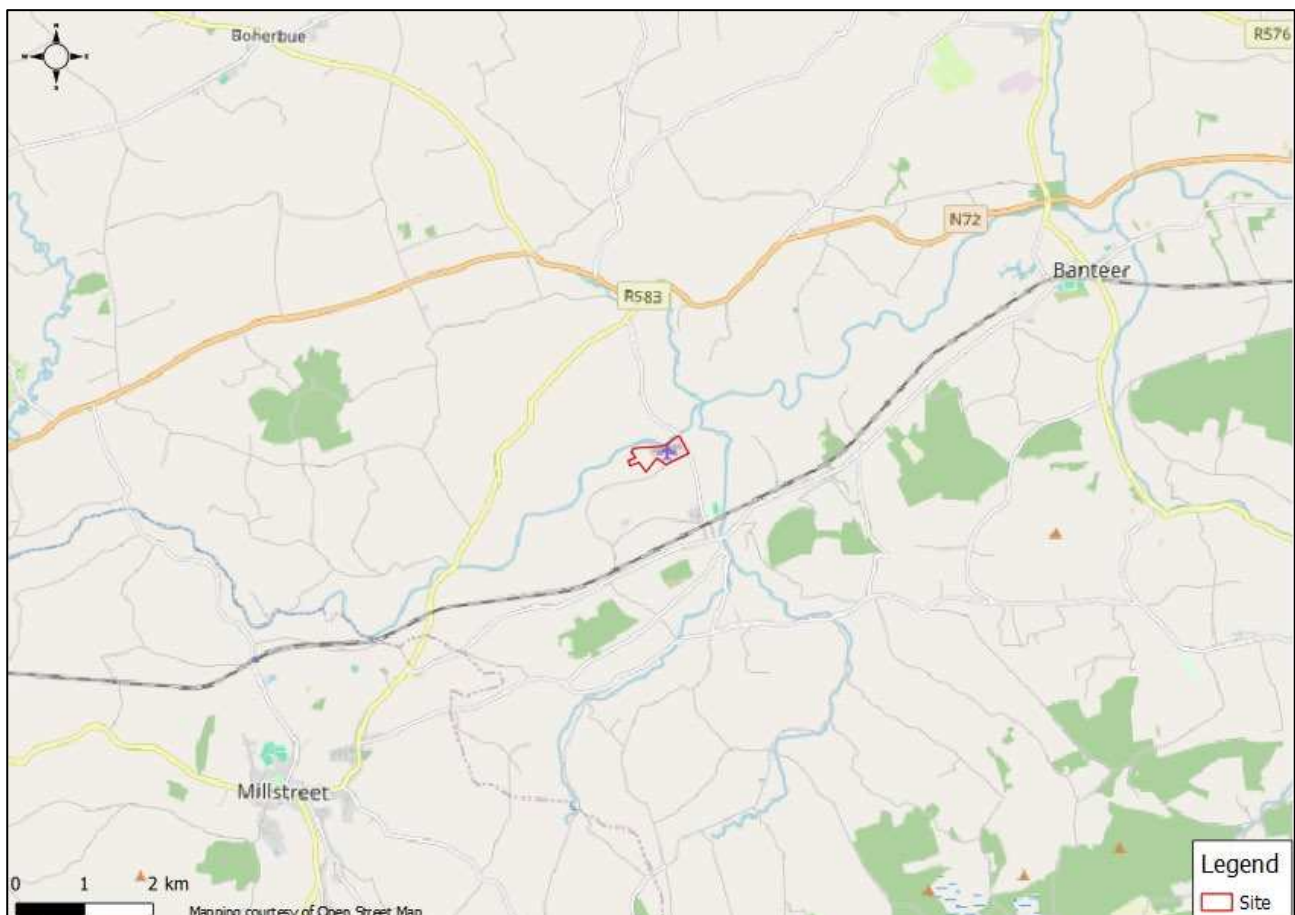
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1 Introduction

Greenleaf Ecology was commissioned by Rathcoole Flying Club to prepare a Report to Inform Screening for Appropriate Assessment (AA) for the proposed Development at Rathcoole Aerodrome (hereafter referred to as the Proposed Development) (see **Figure 1-1**).

This report comprises information in support of screening for AA to be undertaken by the competent authority for the purposes of Article 6(3) of the EU Habitats Directive (Directive 92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora as transposed by the Planning and Development Act (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011) as amended.

Figure 1-1: Site Location



1.1 Legislative Context for Appropriate Assessment

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, better known as “The Habitats Directive”, provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of sites known as Natura 2000.

The Habitats Directive has been transposed into Irish law by Part XAB of the Planning and Development Act (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011) as amended. In the context of the Proposed Development, the governing legislation is the Birds and Habitats Regulations.

Articles 6(3) of the Habitats Directive set out the decision-making tests for plans and projects likely to adversely affect the integrity of European sites (Annex 1.1). Article 6(3) establishes the requirement for AA:

Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

Natura 2000 sites are defined under the Habitats Directive (Article 3) as a coherent European ecological network of special areas of conservation, composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range. In Ireland, these sites are designated as European sites and include Special Protection Areas (SPAs), established under the EU Birds Directive (79/409/EEC, as codified by 2009/147/EC) for birds and Special Areas of Conservation (SACs), established under the Habitats Directive 92/43/EEC for habitats and species.

The competent authority is obliged to consider, in view of best scientific knowledge, whether the proposed works are likely to have a significant effect either individually or in combination with other plans and projects. If screening determines that there is likely to be significant effects on a European site, then AA must be carried out for the proposed works at Rathcoole, including the compilation of a Natura Impact Statement (NIS) to inform the decision making by the Competent Authority.

1.2 Statement of Competence

This AA Screening was carried out by Karen Banks, MCIEEM. Karen is an ecologist with Greenleaf Ecology and has 18 years' experience in the field of ecological assessment. Karen has extensive experience in the production of reports to inform AA screenings and Natura Impact Statements including those for transport infrastructure, small to large scale housing and mixed-use developments, flood alleviation schemes, solar farms and wind farms.

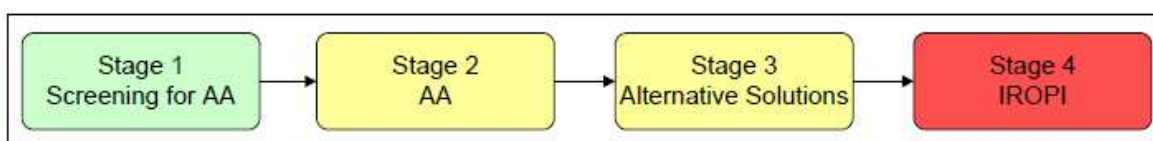
2 Methodology

2.1 Stages of Appropriate Assessment

The Department of the Environment, Heritage and Local Government guidelines (DELHG, 2009, rev. 2010) outlines the European Commission's methodological guidance (EC, 2002) promoting a four-stage process to complete the AA and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

The four stages are summarised diagrammatically in Figure 2-1. Stages 1-2 deal with the main requirements for assessment under Article 6(3) of the Habitats Directive, and Regulation 42 of the European Communities (Birds and Natural Habitats) Regulations. Stage 3 may be part of the Article 6(3) Assessment or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

Figure 2-1: Four stages of Appropriate Assessment



Stage 1 - Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3):

- i. whether a plan or project (in this instance the proposed project) is directly connected to or necessary for the management of the European sites, and
- ii. whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on the European sites in view of their conservation objectives.

If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA). This report fulfils the information necessary to enable the competent authority to screen the proposal for the requirement to prepare an AA.

This report forms Stage 1 of the AA process and sets out the following information:

- Description of the proposed works;
- Characteristics of the proximal European sites; and
- Assessment of significance of the proposed works on the European sites in question.

The methodology followed in relation to this assessment has had regard to the following guidance and legislation:

- European Union Habitats Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora 92/43/EEC;
- Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities (DOEHLG 2009, rev 2010);
- The Planning and Development Act, 2000 (as amended);
- Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg (EC, 2018);
- European Commission Notice Brussels C (2021) 6913 final 'Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC' (EC, 2021);
- Interpretation Manual of European Union Habitats. Version EUR 28. European Commission 2013;
- The European Union (Environmental Impact Assessment and Habitats) Regulations 2011; and

- The European Communities (Birds and Natural Habitats) Regulations, S.I. No. 477 of 2011 (as amended).

2.2 Information consulted for this report

The Screening assessment had regard to the following sources of data and information:

- Information on the location, nature and design of the proposed project provided by RPS;
- Department of Housing, Planning, and Local Government – online land use mapping [Home - My Plan](#);
- Department of Housing, Planning, and Local Government- EIA Portal [gov.ie - EIA Portal \(www.gov.ie\)](#);
- Environmental Protection Agency (EPA) – Water Quality and Water Framework Directive data [EPA Maps](#);
- Geological Survey of Ireland – Geology, soils and Hydrogeology [www.gsi.ie](#);
- National Parks and Wildlife Service – online European site network information, including site conservation objectives [www.npws.ie](#);
- National Parks and Wildlife Service – Information on the status of EU protected habitats in Ireland (NPWS 2019a, 2019b);
- National Biodiversity Data Centre – [www.biodiversityireland.ie](#);
- Ordnance Survey of Ireland – Mapping and Aerial photography [www.osi.ie](#); and
- Site surveys, undertaken between March and August 2024 by Ms K. Banks (see Section 3.4).

2.3 Screening Protocol

The sequence of events when completing the AA Screening process is provided below:

- Ascertain whether the plan or project is necessary for the management of the European site;
- Description of the plan or project and its potential impact;
- Definition of the likely zone of influence for the proposed works;
- Identification of the European sites that are situated (in their entirety or partially or downstream) within the likely zone of influence of the proposed works;
- Identification of the most up-to-date QIs and SCIs for each European site within the zone of influence;
- Identification of the environmental conditions that maintain the QIs/SCIs at the desired target of Favourable Conservation Status;
- Identification of the threats/impacts of the proposed works – actual or potential that could negatively impact the environmental conditions of the QIs/SCIs within the European sites;
- Highlighting the activities of the proposed works that could give rise to significant negative impacts; and
- Identification of other plans or projects, for which in-combination impacts would likely have significant effects.

2.3.1 Screening Determination

In accordance with Part XAB of the Planning Acts and/or the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011) as amended, the competent authority shall:

“determine that an Appropriate Assessment of a plan or project is not required where the plan or project is not directly connected with or necessary to the management of the site as a European site and if it can be excluded on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site”.

2.3.2 Zone of Influence

In accordance with EC (2021) *Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC*, identification of the European sites that may be affected should be done by taking into consideration all aspects of the plan or project that could have potential effects on any European sites located within the zone of influence of the

plan or project. This should take into account all of the designating features (species, habitat types) that are significantly present on the sites and their conservation objectives.

In particular, it should identify:

- Any European sites geographically overlapping with any of the actions or aspects of the plan or project in any of its phases, or adjacent to them;
- Any European sites within the likely zone of influence of the plan or project. Natura 2000 sites located in the surroundings of the plan or project (or at some distance) that could still be indirectly affected by aspects of the project, including as regards the use of natural resources (e.g. water) and various types of waste, discharge or emissions of substances or energy;
- European sites in the surroundings of the plan or project (or at some distance) which host fauna that can move to the project area and then suffer mortality or other impacts (e.g. loss of feeding areas, reduction of home range);
- European sites whose connectivity or ecological continuity can be affected by the plan or project.
- The range of European sites to be assessed, i.e. the zone in which impacts from the plan or project may arise, will depend on the nature of the plan or project and the distance at which effects may occur.

2.3.3 Likely Significant Effects

The threshold for a likely significant effect is treated in the screening exercise as being above a *de minimis* level¹. The opinion of the Advocate General in CJEU case C-258/11 outlines:

“the requirement that the effect in question be ‘significant’ exists in order to lay down a de minimis threshold. Plans or projects that have no appreciable effect on a European site are thereby excluded. If all plans or projects capable of having any effect whatsoever on the site were to be caught by Article 6(3), activities on or near the site would risk being impossible by reason of legislative overkill.”

In this report, therefore, ‘relevant’ European sites are those within the potential zone of influence of the construction and / or operation of the proposed development, and to which likely significant effect pathways were identified through the source-pathway-receptor model.

¹ *Sweetman v. An Bord Pleanála* (Court of Justice of the EU, case C-285/11). A *de minimis* effect is a level of risk that is too small to be concerned with when considering ecological requirements of an Annex I habitat or a population of Annex II species present on a European site necessary to ensure their favourable conservation condition. If low level effects on habitats or individuals of species are judged to be in this order of magnitude and that judgment has been made in the absence of reasonable scientific doubt, then those effects are not considered to be likely significant effects.

3 Project and Site Description

3.1 Project Description

The construction of a hard surfaced runway (740m in length) and taxiway (147.6m in length) with associated ground level lighting, associated interceptors, along with the demolition of an existing hangar to the east of the site and construction of a replacement hangar of approximately the same size and design to the west of the site; the demolition of the existing operations building and paramedic base building to the east of the site, and construction of a new operations and paramedic base building to the west of the site; and the demolition of an existing helipad to the east of the site, and construction of a new helipad to the west of the site, all associated with the HSE Air Ambulance. The development is to be served by a new proprietary waste water treatment system and includes the closure of an existing vehicular entrance onto the L-5215-0 road and its relocation further west along the same road, the upgrade of an existing entrance onto the L-5215-0 road, site landscaping and all other associated site development works. An Environmental Impact Assessment Report (EIAR) has been prepared and will be submitted to the Planning Authority with the application. The EIAR will be available for inspection or purchase at a fee not exceeding the reasonable cost of making a copy during office hours at the offices of the Planning Authority. A Natura Impact Statement will be submitted to the planning authority with the application. The Natura Impact Statement will be available for inspection or purchase at a fee not exceeding the reasonable cost of making a copy during office hours at the offices of the Planning Authority.

3.1.1 Surface Water Drainage

It is proposed to use nature-based, slow-draining solutions and on-site attenuation and infiltration of surface water. The following measures are proposed:

- Grass filter strips of a 5m width with a pea gravel spreader at the edge of the runway/taxiway
- Filter drains filled with stone/gravel at the foot of the filter strips
- Run-off water from the runway filter drains will be conveyed via hydrocarbon separators to attenuation/ soakaways systems

The run-off from the roofs of the re-located air ambulance base will pass through a silt trap to 1 no. soakaway.

Run-off from the concrete apron and heli-pad will drain to gullies and will be conveyed through a full-retention hydrocarbon separator to 1 no. soakaway to the north of the proposed hangar.

3.1.2 Foul Water

Foul water will be treated by a tertiary treatment system and infiltration/ treatment area. A Tri-cel secondary wastewater system and PuraFlo Tertiary 2 Module Filter on a 250 square metre gravel bed is proposed.

3.2 Existing Environment

3.2.1 Site Description

The proposed site supports semi-improved grassland (Fossitt code GS2), improved agricultural grassland (GA1), a small area of arable crops (BC1) and buildings and artificial surfaces (BL3). Fields within the site are bound by linear features including earth banks (BL2), hedgerows (WL1) and treelines (WL2); an active drainage ditch (FW4) is also present.

The Blackwater (Munster) River (FW2) is not located within the proposed site boundary but is adjacent to part of the northern site boundary. Waterbodies are further described in Section 3.2.2 of this report.

No invasive plant species were recorded within the proposed site and its immediate environs.

No Annex I habitats were recorded within the proposed site.

Otter have been recorded in the Blackwater River² and an otter print was recorded in soft mud at the west of the site during ecology surveys undertaken in 2024.

Full details of the existing habitats and species recorded at the proposed site are enclosed within the Biodiversity Chapter of the EIAR accompanying the planning application.

3.2.2 Surface Water

3.2.2.1 Water Bodies

The proposed site is located within the Blackwater (Munster)_070 sub basin. The Blackwater (Munster) River is a 5th order watercourse is located adjacent to the northern boundary of the proposed site where it forms part of Blackwater River (Cork/Waterford) SAC. The Blackwater flows in an easterly direction and eventually discharges into Youghal Harbour approximately 105km downstream.

The northern portion of the proposed site overlies the Rathmore West Ground Waterbody (GWB) and the southern portion of the site overlies the Banteer GWB.

EPA codes for these water bodies are shown below in Table 3-1.

Table 3-1: EPA water body codes

EPA water body name	Water body type	EPA Code	EPA water body code
Blackwater (Munster)_070	River	18B02	IE_SW_18B020900
Rathmore West	Groundwater	n/a	IE_SW_G_070
Banteer	Groundwater	n/a	IE_SW_G_018

3.2.2.2 Surface Water Quality and Risk Characterisation

Macroinvertebrate sampling for Q-value determination was conducted within the Blackwater River as part of EPA's Water Framework Directive monitoring. The nearest sampling point is located within the Blackwater River adjacent to the north-eastern corner of the proposed site at Colthurst Bridge. In 2021 (the latest score available) the Q value score was 4, 'Good'. The Blackwater (Munster)_070 is classified as 'At risk' and has been assigned a 'Good' status under the WFD 2016-2021 round. Rathmore West ground waterbody and Banteer ground waterbody were both considered 'Not at risk' and 'Good' under the WFD.

A summary of the WFD and risk status³ is shown below in Table 3-2.

Table 3-2: Summary of WFD status for waterbodies at the site and its environs

EPA Waterbody Name	Code	Risk	WFD Status 2016-2021
Blackwater (Munster)_070	IE_SW_18B020900	At Risk	Good
Rathmore West	IE_SW_G_070	Not at risk	Good
Banteer	IE_SW_G_018	Not at risk	Good

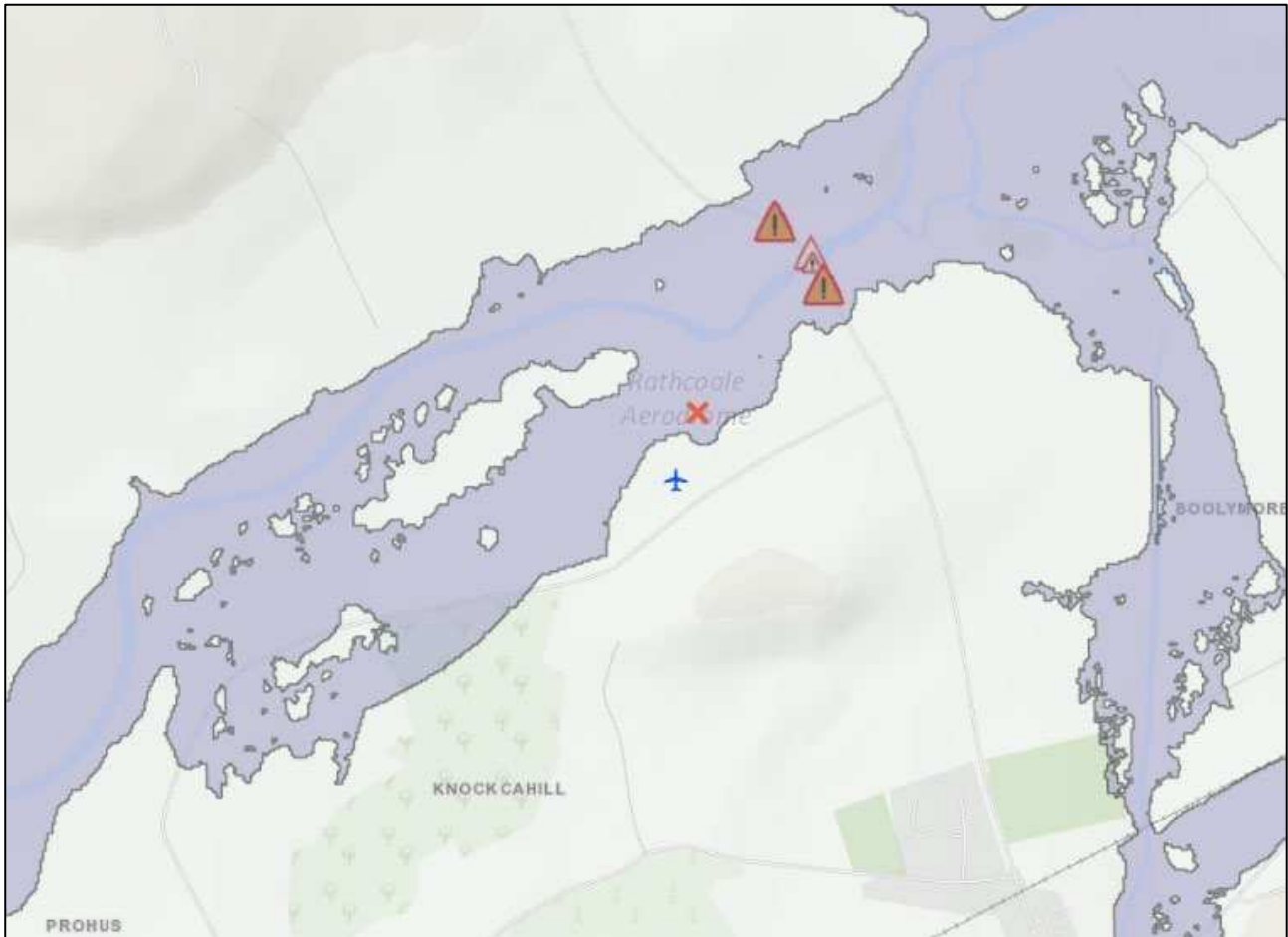
² <https://maps.biodiversityireland.ie/Map>

³ <https://www.catchments.ie/maps/>

3.2.3 Flooding

The Office of Public Works (OPW) flood mapping (<http://www.floodinfo.ie/map/floodmaps/>) indicates the flood extents for the Blackwater River. As indicated in Figure 3-1, the flood extents overlap the proposed site.

Figure 3-1: OPW Flood Risk Mapping of the Study Area



A Site Specific Flood Risk Assessment (SSFRA) completed by IE Consulting (2024) found that:

- The primary potential flood risk to the proposed development site can be attributed to an extreme fluvial event in the River Blackwater. The site is not at risk of pluvial or groundwater flooding.
- In the context of the 'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009' the assessment and analysis undertaken as part of this Site Specific Flood Risk Assessment indicates that the area of the site where the new runway and new taxiway are proposed falls within a delineated fluvial Flood Zone 'A' and Flood Zone 'B'.
- The area of the site where the new HSE Air Ambulance hanger, paramedic prefab base, crew prefab base and new proprietary wastewater treatment system are proposed falls within Flood Zone 'C'.
- The proposed runway and taxiway and associated infrastructure shall be constructed at existing ground levels and shall not involve any significant infilling or ground level raising.
- The proposed runway and taxiway shall therefore have no adverse impact on overland flow conveyance paths or the existing hydrological regime of fluvial flood waters associated with the River Blackwater.
- In addition, surface water runoff from the hard-standing runway shall be collected and attenuated on site in an underground infiltration system and will not result in an increased fluvial or pluvial flood risk elsewhere.

- In summary, and in consideration of the findings of the Site Specific Flood Risk Assessment and the incorporation of the recommendations presented within the SSFRA, the development as proposed is not expected to result in an adverse impact to the existing hydrological regime of the area or increase flood risk elsewhere and is therefore considered to be appropriate from a flood risk perspective.

3.2.4 Soil, Geology and Hydrogeology

The Geological Survey of Ireland (GSI) online database (www.gsi.ie) was consulted for available edaphic, geological and hydrological information of the site and its environs. The site is overlaid by AminDW, Deep well drained mineral (Mainly acidic) and Alluvial (mineral) soils adjacent to the Blackwater River. In terms of bedrock geology, the Dinantian formation, composed of limestone underlies the site to the south and Grey shale, thin siltstone and sandstone underlie the site to the north.

The bedrock units which underlie the site are mapped by the GSI as part of the same Regionally Important Karstified Aquifer to the south and Poor Aquifer to the north of the site. Groundwater vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease at which groundwater may be contaminated. The study area is of 'Moderate' groundwater vulnerability.

3.3 Description of European Sites

This stage of the screening for AA process describes European sites within the likely zone of influence of the proposed project. The methodology for establishing the likely zone of influence is described in Section 2.3.2.

Connectivity between the proposed development and European sites has been reviewed. Connectivity is identified via the potential source-pathway-receptor model which identifies the potential impact pathways such as land, air, hydrological, hydrogeological pathways etc. which may support direct or indirect connectivity of the proposed development to European sites and/or their qualifying features.

In view of the location and characteristics of the proposed development (i.e. hard surfaced runway, taxiway and helipad and associated works, see Section 3.1 for the project description) and the source, pathway and receptors of potential impacts, a 15km radius is considered an appropriate zone of influence to screen all likely significant effects that might impact upon the European sites. Establishment of the likely zone of influence is in line with EC (2021) *Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC*.

The European sites located within 15km of the proposed development are outlined in Table 3-3 and Figure 3-2. There are 4 European sites located within 15km of the proposed development:

1. Blackwater River (Cork/Waterford) SAC (002170)
2. Killarney National Park, Macgillicuddy's Reeks and Caragh River Catchment SAC (000365)
3. Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)
4. Mullaghanish to Musheramore Mountains SPA (004162)

Source – pathway – receptor dynamics were assessed for European sites and it was determined that there is no connectivity (via surface water, groundwater, air or other environmental vectors) between the proposed development and Killarney National Park, Macgillicuddy's Reeks and Caragh River Catchment SAC, Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA and Mullaghanish to Musheramore Mountains SPA and so these European sites will not be considered further in this assessment.

The proposed development is located adjacent to Blackwater River (Cork/Waterford) SAC and supports hydrological connectivity to this European site via an active drainage ditch.

Figure 3-2: European Sites Located within 15km of the Proposed Development

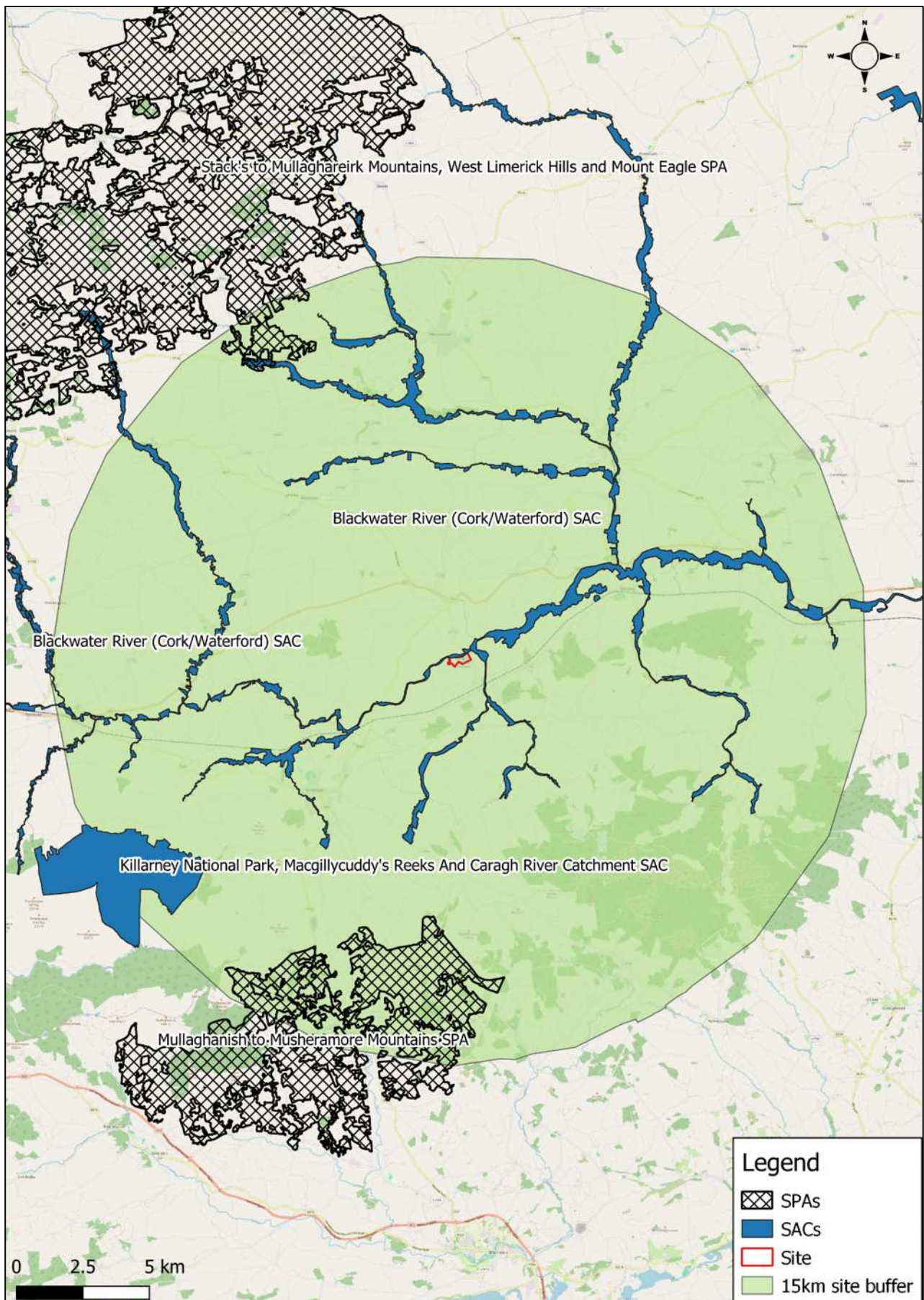


Table 3-3: European Sites within 15km of the Proposed Development

Site Name and Code	Qualifying Features (Annex I Habitats/Annex II Species)	Distance from proposed development	Connectivity
Blackwater River (Cork/Waterford) SAC (002170)	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Perennial vegetation of stony banks [1220] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritima) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation [3260] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0] Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) [91E0] <i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029] <i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092] <i>Petromyzon marinus</i> (Sea Lamprey) [1095] <i>Lampetra planeri</i> (Brook Lamprey) [1096] <i>Lampetra fluviatilis</i> (River Lamprey) [1099] <i>Alosa fallax fallax</i> (Twait Shad) [1103] <i>Salmo salar</i> (Salmon) [1106] <i>Lutra lutra</i> (Otter) [1355] <i>Trichomanes speciosum</i> (Killarney Fern) [1421]	0km (adjacent)	Potential connectivity due to proximity and hydrological connectivity via a drainage ditch. The proposed site and this SAC are both within the Rathmore West Ground Waterbody. GW and SW connectivity exists.
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365)	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110] Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea [3130] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation [3260] Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010]	11.8km	There is no connectivity via surface water, ground water or any other pathway.

	European dry heaths [4030] Alpine and Boreal heaths [4060] Juniperus communis formations on heaths or calcareous grasslands [5130] Calaminarian grasslands of the Violetalia calaminariae [6130] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410] Blanket bogs (* if active bog) [7130] Depressions on peat substrates of the Rhynchosporion [7150] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] Taxus baccata woods of the British Isles [91J0] Geomalacus maculosus (Kerry Slug) [1024] Margaritifera margaritifera (Freshwater Pearl Mussel) [1029] Euphydryas aurinia (Marsh Fritillary) [1065] Petromyzon marinus (Sea Lamprey) [1095] Lampetra planeri (Brook Lamprey) [1096] Lampetra fluviatilis (River Lamprey) [1099] Salmo salar (Salmon) [1106] Rhinolophus hipposideros (Lesser Horseshoe Bat) [1303] Lutra lutra (Otter) [1355] Trichomanes speciosum (Killarney Fern) [1421] Najas flexilis (Slender Naiad) [1833] Alosa fallax killarnensis (Killarney Shad) [5046]		
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)	Hen Harrier (Circus cyaneus) [A082]	12.6km	There is no connectivity via surface water, ground water or any other pathway.
Mullaghanish to Musheramore Mountains SPA (004162)	Hen Harrier (Circus cyaneus) [A082]	9.5km	There is no connectivity via surface water, ground water or any other pathway.

4 Screening Assessment Criteria

4.1 Management of European Sites

Appropriate Assessment is not required where the proposed development is connected with, or necessary to, the management of any European site.

In this case, the proposed development is not directly connected with or necessary to the management of any European site(s).

4.2 Likely Direct, Indirect or Secondary Impacts of the Project on the European Sites

The proposed works include site clearance, earthworks, drainage, and installation of the runway, taxi-way, drainage trenches, new hangar and new air ambulance base (see **Section 3** for the full project description).

There is potential for run-off of deleterious substances from these works to the surrounding environment.

Potential connecting pathways to the Blackwater (Munster) River and Blackwater River (Cork/Waterford) SAC include the drainage ditch at the proposed site, which drains into the Rathcool River c.0.4km to the east of the proposed site, the Rathcool River then flows into the Blackwater (Munster) River a further 0.3km downstream (i.e. a total of 0.6km downstream of the proposed site); there is also potential for overland flow of surface water from the proposed works into the Blackwater (Munster) River.

The potential significant effects on European sites as a result of the proposed development at Rathcoole Aerodrome are primarily related to a change in water quality within Blackwater River (Cork/Waterford) SAC and disturbance impacts, as discussed below.

4.2.1 Overview of Potential Impact Sources and Pathways

Pollutant washout to surface waters during the construction phase

Potential impacts resulting from construction phase works near watercourses are primarily related to three sources of possible water borne pollutants: suspended solids (sediment washout), concrete and hydrocarbons.

The pathways for these pollutants to enter nearby surface waters are via an existing drainage ditch and preferential overland flow paths.

- **Suspended Solids:** The principal source of potentially negative impact on aquatic receptors arises from the escape of excessive amounts of suspended solids / sediment during the construction phase. Sediment export can arise from earthworks and/or erosion of soil stockpiles and excavated areas relating to, e.g., excavation for the runway, taxi-way, drainage trenches and new air ambulance base, material stockpiles and hydrocarbon interceptor excavation; it is also proposed to extend the existing runway culvert by approximately 30m to facilitate the new runway alignment. Escaped solids can settle in watercourses, smothering plants and macroinvertebrates, causing fish to abandon the area at least in the short-term. This can result in reduced recruitment of young fish from affected reaches as a result of egg and fry mortalities and displacement of juveniles from nursery areas.
- Elevated concentrations of suspended solids and resulting turbidity within the water column can also potentially damage the gills, physiology and behaviour of fish (e.g., respiration, migration) and/or benthic macroinvertebrates (e.g., respiration, drift responses).
- Similar to salmonids, lampreys also depend on clean gravels for spawning, and although lamprey nursery areas depend on marginal sediments, excessive amounts of sediment deposition within a short time period could cause smothering of ammocoetes through loss of oxygen exchange.

- Freshwater pearl mussel is a species that is demanding of pristine water quality conditions and is very sensitive to a range of pollutants. Toxic pollution can have very serious and long-term effects on *Margaritifera* which, being benthic suspension feeders, are exposed to pollutants in surface water, sediment, interstitial water and through ingestion of filtered particles with sorbed contaminants.⁴
- **Cement:** Owing to its highly alkaline and corrosive nature, cement is potentially toxic to instream fauna and can cause fish and invertebrate kills downstream. Any concrete spills that did enter drains could be transported to the Rathcool River and/or Blackwater River which can result in localised mortality of fish, bivalves and invertebrates if quantities were large enough. Best practice in construction site layout and management means that the risk of wet concrete loss to surface waters is usually very low.
- **Hydrocarbons:** Hydrocarbons from construction sites can emanate from poorly maintained and leaky construction vehicles, mobile plant and cranes and stationery plant such as pumps and generators. Leakage from poorly secured or non-bunded fuel storage areas including spills during re-fuelling of plant and equipment can also occur. Hydrocarbon spills and leakages can result in oil slicks and tainting of fish, or (if large enough) localised fish and invertebrate kills. Loss of hydrocarbons during the construction phase can be prevented / avoided through best practice in construction management.

As described above, run-off of water-borne pollutants, if severe, could potentially impact on water quality, which could also impact on fish stocks. In turn, a reduction in fish stocks may potentially impact on populations of Otter (*Lutra lutra*).

4.2.2 Blackwater River (Cork/Waterford) SAC

The proposed site is located adjacent to the Blackwater River (Cork/Waterford) SAC, however the works footprint is located outside the boundary of this SAC, therefore no direct impacts will occur through land take or fragmentation of habitats.

There will be no direct impacts on the aquatic habitats of the Blackwater River and Blackwater River (Cork/Waterford) SAC as the works have no riparian or instream physical footprint.

The following freshwater aquatic/ semi aquatic species and habitats are listed as QI species for Blackwater River (Cork/Waterford) SAC:

- *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029]
- *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Alosa fallax fallax* (Twaite Shad) [1103]
- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation [3260]

Freshwater habitat within the proposed site is limited to an active drainage ditch, which in periods of high rainfall supports flowing water but supports low levels of standing water/ water with a sluggish flow in

⁴ Atkinson, S., Magee, M., Moorkens, E.A. & Heavey, M. (2024). Guidance on Assessment and Construction Management in *Margaritifera* Catchments in Ireland. <https://e-mussels.eu/europe/conservation-guidelines>

summer months. The drainage ditch is not of fisheries value and does not provide supporting habitat for aquatic QI species for Blackwater River (Cork/Waterford) SAC.

Freshwater pearl mussel: The results from presence/absence and total count surveys for freshwater pearl mussel show that the Munster Blackwater has a scattered population of mussels over a very wide area from upstream at Knocknagree to as far downstream as Lismore⁵. Conservation Objective mapping for Blackwater River (Cork/ Waterford) SAC⁶ indicates that the stretch of the Blackwater River adjacent to the site is located within the known distribution range for freshwater pearl mussel.

White-clawed crayfish: Within the Blackwater River system, white-clawed crayfish is present only on the Awbeg River, which flows through limestone geology. The main Blackwater is considered chemically unsuitable for the crayfish.

Lamprey species: lamprey have been recorded upstream of the proposed site at Nohoval⁷ and downstream of the site near Banteer.

Twaite shad: limited records of adult shad are listed for the Blackwater, up to Clondulane weir (downstream of Fermoy), but in a survey carried out in summer 2013, no juvenile shad were caught in the Blackwater.

Atlantic salmon: The Blackwater River is a salmonid river and is included within the S.I. 293: European Communities (Quality of Salmonid Waters) Regulations, 1988. Salmon (both 0+ and 1+ and older salmon) have been recorded upstream and downstream of the proposed site during surveys conducted by IFI in 2022.⁸

Otter: the National Biodiversity Data Centre (NBDC) database hold records of otter from Colthurst Bridge, last recorded in 2015. No otter holts or couches were recorded within or adjacent to the site during the site surveys, however otter prints were recorded in soft mud at the west of the site during a site survey in March 2024.

Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation: Water-crowfoot (*Ranunculus* spp) was recorded within the Blackwater River adjacent to the site during site surveys. However, it is noted that p. 36 of the site-specific conservation objectives for the Blackwater River (Cork/Waterford) SAC states that: *“rooted macrophytes should be absent or trace (< 5% cover) in freshwater pearl mussel (Margaritifera margaritifera) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in this SAC, because the mussel requires environmental conditions closer to natural background levels”*.

Construction Phase

Elevated levels of turbidity in association with earthworks during the construction phase or release of deleterious substances such as cement or hydrocarbons could temporarily affect the Blackwater River, which may result in likely significant effects on freshwater pearl mussel, lamprey species and Atlantic salmon as a result of degradation of water quality.

A reduction in water quality may result in a reduction in prey species available for otter that forage along the Blackwater River. However, any reduction in water quality is likely to be temporary and localised. The high

⁵ Atkinson, S., Magee, M., Moorkens, E.A. & Heavey, M. (2023). Supplementary Guidance on Assessment and Construction Management in Margaritifera Catchments in Ireland: Blackwater River (Cork/Waterford) SAC <https://e-mussels.eu/europe/conservation-guidelines>

⁶ [Site specific cons obj \(npws.ie\)](https://www.npws.ie/en/conservation/objectives/site-specific)

⁷ Inland Fisheries Ireland (2023) Fish in Rivers Factsheet: Blackwater (Munster) River Catchment Factsheet 2023/06.

⁸ As Ref 7.

mobility and large foraging ranges of otter means that they are likely to be able to accommodate such localised changes in prey distribution and abundance.

There is potential for temporary visual and noise disturbance to otters foraging in the Blackwater River in the vicinity of the site during construction. No evidence of otter holts was recorded at the proposed site and its environs, however there is suitable habitat for this species in the environs of the site.

There are two locations for Killarney Fern associated with Blackwater River (Cork/Waterford) SAC; one near Lismore and one near Youghal, c.71km and 74km to the east of the site respectively. No potential for likely significant effects on this species as a result of the proposed development has been identified.

The QI habitats for Blackwater River (Cork/Waterford) SAC (Estuaries [1130], Mudflats and sandflats not covered by seawater at low tide [1140], Perennial vegetation of stony banks [1220], Salicornia and other annuals colonising mud and sand [1310], Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) [1330], Mediterranean salt meadows (*Juncetalia maritimi*) [1410]) are coastal or estuarine habitats located within the Blackwater Estuary/ Youghal Harbour c.80km downstream of the proposed site. In view of the nature, size, scale and location of the proposed works, the dilution provided in the estuarine environment of the Blackwater Estuary and naturally fluctuating levels of silt, no impacts on coastal and estuarine Annex I habitats during construction will occur.

The banks of the Blackwater River adjacent to the proposed site were vegetated with grasses and abundant Bracken, with Alder, Ash, Sycamore, Willow and occasional Hawthorn and do not correspond to Annex I habitat or any QI habitats of Blackwater River (Cork/Waterford) SAC. The Priority Annex I habitat Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] is present c.4.9km to the north-east of the proposed site, however, there is no connectivity between the proposed site and this parcel of Alluvial woodland. In view of the nature, size, scale and location of the proposed works, it is not likely that deleterious substances arising from the works will reach this parcel of Alluvial forest. Further, pollution is not noted as an important threat or pressure to Alluvial forests ([N2K IE0000343 dataforms \(europa.eu\)](#)). In view of these factors, significant impacts on Alluvial forests are not expected. There are no Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] mapped within the zone of influence of the proposed development within the conservation objectives for Blackwater River (Cork/Waterford) SAC. No Oak woodland was recorded at the proposed site and its immediate environs. Therefore, the proposed development will not result in likely significant effects on Old sessile oak woods during the construction phase.

Operational Phase

The Conservation Objectives for the Blackwater River (Cork/Waterford) SAC state that the availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle.

As detailed in Chapter 7: Hydrology of the EIAR accompanying the planning application, the proposed new location of the HSE Air Ambulance hanger, paramedic prefab base, crew prefab base and new proprietary wastewater treatment system do not fall within Flood Zone 'A' or Flood Zone 'B', and therefore fall within Flood Zone 'C'. The proposed finished floor level of the buildings is above the estimated 0.1% AEP flood level of 82.1m OD in the River Blackwater.

The proposed runway and taxiway will be constructed at existing ground levels and will not involve any significant infilling or ground level raising. The proposed runway and taxiway will therefore have no adverse impact on overland flow conveyance paths or the existing hydrological regime of fluvial flood waters associated with the River Blackwater. In addition, surface water runoff from the hard-standing runway shall be collected and attenuated on site in an underground infiltration system and will not result in an increased fluvial or pluvial flood risk elsewhere.

It is proposed to extend the existing culvert under the existing runway by approximately 30m to accommodate the proposed runway alignment. It is also proposed to construct a 900mm pipe culvert under the proposed runway along the field drain in the western area of the site. The proposed culverts fall within an OPW NIFM 1% AEP (1 in 100 year – Flood Zone 'A') and a 0.1% AEP (1 in 1000 year – Flood Zone 'B') associated with the River Blackwater. These culvert structures shall be constructed below existing ground levels and are therefore unlikely to result in any adverse impact to the exiting hydrological regime of the area during the occurrence of an extreme fluvial event in the River Blackwater.

In summary, the proposed runway and taxiway will have no adverse effect on overland flow conveyance paths or the existing hydrological regime of fluvial flood waters associated with the River Blackwater; and the proposed development will not result in increased fluvial or pluvial flood risk elsewhere.

During the operational phase, surface water run-off from the runway will be managed by filter strips, filter drains and conveyance of storm water to attenuation systems via hydrocarbon separators. Run-off from the air-ambulance base will pass through a silt trap to a soakaway and run-off from the concrete apron and helipad will pass through a full retention hydrocarbon separator to a soakaway.

Foul water will be treated by a tertiary treatment system and infiltration/ treatment area.

In view of the proposed surface water management features, no adverse effects on surface or groundwater quality are anticipated during the operational phase.

No otter holts were recorded at the proposed site and its immediate environs, therefore there will be no disturbance to otter breeding or resting sites during the operational phase.

The navigation light corridor proposed for the development will increase light levels within the proposed development area. Artificial lighting at night may have an adverse effect on otter foraging and commuting along the Blackwater River and aquatic species within the river. The proposed lighting of the runway is limited to 18 no. runway edge lights plus threshold lights at each end of the runway, all of which are designed to mark the runway but not the area around the runway. The lux measurement at a distance of 10m from the runway will be 0.65lux, which is within the range of lux levels to be expected during a night with a clear full moon. As such, there will be no significant light spill on to important otter and aquatic QI habitat within the Blackwater River, located c.35m from the proposed runway at its closest point. The helipad will be lit by 12 no. green lights and the taxiways will both be lit by 8 no. blue lights; the helipad and taxiways are located to the south of the proposed runway and will not result in light spill onto the Blackwater River. Further, air ambulance services do not operate after the hours of darkness. The proposed development would facilitate the air ambulance service to land after the hours of darkness at Rathcool when required, however it is projected that the number of times that lighting will be used to facilitate a helicopter landing will be limited to 4 to 6 times a year. No nighttime flying will be undertaken by Rathcool Flying Club. In view of these factors, no significant adverse effects on otter or other aquatic species as a result of artificial lighting at night are expected.

No likely adverse impacts on Blackwater River (Cork/Waterford) SAC have been identified during the operational phase.

Invasive Species

No invasive plant species were recorded within the proposed site and its immediate environs. Therefore, no significant adverse effects on Blackwater River (Cork/Waterford) SAC are expected to occur due to the spread of invasive plant species.

4.2.3 Cumulative Impacts with Other Plans and Projects in the Area

As part of the screening for an AA, in addition to the proposed works, other relevant projects and plans in the region must also be considered at this stage and assessed in the context of potential for in-combination effects. These plans and projects are outlined and assessed in **Table 4-1** below.

It is concluded that there will be no negative in-combination effects between the proposed road improvement scheme and plans or projects in the area.

Table 4-1: Other Projects and Plans that could result in potential cumulative impacts

Plan / Programme/Policy	Key Objectives/Policies/Proposals	Potential for In-combination Effects and Mitigation
Cork County Development Plan 2022	The Cork County Development Plan includes the following Objectives of relevance to this report: BE 15-2: Protect sites, habitats and species: a) Protect all natural heritage sites which are designated or proposed for designation under European legislation, National legislation and International Agreements. Maintain and where possible enhance appropriate ecological linkages between these. This includes Special Areas of Conservation, Special Protection Areas, Marine Protected Areas, Natural Heritage Areas, proposed Natural Heritage Areas, Statutory Nature Reserves, Refuges for Fauna and Ramsar Sites. These sites are listed in Volume 2 of the Plan. b) Provide protection to species listed in the Flora Protection Order 2015, to Annexes of the Habitats and Birds Directives, and to animal species protected under the Wildlife Acts in accordance with relevant legal requirements. These species are listed in Volume 2 of the Plan. c) Protect and where possible enhance areas of local biodiversity value, ecological corridors and habitats that are features of the County's ecological network. This includes rivers, lakes, streams and ponds, peatland and other wetland habitats, woodlands, hedgerows, tree lines, veteran trees, natural and semi-natural grasslands as well as coastal and marine habitats. It particularly includes habitats of special conservation significance in Cork as listed in Volume 2 of the Plan. d) Recognise the value of protecting geological heritage sites of local and national interest, as they become notified to the local authority, and protect them from inappropriate development e) Encourage, pursuant to Article 10 of the Habitats Directive, the protection and enhancement of	Policies and objectives of the Cork County Development Plan 2022 ensure that local planning applications comply with proper planning and sustainability and with the requirements of relevant EU Directives and environmental considerations, there is no potential for adverse in-combination effects on European Sites.

	features of the landscape, such as traditional field boundaries, important for the ecological coherence of the Natura 2000 network and essential for the migration, dispersal and genetic exchange of wild species. BE 15-6: Biodiversity and New Development: Provide for the protection and enhancement of biodiversity in the development management process and when licensing or permitting other activities by: a) Providing ongoing support and guidance to developers on incorporating biodiversity considerations into new development through preplanning communications and the Council's guidance document 'Biodiversity and the Planning Process – guidance for developments on the management of biodiversity issues during the planning process' and any updated versions of this advice; b) Encouraging the retention and integration of existing trees, hedgerows and other features of high natural value within new developments; c) Requiring the incorporation of primarily native tree and other plant species, particularly pollinator friendly species in the landscaping of new developments; d) Fulfilling Appropriate Assessment and Environmental Impact Assessment obligations and carrying out Ecological Impact Assessment in relation to development and activities, as appropriate; e) Ensuring that an appropriate level of assessment is completed in relation to wetland habitats subject to proposals which would involve drainage or reclamation. This includes lakes and ponds, watercourses, springs and swamps, marshes, heath, peatlands, some woodlands as well as some coastal and marine habitats; f) Ensuring that the implementation of appropriate mitigation (including habitat enhancement, new planting or other habitat creation initiatives) is incorporated into new development, where the implementation of such development would result in unavoidable impacts on biodiversity - supporting the principle of biodiversity net gain.	
Water Action Management Plan 2024	The Water Action Plan includes targeted measures for all water bodies, with the objective of either protecting water bodies at good or high status or restoring water bodies to at least good status. Where further specific measures are needed in addition to those set in this plan, integrated catchment planning approaches will be used to identify and decide on further specific measures for each water body. This will be reported in 46	The implementation and compliance with key environmental policies, issues and objectives of this management plan will result in positive in-combination effects to European sites. The implementation of this plan will have a positive impact for the biodiversity. It will not contribute to

	Catchment Management Work Plans. These will be used to locate measures within each catchment. The list of water bodies and their associated status, significant pressures/issues and targeted measures, which are to be included in the Catchment Management Work Plans, will include targets for the third-cycle, along with Key Performance Indicators to monitor progress and outcomes.	in-combination effects with the proposed development.
Uisce Éireann Capital Investment Plan 2020-2024	Proposals to upgrade and secure water services and water treatment services countrywide.	Likely net positive impact due to water conservation and more effective treatment of water.
WWTP discharges	Millstreet and Environs Banteer and Environs	Discharges from municipal WWTPs are required to meet water quality standards. Irish Water Capital Investment Plan 2020-2024 proposes to upgrade water treatment services countrywide. The long-term in-combination impact is predicted to be negligible.
IPPC Programme	ALPS Electric (Ireland) Ltd (P0835), located c.7.9km to the south-west of the site	Discharges from these facilities are governed by strict limits to ensure compliance with quality standards. The long-term in-combination impact is predicted to be negligible.
Residential Applications Under consideration	A search was conducted of planning applications (projects) within the vicinity of the proposed development, using the Cork County Council planning portal map viewer⁹. The search was limited to the five -year period preceding the date of issue of this report, and excluded retention applications (i.e. typically local-scale residential or commercial developments where an impact has already occurred), incomplete, withdrawn, and refused applications. Local planning applications in proximity and within the zone of influence of the proposed development are limited to a GAA sports facility (Ref: 236233), extension to dwelling (Ref: 235624), dwelling house (Ref: 245380 & 196001) and small agricultural development (Ref: 204802).	Adherence to the overarching policies and objectives of the Cork County Development Plan 2022 - 2028 ensure that local planning applications and subsequent grant of planning comply with the core strategy of proper planning and sustainability and with the requirements of relevant EU Directives and environmental considerations, there is no potential for adverse in combination effects on European Sites.

⁹[Amharcóir Pleanála - Planning Viewer \(arcgis.com\)](https://arcgis.com)

4.3 Screening Assessment

Table 4-2 identifies the potential direct, indirect and secondary impacts of the proposed development on European Sites within a 15 km radius.

Table 4-2: Potential Significant Effects on European Sites from the Proposed Development

Site Name and Code	Direct Impacts	Indirect / Secondary Impacts	Resource Requirements	Emissions (Disposal to land, Water or Air)	Excavation Requirements
Blackwater River (Cork/Waterford) SAC (002170)	No impact on QI	Potential impacts on aquatic QI species as a result of degradation of water quality, potential disturbance to otter	No impact on QI	Potential impacts on aquatic QI species as a result of degradation of water quality	No impact on QI
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365)	No impact on QI	No impact on QI	No impact on QI	No impact on QI	No impact on QI
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)	No impact on QI	No impact on QI	No impact on QI	No impact on QI	No impact on QI
Mullaghanish to Musheramore Mountains SPA (004162)	No impact on QI	No impact on QI	No impact on QI	No impact on QI	No impact on QI

4.4 Likely Changes to the European Site(s)

The likely changes that could arise from the proposed development at Rathcoole Aerodrome, have been examined in the context of a number of factors that could have a significant effect on the relevant European Sites (**Table 4.3**).

Table 4-3: Likely Changes to European Sites

Site Name and Code	Reduction of Habitat Area	Disturbance to Key Species	Habitat or Species fragmentation	Reduction in Species Density	Changes in Key Indicators of Conservation Value (Water Quality, etc.)	Climate Change
Blackwater River (Cork/Waterford) SAC (002170)	None	Potential disturbance to otter	None	None	Potential impacts on aquatic QI species as a result of	None

					degradation of water quality	
Killarney National Park, Macgillicuddy's Reeks and Caragh River Catchment SAC (000365)	None	None	None	None	None	None
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)	None	None	None	None	None	None
Mullaghanish to Musheramore Mountains SPA (004162)	None	None	None	None	None	None

4.4.1 Elements of the Project where the Impacts are Likely to be Significant

There is potential for significant adverse effects on QI species freshwater pearl mussel, lamprey species and Atlantic salmon for Blackwater River (Cork/Waterford) SAC as a result of degradation of water quality during construction of the proposed Development at Rathcoole Aerodrome.

5 Conclusion

This AA screening report was completed with due regard to relevant European Commission guidance, national guidance and case law.

The potential impacts of the proposed development have been considered in the context of the European sites potentially affected, their qualifying interests or special conservation interests, and their conservation objectives.

Through an assessment of the source-pathway-receptor model, which considered the zone of influence of effects from the Proposed Development and the potential in-combination effects with other plans or projects, the following are the main conclusions:

- In view of the geographical location of the proposed project outside of the Blackwater River (Cork/Waterford) SAC boundary, there is no potential for direct effects on European sites.
- Potential conduits to the Blackwater River (Cork/Waterford) SAC are present via a drainage ditch and overland flow. There is potential for likely significant effects on QI species as a result of degradation of water quality.
- The drainage channel within the site is not suitable to support ex-situ populations of aquatic/semi aquatic QI for Blackwater River (Cork/Waterford) SAC.

In the absence of mitigation, and applying the precautionary principle, the potential for likely significant effects on aquatic and semi-aquatic QI species for Blackwater River (Cork/Waterford) SAC as a result of degradation of water quality and disturbance cannot be excluded. Therefore, a Stage 2 Appropriate Assessment is considered necessary for Blackwater River (Cork/Waterford) SAC.

6 References

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Appendix 6-1

APPENDIX A: SITE CHARACTERISATION FORM

File Reference:

1.0 GENERAL DETAILS (From planning application)

Prefix: Ms

First Name: Aerodrome

Surname: Rathcoole Flying Club

Address:

Rathcoole, Banteer, Co. Cork

Site Location and Townland:

RATHCOOLE

Number of Bedrooms: N/A Maximum Number of Residents: 10

Comments on population equivalent

No bedrooms in this planning application.

Proposed Water Supply:

Mains ☐

Private Well/Borehole ☒

Existing well on-site ☐

Group Well/Borehole ☐

2.0 GENERAL DETAILS (From planning application)

Soil Type, (Specify Type): A mixture of well drained mineral and shallow drained mineral

Subsoil, (Specify Type): Till derived from Devonian Sandstones.

Bedrock Type: Devonian Old Red Sandstones and Dinantian Shales and Limestones

Aquifer Category: Regionally Important Rg Locally Important LI Poor

Vulnerability: Extreme ☒ High ☐ Moderate ☐ Low ☐

Groundwater Body: Gravel and Bedrock Aquifer Status Good

Name of Public/Group Scheme Water Supply within 1 km: N/A

Source Protection Area: ZOC ☐ SI ☐ SO ☐ Groundwater Protection Response: R2¹

Presence of Significant Sites

(Archaeological, Natural & Historical): Ringfort to the east of proposed development.

Past experience in the area:

Severals tests done in this area and surrounding areas in accordance with the 2009 and 2021 Code of Practice.

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions).

GSI Aquifer Category - regionally important, groundwater protection response R2¹, acceptable subject to normal good practice.
Bedrock Type - devonian Old Red Sandstones and Dinantian Shales and Limestones. Potential targets at risk - groundwater.

Note: Only information available at the desk study stage should be used in this section.

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment

Landscape Position: Site below road level.

Slope: Steep (>1:5) ☐ Shallow (1:5-1:20) ☒ Relatively Flat (<1:20) ☐

Slope Comment: land gently sloping to the north

Surface Features within a minimum of 250m (Distance To Features Should Be Noted in Metres)

Houses:

No houses adjacent to the Flying Club

Existing Land Use:

Aerodrome

Vegetation Indicators:

Grass and Rush

Groundwater Flow Direction: south - north

Ground Condition:

Good firm underfoot conditions

Site Boundaries:

Ditch and wood boundaries.

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment (contd.)

Drainage Ditches:*

None evident.

Springs:*

None evident

Wells:*

Existing well on site located to the east of proposed development.

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed system within the site).

Site and surround appears to be fairly free draining. There is no evidence of ponding or poaching on site. Site potentially suitable for on site treatment and disposal of domestic effluent. Location of proposed system to the south east of proposed development. Potential targets at risk - groundwater.

*Note and record water level

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m):

Depth from ground surface
to bedrock (m) (if present):

Depth from ground surface
to water table (m) (if present):

Depth of water ingress:

Rock type (if present):

Date and time of excavation:

Date and time of examination:

Depth of

Surface and

Subsurface

Percolation

Tests

Soil/Subsoil

Texture &

Classification**

Plasticity and

dilatancy***

Soil

Structure

Density/

Compactness

Colour****

Preferential

flowpaths

0.1 m		Silt in topsoil in (A) horizon	not dilatant	crumb	uncompact	brown	rootlets
0.2 m							
0.3 m							
0.4 m							
0.5 m							
0.6 m							
0.7 m							
0.8 m		CLAY soil in (B) horizon with a mixture of stone and silty clay down towards bottom of trial hole	4 / 5 number 255 mm threads, 35mm ribbons	Firm	Compact	brown / grey	
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m							
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m		Sand	Granular	blocky	compact	brown / grey	
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m		Bottom of Trial Hole					
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value:

Likely Surface Percolation Value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

3.2 Trial Hole (contd.) Evaluation:

Clay layer below (A) horizon appears to be fairly heavy soil with an appearance of maybe poor soil permeability. However there is no evidence of flow paths or ingress or mottling.

3.3(a) Subsurface Percolation Test for Subsoil

Step 1: Test Hole Preparation

Percolation Test Hole

	1	2	3
Depth from ground surface to top of hole (mm) (A)	400	400	400
Depth from ground surface to base of hole (mm) (B)	700	700	700
Depth of hole (mm) [B - A]	300	300	300
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

Pre-soak start	Date	11-Mar-2022	11-Mar-2022	11-Mar-2022
	Time	07:00	07:06	07:10
2nd pre-soak start	Date	11-Mar-2022	11-Mar-2022	11-Mar-2022
	Time	10:00	10:10	10:30

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring T_{100}

Percolation Test Hole No.

	1	2	3
Date of test	12-03-2022	12-03-2022	12-03-2022
Time filled to 400 mm	06:06	06:10	06:15
Time water level at 300 mm	09:30	10:00	09:50
Time (min.) to drop 100 mm (T_{100})	204.00	230.00	215.00
Average T_{100}			216.33

If $T_{100} > 480$ minutes then Subsurface Percolation value >120 – site unsuitable for discharge to ground

If $T_{100} \leq 210$ minutes then go to Step 4;

If $T_{100} > 210$ minutes then go to Step 5;

Step 4: Standard Method (where $T_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)
1	09:35	14:00	265.00	10:05	14:45	280.00	09:55	14:30	275.00
2	14:04	19:15	311.00	14:48	19:35	287.00	14:35	19:20	285.00
3	19:18	23:45	267.00	19:38	23:57	259.00	19:25	23:54	269.00
Average Δt Value			281.00			275.33			276.33
	Average $\Delta t/4 =$ [Hole No.1] 70.25 (t_1)			Average $\Delta t/4 =$ [Hole No.2] 68.83 (t_2)			Average $\Delta t/4 =$ [Hole No.3] 69.08 (t_3)		

Result of Test: Subsurface Percolation Value = 69.39 (min/25 mm)

Comments:

Wastewater from a standard pre - cast concrete septic tank is highly likely to cause ponding at the surface of the percolation area/ NOT suitable for this system. Maybe suitable for some form of a secondary treatment system and polishing filter at a depth of the t - test hole.

Step 5: Modified Method (where $T_{100} > 210$ minutes)

Percolation Test Hole No.	1					
Fall of water in hole (mm)	Time Factor = T_1	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_{10} = T_1 / T_m$	T - Value = $4.45 / K_{10}$
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T - Value	T - Value Hole 1 = (T_1)		0.00		

Percolation Test Hole No.	2					
Fall of water in hole (mm)	Time Factor = T_1	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_{10} = T_1 / T_m$	T - Value = $4.45 / K_{10}$
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T - Value	T - Value Hole 2 = (T_2)		0.00		

Result of Test: Subsurface Percolation Value =

0.00 (min/25 mm)

Percolation Test Hole No.	3					
Fall of water in hole (mm)	Time Factor = T_1	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_{10} = T_1 / T_m$	T - Value = $4.45 / K_{10}$
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T - Value	T - Value Hole 3 = (T_3)		0.00		

Comments:

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

Pre-soak start	Date	11-Mar-2022	11-Mar-2022	11-Mar-2022
	Time	07:20	07:24	07:30
2nd pre-soak start	Date	11-Mar-2022	11-Mar-2022	11-Mar-2022
	Time	10:15	10:00	10:30

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring T_{100}

Percolation Test Hole No.	1	2	3
Date of test	12-Mar-22	12-Mar-22	12-Mar-2022
Time filled to 400 mm	06:25	06:30	06:35
Time water level at 300 mm	10:00	09:45	09:50
Time to drop 100 mm (T_{100})	215.00	195.00	195.00
Average T_{100}			201.67

If $T_{100} > 480$ minutes then Surface Percolation value >90 – site unsuitable for discharge to ground

If $T_{100} \leq 210$ minutes then go to Step 4;

If $T_{100} > 210$ minutes then go to Step 5;

Step 4: Standard Method (where $T_{150} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)
1	10:03	14:00	237.00	09:48	13:35	227.00	09:55	13:45	230.00
2	14:06	18:30	264.00	13:39	18:00	261.00	13:50	18:12	262.00
3	18:33	23:00	267.00	18:35	22:50	255.00	18:15	22:55	280.00
Average ΔT Value			256.00			247.67			257.33
	Average $\Delta T/4 =$ [Hole No.1] 64.00 (T_1)			Average $\Delta T/4 =$ [Hole No.2] 61.92 (T_2)			Average $\Delta T/4 =$ [Hole No.3] 64.33 (T_3)		

Result of Test: Surface Percolation Value = 63.42 (min/25 mm)

Comments:

Site is suitable for a secondary wastewater treatment system and a polishing filter / tertiary filter.

Step 5: Modified Method (where $T_{150} > 210$ minutes)

Percolation Test Hole No.	1					
Fall of water in hole (mm)	Time Factor $= T_r$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) $= T_m$	K_{15} $= T_r / T_m$	T-Value $= 4.45 / K_{15}$
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T-Value	T-Value Hole 1 = (T_1)			0.00	

Percolation Test Hole No.	2					
Fall of water in hole (mm)	Time Factor $= T_r$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) $= T_m$	K_{15} $= T_r / T_m$	T-Value $= 4.45 / K_{15}$
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T-Value	T-Value Hole 2 = (T_2)			0.00	

Result of Test: Surface Percolation Value =

0.00 (min/25 mm)

Percolation Test Hole No.	3					
Fall of water in hole (mm)	Time Factor $= T_r$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) $= T_m$	K_{15} $= T_r / T_m$	T-Value $= 4.45 / K_{15}$
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T-Value	T-Value Hole 3 = (T_3)			0.00	

Comments:

4.0 CONCLUSION of SITE CHARACTERISATION

Integrate the information from the desk study and on-site assessment (i.e. visual assessment, trial hole and percolation tests) above and conclude the type of system(s) that is (are) appropriate. This information is also used to choose the optimum final disposal route of the treated wastewater.

Slope of proposed infiltration / treatment area:

Are all minimum separation distances met?

☒

Depth of unsaturated soil and/or subsoil beneath invert of gravel (or drip tubing in the case of drip dispersal system)

Percolation test result: Surface:

Sub-surface:

Not Suitable for Development ☐

Suitable for Development ☒

Identify all suitable options

1. Septic tank system (septic tank and percolation area) (Chapter 7)
2. Secondary Treatment System (Chapters 8 and 9) and soil polishing filter (Section 10.1)
3. Tertiary Treatment System and Infiltration / treatment area (Section 10.2)

Discharge Route¹

Groundwater

5.0 SELECTED DWWTS

Propose to install:

and discharge to:

Invert level of the trench/bed gravel or drip tubing (m)

Site Specific Conditions (e.g. special works, site improvement works testing etc.

In my opinion the only way to treat and dispose of domestic effluent is to install a Tricel secondary wastewater treatment system and 2 Tero modules filters which will sit on a 250 Sq.m gravel bed (300mm).

¹ A discharge of sewage effluent to "waters" (definition includes any or any part of any river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial) will require a licence under the Water Pollution Acts 1977-90. Refer to Section 2.4.

6.0 TREATMENT SYSTEM DETAILS

SYSTEM TYPE: Septic Tank Systems (Chapter 7)

Tank Capacity (m ³)		Percolation Area		Mounded Percolation Area	
		No. of Trenches		No. of Trenches	
		Length of Trenches (m)		Length of Trenches (m)	
		Invert Level (m)		Invert Level (m)	

SYSTEM TYPE: Secondary Treatment System (Chapters 8 and 9) and polishing filter (Section 10.1)

Secondary Treatment Systems receiving septic tank effluent (Chapter 8)

Media Type	Area (m ²)*	Depth of Filter	Invert Level
Sand/Soil			
Soil			
Constructed Wetland			
Other			

Packaged Secondary Treatment Systems receiving raw wastewater (Chapter 9)

Type	Tri - Cel Secondary System
Capacity PE	10
Sizing of Primary Compartment	2.40 m ³

Polishing Filter*: (Section 10.1)

Surface Area (m ²)*	250.00	Option 3 - Gravity Discharge Trench length (m)	
Option 1 - Direct Discharge Surface area (m ²)		Option 4 - Low Pressure Pipe Distribution Trench length (m)	
Option 2 - Pumped Discharge Surface area (m ²)		Option 5 - Drip Dispersal Surface area (m ²)	

SYSTEM TYPE: Tertiary Treatment System and infiltration / treatment area (Section 10.2)

Identify purpose of tertiary treatment	Provide performance information demonstrating system will provide required treatment levels	Provide design information
Due to poor soil permeability conventional perforated pipework would no work on this site.	It will reduce microbial pathogens and a considerable reduction in phosphorus and nitrogen levels.	Propose to install a tri - cel secondary wastewater treatment system and a puraflo 2 module tertiary filter.

DISCHARGE ROUTE:

Groundwater ☒	Hydraulic Loading Rate * (l/m ² .d)	0.90	Surface area (m ²)	250.00
Surface Water ** ☐	Discharge Rate (m ³ /hr)			

* Hydraulic loading rate is determined by the percolation rate of subsoil

** Water Pollution Act discharge licence required

6.0 TREATMENT SYSTEM DETAILS

QUALITY ASSURANCE:

Installation & Commissioning

Installed by a fully qualified and insured person. All works documented and photographed by a suitably qualified person.

On-going Maintenance

Yearly on going maintenance is imperative and a contract taken out by clients and manufacturer.

7.0 SITE ASSESSOR DETAILS

Company: O' Riordan Architectural and Building Services Limited.

Prefix: Mr First Name: Brian Surname: O' Riordan

Address: Castlelands, Buttevant, Co. Cork.

Qualifications/Experience: Arch Dip and a qualified site assessor in accordance with the 2021 EPA Code of Practice

Date of Report: 24-Mar-2022

Phone: (086) 8294046

E-mail: brianoriordanarchitect@gmail.com

Indemnity Insurance Number: AP10001650

Signature:

Brian O' Riordan Arch Dip

O' Riordan Arch
& Building Services Ltd.
Castlelands, Buttevant,
Co. Cork.
Tel: 022 / 25096
086 / 8294046

Level 6 Specific Purpose Certificate Teastas Cuspóra Shainiúil Leibhéal 6

Site Suitability On-Site Wastewater Treatment

Awarded to
Bronnta ar

Brian O'Riordan

16/05/2008

Doreen O'Rourke

Chair/Cathaoirleach FETAC

Stam Uile Hynes

Chief Executive/Príomhfheidhmeannach FETAC

GSI - Soils



Legend

TEAGASC_Soils_50K...

- AminDW - Deep well drained mineral (Mainly acidic)
- AminPD - Mineral poorly drained (Mainly acidic)
- AminPDPT - Peaty poorly drained mineral (Mainly acidic)
- AminSW - Shallow well drained mineral (Mainly acidic)
- AminSP - Shallow poorly drained mineral (Mainly acidic)
- AminSPPT - Shallow peaty poorly drained mineral (Mainly acidic)
- AminSRPT - Shallow, rocky, peaty/non-peatymi... complexes (Mainly acidic)

- BminDW - Deep well drained mineral (Mainly basic)
- BminPD - Mineral poorly drained (Mainly basic)
- BminPDPT - Peaty poorly drained mineral (Mainly basic)
- BminSW - Shallow well drained mineral (Mainly basic)
- BminSP - Shallow poorly drained mineral (Mainly basic)
- BminSPPT - Shallow peaty poorly drained mineral (Mainly basic)

- BminSRPT - Shallow, rocky, peaty/non-peatymi... complexes (Mainly basic)

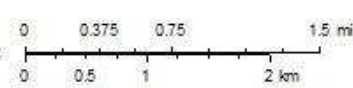
- BktPt - Blanket peat
- FenPt - Fen peat
- RsPt - Raised Peat
- Cut - Cutover/cutaway peat
- AlluvMIN - Alluvial (mineral)
- AlluvMRL - Alluvial (marl)
- Lac - Lacustrine type soils
- Scree - Scree
- AeoUND - Aeolian undifferentiated
- MarSands - Marine sand and gravel
- MarSed - Marine/estuarine sediments
- Made - Made ground
- Water - Water
- Unclass

Scale: 1:54,308

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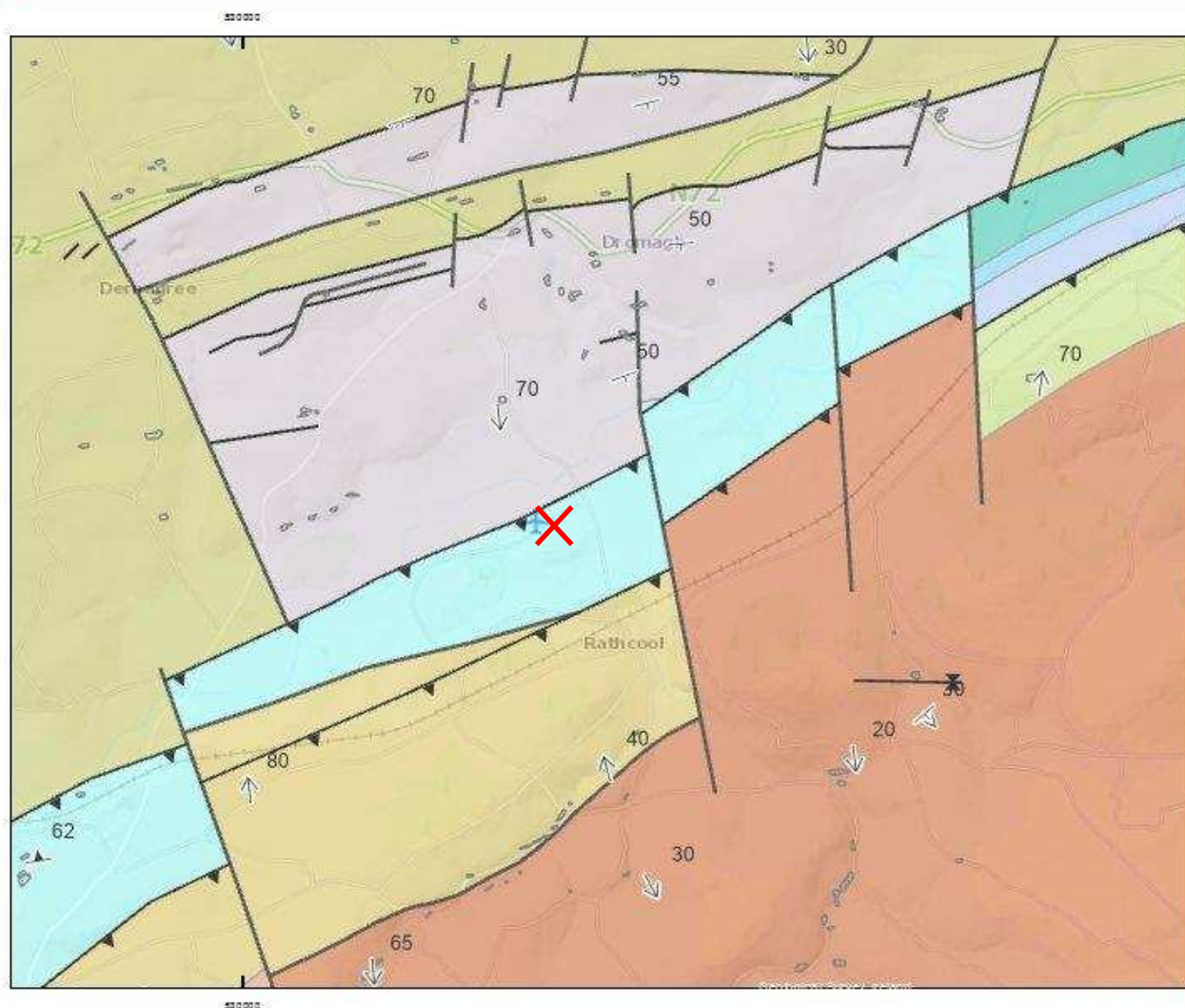
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GSI - Bedrock



Legend

IE_GSI_Structural_Sy...

- ↑ Dip of bedding or main foliation, old GSI data
- First foliation parallel to bedding
- ⊥ Foliation trend, Thorrs and Rosses Granites
- ⊥ Horizontal Bedding
- ↗ Strike and dip of bedding, right way up
- ↖ Strike and dip of bedding, way up unknown
- ↗ Strike and dip of first foliation
- ↖ Strike and dip of overturned bedding
- ↗ Strike and dip of second foliation
- ↖ Strike and dip of third foliation
- ↗ Strike and plunge of first generation fold axis
- ↖ Strike and plunge of second generation fold axis
- ↗ Strike and plunge of third generation fold axis
- ↖ Strike of vertical bedding/foliation
- ↗ Strike of vertical first foliation

Bedrock Outcrops

IE_GSI_Geological_Li...

- ↖ Anticlinal Axis
- ↗ Antiformal axis
- Aquifer Boundary
- - - Area
- Coal seam
- Dyke
- Fault
- Ghost Line
- Goniatite marine band (R1-R4)

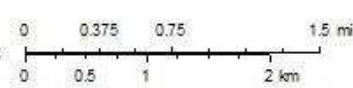
- Lithological boundary offshore
- Metadolerite sheet, mainly sills
- Paleogene/Tertiary Dyke
- ✕ Synclinal Axis
- ✕ Synformal axis
- Tectonic Slide, barbs on hanging-wall
- Thin stratigraphical unit, diagrammatic
- ▲ Thrust, barbs on hanging-wall side
- Tuff band
- Unconformity, dots on younger side
- X-Section

Scale: 1:54,308

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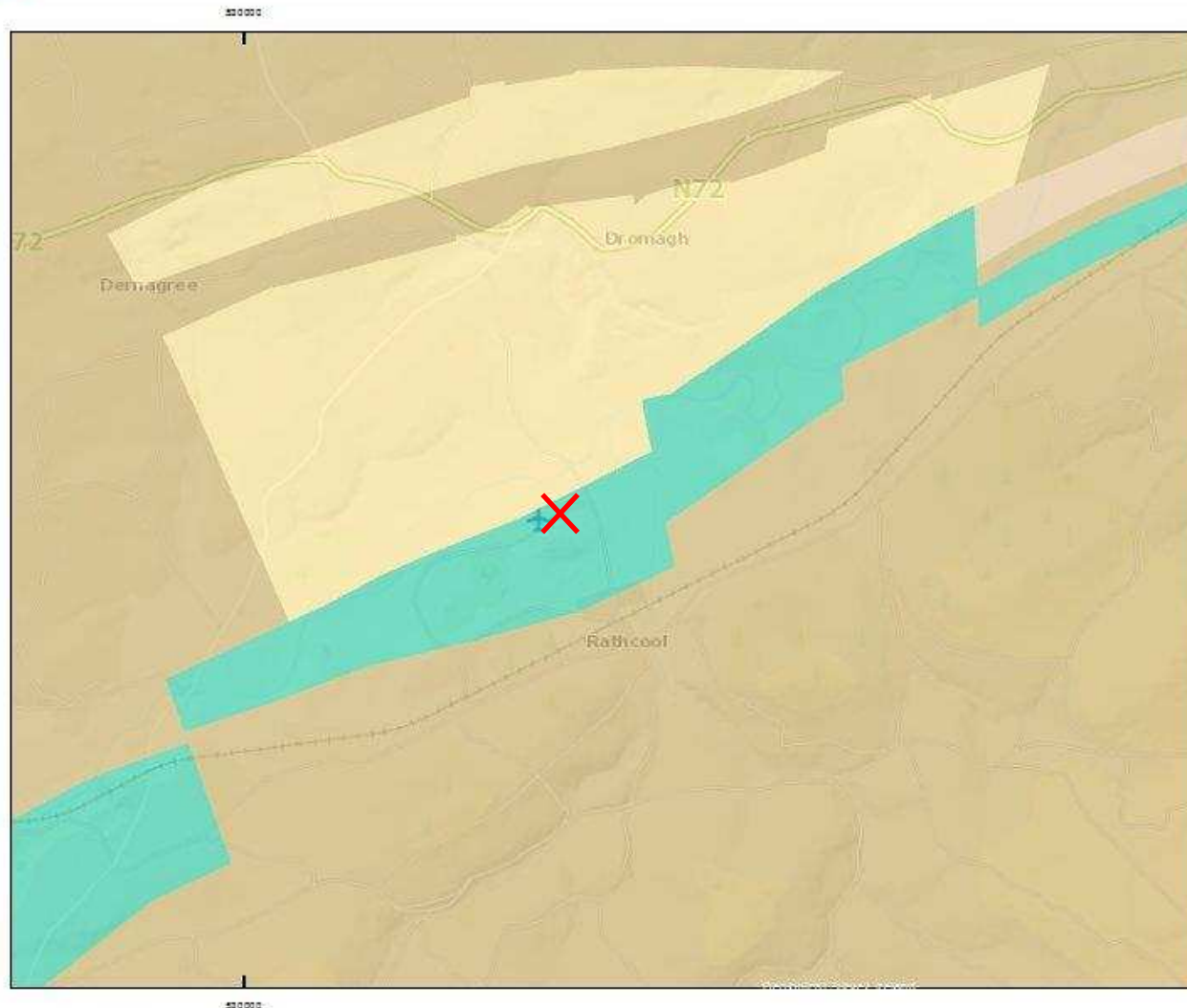
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GSI - Aquifers



Legend

IE_GSI_Bedrock_Aqui...

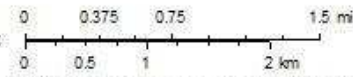
- Rkc - Regionally Important Aquifer - Karstified (conduit)
- Rkd - Regionally Important Aquifer - Karstified (diffuse)
- Rk - Regionally Important Aquifer - Karstified
- Rf - Regionally Important Aquifer - Fissured bedrock
- Rf/Rk - Regionally Important Aquifer - Fissured bedrock/Regionally Important Aquifer - Karstified
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Lk - Locally Important Aquifer - Karstified
- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- PI - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Fu - Poor Aquifer - Bedrock which is Generally Unproductive
- Lake
- Unclassified

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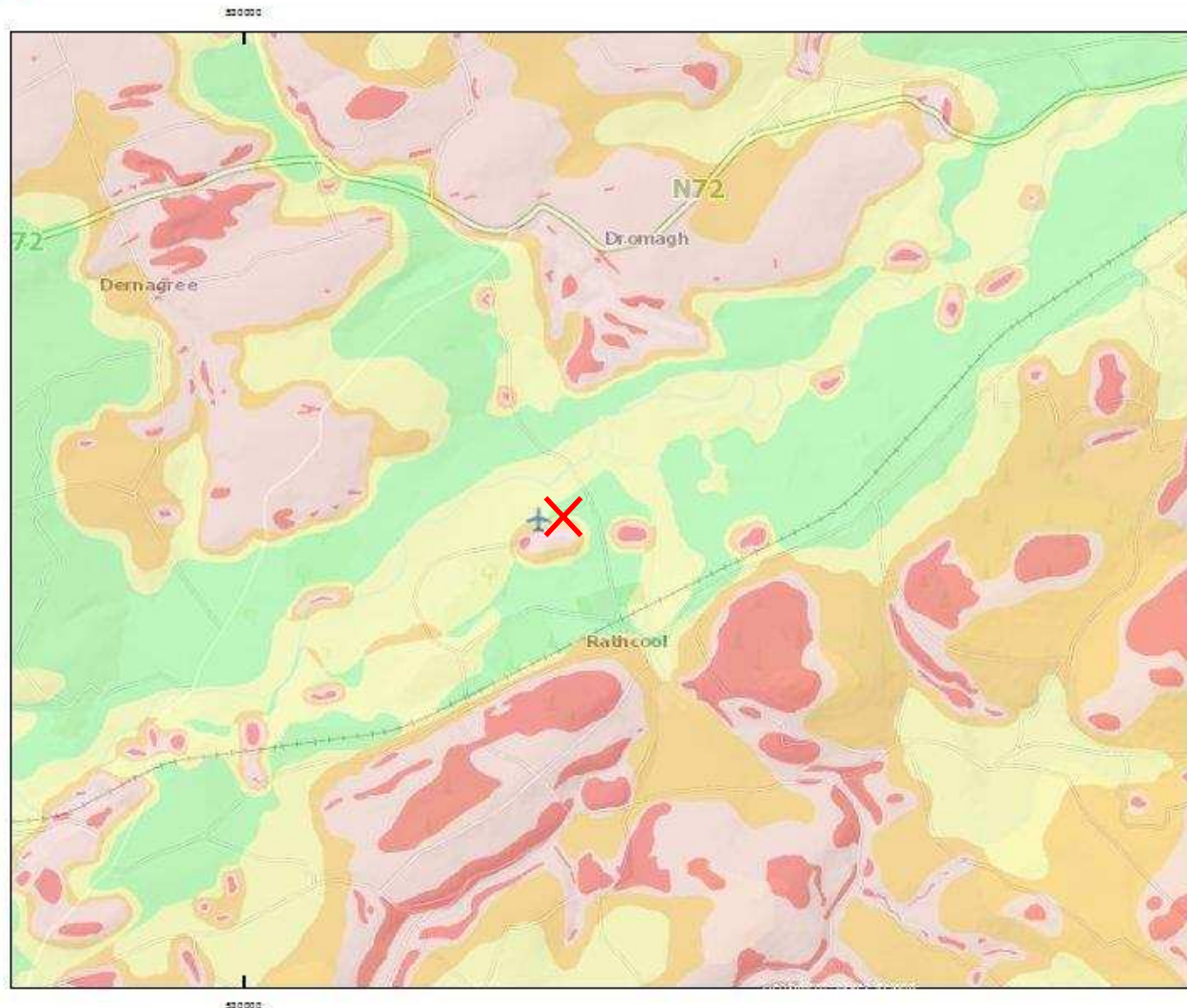
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- Legend
IE_GSI_Groundwater_...
- Rock at or near
 - Surface or Karst
 - Extreme
 - High
 - Moderate
 - Low
 - Water

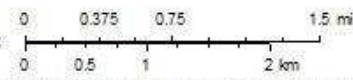


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1 TEST HOLE



SOIL HEAP



TRIAL HOLE



P TEST HOLE



TRIA
Hole



TRIA
Hole



TRIA
Hole



TRIA
Hole



SITE



SITE



TEST HOLES



TEST HOLES

4' TEST HOLE



4' TEST HOLE



4' TEST HOLE



4' TEST HOLE



'T' TEST HOLE



THREAD TEST



'p' TEST HOLE



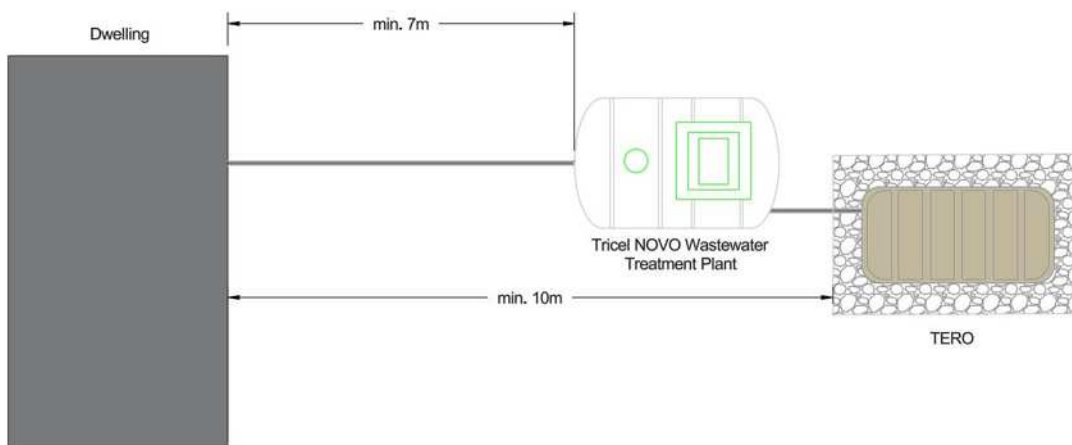
'T' TEST HOLE

Date	24/09/2024
Report No:	TSA_C_16232_1
Client Name	Rathcool Flying Club
Site Location & Townland	Rathcool Flying Club, Rathcool, Cork Tel: 083 829 9938 Email: dcrowley045@gmail.com

Thank you for choosing Tricel for your wastewater treatment requirements. This report contains the following information for your site and is based on a population of 10 and a subsurface/surface value of between 51-75.

Based on the information provided to us and using SR66 and the EPA Code of Practice: Wastewater Treatment and Disposal Systems Serving Single Houses (p.e. ≤ 10), the appropriate solution for treating wastewater on your site is a Tricel Novo Package Plant and Tricel Tero.

Typical layout of a Tricel Novo Package Plant and Tricel Tero:



Note:

In the above named site, a substitute wastewater treatment system may not be put in place of the following recommendation.

This recommendation only applies to the above named site based on the information supplied to Tricel.

A Site Characterisation Form should accompany this report. Tricel cannot be responsible for misinformation due to misleading information being received by us from clients.

Section 1: Information on the Novo Package Plant

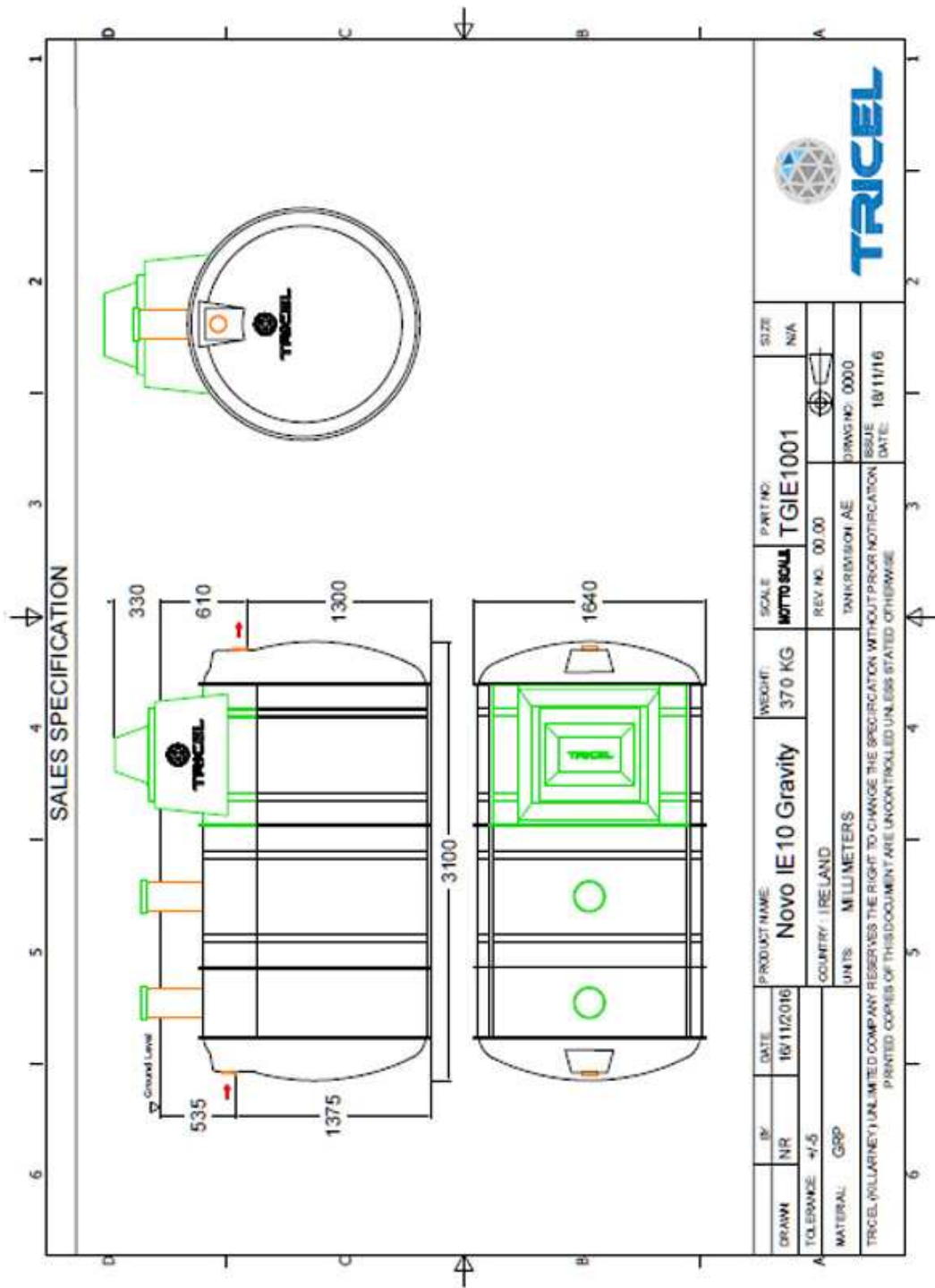
- Manufacturers report and sizing of the Tricel Novo Package Plant.
- Drawings of the Novo Package Plant.
- Pump selection and technical data
- Certification of the selected Novo Package Plant.
- Brochure on the Novo Package Plant.
- Optional Novo maintenance agreement.

For your site, we recommend a Novo IRL10 wastewater treatment plant which is designed to treat a maximum of 1500 litres of wastewater per day. The Tricel Novo range of wastewater treatment plants is fully in conformance with EN12566-3 and complies with SR66.

The Novo IRL10 has a capacity of 5550 litres, of which 2550 are in the primary chamber, this ensures a long desludging interval.

This solution contains a BEST FOUR pump based on an the Length of Rising Main 10 metres and Difference in Height of Rising Main 1.2 metres. A 38mm compression is supplied for connection to a rising main of 38mm internal bore pipework. Details and pump specifications are contained in Section 1.

Section 1



Rev.G

SUBMERSIBLE SUMP PUMPS

BEST 2-5

SPECIFICATIONS

50 Hz

PUMP		
Liquid Handled	Type of liquid	Clean / dirty water
	Max temperature [°C]	35
	Max solids size [mm]	10 (suspended particles)
Maximum immersion [m]		10
Construction	Impeller	Open centrifugal type
	Shaft seal type	Double mechanical seal
	Bearing	Sealed ball bearing
Pipe Connection	Suction-Flange	Strainer
	Discharge-Flange [inch]	G 1½ UNI ISO 228
Material	Casing	AISI 304
	Impeller	AISI 304
	Casing cover	AISI 304
	Shaft seal	Pump side : Sic/Sic/NBR Motor side : Carbon/Ceramic/NBR
	Seal cover	AISI 304
	Shaft	AISI 303 (wet extension)
	Lubricating liquid	White mineral oil ESSO MARCOL 172 (180 cc)
Applicable standard of test		ISO 9906 - Annex A

MOTOR		
Type	Submersible dry type	
	Single Phase	Three Phase
No. of Poles	2	
Rotation speed [min ⁻¹]	≈2800	
Insulation Class	F	
Protection degree	IP 68	
Power rating	[kW]	0.55 ÷ 1.1
	[HP]	0.75 ÷ 1.5
Frequency [Hz]	50	
Voltage [V]	230 ±10%	400 ±10%
Capacitor	Built in	-
Over load protection	Built in	-
Float Switch	Optional	-
Float Switch Cable	material	H07RN-F
	size	3G1
Casing material	AISI 304	
Base material/motor support	AISI 304	
Power cable	length [m]	10
	material	H07RN-F
	size	3G1 (Best 2) 3G1.5 (Best 3, 4) 4G1
Dimensions of cable entry		Cable Gland

200



EBARA PUMPS EUROPE S.p.A.

Rev. G

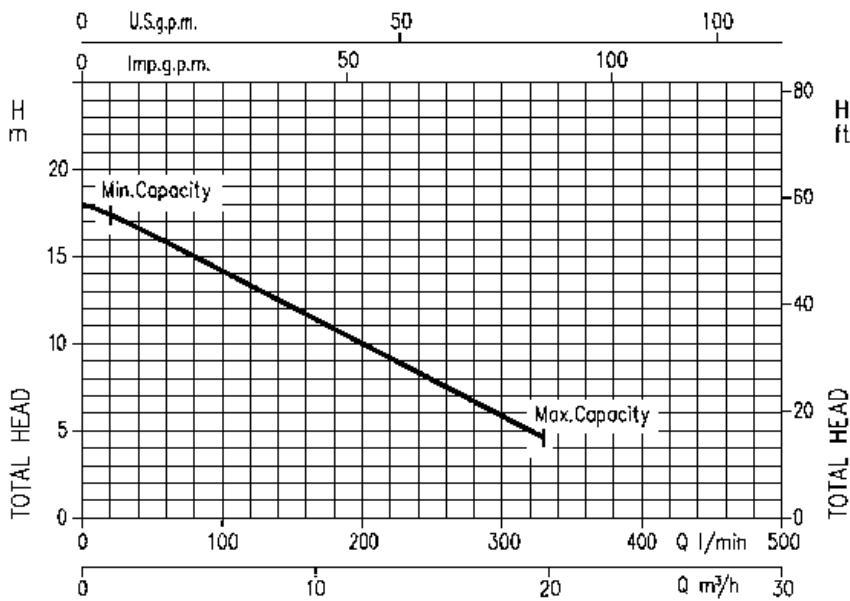
SUBMERSIBLE SUMP PUMPS

BEST 2-5

PERFORMANCE CURVE

50Hz

PUMP CHARACTERISTIC PERFORMANCE
BEST 4 (1.1 kW) SYNCHRONOUS SPEED : 3000 min⁻¹



Temperature of water: 20°C
Impeller diameter = 125 mm
Applicable standard of test: ISO 9906 – Annex A

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EBARA PUMPS EUROPE S.p.A.

Certificate in accordance with SR66 for EN12566-Part 3



Prüfinstitut für
Abwassertechnik
GmbH

TREATMENT PERFORMANCE RESULTS

Tricel (Killarney)
Ballyspillane Industrial Est., Killarney, Co. Kerry, Ireland

EN 12566-3
Results corresponding to EN 12566-3 and S.R. 66
PIA-SR66-1512-1062

Novo
Submerged fixed film

Nominal organic daily load	0.26 kg/d	
Nominal hydraulic daily load	0.90 m ³ /d	
Material	Glass reinforced plastic	
Watertightness	Pass	
Structural behaviour (Calculation)	Pass (also wet conditions)	
Durability	Pass	
Treatment efficiency (nominal sequences)		
	Efficiency	Effluent
	COD	91.6 %
	BOD ₅	95.9 %
	NH ₄ -N	79.9 %
	SS	95.3 %
		16 mg/l
Number of desludging	Not more than once	
Electrical consumption	1.1 kWh/d	

Performance tested by:

PIA – Prüfinstitut für Abwassertechnik GmbH
(PIA GmbH)
Hergenrather Weg 30
52074 Aachen, Germany

This document replaces neither the declaration
of performance nor the CE marking.



Notified Body
No.: 1739



Certified according to
ISO 9001:2008



ILAC-MRA



DAkkS
Deutsche
Akkreditierungsstelle
D-PL 17712-01-00



geprüft - tested - testé

Elmar Lancé July 2016

NOVO BROCHURE

Homeowners: Individual domestic installation



- The lightweight nature of the system makes for easy on-site delivery.



- No need for big excavators and large holes that disrupt and disturb your garden.



- Very low visual impact from fully installed units.

Larger projects: Commercial installations up to 50PE



- These units are suitable for installation at housing estates, camping sites, hotels etc., and have low maintenance and running costs.



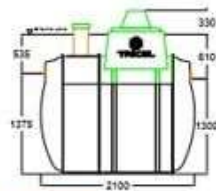
- Each WWTP unit is constructed of lightweight SMC and is easy to maneuver which simplifies the installation process.



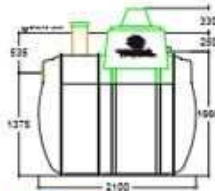
- Example of a fully installed 50PE Novo wastewater treatment unit in a 5-star hotel.

Technical characteristics/ Plant dimensions

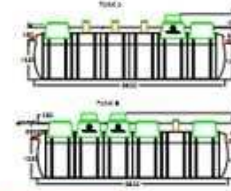
Form	Design Population	No. of people	Length	Width	Height	Horizontal inlet/outlet diameter	Weight empty	Inlet Invert to base	Outlet Invert to base	Inlet Invert to ground level	Air blower rating
			m			mm	kg		m		Watts
IE6		1-6	2.1	1.64	2.24	110	270	1.375	1.3	0.535	60
IE6+		2-6	2.6	1.64	2.24	110	300	1.375	1.3	0.535	60
IE8		2-8	2.6	1.64	2.24	110	300	1.375	1.3	0.535	80
IE10		3-10	3.1	1.64	2.24	110	370	1.375	1.3	0.535	80
IE11		4-12	3.6	1.64	2.27	110	400	1.375	1.3	0.535	100
IE18		6-18	4.6	1.64	2.27	110	500	1.375	1.3	0.535	200
IE24		8-24	6.6	1.64	2.27	150	700	1.35	1.3	0.56	200
IE30	Tank A	10-30	2.6	1.64	1.99	150	300	1.35	1.3	0.46	
	Tank B		5.6	1.64	2.27	150	600	1.35	1.3	0.56	200 + 80
IE36	Tank A	12-36	3.6	1.64	1.99	150	400	1.35	1.3	0.46	
	Tank B		6.6	1.64	2.27	150	700	1.35	1.3	0.56	200 + 80
IE42	Tank A	14-42	5.6	1.64	2.27	150	600	1.35	1.3	0.46	
	Tank B		5.6	1.64	2.27	150	600	1.35	1.3	0.56	200 x 2
IE50	Tank A	16-50	6.6	1.64	2.27	150	700	1.35	1.3	0.46	
	Tank B		6.6	1.64	2.27	150	700	1.35	1.3	0.56	200 + 120 + 80



- **IE6 gravity outlet**
Up to 6PE domestic gravity flow outlet.



- **IE6 pumped outlet**
1-6 domestic pumped unit. Suitable for pumping to a raised discharge area (over).



- **Gravity IE50 outlet**
Suitable for commercial installation, caters for up to 50 people.

Tricel Novo riser options for deep installation

Tricel offer 3 different manhole riser heights to suit different Invert/Inlet levels. Manhole risers allow for the positioning of the treatment plants at the depth which is optimum to each individual installation. Wastewater is gravity fed from the home to your treatment plant. The inlet pipe's position from the premises determines the excavation depth for the WWT plant. Tricel offer a choice of manhole risers 150mm/500mm/750mm to help with installation where site conditions require a flexible solution.

Tricel Novo: Wastewater Treatment System
Service Agreement

Establishing a regime of yearly inspections and maintenance is advised to ensure that your Tricel Novo continues to perform to the same high standards throughout its lifetime. The service agreement covers travel, the service and the labour cost of servicing only. Other labour costs are excluded, as are all replacement parts.

Tricel (Killarney) Unlimited Company, Ballyspillane Industrial Estate, Killarney, Co. Kerry, V93 X253, Ireland ("the Company") enter this Tricel Novo service agreement with the Customer named below:

<u>Customer Details:</u>			
Name:			
Address:		Address of Site: (If other)	
Telephone No.:			
Date of Tricel Novo Order:			
Work Order No.:			
Date of Delivery of Tricel Novo:			
Date of System Commissioning:			
Service Agreement Fee Paid:			
Date of Service Agreement Commencement:			
Unit Serial No.:			

During routine servicing, the service technician will perform a series of checks and procedures:

Checks:

- The air-diffuser is monitored to check for sufficient dispersion of air.
- The sludge return system is functioning correctly.
- The covers and locks are in place and in good condition.
- General appearance and condition of the treatment system is good.

Procedures:

- The blower is tested.
- The blower filter is replaced.
- The system alarm is tested.
- The pump and float-switch are tested (If applicable).
- The vents are cleared of any blockages.
- The sludge level in the primary chamber is measured.

Notes:

- Full inspection labour is covered (including any immediate minor system adjustment required). This service agreement does not cover the cost of any labour or materials that may arise as a result of this inspection.
- Components that require replacing will incur additional charges.
- All service agreements exclude de-sludging.

Tricel (Killarney) Unlimited Company trading as Tricel

March 2017

Section 2: Information on Tertiary Treatment and Disposal route

The proposed solution to use on site is a Tero module.

This system will provide tertiary treatment a total of 2 modules are required to ensure the loading rate of the coconut coir filter per day is not exceeded.

The tertiary treated liquids is disposed into the ground through a gravel distribution layer required underneath the Tero module. The gravel distribution layer must be 300mm thick and should be 250m² based on a population of 10 and a Subsurface/surface Value of 51-75.

The location and construction of the Tertiary infiltration area is the responsibility of the site engineer. A full site layout drawing should accompany this report.

The EPA CoP 2021 outlines the design, siting and construction requirements for tertiary polishing filters. The tables below outline some of the key factors to take into consideration when designing and locating a tertiary polishing filter.

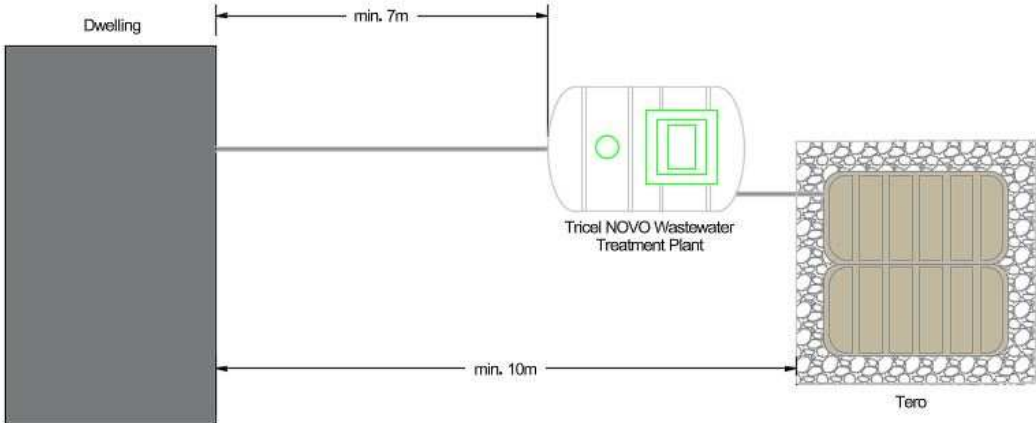
Table 6.2: Minimum separation distances from the entire DWWTS

Features			DWWTS – periphery of tank/plant and infiltration/ treatment area (m)
Public/group water supply abstraction points/wells			60
Down-gradient domestic well	3 ≤ PV ≤ 10 (usually SAND- or GRAVEL-dominated material)	Depth of soil/subsoil > 2.0 m between invert level and bedrock, and water table 1.2–2.0 m	60
		Depth of soil/subsoil 2.0–8.0 m between invert level and bedrock, and water table > 2.0 m	40
		Depth of soil/subsoil > 8.0 m between invert level and bedrock, and water table > 2.0 m	30
	10 < PV ≤ 30 (usually SILT- or SAND- or silty GRAVEL-dominated material)	Depth of soil/subsoil 1.2–8.0 m between invert level and bedrock	45
		Depth of soil/subsoil > 8.0 m between invert level and bedrock	30
	30 < PV ≤ 120 (usually SILT/ CLAY- or CLAY-dominated material)	Depth of soil/subsoil 1.2–3.0 m between invert level and bedrock	40
		Depth of soil/subsoil ≥ 3.0 m between invert level and bedrock	30
Alongside domestic well			25
Up-gradient domestic well			15
Karst feature			15
Lake or foreshore			50
Watercourse/stream			10
Open drain or drainage ditch			10
Adjacent tank/plant and percolation area, polishing filter or infiltration area			10
On-site dwelling house			7 (tank/plant) 10 (free water surface constructed wetland) 10 (infiltration/ treatment area)
Neighbouring dwelling house			7 (tank/plant) 25 (free water surface constructed wetland) 10 (infiltration/ treatment area)
Surface water soakway ^a			5
Road			4
Slope break/cuts			4
Trees ^b			3
Site boundary			3
Heritage features, NHA/SAC/SPA ^c			See note
PV, percolation value.			
^a The soakaway for surface water drainage should be located down-gradient of the infiltration/treatment area; it should also be ensured that this distance is maintained from neighbouring storm water disposal areas or soakaways.			
^b Tree roots may lead to PFPs developing. The canopy spread indicates potential root coverage.			
^c The distances required depend on the importance of the feature. Therefore, advice should be sought from the local authority and/or from the the Department of Housing, Local Government and Heritage, specifically the National Monuments Service and the National Parks and Wildlife Service.			

Table 6.1 EPA CoP 2021: Minimum separation distances

Please see attached the accompanying documents in Section 2 for the Tricel Tero

- Separation Distances
- Tero Drawing
- Tero Technical Specification
- Technical information on the Tero



The Tricel Tero modules are filled with coconut coir. The wastewater is distributed over the top of the coir filter using a specially designed pipe network. Through a combination of biological, chemical and physical processes the coir treats the wastewater as it filters through. At the outlet of the Tero modules the tertiary treated wastewater is discharged into the in situ subsoil through a gravel distribution area.

TERO BROCHURE

TERO module

The Tricel TERO tertiary wastewater system further purifies the treated effluent from a packaged wastewater treatment plant resulting in a reduced area and depth of discharge bed.

Stage One:

TERO receives secondary treated effluent from a wastewater treatment plant. The TERO is designed to work seamlessly with the Tricel NOVO but can also be used with third-party products, providing that a pumped discharge with a dose limit is utilised.

Stage Two:

The pre-treated effluent is dispersed using an easily serviceable distribution network which ensures the effluent is distributed evenly and uniformly onto natural filter media. The effluent filters through the media and is treated by a combination of biological, chemical and physical processes. The treated water is transported to the soil at the base of the tank.

DIAGRAM INDEX

1. Tricel NOVO wastewater treatment plant
2. TERO Module
3. Inlet Pipe
4. Distribution Pipework
5. Coconut Fibre
6. Outlets
7. Gravel Bed

Tricel TERO Tertiary Treatment System

The environmental advantages of TERO

- Improved E.coli treatment efficacy. Test results show less than 1000 cfu/100ml, reducing soil depth requirements to 600mm.
- TERO is an Environmentally friendly system that utilises natural, long-life renewable media. The remarkable filtration properties of coconut fibre requires no chemical additives in achieving exceptional results.
- The closed system design of TERO greatly reduces odour whilst ensuring high treatment efficiency of the wastewater.

Advantages for you

- Compact system - one module meets requirements for 6PE.
- The modular design of TERO makes it ideal for retrofit upgrades, extensions etc., and can be used with many existing treatment systems.
- The shallow profile of TERO makes it easy to incorporate into landscape design.
- Simple maintenance. No desludging required.
- No electrical components or power consumption used in the TERO system.

Advantages for installation

- Easy installation - Flat base for easy installation, one inlet connection from wastewater plant. Reduced discharge depth and area, thus reducing contractor expense and costs.
- Plug and play system - assembled module with single input connector.

The TERO system has undergone a rigorous performance testing regime to achieve the highest results required. The tables below show the sizes and the wastewater treatment capability of a TERO. If you have any specific requirements, please contact the Tricel sales team who will be able to assist you with your enquiry.

Tertiary Treatment Performance	
ESSENTIAL CHARACTERISTICS	PERFORMANCE
Nominal Organic Design Load	0.01 kg BOD/d
Nominal Hydraulic Daily Design Load	0.90 l/d
COD	34 mg/l
BOD5	5 mg/l
SS	4 mg/l
NH4+	0.2 mg/l
Electrical Power Consumption	0.2 kWh/d
Number of desludging	0

* determined at temperatures of > 12°

TERO module dimensions	
Length	2.444m
Height	1.078m
Width	1.012m
Weight (one TERO module)	315kg

SEWAGE TREATMENT SIMPLIFIED

Sewage Treatment: Combination of physical and biological processes which break down the organic and inorganic sewage content which cause pollution to receiving waters.

Receiving Waters: All groundwaters and watercourses such as streams and rivers.

Population Equivalent (PE): A measure of the number of people the treatment plant serves.

Media: Coconut fibre.

Sludge: The solids that settle to the bottom of the tank chambers.

BOD: Biological Oxygen Demand measured in milligrams per litre (mg/l) is a relative measure of how polluting the sewage is.

SS: Suspended Solids measured in milligrams per litre (mg/l) includes all suspended matter both organic and inorganic.

E.Coli bacteria: commonly used as an indicator microorganism for faecal pollution, and the sanitary quality of foods and water, measured in (cfu/100ml).

Pathogenic Bacteria: Pathogenic bacteria such as Streptococcus are bacteria which cause disease in humans and animals.

Simple installation, minimum maintenance

Easily installed by your contractor with full commissioning provided by qualified Technician. Annual maintenance recommended to extend life and performance of the system.

Complementary products for the TERO residential system

- High Level Alarm(s)
- Sample Chambers
- Weatherproof GRP Enclosures & Kiosks

The Tero modules are a tertiary treatment filter. They can be located above or below ground depending on the existing bedrock or subsoil. According to the EPA Code 2021 the tertiary treated effluent can be discharge to ground through a gravel distribution area. As outlined below in table 10.1 the area required per person of this distribution bed is dependent on the Subsurface value of the receiving subsoil. It is compulsory that the percolation test is carried out at the infiltration level which is located at the base of the proposed distribution layer. This distribution bed should comprise of a 300mm layer of 12 -32mm gravel

Table 10.1: Infiltration/treatment area and trench length design for tertiary treatment, per PE

Percolation values (PVs)	Pumped or underlying gravity discharge (Options 1 and 2)	Gravity discharge into 500 mm wide trenches (Option 3)	Low-pressure pipe distribution into 300 mm wide trenches (Option 4)	Drip dispersal system (Option 5)	Tertiary infiltration area (Option 6)
	Area required per person (m ²)	Trench length required per person (m)	Trench length required per person (m)	Area required per person (m ²)	Area required per person (m ²)
$3 \leq PV \leq 20$	≥ 7.5	≥ 6	≥ 6	≥ 5	≥ 3.75
$21 < PV \leq 40$	≥ 15	≥ 12	≥ 12	≥ 14	≥ 7.5
$41 < PV \leq 50$	≥ 30	≥ 17	≥ 17	≥ 16	≥ 15
$51 < PV \leq 75$	≥ 50	≥ 19	≥ 19	≥ 22	≥ 25
$76 < PV \leq 90$	–	–	≥ 28	≥ 34	–
$91 < PV \leq 120$	–	–	–	≥ 54	–

Table 10.1 from EPA CoP 2021 - Loading rates for infiltration/treatment area

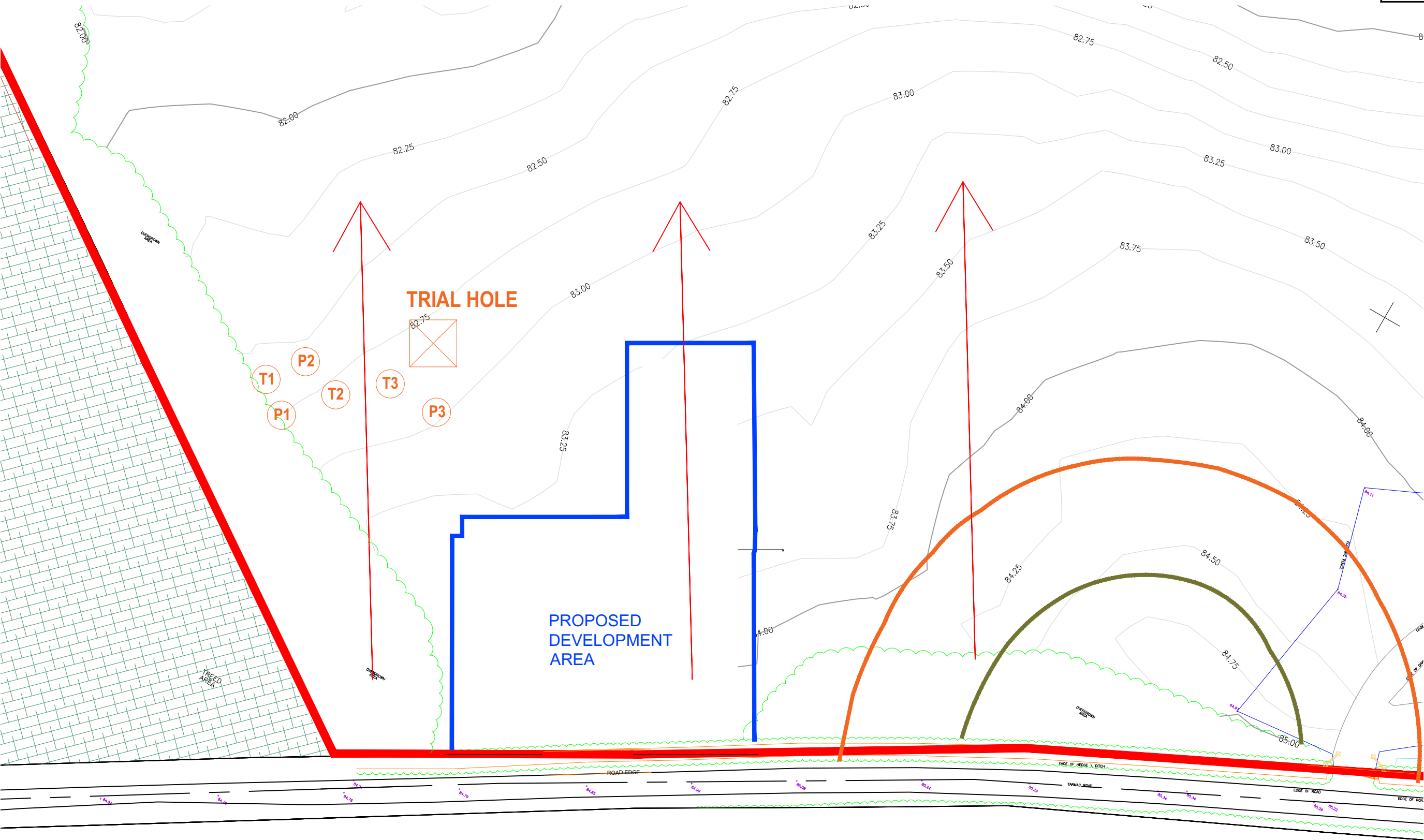
Terms and conditions:

Tricel cannot accept responsibility for incorrect site details or calculations as these are based on user inputs which are outside of Tricel control.

Full terms of website use are available at www.tricelsiteassessor.ie/TermsOfWebsiteUse

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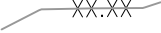


AIR AMBULANCE BASE SITE PLAN WWTS - SITE ASSESS TEST HOLES SCALE - 1:500 @ A3

SITE SUBJECT TO PLANNING
APPLICATION OUTLINED IN RED THUS:



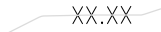
TOPO. CONTOUR - 1m INTERVALS:



ESTIMATED DIRECTION OF
GROUNDWATER FLOW:



TOPO. CONTOUR - 0.25m INTERVALS:



ADJACENT WOOD:



RINGFORT (CO04488)
EXTENT & OUTER LINE OF BUFFER:



Rev.	Date	By	Description
A	25.09.24	MH	ISSUED FOR SITE ASSESS. REPORT

Waterman Kelly
CONSULTING CIVIL
& STRUCTURAL ENGINEERS
4 Union Quay, Cork, T12 C7VK
Web: www.watermankelly.ie | Tel: 021 4315730
E-mail: info@watermankelly.ie

Client	RATHCOOL FLYING CLUB		
Name of Job	PROPOSED DEVELOPMENT AT RATHCOOL AERODROME, RATHCOOL, MALLOW, CO. CORK.		
Title of Drawing	AIR AMBULANCE BASE SITE PLAN WWTS - SITE ASSESS TEST HOLES		
Scale	AS-SHOWN(A3)	Date	16.05.2024
Drawn	MH	Checked	EW
Drawing No.	WK10672 - B-05		Issue
		PL	

Appendix 6-2



Surface-water Management Design & Drainage Impact Assessment

**Proposed Development
at
Rathcool Aerodrome,
Rathcool,
Co. Cork**

Client: Rathcool Flying Club

Job No: WK10672

WATERMAN KELLY
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4 UNION QUAY, CORK
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info@watermankelly.ie



Revision:	By:	Checked:	Issue Date:
01 – Issued for Review	MH	EW	25/09/24
02 – Issued for Review	MH	EW	21/11/24
03 – Issued for Final Review	MH	EW	17/02/25

1.0 Introduction

2.0 Design Approach

3.0 Local Authority Requirements

4.0 SuDS Design Guidance

5.0 Site Testing & Assessment

6.0 Assessment of Surface Water Run-off from Proposed Development

7.0 Proposed Site-specific Measures

8.0 SuDS Design

9.0 Re-located Air Ambulance Base Compound

10.0 Conclusion

Appendices

1.0 Introduction

The site is situated in a rural location in Rathcool, North Co. Cork.

The flying club have been operating a licensed aerodrome on the site since 1962. They currently use a grass airstrip for take-off and landing of light aircraft. The air ambulance service has been operating from the site since 2019.

The Rathcool Flying Club intend to apply for planning permission for the following:

The construction of a hard surfaced runway (740m in length) and taxiway (147.6m in length) with associated ground level lighting, associated interceptors, along with the demolition of an existing hangar to the east of the site and construction of a replacement hangar of approximately the same size and design to the west of the site; the demolition of the existing paramedic prefabricated base and crew prefabricated base to the east of the site, and construction of a replacement paramedic prefabricated base and crew prefabricated base to the west of the site; and the breaking up / removal of a helipad to the east of the site, and construction of a new helipad to the west of the site, all associated with the HSE Air Ambulance. The development is to be served by a new proprietary waste water treatment system and includes the closure of an existing vehicular entrance onto the L-5215-0 road and its relocation further west along the same road, site landscaping and all other associated site development works. An Environmental Impact Assessment Report (EIAR) has been prepared and will be submitted to the Planning Authority with the application. The EIAR will be available for inspection or purchase at a fee not exceeding the reasonable cost of making a copy during office hours at the offices of the Planning Authority. A Natura Impact Statement will be submitted to the planning authority with the application. The Natura Impact Statement will be available for inspection or purchase at a fee not exceeding the reasonable cost of making a copy during office hours at the offices of the Planning Authority.

The surfaced and re-orientated runway will improve safety of operations of the flying club and the air ambulance service.

The 30-degree rotation allows for better approach lines to the runway – avoiding Mount Hillary to the East and aligning the runway with the Blackwater valley.

This report deals with the surface water generation and disposal from both the proposed hard-surface runway and the proposed relocated ambulance base.

2.0 Design Proposal

The proposed runway will create a large, sealed surface on which surface water will be generated and need to be disposed of in a controlled manner.

The proposed runway will have an area of c.13,320m² and thus will generate a large volume of water in storm events.

Fortunately, the linear nature of the runway allows for ready collection and disposal of this generated water.

We propose the use of SuDS and nature-based measures, where possible, in line with Objective WM11-10 of the Cork County Development Plan 2022.

The intention will be for the proposed drainage system to match the existing greenfield run-off rate, to ensure that existing on-site features are not overloaded and to ensure that the run-off rate from the proposed development and overall site will not exceed the current rate.

This will be done in consultation with the local authority engineers and with other consultants involved in the project, including but not limited to the following:

- Flood Risk Consultant
- Landscape designer
- Environmental Consultant
- Ecology Consultant

The design will also balance the needs of the flying club and air ambulance service for safe operation on the site.

We will prepare a Drainage Impact Assessment for large-scale development in line with *County Development Plan 2022 – Advice Note 1 – Surface Water Management (December 2022)*.

2.1 Drainage Design Approach

It is proposed to use nature-based, slow-draining solutions and on-site attenuation and infiltration of surface water.

SuDS components to be considered:

- Grass filter strips
- Filter drains
- Over-flowing to separate attenuation soakaways if necessary

3.0 Local Authority Requirements

Cork County Council is the local authority for the area in which the subject site is located.

Chapter 11 - *Water Management* of the current County Development Plan (CDP), 2022 sets out Cork County Council's requirements for surface water management.

Specifically, Section 11.10 has guidance on *Surface Water*.

The CDP Objective WM 11-10 states the following:

County Development Plan Objective WM 11-10: Surface Water, SuDS and Water Sensitive Urban Design	
a)	Require that all new developments incorporate sustainable drainage systems (SuDS). Efforts should be taken to limit the extent of hard surfacing and impermeable paving.
b)	Encourage the application of a Water Sensitive Urban Design approach in the design of new development or other urban interventions. Opportunities to contribute to, protect or re-enforce existing green infrastructure corridors or assets should be maximised.
c)	Optimise and maximise the application of Sustainable Urban Drainage Systems (SuDS) to mitigate flood risk, enhance biodiversity, protect and enhance visual and recreational amenity; all in the most innovative and creative manner appropriate and in accordance with best practices. Proposals should demonstrate that due consideration has been given to nature based solutions in the first instance in arriving at the preferred SuDS solution for any development.
d)	Provide adequate storm water infrastructure in order to accommodate the planned levels of growth expected for the County.
e)	Where surface water from a development is discharging to a waterbody, appropriate pollution control measures (e.g, hydrocarbon interceptors, silt traps) should be implemented.
f)	The capacity and efficiency of the national road network drainage regimes will be safeguarded for national road drainage purposes.

A specific objective in relation to protection of the riparian zone, WM 11-11 states the following:

County Development Plan Objective WM 11-11: River Channel Protection	
a)	Ensure adequate protection measures along watercourses, keeping them free from development by ensuring development is kept 10m or other appropriate distance from stream and river banks in line with best practice for riparian corridors. Development altering the hydromorphology of a watercourse will not normally be permitted, where it may result in the deterioration in the status of a water body through for example, impacts on water quality, quantity or flow rate, riparian habitat or protected species.
b)	There will be a presumption against the use of culverts and opportunities to actively remove existing culverts and re-naturalise/ daylighting watercourses will be encouraged in development proposals.
c)	Where river crossings are considered necessary, clear span river crossing structures shall be used on fisheries waters where possible. The Council will consult with Inland Fisheries Ireland in relation to any such proposals.

A further specific objective in relation to surface water management WM 11-12 states the following:

County Development Plan Objective WM 11-12: Surface Water Management	
Manage surface water catchments and the use and development of lands adjoining streams, watercourses and rivers in such a way as to minimise damage to property by instances of flooding and with regard to any conservation objectives of European sites within the relevant catchments and floodplains.	

Subsequent to the publication of the CDP, Cork County Council published *Development Plan 2022 Advice Note No. 1 Surface Water Management, December 2022*.

This document provided more detailed advice surface water management for proposed development.

It requires that:

Every application for development must submit a Drainage Impact Assessment (DIA) demonstrating how the development successfully uses Sustainable Urban Drainage Systems (SuDS) and nature-based solutions to manage surface water within and adjacent to the site...

Cork County Council requires a softer engineered or 'nature-based approach' to be used to manage rainfall runoff on the site i.e., to manage and treat surface water above-ground rather than sending rainfall below-ground into drains, pipes, attenuation tanks and other 'hard engineering' solutions. The aim is to maximise the retention and/or infiltration of storm water runoff on-site, minimise discharges to the public drainage system and to limit the discharge rates from the site to greenfield runoff rate or less.

A drainage impact assessment, as outlined above, will form part of this report.

4.0 SuDS Design Guidance

Design Reference Documents:

The following documents are generally used in reference to our design/specification for Surface Water Disposal/SuDS Assessments:

- Cork County Council County Development Plan 2022
- CCC Development Plan 2022 Advice Note No. 1 Surface Water Management, December 2022
- CIRIA C753 – The SuDS Manual
- The Greater Dublin Regional Code of Practice for Drainage Works
- Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas – Best Practice Interim Guidance Document
- Blue Green Infrastructure and Nature-based Solutions Framework

Many of these documents deal with the design of surface water measures for development in urban areas.

These are largely not relevant to the surface water design for this project, considering its rural setting.

We propose the use of CIRIA C753 as the primary reference document for this project.

CIRIA C753 – The SuDS Manual is a comprehensive reference document for SuDS design and specification for developments of all sizes, providing useful design information, diagrams, photographs, worked examples, etc.

5.0 Site Investigation/Testing & Assessment

Site testing was specified to allow the design of the proposed surface water disposal measures.

Soil infiltration rate tests to BRE365 was carried out at several locations – 4No. - across the proposed site – marked with 'TH' below:



Trial holes were also excavated at each test location to determine the soil make-up, assess each soil stratum and determine the depth of the water table/bedrock should they be encountered.

See Appendix A for details of the site investigation.

The site is considered largely suitable to for the implementation of SuDS nature-based solutions.

On review of the site investigation/testing results obtained, we have divided the site in 4No. zones – these correspond with the trial hole locations.

Refer to Drawing *WK10672 – C-02 – Site Layout Plan- Drainage* for the location of these zones.

They may be summarised as follows:

- Zone 1: encompasses the proposed taxi-way
- Zone 2: encompasses the eastern third of the proposed runway
- Zone 3: encompasses the middle third of the proposed runway
- Zone 4: encompasses the western third of the proposed runway

With this approach, any varying subsoil or infiltration characteristics across the site will be taken into account, thus ensuring the most appropriate design possible.

6.0 Assessment of Surface Water Run-off from Proposed Development

6.1 Water Quality

Considering the proximity of the proposed development to the Blackwater River Special Area of Conservation SAC, water quality will be a design priority.

The National Groundwater Vulnerability for the site is designated as 'Moderate' (M) and the groundwater resource/aquifer is designated as 'Poor' (Pu) – as outlined in the Geological Survey Ireland Spatial Resources mapping system.

This results in a response category of R1 in Table E1 of the EPA CoP 2021, i.e. the following is recommended:

Acceptable subject to normal good practice (i.e. system selection, construction, operation and maintenance in accordance with this CoP)

Whilst the above is in relation to domestic wastewater, it is also relevant for the proposed use of infiltration systems for discharge of surface water on-site.

In relation to SuDS design, we will follow the 'Good practice for SuDS treatment design' principles as set out in Box 4.3 of C753, as relevant to this project, as follows:

A. Manage surface water runoff close to source

Where practicable, treatment systems should be designed to be close to the source of runoff.

The advantages of this approach from a water quality perspective are as follows:

- It is easier to design effective treatment when the flow rate and pollutant loadings are relatively low.
- The treatment provided can be proportionate to the pollutant loadings, i.e. parts of the site with low pollutant loads do not need to have as much treatment as highly polluting parts of the site.
- Accidental spills or other pollution events can be isolated more easily and dealt with effectively without affecting the downstream drainage system.
- Poor treatment performance or component damage/failure can be isolated more easily and dealt with effectively without impacting on the whole site.

B. Treat surface water runoff on the surface

Where practicable, treatment systems should be designed to be on the surface. The advantages of this approach from a water quality perspective are as follows:

- Where sediments are exposed to UV light, photolysis and volatilisation processes can act to break down contaminants - specifically oils and other hydrocarbons.
- If sediment is trapped in accessible parts of the SuDS, it can be removed easily as part of routine landscape maintenance work.
- It enables use of evapotranspiration and some infiltration to the ground to reduce runoff volumes and associated total contaminant loads (i.e. Interception), provided that the risk to groundwater is managed appropriately
- It allows treatment to be delivered by vegetation.
- Sources of pollution can be easily identified.
- Accidental spills or misconnections are visible immediately and can be dealt with rapidly.
- Poor treatment performance or component damage/failure is easily identified during routine inspections, and remedial works can be planned efficiently.

C. Treat surface water runoff to remove a range of contaminants

The SuDS design should consider the likely presence and significance of any contaminant that may pose a risk to the receiving environment, and the SuDS component or combination of components selected should include treatment processes that, in combination, are likely to reduce this risk to acceptably low levels.

D. Minimise risk of sediment remobilisation

The SuDS design should consider and mitigate the risks of sediments (and other contaminants) being remobilised and washed into receiving surface waters (or onto surfaces through which runoff is designed to infiltrate) during events greater than those for which the treatment component has been specifically designed.

E. Minimise impacts from accidental spills

By using a number of components in series, SuDS design can help ensure that accidental spills are trapped in/on upstream component surfaces, facilitating contamination management and removal.

The selected SuDS components should deliver a robust treatment design that manages the risks appropriately - taking account of the uncertainty and variability associated with both the pollution loadings and the treatment processes.

6.2 Water Quality Design Standards

The treatment design will be prioritised for the majority of small rainfall events, i.e. up to 10mm or 'first flush'.

This is termed **Interception**.

Runoff from small rainfall events can pose a particular problem for water quality in receiving surface waters because:

- It contains the initial flush of pollutants that has built up on surfaces during the preceding dry period
- There are many more smaller rainfall events than larger ones, leading to frequent flushing of pollutants from surfaces
- The volume of runoff from all small rainfall events tends to comprise a significant proportion of the total runoff volume in any given period, and together with the relatively higher pollution concentrations, can contribute significantly to total pollutant loadings from the site over a specified period of time.

Interception can be delivered via rainwater harvesting systems, green roofs, infiltration systems, pervious surfaces and vegetated SuDS.

By using the storage available in soil or aggregate matrices, together with evapotranspiration and infiltration processes, many components can intercept the first flush of rainfall for contributing surfaces several times greater than their own surface area.

Requiring Interception for the "majority" of events recognises that once soils are saturated (mainly during or following long periods of wet winter weather) runoff will occur, and drainage systems cannot be expected to prevent this. Events that follow on quickly from a previous event may also not be completely captured by a drainage system designed for Interception.

Maximising Interception in the summer months is particularly important for protecting receiving surface waters.

Runoff during the summer months can cause greater problems for receiving surface waters than runoff in winter months, due to low flows in the receiving surface water. Limited dilution of pollutants within runoff and within the receiving surface water receptor may cause increased localised pollutant impact.

With regard to discharge to groundwater, there should be a minimum depth of 1m of unsaturated aquifer material between the base of any infiltration system and the maximum likely groundwater level (taking account of potential shifts in groundwater level resulting from extended periods of wet weather).

6.3 Water Quality Risk Management

Considering the proposed development and the moderate vulnerability of the on-site Groundwater, we consider that the use of the 'Simple SuDS hazard mitigation indices' as appropriate.

This method states the following:

To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type):

$$\text{Total SuDS mitigation index (for each contaminant type)} \geq \text{Pollution hazard index (for each contaminant type)}$$

The following tables have been extracted from C753.

The appropriate indices, which will be used in our risk assessment, have been outlined in red.

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

Notes

- 1 Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).
- 2 These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.

Where 2No. components are proposed in series, the

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5 (\text{mitigation index}_2)$$

Where:

$$\text{mitigation Index}_n = \text{mitigation index for component } n$$

A factor of 0.5 is used to account for the reduced performance of secondary or tertiary components associated with already reduced inflow concentrations.

Our primary route for discharge will to groundwater via infiltration components.

Our proposed components will be grass filter strips and filter drains, thus the most appropriate components have been highlighted in red below:

TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater			
Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates¹	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.6 ⁴	0.5	0.6
A soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.8 ⁴	0.8	0.8
Proprietary treatment systems ^{5, 6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

Notes

- 1 All designs must include a minimum of 1 m unsaturated depth of aquifer material between the infiltration surface and the maximum likely groundwater level (as required in Infiltration design – Chapter 25).
- 2 For example as recommended in Sniffer (2008a and 2008b), Scott Wilson (2010) or other appropriate guidance.
- 3 Alternative depths may be considered where it can be demonstrated that the combination of the proposed depth and soil characteristics will provide equivalent protection to the underlying groundwater – see note 1.
- 4 If significant volumes of sediment are allowed to enter an infiltration system, there will be a high risk of rapid clogging and subsequent system failure.
- 5 See Chapter 14 for approaches to demonstrate product performance. Note: a British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: www.britishwater.co.uk/Publications/codes-of-practice.aspx
- 6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution, where there is a requirement to retrofit treatment. WAT-RM-08 (SEPA, 2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

For each hazard, the proposed level of treatment exceeds the hazard index, as follows:

Total Suspended Solids (TSS):

Hazard Index: **0.5**
Mitigation Index: $0.6 + 0.5(0.4) = \mathbf{0.8}$

Metals

Hazard Index: **0.4**
Mitigation Index: $0.5 + 0.5(0.4) = \mathbf{0.7}$

Hydrocarbons

Hazard Index: **0.4**
Mitigation Index: $0.6 + 0.5(0.4) = \mathbf{0.8}$

Thus, adequate treatment is deemed to be provided via the proposed SuDS components, for discharge to groundwater.

We have also carried out a risk assessment for discharge to surface waters:

TABLE 26.3	Indicative SuDS mitigation indices for discharges to surface waters			
	Type of SuDS component	Mitigation indices ¹		
		TSS	Metals	Hydrocarbons
	Filter strip	0.4	0.4	0.5
	Filter drain	0.4 ²	0.4	0.4
	Swale	0.5	0.6	0.6
	Bioretention system	0.8	0.8	0.8
	Permeable pavement	0.7	0.6	0.7
	Detention basin	0.5	0.5	0.6
	Pond ⁴	0.7 ³	0.7	0.5
	Wetland	0.8 ³	0.8	0.8
	Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Notes

- 1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.
- 2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.
- 3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.
- 4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.
- 5 See Chapter 14 for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: <http://tinyurl.com/ql7yuj7>
- 6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

For each hazard, the proposed level of treatment exceeds the hazard index, as follows:

Total Suspended Solids (TSS):

Hazard Index: **0.5**
Mitigation Index: $0.4 + 0.5(0.4) = \mathbf{0.6}$

Metals

Hazard Index: **0.4**
Mitigation Index: $0.4 + 0.5(0.4) = \mathbf{0.6}$

Hydrocarbons

Hazard Index: **0.4**
Mitigation Index: $0.5 + 0.5(0.4) = \mathbf{0.7}$

Thus, adequate treatment is also deemed to be provided via the proposed SuDS components for discharge to surface waters, if required.

7.0 Proposed Site-specific Measures

7.1 Surface Water Quality

As recommended in CIRIA C753 the use of filter strips and filter drains is proposed.

These SuDS components are linear in nature and are particularly well suited for managing runoff from roads and are easily incorporated into roadside space, or in our case the runway side space.

Considering the linear, road-like nature of the proposed runway and taxi-way, these are appropriate SuDS components to specify.

These features are low impact and suitably nature-based for this environmentally/ecologically sensitive site.

They are also low in profile and thus are acceptable from an aerodrome safety point of view as elements within the runway strip.

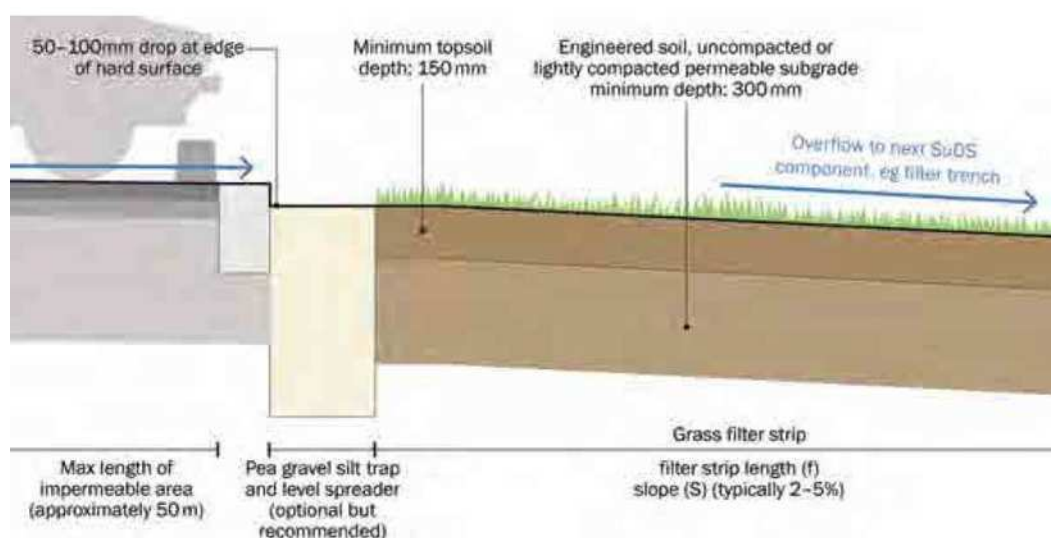
7.2 Filter Strips

7.2.1 Filter Strips - General Description

Much of the below information is extracted from CIRIA C753.

Filter strips are designed to treat runoff from adjacent impermeable areas by promoting sedimentation, filtration and infiltration (where acceptable).

See below filter strip schematic (Fig. 15.2 from CIRIA C753):



The runoff is designed to flow as a sheet across the filter strip at sufficiently low velocities that treatment processes can take place effectively.

They are often used as either a pre-treatment component before swales, bioretention systems and trenches (to extend the life of these components by capturing sediment).

They are also suitable for managing runoff from car parks and other impermeable and permeable areas.

Considering that the proposed runway is a road-like, linear feature, the use filter strips is considered appropriate for this development.

7.2.2 Hydraulic Design

Taxi-way Filter Strip Hydraulic Design

Taxi-way - Filter Strip Design Data:

Area (half - 5m x 148m):	740	m ²
Met Eireann - 1:1 event, 15 mins:	6.6	mm
Equivalent hourly depth (x4):	26.4	mm
Q for 1:1 year - 90% runoff:	0.0049	m ³ /s
Width of Filter Strip:	148	m
Length of Filter Strip:	3	m (direction of flow)
Mannings "n" used:	0.35	(for below grass flow)
Slope:	0.03	(1:33)

Step 1 - Check flow depth and velocity for 1:1 year event

d(mm)	V(m/s)	Q(l/s)	Q(m ³ /s)
5	0.014	11	0.011
10	0.023	34	0.034
15	0.030	67	0.067
20	0.036	108	0.108
25	0.042	157	0.157
30	0.048	212	0.212
35	0.053	274	0.274

This demonstrates that the 1:1 year treatment event will flow at a depth of <15 mm

(i.e. below the height of the vegetation), with a velocity of 0.3 m/s or less.

This means that design criteria for the treatment event are met.

Step 2 - Check residence time for 1:1 year event

The flow velocity is approximately 0.0062 m/s, therefore the time to travel 5 m filter strip is just over 8 minutes. This is acceptable.

Step 3 - Check flow velocities for more extreme events

A check is required that velocities remain below 1.5 m/s for extreme flows to prevent erosion. Assuming a rainfall intensity of 150 mm/hr (very conservative considering Met Eireann data) for the 1:100 year event:

$$Q = 0.150/3600 \times 740 \times 0.9 \times 1000 = 27.75 \text{ l/s}$$

which meets the design criteria of < 1.5 m/s for the extreme event.

Taking the above into account, for the taxi-way, we propose filter strips of 3m width at a 3% gradient.

Runway Filter Strip Hydraulic Design

Runway - Filter Strip Design Data:

Area (half - 9m x 740m):	6660	m ²
Met Eireann - 1:1 event, 15 mins:	6.6	mm
Equivalent hourly depth (x4):	26.4	mm
Q for 1:1 year - 90% runoff:	0.0440	m ³ /s
Width of Filter Strip:	740	m
Length of Filter Strip:	5	m (direction of flow)
Mannings "n" used:	0.35	(for below grass flow)
Slope:	0.03	(1:33)

Step 1 - Check flow depth and velocity for 1:1 year event

d(mm)	V(m/s)	Q(l/s)	Q(m ³ /s)
5	0.014	54	0.054
10	0.023	170	0.170
15	0.030	334	0.334
20	0.036	540	0.540
25	0.042	783	0.783
30	0.048	1061	1.061
35	0.053	1371	1.371

This demonstrates that the 1:1 year treatment event will flow at a depth of <15 mm

(i.e. below the height of the vegetation), with a velocity of 0.3 m/s or less.

This means that design criteria for the treatment event are met.

Step 2 - Check residence time for 1:1 year event

The flow velocity is approximately 0.01 m/s, therefore the time to travel 5 m filter strip is just over 8 minutes. This is acceptable.

Step 3 - Check flow velocities for more extreme events

A check is required that velocities remain below 1.5 m/s for extreme flows to prevent erosion. Assuming a rainfall intensity of 150 mm/hr (very conservative considering Met Eireann data) for the 1:100 year event:

$$Q = 0.150/3600 \times 6660 \times 0.9 \times 1000 = 249.75 \text{ l/s}$$

which meets the design criteria of < 1.5 m/s for the extreme event.

Taking the above into account, for the runway, we propose filter strips of 5m width at a 3% gradient.

7.2.3 Flow-spreading Device

A flow-spreading device will be included upstream of the filter strip to ensure consistent lateral inflow along the length of the component. This can also provide some degree of pre-treatment by trapping sediment upstream of the strip.

We propose the construction of a pea gravel level spreader at the edge of the runway/taxi-way.

This will also be compatible with IAA aerodrome safety requirements

7.2.4 Construction

The filter strip locations should be clearly marked before site work begins and protected by signage and silt fencing, to avoid their disturbance during construction. No vehicular traffic, except that specifically used to construct the component, should be allowed close to the filter strip.

Excavating equipment should operate from the side of the filter strip to avoid compaction of the subsoil.

The filter strip should be constructed using careful grading techniques to provide an even and consistent longitudinal slope, with no severe undulations that will cause localised ponding or promote flow in channels.

A newly constructed filter strip should be protected from surface water flows until vegetation has been established. This may be achieved by covering the filter strip with clear plastic until the vegetation is well rooted or placing an erosion control blanket over the freshly applied seed mix.

Ideally filter strips should be planted in the spring, when vegetation can become established with minimum irrigation needs. If more than 30% of the treatment area is bare after four weeks, reseeding or replanting will be required to achieve 90% coverage.

If sediment from construction work accumulates on a filter strip, it should be cleared and the strip fully rehabilitated.

7.2.5 Filter Strip Planting

The filter strip surface should be planted with an appropriate grass mixture. Filter strips are subject to both wet and dry conditions, as well as sediment and debris accumulation so a mixture of dry-area and wet-area grasses, able to prevent erosion and capable of growing through any silt deposits will be used.

A dense, soil binding, grass cover is required - that will need to be maintained at lengths of 75 to 150 mm to ensure effective filtration performance during regular events.

The fertilising of the proposed filter strips will be avoided, if possible, as the receiving environment may be sensitive to nutrient loadings.

7.2.6 Operation and Maintenance Requirements

In the past, there have been recommendations that keeping grass short in filter strips prevents the grass being flattened by the flow of water and improves pollution removal.

However, the risk of pollution removal being compromised is now considered to be minimal, and there is no reason for a blanket requirement to keep the grass short in all swales and filter strips.

See below table on recommended Operation and Maintenance Requirements (Table 15.1 from CIRIA C753):

TABLE 15.1 **Operation and maintenance requirements for filter strips**

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (eg oils)	Monthly (at start, then half yearly)
	Check flow spreader and filter strip surface for even gradients	Monthly (at start, then half yearly)
	Inspect gravel flow spreader upstream of filter strip for clogging	Monthly (at start, then half yearly)
	Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly (at start, then half yearly)
Occasional maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10% of the filter strip area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

7.3 Filter Drains

7.3.1 Filter Drains - General Description

Filter strips can deliver Interception (i.e. reduce or prevent runoff during small rainfall events) but CIRIA C753 recommends that filter strips do not tend to provide significant infiltration during large storm events, so they do not contribute to volumetric reductions during design storms.

Thus, we propose the formation of filter drains at the foot of the filter strips.

Filter drains are shallow trenches filled with stone/gravel that create temporary subsurface storage for the attenuation, conveyance and filtration of surface water runoff. The stone may be contained in a simple trench lined with a geotextile, geomembrane or other impermeable liner.

Filter drains may be lined, if required, or may allow infiltration depending on the suitability of the underlying soils and the protection they afford to the groundwater.

For the proposed taxi-way, the filter drains will allow for infiltration of the surface water into the underlying soil, thus will be designed as linear soakaways/soakpits, running adjacent to both sides of the taxiway.

For the proposed runway, the filter drains will be lined with an impermeable geomembrane and will be used for surface treatment and to convey the run-off water to off-line attenuation/soakaway systems adjacent to the runways.

Much of the below information is extracted from CIRIA C753.

See below filter drain schematic (Fig. 16.2 from CIRIA C753):

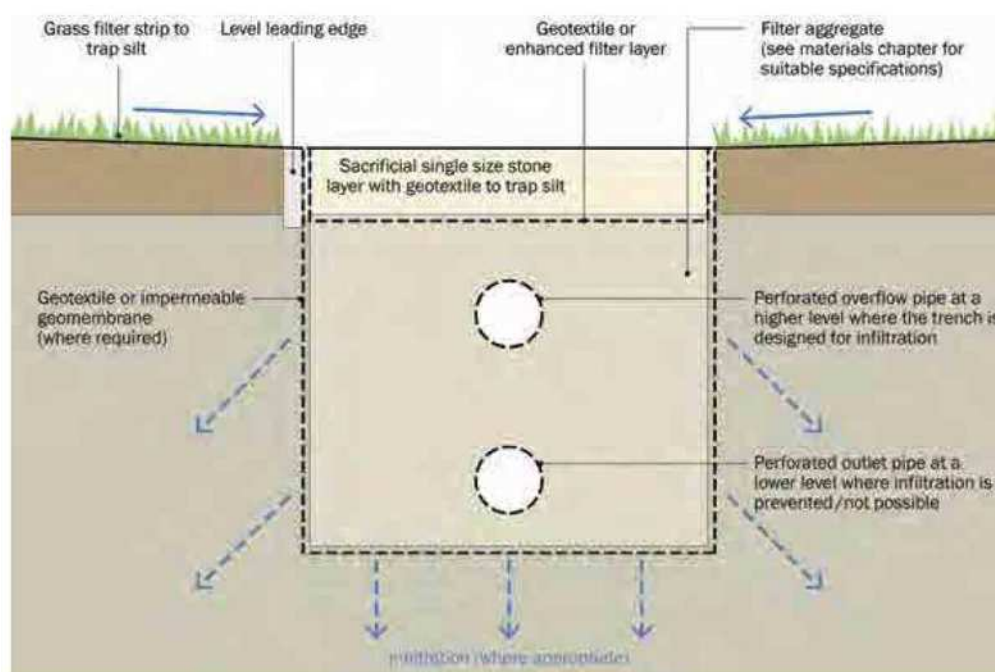


Figure 16.2 Filter drain schematic

Filter drains should ideally receive lateral inflow from an adjacent impermeable surface that is pre-treated using a vegetated filter strip or equivalent. Filter drains can help reduce pollutant levels in runoff by filtering out fine sediments, metals, hydrocarbons and other pollutants. They can also encourage adsorption and biodegradation processes.

A perforated pipe should be provided near the base of the filter drain to collect and convey water to downstream drainage components, if required.

Where a network of filter drains is established, high-level pipes can be used to transfer excess waters around the system in the event of localised overloading. Filter drains can replace conventional pipework as conveyance systems, and the use of adjacent filter strips or flow spreaders can remove the need for kerbs and gullies when systems are located adjacent to roads or highways, or in this case, a runway and taxi-way.

Where infiltration is allowed, the maximum groundwater level should be at least 1 m below the base of the trench.

This 1m 'buffer' of subsoil is available for the proposed infiltration filter drains proposed for both sides of the taxi-way.

As the test results at trial holes 2 and 4 found subsoil conditions to be unsuitable for a filter drain type system – due to the high level of the water table.

Trial hole 3 found conditions to be unsuitable for an infiltration/soakaway system due to high water table and a poor infiltration rate.

We will use filter drains as collection/carrier drains with a perforated pipe at the base of the drain and the base and sides of the trench wrapped in impermeable geotextile in Zones 2, 3 and 4.

These will convey the run-off water to off-line attenuation/infiltration/soakaway systems, via appropriate hydrocarbon separators.

The voids ratio and permeability of the granular fill in filter drains should be sufficiently high to allow adequate percolation and to control the risk of blockage.

For all filter drains, any lengths of perforated pipes that are more than 10 m should be spaced between access sumps (also known as catchpits) so that the pipes can be cleaned by jetting out or rodding (these sumps can be up to 90 m apart for longer runs of trench).

Access sumps should always be accessible and clearly identifiable.

We have included for access sumps/catchpits at c.72m centres along each filter drain.

This will allow adequate access for inspection and de-silting.

7.3.2 Hydraulic Design

The proposed filter drains for the taxi-way have been designed as infiltration SuDS components, i.e. linear soakaways.

Thus, they have been designed as soakaways to BRE 365 (2016) – providing attenuation and infiltration of the generated surface water.
Refer to the design calculations in Appendix D.

For the proposed taxiway (Zone 1) full infiltration is deemed achieved for up to and including 100-year events, thus collection of surface water by, and conveyance through, the perforated pipe is deemed unnecessary, thus no further hydraulic design will be carried out for this.

Notwithstanding the above, we propose the installation of a perforated pipe to allow distribution of run-off water within the filter drain.

For the proposed runway (Zones 2, 3 and 4) we have carried out hydraulic design in accordance with document C753, as detailed below:

Runway-way Filter Drain

Zones 2, 3 and 4:

Step 1 - estimate the rate of flow from the point of entry to the receiving perforated pipe through the gravel filter media

Length of Filter Drain:	220	m
Depth of Filter drain:	1	m
Width of Filter drain:	0.9	m
Porosity of filter aggregate:	0.3	
Slope on Filter Drain base, i:	0.001	m/m (assumed as 1 for vertical flow)
Permeability of filter aggregate, k:	0.0005	m/s

Run-way - Filter Strip Design Data:

Area (half - 9m x 122m):	1098	m ²
Met Eireann - 1:1 event, 15 mins:	6.6	m
Equivalent hourly depth (x4):	26.4	m
Met Eireann - 1:10 event, 15 mins:	10.4	m
Equivalent hourly depth (x4):	41.6	m
Met Eireann - 1:30 event, 15 mins:	12.5	m
Equivalent hourly depth (x4):	50	m
Met Eireann - 1:100 event, 15 mins:	15.3	m
Equivalent hourly depth (x4):	61.2	m

Using the same inflows as for the filter strip:

1-year runoff rate:	0.0440	(m ³ /s)
10-year runoff rate:	0.0693	(m ³ /s)
30-year runoff rate:	0.0833	(m ³ /s)
100-year runoff rate:	0.1019	(m ³ /s)

Q = Aki

$$Q = 0.099 \text{ (m}^3\text{/s) or } 99 \text{ l/s}$$

which represents somewhere between a
1:30 and a 1:100-year event, which is
acceptable

Step 2 - Check capacity of perforated pipe collection system

$$Q = C_d A_0 \text{SQRT}(2gh)$$

We propose the installation of a 50mm diameter JFC perforated Corripipe

C_d :	0.8	m
Nom. OD:	512	mm
Wall Thickness:	31	mm
Slots per Dwell:	3	
Nom. Slot Width:	2.8-3.5	mm
Perforation Area:	4024	mm ² /m
	= 0.004024	m ² /m
Q per perforation:	0.005	m ³ /s / m
Q Total:	0.99	m ³ /s

This flow rate comfortably exceeds all rates of flow considered (from 1-year to 100-year) through the filter aggregate, therefore the design is acceptable.

Specifications of proposed pipes:

TABLE 2. - CORRIPIPE™ DIMENSIONS			
NOMINAL SIZE (MM)	NOM. ID (MM)	NOM. OD (MM)	PIPE LENGTH (M)
94	94.5	111.5	6
100	100	119	6
150	150	178	6
225	225	265	6
300	300	354	6
375	372	426	6
450	445	512	6
600	592	680	6
750	750	848	6
900	900	1024	6
1050	1050	1200	6

TABLE 3. - PERFORATED PIPE DETAIL			
NOMINAL SIZE (MM)	NO. OF SLOTS PER DWELL*	NOM. SLOT WIDTH (MM)	PEF. AREA (MM ² /M)
94	4	2.0-2.5	7920
100	n/a	n/a	n/a
150	4	2.0-2.5	6120
225	4	2.0-2.5	4680
300	4	2.0-2.5	5120
375	3*	2.7-3.3	4263
450	3*	2.8-3.5	4024
600	3*	2.9-3.5	4942
750	3	3.0-4.0	13716
900	4	3.0-4.0	14688
1050	4	3.0-4.0	10944

* Slots on alternate dwells

Runway-way Filter Drain - Pipe Capacity to Carry Flow - Check

		Kinematic Viscosity	0.00000131	m ² /s @ 10 Deg. C
		Acceleration due to Gravity	9.81	m/s ²
		Effective roughness	0.0015	m
Ref.	Capacity Calculations			
	Size	Gradient	Velocity	Capacity
MH	mm	1 in	m/s	ℓ/s
Inlet	450	1000	0.77	122.8
Outlet				

For longest length of pipe in Filter Drain - 220m:

Max. Contrib. Area (half - 9m x 220m):	1980	m ²
Met Eireann - 1:1 event, 15 mins:	6.6	mm
Equivalent hourly depth (x4):	26.4	mm
Met Eireann - 1:10 event, 15 mins:	10.4	mm
Equivalent hourly depth (x4):	41.6	mm
Met Eireann - 1:30 event, 15 mins:	12.5	mm
Equivalent hourly depth (x4):	50	mm
Met Eireann - 1:100 event, 15 mins:	15.3	mm
Equivalent hourly depth (x4):	61.2	mm

1 year runoff rate:	0.0131	(m ³ /s)	or	13.07	l/s
10-year runoff rate:	0.0206	(m ³ /s)	or	20.59	l/s
30-year runoff rate:	0.0248	(m ³ /s)	or	24.75	l/s
100-year runoff rate:	0.0303	(m ³ /s)	or	30.29	l/s

Thus, the proposed pipe diameter and gradient can comfortably take the flow from the contributing area for all rates tested from 1-year to 100-year events.

Adequate self-cleaning velocity (> 0.75m/s) is also achieved.



For concentrated flows at connecting pipes to offline attenuation/soakaway systems, we have allowed for 4-times the flow or please see below:

1 year runoff rate x 4:	0.0523	(m ³ /s)	or	52.27	l/s
10-year runoff rate x 4:	0.0824	(m ³ /s)	or	82.37	l/s
30-year runoff rate x 4:	0.0990	(m ³ /s)	or	99.00	l/s
100-year runoff rate x 4:	0.1212	(m ³ /s)	or	121.18	l/s

Considering that the 450mm diameter pipe @ 1:1000 gradient (as tested for the filter drains) has adequate capacity, this will also be used for the connecting pipes to the offline attenuation/soakaways

Again, the proposed pipe diameter and gradient can comfortably take the flow from the combined contributing area for all rates tested from 1-year to 100-year events.

Adequate self-cleaning velocity (> 0.75m/s) is also achieved.

7.3.3 Surface Water Treatment

For the infiltration type filter drains at both sides of the proposed taxi-way (Zone 1), significant reduction in contaminant loads will be achievable when used in combination with the proposed filter strips.

This setup meets the requirements of our *Water Quality Risk Assessment* in Section 6.3 above.

For the proposed runway (Zones 2, 3 and 4), the use of filtration type filter drains is not acceptable, mainly due to the high water-table and inadequate depth of subsoil to allow sufficient filtration.

Whilst these 'sealed' drains will provide some treatment as the run-off water is conveyed to the proposed offline attenuation/soakaway systems, we recommend the installation of hydrocarbon separators upstream of the proposed offline attenuation/soakaway systems.

7.3.4 Construction

Filter drains should be protected before completion and stabilisation of the upstream development areas.

They should not be used for drainage of construction sites, where untreated runoff is likely to contain large amounts of silt, debris and other pollutants, as this will cause rapid clogging of the systems.

All trench excavations should follow construction best practice and be supported, if required. No personnel should be allowed to enter an unsupported trench deeper than 1.2 m. Trench supports should be designed to guarantee the safety of those working in the trench.

Support may also be needed for shallower trenches in weak ground.

Filter drain formations should be flat or to a shallow grade to reduce the risk of ponding and negative filter gradients. Geotextile and stone fill should be clean before construction.

Backfill should be placed in 100-150mm layers and lightly compacted as required.

All geotextiles should be wrapped and secured to prevent gravel or stone from clogging with sediments.

The drain-down time after a storm should be observed after completion or modification of the facility to confirm that the desired drain time has been obtained (BRE, 1991).

A construction phase health and safety plan is required under the Safety, Health and Welfare at Work (Construction) Regulations (as amended).

This should ensure that all construction risks have been identified, eliminated, reduced and/or controlled where appropriate.

7.3.5 Operation and Maintenance Requirements

Filter drains will require regular maintenance to ensure continuing operation to design performance standards.

See below table, detailing maintenance requirements, extracted from C753:

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

7.4 Hydrocarbon Separator

Bypass hydrocarbon separators are proposed upstream of the attenuation/soakaway systems - described below.

Note that the run-off water will have been subject to significant treatment – removal of suspended solids, hydrocarbons and metals – via the proposed filter strips and filter drains.

Thus, we propose the installation of bypass separators.

These bypass separators have been sized to fully treat all flows generated by rainfall rates of up to and including 100-year events.

Flows above this rate will be allowed to bypass the separator.

These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

This will be Class I separator, which is designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

We propose the installation of a Klargestor NSBE015 units.

Refer to Appendix E for details.

7.5 Surface Water Attenuation/Soakaway/Infiltration System

We propose the use of JFC Civils HydroChamber attenuation/soakaway system for the proposed offline attenuation/soakaway/infiltration systems.

The sizing of these chambers is based on trial hole assessment/testing carried out at the proposed system location and has been carried out to BRE Digest 365. See design calculations for the sizing of this system in the attached Appendix E.

The volumes of storage to provided are as follows:

- Zone 2: 500 m³
- Zone 4: 330 m³

Note that this volume accounts for the void space created by the HydroChamber sections and the void space within the specified broken stone contained in the system.

The specific design and configuration of this system has been detailed in the accompanying drawing – *WK10672 – C-11 – Proposed Soakaways*.

During a rainstorm event all stormwater run-off from the runway is piped, via the hydrocarbon separator described above, into the catchpit manhole upstream of the system where sediment and floatables are trapped.

It then flows through the inspection/inlet manhole and on to the perforated distribution pipe.

The water permeates through the perforated distribution pipe and into the surrounding stone as well as flowing through the inspection manifold into the chambers.

The distribution pipe, HydroChambers and backfill stone provide the storage volume as the water infiltrates into the surrounding ground.

Refer to Appendix G for information on the JFC Civils HydroChamber attenuation/Soakaway.

8.0 SuDS Selection Hierarchy Sheet – Cork County Council

This table is based on Table 4 of Cork County Council's County Development Plan 2022 Advice Note No. 1 – Surface Water Management (December 2022).

This table has been completed to take into account the SuDS measures (as detailed above) that are proposed to serve the proposed runway and taxiway.

See below:

Table 4 CORK COUNTY COUNCIL SUDS SELECTION HIERARCHY SHEET FOR LARGE-SCALE DEVELOPMENT AND AGRICULTURAL DEVELOPMENT				
SuDS Measures	Measures to be used on site	Rationale for selecting / not selecting measure	Area of feature (m ²)	Attenuation volume of feature (m ³) (see No. 8)
Source Control				
Providing storage at source				
Swales	No	Not appropriate for the size of site/volume of surface water involved and relatively flat topography.	N/A	N/A
Integrated constructed tree pits	No	Not appropriate for site - additional trees could obstruct aircraft.	N/A	N/A
Rainwater Butts	No	Not appropriate for the size of site/volume of surface water involved.	N/A	N/A
Downpipe Planters	No	Not appropriate for the size of site/volume of surface water involved.	N/A	N/A
Rainwater Harvesting	No	Not appropriate for the size of site/volume of surface water involved.	N/A	N/A
Soakaways	Yes	Offline, large volume soakaways incorporating proprietary chambers to increase void space, are proposed for the runway.	Runway: 1,160 m ² Air-Amb. Base: 90 m ²	Runway: 833 m ³ Air-Amb. Base: 36.4 m ³
Infiltration trenches	No	Other infiltration measures specified.	N/A	N/A
Permeable pavement (Grasscrete, Block Paving, Porous Asphalt, etc)	No	Not appropriate for site - not appropriate for runway design/specification.	N/A	N/A
Green Roofs	No	Not appropriate for site.	N/A	N/A
Green wall	No	Not appropriate for site.	N/A	N/A
Filter strips	Yes	Proposed to treat runoff from impermeable runway/taxi-way by promoting sedimentation, filtration and infiltration	Runway: 7,350 m ² Taxiway: 780 m ²	N/A
Bio-retention systems/Raingardens	No	Not appropriate for site.	N/A	N/A
Blue Roofs	No	Not appropriate for site.	N/A	N/A
Filter Drain	Yes	Linear measure suited to the linear nature of the development - provides subsurface storage for the attenuation, conveyance and filtration of surface water runoff. Not suitable for the proposed runway due to high water table.	Taxi-way: 234 m ²	Taxi-way: 281 m ³
Site Control				
Detention Basins	No	Not appropriate due to site topographical challenges.	N/A	N/A
Retention basins	No	Not appropriate due to site topographical challenges.	N/A	N/A
Regional Control				
Ponds	No	Not appropriate due to site topographical challenges.	N/A	N/A
Wetlands	No	Not appropriate due to site topographical challenges.	N/A	N/A
Other				
Petrol/Oil interceptor/Grit Trap	Yes	The use of filter strips & drains as detailed by CIRIA C753 are considered to provide the necessary filtration of the surface water run-off for the taxi-way. We propose 2No. bypass separators upstream of the 2No. soakaway/infiltration systems serving the proposed runway.	Runway: c.15 m ² Air-Amb. Base: c.3 m ²	N/A
Attenuation tank – only as a last resort where other measures are not feasible	No	The use of hard-engineering solutions has been avoided, where possible, in favour of the specification of nature-based SuDS solutions - as required in Cork County Council County Development Plan 2022.	Refer to Runway soakaways above, which provide for both attenuation and infiltration.	Refer to Runway soakaways above, which provide for both attenuation and infiltration.
Oversized pipes– only as a last resort where other measures are not feasible	No	Not feasible	N/A	N/A
Other	No	-	N/A	N/A
Notes: Cork County Council is seeking above-ground solutions rather than tanks or oversized pipes. Above ground flows through swales, basins etc. are encouraged. 1. Demonstrate SuDS system will have sufficient Pollutant removal efficiency in accordance with CIRIA Suds Manual C753. 2. Basins and swale sides should be no steeper than 1:4 and no deeper than 1.2m in the 1%AEP. 3. Culverting should be avoided. 4. De-culverting is encouraged. 5. Please submit evidence of infiltration rates. 6. To account for climate change in the design of the drainage system rainfall intensities should be factored up by 20%. 7. The applicant must provide SuDS checklists in accordance with the Appendix B of the CIRIA Suds manual C753. 8. The applicant must provide discharge rate applied with supporting calculations.				

9.0 Re-located Air Ambulance Base Compound

Due to the scale of the buildings involved, we are treating this compound as a separate entity from a surface water point of view.

Impermeable surfaces, i.e. those generating surface water run-off will consist of the roofs of the proposed buildings and the concrete apron and the helicopter landing pad (heli-pad).

Other impermeable surfaces will be minor in nature (i.e. footpaths) and draining to adjacent grassed areas.

The majority of external surface area (i.e. the car parking area) will be finished in with permeable unbound/gravel.

9.1 Surface Water Quality

The water quality of the surface water run-off from the roofs of the proposed development will be largely good.

Nonetheless, we propose the installation of a silt trap chamber upstream of the proposed connection to the proposed surface water disposal features.

9.1.1 Hydrocarbon Separator

The concrete apron and the helicopter landing pad (heli-pad) to the front (north) of the proposed hangar will be re-fuelling of the helicopter will take place.

This area will be fully kerbed around the perimeter and graded to rainwater gullies so that all surface water generated thereon is captured.

This run-off water will then be conveyed through a 'full-retention' hydrocarbon separator.

Full retention separators are used in high-risk spillage areas such as:

- Fuel distribution depots
- Vehicle workshops
- Scrap yards

All surface water flowing through this separator will be treated to a Class I standard.

This will be Class I separator, which is designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

We propose the installation of a Klargestor NSFA010 unit.

Refer to Appendix E for details.

9.2 Surface Water Quantity/Volume

Note below the on-site impermeable areas that are proposed:

Proposed Hangar Roof Area	411	Sq.m
Proposed Base & Operations Building Roof Area:	143	Sq.m
Proposed Concrete Apron & Helipad:	500	Sq.m

We will use the above areas to design appropriate soakaways to affectively dispose of surface water generated.

9.3 Proposed Surface Water Disposal Measures

See Appendix G for soakway design calculations.

We propose 1No. soakaway to dispose of the surface generated on the proposed concrete apron and the helicopter landing pad (heli-pad) to the front (north) of the proposed hangar.

This will be a traditional stone-filled soakaway, with storage volume of 17.86m³.

We propose another soakaway to dispose of the surface generated on the roofs of the proposed base and hangar buildings.

These will also be a traditional stone-filled soakaways, with storage volume of 3.78m³ and 14.58 m³ respectively.

10.0 Conclusion

Based on the foregoing assessment and design we predict that the surface water run-off generated on-site due to the proposed development can be successfully managed and treated on the site.

We have maximised the nature-based treatment, retention and infiltration of storm water runoff on-site.

The proposed SuDS measures will address the requirements of the current Cork County Development Plan in mitigating the surface water and allowing infiltration on-site.

A handwritten signature in black ink, appearing to read 'Mark Hegarty', with a long horizontal flourish extending to the right.

MARK HEGARTY

B.E. C.Eng. MIEI

WATERMAN KELLY CONSULTING ENGINEERS

Appendix A

Site Investigation Reports

Clement O' Sullivan

Engineering Design Solutions Ltd.

Garrynagearagh, Mourneabbey, Mallow, Co. Cork, P51 T992

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V.A.T. Reg No: IE 4010612CH

TRIAL HOLE REPORT

FOR

Site Development Works

AT

**Rathcool Flight Club, Rathcool Aerodrome,
Knockcahill & Rathcool, Mallow, Co Cork.**



And



INTRODUCTION

The site in the townlands of Knockcahill & Rathcool outside Rathcool Village. The site is considering an application for new development at the runway for Rathcool Flying Club. A previous application was for : *Construction of a hard surfaced runway, taxiway and helipad with associated ground level lighting, associated interceptors along with relocation of existing hanger, paramedic prefab base, crew prefab base all associated with the Irish Community Air Ambulance, all of which to be serviced by a new proprietary waste water treatment, new vehicle entrance and associated site works. A Natura Impact Statement will be submitted to the Planning Authority with the application.*

The site has been designed by Waterman Kelly Consulting Engineers, who tasked Clement O' Sullivan to field study assess the storm water characteristics of the runway to determine the infiltration rate of the lands for development. The trial holes were excavated close to the test holes to confirm / determine soil types and water table levels on site.

The initial brief to the developer was to excavate 4# locations on site as per mark up of layout drawing and excavate trial holes to a depth of ideally below water table and excavate test holes close by to confirm water infiltration rates.

The site was visited on the 30th of July 2024 and conditions were dry. Each trial hole was tagged and approximate ITM co-ordinates recorded. The trial holes were excavated until water ingress was observed during the excavation.

Due to the fact that the test holes and trial holes were excavated on the same day (availability of operator and machinery), the water table would not be given sufficient time to normalise. With that considered, the trial holes were excavated first and the depths of the test holes were to a depth where the estimated water table would be expected but also to a depth to allow stone infiltration design.

All holes are cuboid in profile, i.e. each hole was excavated in a sweeping profile of the excavator bucket and the bucket was circa 900mm wide with teeth causing rippling and tearing of stones in the test holes. All test holes were irregular in final profile due to the nature of the soil. For these soil conditions a rectangular hole was excavated as best permissible.

A measuring staff was placed and secured close to centrally in the trial hole and left in place, undisturbed, for a minimum of 48 hours. Due to health and safety, not all the holes were accessed and some holes were observed from the surface. A total of 9# soil samples were taken in various holes with the soil characterisation visually assessed between trial holes.

All samples were dried and then weighted. Soil was then passed through a 5mm and 2mm sieve to remove larger peds and the comparative weights recorded. Any cobbles / particles weighing more than 50% of the sample weight becomes the dominant weight and is recorded in capitals in the chart.

Sample	Dry Weight	Weight Retained in 2mm Sieve	Weight Passing 2mm Sieve	% Retained	% Passed
1A	546	361	185	66.1%	33.9%
1B	913	718	195	78.6%	21.4%
1C	832	745	87	89.5%	10.5%
1D	796	388	408	48.7%	51.3%
3A	639	283	356	44.3%	55.7%
3B	361	259	102	71.7%	28.3%
3C	1157	771	386	66.6%	33.4%
4A	530	123	407	23.2%	76.8%
4B	998	790	208	79.2%	20.8%

TRIAL HOLE # 1

Irish Transverse Mercator (ITM) Co-ordinates : 532848.543 , 595291.760

- Average Surface Level : 83.141m Malin Head
- Approximate Invert Level : 79.251m Malin Head
- Depth of Trial Hole : 3.890m
- Approximate Water Depth : 670mm
- Approximate Water Table Level : 79.921m Malin Head
- No Bedrock encountered
- Date & Time of Excavation : 30/07/2024 @ 11:00
- Date & Time of Inspection : 01/08/2024 @ 16:08

Depth		Soil/Subsoil Texture & Classification	Placticity & Dilatancy	Soil Structure	Density / Compactness	Colour	Preferential Flowpaths
0.10m	3.90m	300mm topsoil, GRAVELS wrapped in sandy silt	3,4,2 Treads 40,60,50 Ribbon Dilatant	Granular and Crumb – Sample 1A @ 3.75m, 66.1% retained	Very Hard	Dark Brown	Rootlets widely spaced
0.20m	3.80m						
0.30m	3.70m						
0.40m	3.60m	300mm GRAVELS wrapped in silt		Granular and Crumb	Firm	Golden Brown	
0.50m	3.50m						
0.60m	3.40m						
0.70m	3.30m	1800mm of BOULDERS & COBBLES wrapped in sandy silt	1,2,2 Treads 20,30,30 Ribbon Dilatant No cohesion	Granular and Crumb – Sample 1B @ 3.00m 78.6% retained in 2mm sieve Granular and Crumb – Sample 1C @ 2.00m 89.5% retained in 2mm sieve	Very Loose	Purple Brown	
0.80m	3.20m						
0.90m	3.10m						
1.00m	3.00m						
1.10m	2.90m						
1.20m	2.80m						
1.30m	2.70m						
1.40m	2.60m						
1.50m	2.50m						
1.60m	2.40m						
1.70m	2.30m						
1.80m	2.20m						
1.90m	2.10m						
2.00m	2.00m						
2.10m	1.90m						
2.20m	1.80m						
2.30m	1.70m						
2.40m	1.60m						
2.50m	1.50m	1500mm of hard SILTS wrapping around gravels	3,3,4 Treads 80,90,80 Ribbon	Granular and Crumb – Sample 1D @ 1.00m 48.7% retained in 2mm sieve	Very Hard	Purple Brown	Water ingress around 3.00m below ground level
2.60m	1.40m						
2.70m	1.30m						
2.80m	1.20m						
2.90m	1.10m						
3.00m	1.00m						
3.10m	0.90m						
3.20m	0.80m						
3.30m	0.70m						
3.40m	0.60m						
3.50m	0.50m	Water Table @ 79.921m	Water Table @ 79.921m	Water Table @ 79.921m	Water Table @ 79.921m	Water Table @ 79.921m	Water Table @ 79.921m
3.60m	0.40m						
3.70m	0.30m						
3.80m	0.20m						
3.90m	0.10m						

TRIAL HOLE # 1 - @ Excavation 30/07/2024 @ 11:00





TRIAL HOLE # 1 - @ Inspection 01/08/2024 @ 16:08



TRIAL HOLE # 2

Irish Transverse Mercator (ITM) Co-ordinates	:	532774.491 , 595410.451
• Average Surface Level	:	81.557m Malin Head
• Approximate Invert Level	:	79.045m Malin Head
• Depth of Trial Hole	:	2.512m
• Approximate Water Depth	:	1000mm
• Approximate Water Table Level	:	80.045m Malin Head
• No Bedrock encountered		
• Date & Time of Excavation	:	30/07/2024 @ 12:45
• Date & Time of Inspection	:	01/08/2024 @ 16:12

Depth		Soil/Subsoil Texture & Classification	Placticity & Dilatancy	Soil Structure	Density / Compactness	Colour	Preferential Flowpaths
0.10m	2.50m	300mm topsoil, GRAVELS wrapped in sandy silt	4,2,3 Treads 60,70,70 Ribbon Dilatant	Granular and Crumb	Very Hard	Dark Brown	Rootlets widely spaced
0.20m	2.40m						
0.30m	2.30m						
0.40m	2.20m						
0.50m	2.10m	1100mm GRAVELS wrapped in silt	No cohesion	Granular and Crumb	Firm	Golden Brown	Water ingress around 1.50m below ground level with water table rising
0.60m	2.00m						
0.70m	1.90m						
0.80m	1.80m						
0.90m	1.70m						
1.00m	1.60m						
1.10m	1.50m						
1.20m	1.40m						
1.30m	1.30m						
1.40m	1.20m						
1.50m	1.10m						
1.60m	1.00m	Water Table @ 80.045m	Water Table @ 80.045m	Water Table @ 80.045m	Water Table @ 80.045m	Water Table @ 80.045m	Water Table @ 80.045m
1.70m	0.90m	1200mm of BOULDERS & COBBLES wrapped in sandy silt	2,3,1 Treads 80,90,80 Ribbon	Granular and Crumb	Firm / Loose	White Marley Gravels – indication of water table due to lack of oxygen in soils and white staining	
1.80m	0.80m						
1.90m	0.70m						
2.00m	0.60m						
2.10m	0.50m						
2.20m	0.40m						
2.30m	0.30m						
2.40m	0.20m						
2.50m	0.10m						

TRIAL HOLE # 2 - @ Excavation 30/07/2024 @ 12:45



TRIAL HOLE # 2 - @ Inspection 01/08/2024 @ 16:12



TRIAL HOLE # 3

Irish Transverse Mercator (ITM) Co-ordinates	:	532537.750 , 595234.066
• Average Surface Level	:	81.748m Malin Head
• Approximate Invert Level	:	79.424m Malin Head
• Depth of Trial Hole	:	2.324m
• Approximate Water Depth	:	1060mm
• Approximate Water Table Level	:	80.484m Malin Head
• No Bedrock encountered		
• Date & Time of Excavation	:	30/07/2024 @ 14:14
• Date & Time of Inspection	:	01/08/2024 @ 16:16

Depth		Soil/Subsoil Texture & Classification	Placticity & Dilatancy	Soil Structure	Density / Compactness	Colour	Preferential Flowpaths
0.10m	2.30m	150mm topsoil	3,4,2 Treads	Granular and	Firm	Dark Brown	Rootlets widely
0.20m	2.20m	SILT/CLAY with	60,80,80 Ribbon	Crumb–			spaced
0.30m	2.10m	gravel deposits	Sample 3A @	2.20m, 44.3% ret'			
0.40m	2.00m	1150mm		Structureless in	Very Soft	Golden Brown	
0.50m	1.90m	GRAVEL with		natural state,			
0.60m	1.80m	clay wrapping.	3,4,4 Treads	granular when dry			
0.70m	1.70m	Note clay causing	120,130,130	and crumbed –			
0.80m	1.60m	high levels of	Ribbon	Sample 3B @			
0.90m	1.50m	cohesion to		1.75m			
1.00m	1.40m	gravels leaving		71.7% retained in			
1.10m	1.30m	sample		2mm sieve			
1.20m	1.20m	structureless.					
1.30m	1.10m						
1.40m	1.00m	Water Table @ 80.484m	Water Table @ 80.484m	Water Table @ 80.484m	Water Table @ 80.484m	Water Table @ 80.484m	Water Table @ 80.484m
1.50m	0.90m	1000mm of	No cohesion	Granular and	Firm and Loose	Blue Gravels	Very fluid and
1.60m	0.80m	BOULDERS &		Crumb – Sample			wet
1.70m	0.70m	COBBLES		3C @ 0.75m			
1.80m	0.60m	wrapped in sandy		66.6% retained in			
1.90m	0.50m	silt		2mm sieve			
2.00m	0.40m						
2.10m	0.30m						
2.20m	0.20m						
2.30m	0.10m						

TRIAL HOLE # 3 - @ Excavation 30/07/2024 @ 14:14





TRIAL HOLE # 3 - @ Inspection 01/08/2024 @ 16:16



TRIAL HOLE # 4

Irish Transverse Mercator (ITM) Co-ordinates	:	532206.007 , 595187.338
• Average Surface Level	:	82.464m Malin Head
• Approximate Invert Level	:	79.856m Malin Head
• Depth of Trial Hole	:	2.599m
• Approximate Water Depth	:	890mm
• Approximate Water Table Level	:	80.746m Malin Head
• No Bedrock encountered		
• Date & Time of Excavation	:	30/07/2024 @ 15:20
• Date & Time of Inspection	:	01/08/2024 @ 16:24

Depth		Soil/Subsoil Texture & Classification	Placticity & Dilatancy	Soil Structure	Density / Compactness	Colour	Preferential Flowpaths
0.10m	2.60m	600mm SILT wrapping gravels with sandy texture	3,3,2 Treads 80,60,90 Ribbon Dilatant	Granular and Crumb – Sample 4A @ 2.30m, 23.2% retained	Firm	Dark Brown	Rootlets widely spaced
0.20m	2.50m						
0.30m	2.40m						
0.40m	2.30m						
0.50m	2.20m						
0.60m	2.10m	2000mm of BOULDERS & COBBLES wrapped in sandy silt	Poor cohesion	Granular and Crumb – Sample 4B @ 1.00m 79.2% retained in 2mm sieve	Very Loose	Purple Brown	
0.70m	2.00m						
0.80m	1.90m						
0.90m	1.80m						
1.00m	1.70m						
1.10m	1.60m						
1.20m	1.50m						
1.30m	1.40m						
1.40m	1.30m						
1.50m	1.20m						
1.60m	1.10m						
1.70m	1.00m						
1.80m	0.90m	Water Table @ 80.746m	Water Table @ 79.921m	Water Table @ 79.921m	Water Table @ 79.921m	Water Table @ 79.921m	Water Table @ 79.921m
1.90m	0.80m						
2.00m	0.70m						
2.10m	0.60m						
2.20m	0.50m						
2.30m	0.40m						
2.40m	0.30m						
2.50m	0.20m						
2.60m	0.10m						

TRIAL HOLE # 4 - @ Excavation 30/07/2024 @ 15:20



TRIAL HOLE # 4 - @ Inspection 01/08/2024 @ 16:24



CONCLUSION

The site at Knockcahill & Rathcool outside Rathcool Village is acceptable for use as on site surface water disposal.

The information gathered during the site investigation does not indicate any special risks such as chemical contamination, ground failure features or any other identifiable features.

Trial Hole # 3 was cited close to the location of the ditch line and the soil deposits encountered was extremely soft and wet. This may be contributory to soils deposited during ditch cleaning or generally “heavy” soil to the local area. The soil encountered at Area 3 was not consistent with the other test holes and may be isolated to this area. It would be my recommendation to provide a sterilisation zone of approximately 20.0m both sides of the original ditch line and either use the infiltration rate from test hole # 3 or else locate the soakaways outside these zones.

The 4 trial Holes recorded different water table levels. This would be expected as the resistance of flow through soils can affect water table both from rivers and streams as well as water flows from uplands area.

The topographic survey also recorded top water levels in 2 points giving 6 total water levels

Trial Hole 1	ITM: 532848.543 , 595291.760	:	79.921m	Malin Head
Trial Hole 2	ITM: 532774.491 , 595410.451	:	80.045m	Malin Head
Trial Hole 3	ITM: 532537.750 , 595234.066	:	80.484m	Malin Head
Trial Hole 4	ITM: 532206.007 , 595187.338	:	80.746m	Malin Head
River Level	ITM: 532050.036 , 595349.210	:	80.363m	Malin Head
River Level	ITM: 532547.781 , 595377.678	:	80.097m	Malin Head

Trial Hole # 1 is located uphill of all other points and even through the soil is GRAVEL, the level of silt fines are greater than the other test holes. Trial Hole # 1 is more natural soils where #2, #3 and #4 shows more fluvial gravels, which are round in shape and good composition of boulders, gravels, sands, and silts which provided a loose material and the over burden subsoils functioned as shelves to the trial holes.

From above data, the water table to the southern section of the field is based on soil resistance whereas the other data is possibly fluvial water table from the river. The topographic Survey was done on the 17th June 2024 so the levels of water table at the time of survey and trial hole assessment is more or less identical.

From that, the average water table (excluding TH#1) is 80.347m

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STORM WATER DESIGN REPORT

FOR

Site Development Works

AT

**Rathcool Flight Club, Rathcool Aerodrome,
Knockcahill & Rathcool, Mallow, Co Cork.**



And



INTRODUCTION

The site in the townlands of Knockcahill & Rathcool outside Rathcool Village. The site is considering an application for new development at the runway for Rathcool Flying Club. A previous application was for : *Construction of a hard surfaced runway, taxiway and helipad with associated ground level lighting, associated interceptors along with relocation of existing hanger, paramedic prefab base, crew prefab base all associated with the Irish Community Air Ambulance, all of which to be serviced by a new proprietary waste water treatment, new vehicle entrance and associated site works. A Natura Impact Statement will be submitted to the Planning Authority with the application.*

The site has been designed by Waterman Kelly Consulting Engineers, who tasked Clement O' Sullivan to field study assess the storm water characteristics of the runway to determine the infiltration rate of the lands for development.

The initial brief to the developer was to excavate 4# locations on site as per mark up of layout drawing and excavate test holes to a depth of ideally 1.0m above water table, circa 1.5m deep, 1.0m wide, 1.0m long. and excavate trial holes close by to confirm water tables.

The site was visited on the 30th of July 2024 and conditions were dry.

Each test hole was tagged and approximate ITM co-ordinates recorded.

Due to the fact that the test holes and trial holes were excavated on the same day (availability of operator and machinery), the water table would not be given sufficient time to normalise. With that considered, the trial holes were excavated first and the depths of the test holes were to a depth where the estimated water table would be expected but also to a depth to allow stone infiltration design.

The time of initial fill, end of fill (100%), 75% fill, 50% fill and 25% fill recorded on all holes with the exception of #3 due to slow rate of infiltration. For test hole # 3, the 50% and 25% rate is interpolated from the data previously recorded for the hole. Test hole #4 also rapidly dropped faster than expected so the results recorded are interpreted from the times recorded. Test Hole # 4 is not expected to differ from that data shown below.

While every effort was taken to record and photograph each test hole in real time, the placement of water in soil and the final dimensions of gravel trial holes makes it impossible for accurate readings and some dimensions are taken as average across the profile of the holes.

All holes are cuboid in profile, i.e. each hole was excavated in a sweeping profile of the excavator bucket and the bucket was circa 900mm wide with teeth causing rippling and tearing of stones in the test holes. All test holes were irregular in final profile due to the nature of the soil. For these soil conditions a rectangular hole was excavated as best permissible.

The test results, procedure and methods of calculations are based on BRE Digest 365, Soakaway Design, Revised 2016. The following data and report are based on the field data recorded at the time and location of inspection only and the information is only relevant to the locations recorded.

BRE Digest 365 3.2 Site investigation and testing

Site investigation and testing should be carried out prior to design or construction work taking place; this is part of the design process. Ground conditions, even in the same location, can vary especially on previously-used brownfield land. The site investigation (including desk research and ground investigation) will be required to assess the following:

- water table depth and perched water table presence/depth (based on the worst annual case, ie during April or May)

- chemical contamination risks
- suitability of strata for soakaway discharges, including permeability.

Desk studies are preferred even for small site developments, items that should be reviewed are well records, geological maps and records, OS maps and aquifer protection maps. In the site investigation, boreholes and/or soakage trial pits can be used to determine the ground condition, soil material and presence and depth of groundwater. Soakage trial pits can also be used for the infiltration tests described in Section 3.2.3.

3.2.3 Rate test

Field investigations are required to confirm infiltration rates.

The procedure recommended in this Digest is to excavate a soakage trial pit to the same depth as anticipated in the full-size soakaway. For run-off from 100m² this will be 1m to 1.5m below the invert level of the drain discharging to the soakaway. Overall depths of excavation will be typically 1.5m to 2.5m for permeable areas >100m² draining to the soakaway.

The soakage trial pit should be 1m to 3m long and 0.3m to 1m wide. It should have vertical sides trimmed square and, if necessary for stability, should be filled with granular material. When granular fill is used, a full-height, perforated, vertical observation tube should be positioned in the soakage trial pit so that water levels can be monitored with a dip tape. It should be possible to construct a suitably-dimensioned pit with a backhoe loader or mini-excavator.

Narrow, short pits use less water during the soakage tests but may be more difficult to trim and clean prior to testing. Measure the soakage trial pit carefully before trials. For safety reasons do not enter the soakage trial pit. A lot of water will be used to determine the soil infiltration rate so a water bowser may be needed. The inflow should be rapid so that the soakage trial pit can be filled to its maximum effective storage depth in a short time, ie to the design invert level of the drain to the soakaway. Take care that the inflow does not cause the walls of the soakage trial pit to collapse.

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

where:

V_{p75-25} = the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth

a_{s50} = the internal surface area of the soakage trial pit up to 50% effective storage depth and including the base area

t_{p75-25} = the time for the water level to fall from 75% to 25% effective storage depth.

Based on observations on site, any depths below the levels excavated on site would result in a faster infiltration rate on site.

TEST HOLE # 1

Irish Transverse Mercator (ITM) Co-ordinates	:	532853.594 , 595297.181
• Surface Length	:	2400mm
• Surface Width	:	1100mm
• Average Surface Level	:	83.110m Malin Head
• Approximate Invert Level	:	81.413m Malin Head
• Approximate Hole Depth	:	1.697m Malin Head
• Approximate Water Depth	:	1500mm
• Approximate Volume (m ³)	:	3.960m ³ of water added
• Approximate Water Table Level	:	79.921m Malin Head

Time @ end of pour 12:15 (t₁₀₀)

• Approximate Depth of water in hole	:	1500mm
• Approximate Volume @ 100%	:	3.960m ³
• Contact Surface of water in hole with soil	:	13.140m ²

Time at 75% of pour 12:18 (t₇₅)

• Approximate Depth of water in hole	:	1125mm
• Approximate Volume @ 75%	:	2.970m ³
• Contact Surface of water in hole with soil	:	10.515m ²

Time at 50% of pour 12:25 (t₅₀)

• Approximate Depth of water in hole	:	750mm
• Approximate Volume @ 50%	:	1.980m ³
• Contact Surface of water in hole with soil	:	7.890m ²

Time at 25% of pour 12:40 (t₂₅)

• Approximate Depth of water in hole	:	375mm
• Approximate Volume @ 25%	:	0.990m ³
• Contact Surface of water in hole with soil	:	5.265m ²

Additional Comments:

The test hole was excavated approximately 1.492m above water table recorded in Trial Hole # 1.
Soil indicates good drainage and good gravels – site suitable for soakaway.

Images of Test Hole # 1



Level @ 100% : 12:15



Level @ 75% : 12:18



Level @ 50% : 12:25



Level @ 25% : 12:40

TEST HOLE # 2

Irish Transverse Mercator (ITM) Co-ordinates	:	532770.106 , 595405.272
• Surface Length	:	2600mm
• Surface Width	:	1150mm
• Average Surface Level	:	81.751m Malin Head
• Approximate Invert Level	:	80.550m Malin Head
• Approximate Hole Depth	:	1.201m Malin Head
• Approximate Water Depth	:	1000mm
• Approximate Volume (m ³)	:	2.990m ³ of water added
• Approximate Water Table Level	:	80.045m Malin Head

Time @ end of pour 13:18 (t₁₀₀)

• Approximate Depth of water in hole	:	1000mm
• Approximate Volume @ 100%	:	2.990m ³
• Contact Surface of water in hole with soil	:	10.490m ²

Time at 75% of pour 13:29 (t₇₅)

• Approximate Depth of water in hole	:	750mm
• Approximate Volume @ 75%	:	2.243m ³
• Contact Surface of water in hole with soil	:	8.615m ²

Time at 50% of pour 13:55 (t₅₀)

• Approximate Depth of water in hole	:	500mm
• Approximate Volume @ 50%	:	1.495m ³
• Contact Surface of water in hole with soil	:	6.740m ²

Time at 25% of pour 14:42 (t₂₅)

• Approximate Depth of water in hole	:	250mm
• Approximate Volume @ 25%	:	0.748m ³
• Contact Surface of water in hole with soil	:	4.865m ²

Additional Comments:

The test hole was excavated approximately 0.505m above water table recorded in Trial Hole # 2.
Soil indicates good drainage and good gravels – site suitable for soakaway.

Images of Test Hole # 2



Level @ 100% : 13:18



Level @ 75% : 13:29



Level @ 50% : 13:55



Level @ 25% : 14:42

TEST HOLE # 3

Irish Transverse Mercator (ITM) Co-ordinates	:	532545.444 , 595238.650
• Surface Length	:	2400mm
• Surface Width	:	1100mm
• Average Surface Level	:	81.805m Malin Head
• Approximate Invert Level	:	80.695m Malin Head
• Approximate Hole Depth	:	1.110m Malin Head
• Approximate Water Depth	:	0.600mm
• Approximate Volume (m ³)	:	1.584m ³ of water added
• Approximate Water Table Level	:	80.484m Malin Head

Time @ end of pour 14:40 (t₁₀₀)

• Approximate Depth of water in hole	:	0.600mm
• Approximate Volume @ 100%	:	1.584m ³
• Contact Surface of water in hole with soil	:	6.840m ²

Time at 75% of pour 17:40 (t₇₅)

• Approximate Depth of water in hole	:	450mm
• Approximate Volume @ 75%	:	1.188m ³
• Contact Surface of water in hole with soil	:	5.790m ²

Time at 50% of pour Unknown 22:00 (t₅₀) - Estimated

• Approximate Depth of water in hole	:	300mm
• Approximate Volume @ 50%	:	0.792m ³
• Contact Surface of water in hole with soil	:	4.740m ²

Time at 25% of pour Unknown 2.00 (t₂₅) - Estimated

• Approximate Depth of water in hole	:	150mm
• Approximate Volume @ 25%	:	0.396m ³
• Contact Surface of water in hole with soil	:	3.690m ²

Additional Comments:

The test hole was excavated approximately 0.211m above water table recorded in Trial Hole # 3. From the onset, the soil was much softer and higher cohesion. It would be strongly advised that if any excavation encounters this type of soil, the soakaways should be relocated.

Soil indicates poor drainage close to the stream embankment – site not suitable for soakaway.

The test hole was empty post 48 hours after fill so it does percolate.

Images of Test Hole # 3



Level @ 100% : 14:40



Level @ 75% : 17:40

TEST HOLE # 4

Irish Transverse Mercator (ITM) Co-ordinates	:	532201.132 , 595195.388
• Surface Length	:	2250mm
• Surface Width	:	1100mm
• Average Surface Level	:	82.534m Malin Head
• Approximate Invert Level	:	81.336m Malin Head
• Approximate Hole Depth	:	1.198m Malin Head
• Approximate Water Depth	:	800mm
• Approximate Volume (m ³)	:	1.980m ³ of water added
• Approximate Water Table Level	:	80.746m Malin Head

Time @ end of pour 15:40 (t₁₀₀)

• Approximate Depth of water in hole	:	800mm
• Approximate Volume @ 100%	:	1.980m ³
• Contact Surface of water in hole with soil	:	7.835m ²

Time at 75% of pour 15:45 (t₇₅)

• Approximate Depth of water in hole	:	600mm
• Approximate Volume @ 75%	:	1.485m ³
• Contact Surface of water in hole with soil	:	6.495m ²

Time at 50% of pour 15:53 (t₅₀)

• Approximate Depth of water in hole	:	400mm
• Approximate Volume @ 50%	:	0.990m ³
• Contact Surface of water in hole with soil	:	5.155m ²

Time at 25% of pour 16:02 (t₂₅)

• Approximate Depth of water in hole	:	200mm
• Approximate Volume @ 25%	:	0.495m ³
• Contact Surface of water in hole with soil	:	3.815m ²

Additional Comments:

The test hole was excavated approximately 0.590m above water table recorded in Trial Hole # 4.
Soil indicates good drainage and good gravels – site suitable for soakaway.

Images of Test Hole # 4



Level @ 100% : 15:40



Level @ 50% : 15:53



Level @ 25% : 16:02

CONCLUSION

The site at Knockcahill & Rathcool outside Rathcool Village is acceptable for use as on site surface water disposal.

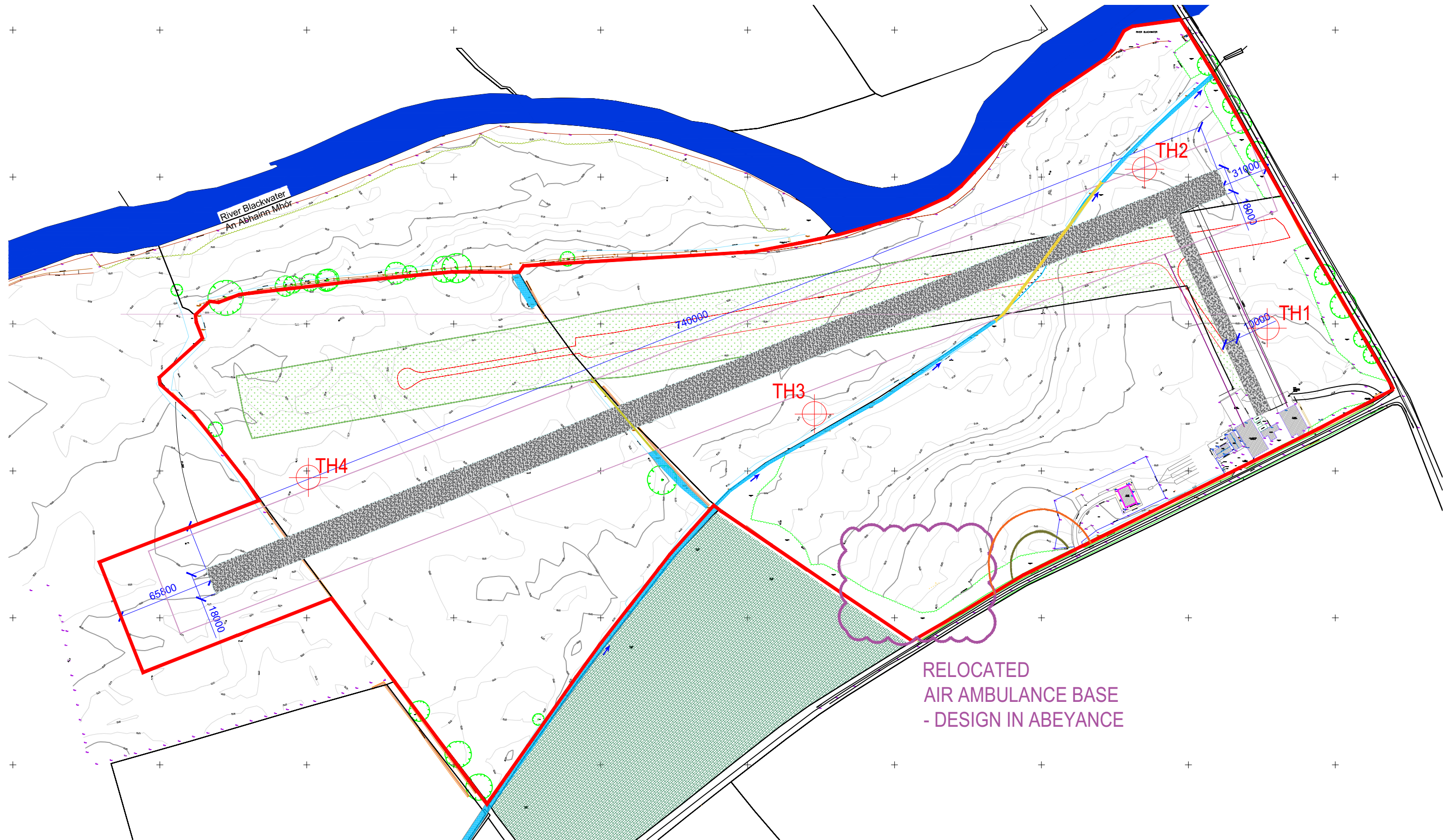
The information gathered during the site investigation does not indicate any special risks such as chemical contamination, ground failure features or any other identifiable features.

The general soakaway infiltration rate can be computed from test holes 1, 2, and 4.

Test Hole # 3 was cited close to the location of the ditch line and the soil deposits encountered was extremely soft and wet. This may be contributory to soils deposited during ditch cleaning or generally “heavy” soil to the local area. The soil encountered at Area 3 was not consistent with the other test holes and may be isolated to this area.

It would be my recommendation to provide a sterilisation zone of approximately 20.0m both sides of the original ditch line and either use the infiltration rate from test hole # 3 or else locate the soakaways outside these zones.





**SITE LAYOUT PLAN
TRIAL/INFILTRATION TEST
HOLE LOCATIONS**
SCALE - 1:2500 @ A3

				Client	RATHCOOL FLYING CLUB		
				Name of Job	PROPOSED DEVELOPMENT AT RATHCOOL AERODROME, RATHCOOL, MALLOW, CO. CORK.		
				Title of Drawing	SITE LAYOUT PLAN TRIAL/INFILTRATION TEST HOLE LOCATIONS		
Rev.	Date	By	Description	Scale	Date	Drawn	Checked
A	25.09.24	MH	ISSUED FOR INCLUSION IN S.W. REPORT	AS-SHOWN(A3)	16.05.2024	MH	EW
				Drawing No. WK10672 - C-14			
				Issue PL			

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Appendix B

Soil Infiltration Rate Calculations

Test Hole 1 - Infiltration Rate Calculation:

Extract from BRE365 (2016):

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

where:

V_{p75-25} = the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth

a_{s50} = the internal surface area of the soakage trial pit up to 50% effective storage depth and including the base area

t_{p75-25} = the time for the water level to fall from 75% to 25% effective storage depth.

$$\text{Soil Infiltration Rate } f: \quad V_{p75-25} / a_{s50} \times t_{p75-25}$$

TH Depth (m): 1.5 m

TH Length (m): 2.4 m

TH Width (m): 1.1 m

V_{p75-25} 1.98 m³

a_{s50} 7.89 m²

t_{p75-25} 22 minutes

$f =$ 0.000190114 m/sec

$=$ 0.00019011 m/sec

Test Hole 2 - Infiltration Rate Calculation:

Extract from BRE365 (2016):

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

where:

V_{p75-25} = the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth

a_{s50} = the internal surface area of the soakage trial pit up to 50% effective storage depth and including the base area

t_{p75-25} = the time for the water level to fall from 75% to 25% effective storage depth.

$$\text{Soil Infiltration Rate } f: \quad V_{p75-25} / a_{s50} \times t_{p75-25}$$

TH Depth (m): 1 m

TH Length (m): 2.6 m

TH Width (m): 1.15 m

V_{p75-25} 1.495 m³

a_{s50} 6.74 m²

t_{p75-25} 73 minutes

$f =$ 5.06416E-05 m/sec

$=$ 0.00005064 m/sec

Test Hole 3:

Test results poor - not considered in calculation.

Test Hole 4 - Infiltration Rate Calculation:

Extract from BRE365 (2016):

$$\text{Soil infiltration rate } f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

where:

V_{p75-25} = the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth

a_{s50} = the internal surface area of the soakage trial pit up to 50% effective storage depth and including the base area

t_{p75-25} = the time for the water level to fall from 75% to 25% effective storage depth.

Soil Infiltration Rate f:	$V_{p75-25} / a_{s50} \times t_{p75-25}$
TH Depth (m):	0.8 m
TH Length (m):	2.25 m
TH Width (m):	1.1 m
V_{p75-25}	0.99 m ³
a_{s50}	5.155 m ²
t_{p75-25}	17 minutes
f =	0.000188281 m/sec
=	0.00018828 m/sec

Appendix C

Site-specific Met Eireann Rainfall Return Periods

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 132682, Northing: 95259,

DURATION	Interval		Years										
	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	120,
5 mins	3.3,	4.1,	4.4,	5.0,	5.3,	5.5,	6.3,	7.1,	7.7,	8.3,	8.9,	9.3,	9.6,
10 mins	4.6,	5.6,	6.2,	6.9,	7.4,	7.7,	8.8,	10.0,	10.7,	11.6,	12.4,	13.0,	13.4,
15 mins	5.4,	6.6,	7.3,	8.1,	8.7,	9.1,	10.4,	11.7,	12.5,	13.7,	14.6,	15.3,	15.8,
30 mins	7.3,	8.9,	9.8,	10.9,	11.7,	12.2,	14.0,	15.8,	16.9,	18.4,	19.7,	20.6,	21.3,
1 hours	9.8,	12.1,	13.2,	14.7,	15.7,	16.5,	18.8,	21.3,	22.8,	24.8,	26.5,	27.8,	28.7,
2 hours	13.2,	16.2,	17.7,	19.9,	21.2,	22.2,	25.4,	28.6,	30.7,	33.4,	35.7,	37.5,	38.6,
3 hours	15.7,	19.3,	21.1,	23.6,	25.3,	26.5,	30.2,	34.1,	36.5,	39.8,	42.5,	44.6,	46.0,
4 hours	17.7,	21.9,	23.9,	26.8,	28.6,	30.0,	34.2,	38.6,	41.3,	45.0,	48.1,	50.5,	52.0,
6 hours	21.1,	26.0,	28.5,	31.9,	34.0,	35.7,	40.7,	45.9,	49.2,	53.6,	57.3,	60.1,	61.9,
9 hours	25.2,	31.0,	33.9,	37.9,	40.5,	42.5,	48.4,	54.7,	58.6,	63.8,	68.2,	71.5,	73.7,
12 hours	28.5,	35.1,	38.3,	42.9,	45.8,	48.0,	54.8,	61.9,	66.3,	72.2,	77.2,	81.0,	83.4,
18 hours	33.9,	41.8,	45.6,	51.1,	54.6,	57.2,	65.3,	73.7,	78.9,	86.0,	91.9,	96.4,	99.3,
24 hours	38.3,	47.3,	51.7,	57.8,	61.8,	64.7,	73.8,	83.4,	89.3,	97.3,	104.0,	109.1,	112.4,
2 days	48.7,	58.9,	63.9,	70.8,	75.2,	78.5,	88.5,	98.9,	105.3,	113.8,	121.0,	126.3,	129.8,
3 days	57.9,	69.4,	74.9,	82.5,	87.3,	90.9,	101.9,	113.1,	120.0,	129.2,	136.8,	142.5,	146.3,
4 days	66.6,	79.1,	85.1,	93.4,	98.7,	102.5,	114.3,	126.4,	133.7,	143.5,	151.7,	157.7,	161.6,
6 days	82.8,	97.3,	104.2,	113.7,	119.7,	124.1,	137.4,	151.0,	159.2,	170.1,	179.1,	185.8,	190.2,
8 days	98.1,	114.5,	122.2,	132.8,	139.4,	144.3,	159.0,	174.0,	183.0,	194.9,	204.8,	212.0,	216.8,
10 days	112.9,	131.0,	139.5,	151.1,	158.3,	163.7,	179.7,	195.9,	205.7,	218.5,	229.1,	237.0,	242.0,
12 days	127.4,	147.1,	156.3,	168.9,	176.7,	182.4,	199.7,	217.1,	227.6,	241.3,	252.6,	261.0,	266.4,
16 days	155.7,	178.4,	189.0,	203.3,	212.2,	218.8,	238.4,	258.0,	269.8,	285.1,	297.8,	307.1,	313.2,
20 days	183.6,	209.1,	220.9,	237.0,	246.9,	254.2,	275.9,	297.5,	310.5,	327.4,	341.4,	351.6,	358.2,
25 days	218.1,	247.0,	260.3,	278.3,	289.4,	297.5,	321.8,	345.8,	360.2,	378.9,	394.3,	405.6,	412.8,

NOTES:

These values are derived from a Depth Duration Frequency (DDF) Model update 2023

For details refer to:

'Mateus C., and Coonan, B. 2023. Estimation of point rainfall frequencies in Ireland. Technical Note No. 68. Met Eireann',

Available for download at:

<http://hdl.handle.net/2262/102417>

Appendix D

Filter Drain

Linear Soakaway Design

(Taxi-way)

Filter Drain Sizing

The use of infiltration filter drains is proposed for both sides of the taxi-way. These will act as shallow, linear soakaways adjacent to the edge of the impermeable surfaces.

On review of the results obtained from our site investigation/testing we have divided the site in 4No. zones – these correspond with the trial hole locations. With this approach, any varying subsoil or infiltration characteristics across the site will be taken into account, thus ensuring the most appropriate design possible.

These filter drains are proposed for Zone 1.

The filter drains within each Zone 1 will be designed with the specific data obtained from the testing for that zone.

As the test results at trial holes 2 and 4 found subsoil conditions to be unsuitable for a filter drain type system – due to the high level of the water table.

We will use filter drains as collection/carrier drains with a perforated pipe at the base of the drain and the base and sides of the trench wrapped in impermeable geotextile.

These will convey the run-off water to off-line attenuation/infiltration/soakaway systems, via appropriate hydrocarbon separators.

Zone 3 was found to be unsuitable for an infiltration/soakaway system, thus the surface water entering the drains will be conveyed to attenuation/soakaway systems in Zones 2 and 4.

Filter Drain/Linear Soakaway Calculation to BRE Digest 365:2016

Calculation Parameters/Assumptions:

- Rainfall Data: Met Eireann (2023) – Site-specific
- Contributing Areas:

Zone 1:
(Surface water run-off from the taxi-way)

Taxiway total width: 10m
Taxiway half-width: 5m
Taxi way length: 147m
Zone 1 Contributing Area: 735m²
- Tested Soil Infiltration Rate: as per the attached calculations (based on site tests)
- Return period: 100-year
- Climate Change increase: 20 %
- Percentage free volume: 30 %
- The percentage run off is taken as 100% from the contributing areas (as per BRE digest 365)
- No allowance is made for the time taken for run-off to discharge to the soakaway/infiltration system: the required storage volume is calculated on the basis of instantaneous discharge to the soakaway/infiltration system (as per BRE 365)
- The outflow from the soakaway/infiltration system is under-estimated (as per BRE 365)

Project Rathcoole Aerodrome				Job no. WK10672	
Calcs for Zone 1 - 100 yr Linear Soakaway - Taxiway				Start page no./Revision 1	
Calcs by MH	Calcs date 20/09/2024	Checked by EW	Checked date 20/09/2024	Approved by	Approved date

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	$A = 735.0 \text{ m}^2$
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	$r = 0.210$
5-year return period rainfall of 60 minutes duration	$M5_{60\text{min}} = 16.5 \text{ mm}$
Increase of rainfall intensity due to global warming	$p_{\text{climate}} = 20 \%$

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	$d = 1200 \text{ mm}$
Width of pit	$w = 900 \text{ mm}$
Length of pit	$l = 126000 \text{ mm}$
Percentage free volume	$V_{\text{free}} = 30 \%$
Soil infiltration rate	$f = 19.0 \times 10^{-6} \text{ m/s}$
Wetted area of pit 50% full	$a_{s50} = l \times d + w \times d = 152280000 \text{ mm}^2$

Table equations

Inflow (cl.3.3.1)	$I = M100 \times A$
Outflow (cl.3.3.2)	$O = a_{s50} \times f \times D$
Storage (cl.3.3.3)	$S = I - O$

Note: The following Z2 table values are user defined.

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m³)	Outflow (m³)	Storage required (m³)
5	0.29;	5.7;	1.88;	10.8;	7.92;	0.87;	7.05
10	0.43;	8.5;	1.94;	16.5;	12.12;	1.74;	10.39
15	0.54;	10.7;	1.97;	21.1;	15.49;	2.61;	12.89
30	0.73;	14.5;	1.98;	28.6;	21.02;	5.21;	15.81
60	1.00;	19.8;	1.93;	38.3;	28.12;	10.42;	17.69
120	1.33;	26.3;	1.88;	49.5;	36.38;	20.84;	15.53
240	1.77;	35.0;	1.81;	63.4;	46.61;	41.69;	4.93
360	2.21;	43.8;	1.75;	76.6;	56.32;	62.53;	0.00
600	2.62;	51.9;	1.71;	88.8;	65.30;	104.22;	0.00
1440	3.60;	71.3;	1.63;	116.5;	85.65;	250.13;	0.00

Required storage volume $S_{\text{req}} = 17.69 \text{ m}^3$

Soakaway storage volume $S_{\text{act}} = l \times d \times w \times V_{\text{free}} = 40.82 \text{ m}^3$

PASS - Soakaway storage volume

Time for emptying soakaway to half volume $t_{s50} = S_{\text{req}} \times 0.5 / (a_{s50} \times f) = 50\text{min } 56\text{s}$

PASS - Soakaway discharge time less than or equal to 24 hours

Appendix E

Proposed Hydrocarbon Separators

Klargester Full Retention Separators

NSF RANGE



Full Alarm
Range Available



Full retention separators are used in high risk spillage areas such as fuel distribution depots, vehicle workshops and scrap metal recycling yards.

Each full retention separator design includes the necessary volume requirements for:

- Oil separation capacity
- Oil storage volume
- Silt storage capacity
- Coalescer (Class 1 units only)
- Automatic closure device

Our full retention separators treat the whole of the specified flow.

Performance and Compliance

- › Kingspan were one of the first UK manufacturers to have the required range certified to EN 858-1 in the UK.
- › The NSF number denotes the flow at which the separator operates.
- › Approved by The British Standards Institute (BSI) in relation to flow and process performance, meeting effluent quality requirements of EN 858-1.

Technical Specifications

Model Reference	Flow (l/s)	Drainage Area (m2) PPG-3 (0.018)	Storage Capacity (Ltrs)		Length (mm)	Diameter (mm)	Manhole Cover Dimensions (mm)	Base Inlet Invert (mm)	Base to Outlet Invert (mm)	Min Inlet Invert (mm)	Standard Pipework Diameter (mm)
			Silt	Oil							
Polyethylene Chamber Construction											
NSFP003	3	170	300	30	1700	1350	600	1410	1335	550	160
NSFP006	6	335	600	60	1700	1350	600	1410	1335	550	160
GRP Chamber Construction											
NSFA010	10	555	1000	100	2610	1225	600	1050	1000	500	200
NSFA015	15	835	1500	150	3910	1225	600	1050	1000	1000	200
NSFA020	20	1115	2000	200	3200	2010	600	1810	1760	1000	315
NSFA030	30	1670	3000	300	3915	2010	600	1810	1760	1000	315
NSFA040	40	2225	4000	400	4640	2010	600	1810	1760	1000	315
NSFA050	50	2780	5000	500	5425	2010	600	1810	1760	1000	315
NSFA065	65	3160	6500	650	6850	2010	600	1810	1760	1000	315
NSFA080	80	4445	8000	800	5744	2820	600	2500	2450	1000	315
NSFA100	100	5560	10000	1000	6200	2820	600	2500	2450	1000	400
NSFA125	125	6945	12500	1250	7365	2820	600	2500	2450	1000	450
NSFA150	150	8335	15000	1500	8675	2820	600	2500	2450	1000	525
NSFA175	175	9725	17500	1750	9975	2820	600	2500	2450	1000	525
NSFA200	200	11110	20000	2000	11280	2820	600	2500	2450	1000	600
NSFA210	210	11667	21000	2100	11991	2820	600	2550	2450	1000	600
NSFA225	225	12500	22500	2250	12760	2820	600	2550	2450	1000	600
NSFA240	240	13333	24000	2400	13527	2820	600	2550	2450	1000	600
NSFA255	255	14167	25500	2550	14295	2820	600	2550	2450	1000	600
NSFA270	270	15000	27000	2700	15065	2820	600	2550	2450	1000	600
NSFA285	285	15833	28500	2850	15833	2820	600	2550	2450	1000	600

* Some units have more than one access shaft – diameter of largest shown.

Klargester Bypass Separators

NSB RANGE

Concentration
Less Than5
MG/L

Bypass separators are used when it is considered an acceptable risk to not provide full treatment for very high flows, such as, where the risk of a large spillage and heavy rainfall occurring at the same time is small. Typical applications include surface car parks, roadways and lightly contaminated commercial areas.

Product Benefits

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or polyethylene construction (subject to model).

Performance & Compliance

- › Fully compliant and tested to EN 858-1.
- › Bypass separators are tested by British standards institute (BSI).
- › Certified flow and process performance assessing effluent qualities to the requirements of EN 858-1.
- › The unit is designed to treat the 'first flush' - 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = $0.0018A(m^2)$.
- › Class I separators are designed to achieve a concentration of less than 5mg per litre.

Technical Specifications

Model Reference	Flow (l/s)	Peak Flow Rate (l/s)	Drainage Area(M2) Based on UK rainwater flow	Storage Capacity (Ltrs)		Length (mm)	Diameter (mm)	Access Shaft Diameter (mm)	Base Inlet Invert (mm)	Base to Outlet Invert (mm)	Standard Fall Across (mm)	Min Inlet Invert (mm)	Standard Pipework Diameter (mm)**
				Silt	Oil								

Polyethylene Chamber Construction

NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160

GRP Chamber Construction

NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

* Some units have more than one access shaft – diameter of largest shown | ** Larger pipework available on request.

† Achieves concentration of less than 5MG/L

Appendix F

Proposed Offline Attenuation/ Soakaway System

Attenuation/Soakaway Calculation to BRE Digest 365:2016

Calculation Parameters/Assumptions:

- Rainfall Data: Met Eireann (2023) – Site-specific

- Contributing Areas:

Total: 13,320m² (740m x 18m)

Zone 2:

(Surface water run-off from the runway with zone 2 and allowing for half of the area of zone 3)

Runway total width: 18m

Zone 2 runway length: 247m

Contributing runway length from Zone 3: 123m

Zone 2 Contributing Area: 6,660m²

Zone 4:

(Surface water run-off from the runway with zone 4 and allowing for half of the area of zone 3)

Runway total width: 18m

Runway half-width: 9m

Zone 4 runway length: 247m

Contributing runway length from Zone 3: 123m

Zone 4 Contributing Area: 6,660m²

- Tested Soil Infiltration Rate: as per the attached calculations (based on site tests)
- Return period: 100-year
- Climate Change increase: 20 %
- Percentage free volume: 62 %
As calculated for the proposed HydroChamber system – to included for void space in each unit and also the surrounding broken stone.
- The percentage run off is taken as 100% from the contributing areas (as per BRE digest 365)
- No allowance is made for the time taken for run-off to discharge to the soakaway/infiltration system: the required storage volume is calculated on the basis of instantaneous discharge to the soakaway/infiltration system (as per BRE 365)
- The outflow from the soakaway/infiltration system is under-estimated (as per BRE 365)



CIVILS

Quality Plastic Solutions

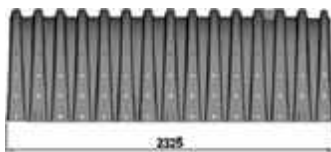
HydroChamber

The HydroChamber is an arched chamber attenuation system designed specifically for building underground storage tanks for stormwater runoff in attenuation and soak away applications. Its superior design make it suitable for building storage tanks under HGV trafficked and car park areas as well as non-trafficked areas (e.g. green amenity areas). JFC HydroChambers have many advantages over other similar products including BBA certification for HGV loading, superior structural strength, silt management, maintenance and inspection capabilities and cost effectiveness.

JFC HydroChambers are manufactured from high density polyethylene plastic and are backfilled with 35/50mm clean washed crushed stone. The corrugated arch shape of the HydroChamber provides excellent structural strength confirmed by independently witnessed field tests where the chambers were exposed to loads 3.5 times greater than that expected in normal service.

HydroChambers can be used in three different types of Stormwater management systems:

- Infiltration / Soak-away System
- Permeable Attenuation System
- Impermeable Attenuation System



Features & Benefits:

- Design and Installation Manuals provided
- BBA Certification
- Sizing Calculator
- Superior Structural Integrity
- AutoCAD Drawings
- Visual and Camera Inspection
- Full Technical Assistance
- Silt / Grit Management System
- Installation Service
- Stackable for storage on site

HydroChamber 800 Specification

- Overall Dimensions (mm): 2325 x 1265 x 800
- Installed Dimensions (mm): 2175 x 1265 x 800
- Nominal Storage* 2.1 – 2.8m³ / Chamber
- Lateral Flow: 114 Holes x Ø20mm

* System storage is dependent on foundation depth, distribution pipe diameter and the overall system size. See HydroChamber calculator for more details.



Make JFC Your Stormwater Management Consultant & Provider

Inspection & Design Services

- Customised Stormwater management solutions in accordance with local authority legislation.
- Tank sizing and calculations.
- Detailed report (for planning permission).
- On site consultation.

Supply & Installation Services

JFC offer a number of options when supplying and installing a Stormwater management system

- Supervised installation.
- Supply only.

All JFC Stormwater management solutions include full excavation drawings.

JFC also offer a number of services to enhance the supply and installation of the Stormwater management system.

These include:

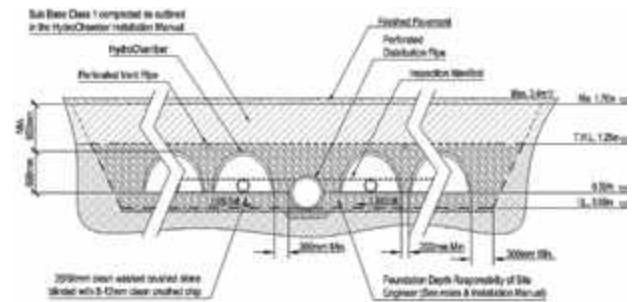
- Full Design Service
- Design Manuals
- Stormwater Management Reports
- Installation Manuals
- Excavation drawings
- BBA Certification
- AutoCAD Drawings



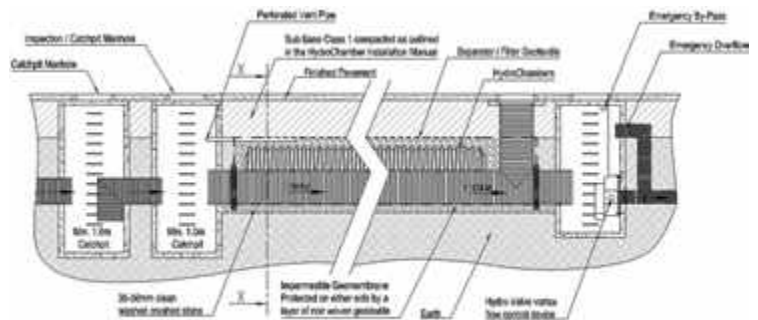
Inspection & Maintenance

The HydroChamber is a unique attenuation system that minimises the entrance of grit / silt due to the application of two upstream catch-pit manholes.

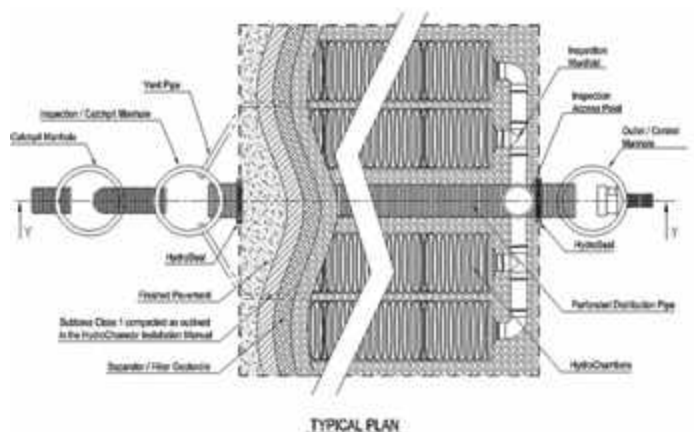
Standard drain cleaning and inspection equipment allows maintenance and inspection to be conducted on the main distribution pipe. Chamber rows can be camera inspected as required.



TYPICAL SECTION X-X



TYPICAL SECTION Y-Y



TYPICAL PLAN

IRELAND

Tel. +353 93 24066
Email. info@jfccivils.com

UNITED KINGDOM

Tel. +44 1928 583391
Email. info@jfccivils.com

HydroChamber Calculator VR13

Issue Date: 12/12/11

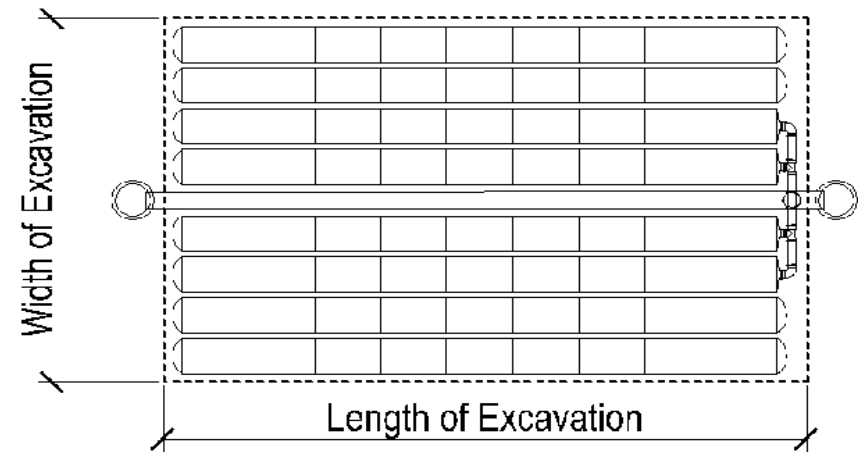
Note: The Calculator can be updated at any time without prior notification. Please check with JFC for most recent publication

INPUT

Target Storage Capacity (m³)	441
Foundation Stone Under Chambers (mm)	150
Distribution Pipe Diameter (mm)	450
Number of Chambers Wide	12.00
Number of Chambers Long Indication	15.83
Number of Chambers Long rounded up	16.00
Use 45° Banking for Storage Calculation	yes
Estimated Porosity of Stone	0.4

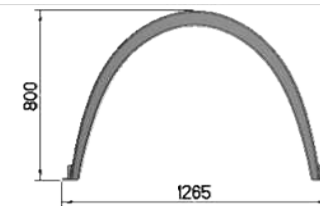
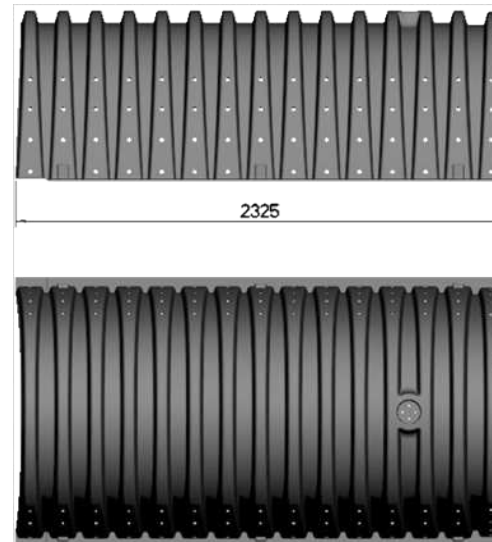
OUTPUT

Actual Volume of Storage Provided (m³)	502.01
Total Width of Excavation (m)	19.28
Total Length of Excavation (m)	36.45
Estimated Stone Requirement (Tons)	1023
Actual No. of Chambers Required	192
Actual No. of Endcaps Required	24



Instructions

- Enter target storage capacity
- Select proposed foundation depth
- Select distribution pipe diameter
- Enter number of chambers wide to provide the required excavation width
- Modify number of chambers long to achieve the required actual storage volume.
- The number of chambers wide and long may be modified along with the foundation depth to provide the storage volume required within width and length constraints



HydroChamber 800 Specification

Overall Dimensions (mm): 2325 X 1265 X 800

Installed Dimensions (mm): 2175 X 1265 X 800

Nominal Chamber Storage (m³): 1.40

System Storage* (m³): 2.1—2.8 m³ / Chamber

Lateral Flow : 114 Holes of Ø20mm

* System storage is dependent upon foundation depth, distribution pipe diameter and porosity of stone aggregate. A minimum stone height above the crown of the chambers of 150mm is assumed. See HydroChamber design manual more details.

HydroChamber Calculator VR13

Issue Date: 12/12/11

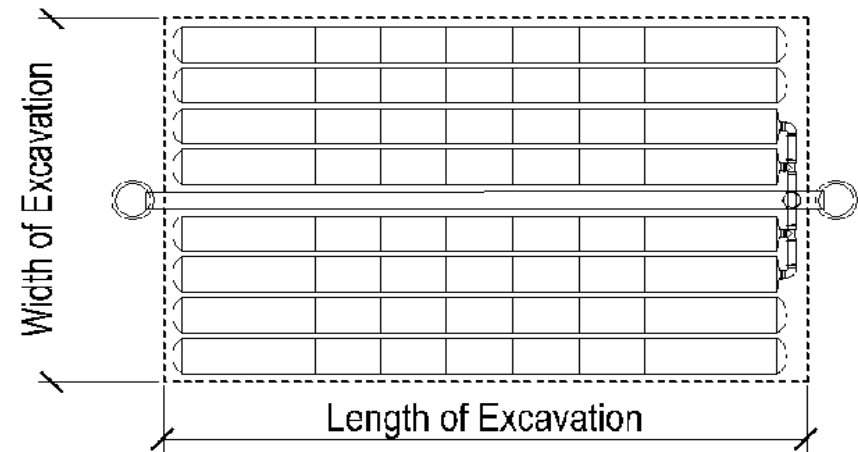
Note: The Calculator can be updated at any time without prior notification. Please check with JFC for most recent publication

INPUT

Target Storage Capacity (m³)	316
Foundation Stone Under Chambers (mm)	150
Distribution Pipe Diameter (mm)	450
Number of Chambers Wide	8.00
Number of Chambers Long Indication	17.13
Number of Chambers Long rounded up	15.00
Use 45° Banking for Storage Calculation	yes
Estimated Porosity of Stone	0.4

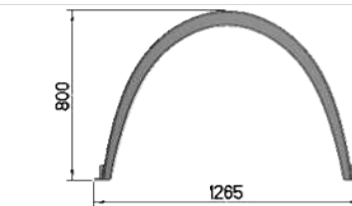
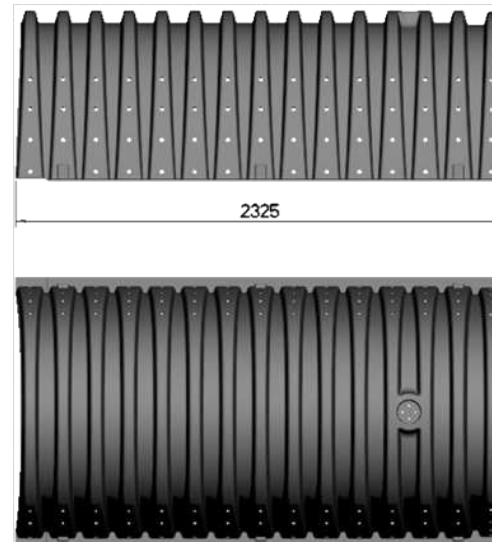
OUTPUT

Actual Volume of Storage Provided (m³)	330.61
Total Width of Excavation (m)	13.42
Total Length of Excavation (m)	34.28
Estimated Stone Requirement (Tons)	707
Actual No. of Chambers Required	120
Actual No. of Endcaps Required	16



Instructions

- Enter target storage capacity
- Select proposed foundation depth
- Select distribution pipe diameter
- Enter number of chambers wide to provide the required excavation width
- Modify number of chambers long to achieve the required actual storage volume.
- The number of chambers wide and long may be modified along with the foundation depth to provide the storage volume required within width and length constraints



HydroChamber 800 Specification

Overall Dimensions (mm): 2325 X 1265 X 800

Installed Dimensions (mm): 2175 X 1265 X 800

Nominal Chamber Storage (m³): 1.40

System Storage* (m³): 2.1—2.8 m³ / Chamber

Lateral Flow : 114 Holes of Ø20mm

* System storage is dependent upon foundation depth, distribution pipe diameter and porosity of stone aggregate. A minimum stone height above the crown of the chambers of 150mm is assumed. See HydroChamber design manual more details.

5.0 Infiltration / Soak-away

During a rainstorm event all stormwater is piped into the catchpit manhole where sediment and floatables are trapped. It then flows through the inspection / inlet manhole and on to the perforated distribution pipe.

The water permeates through the perforated distribution pipe and into the surrounding stone as well as flowing through the inspection manifold into the chambers. The distribution pipe, HydroChambers and backfill stone provide the storage volume as the water infiltrates the surrounding ground.

5.1 Infiltration Design

The required size for the HydroChamber infiltration tank will be determined from the following parameters after a detailed site audit - site topography, winter water table level, soil type, soil infiltration rate, soil contamination and local authority regulations. The calculations should be based on either CIRIA Report 156 Infiltration Drainage or the BRE Digest 365 and comply with EN 725-2008 National Annex for Hydraulic Calculations. A trial hole should be dug in the proposed location of the system to determine infiltration characteristics for use in storage calculations.

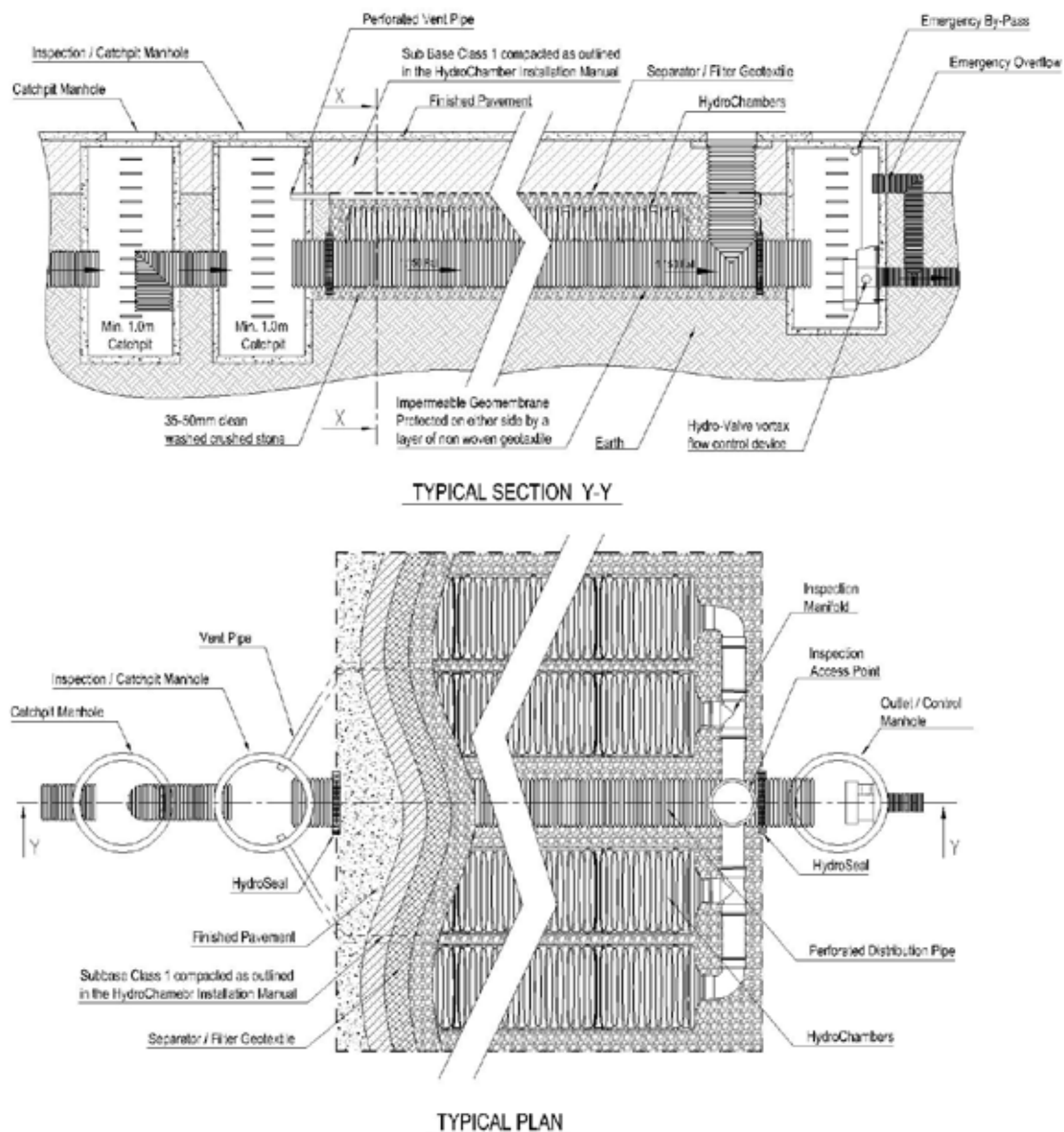


Fig. 5.1 - Infiltration / Soakaway System Front Section and Plan

Certificate

independent certification of your products & services

This is to certify that the following product or service has met the requirements detailed below

JFC Manufacturing Co. Ltd HydroChamber

for soakaways and open-top detention tanks as developed and manufactured by:

JFC Manufacturing Co. Ltd
Weir Road
Tuam
Co. Galway
Ireland

This product meets the requirements set out in PT/273/0608-AS.

assessor



director

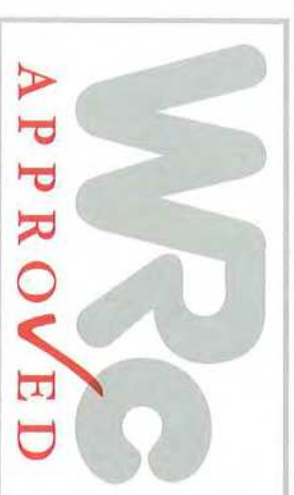


18 June 2008

issue date

18 June 2013

expiry date



PT/273/0608

Appendix G

Proposed Soakaways to Serve Air Ambulance Base

Soakaway Calculation to Serve Air Ambulance Base to BRE Digest 365:2016

Calculation Parameters/Assumptions:

- Rainfall Data: Met Eireann (2023) – Site-specific
- Contributing Areas:

Proposed Hangar Roof Area	411	Sq.m
Proposed Base & Operations Building Roof Area:	143	Sq.m
Proposed Concrete Apron & Helipad:	500	Sq.m

- Tested Soil Infiltration Rate: as per the attached calculations (based on site tests).
Based on Zone 1 test results.
- Return period: 100-year
- Climate Change increase: 20 %
- Percentage free volume: 30 %
- The percentage run off is taken as 100% from the contributing areas (as per BRE digest 365)
- No allowance is made for the time taken for run-off to discharge to the soakaway/infiltration system: the required storage volume is calculated on the basis of instantaneous discharge to the soakaway/infiltration system (as per BRE 365)
- The outflow from the soakaway/infiltration system is under-estimated (as per BRE 365)

Project Rathcoole Aerodrome				Job no. WK10672	
Calcs for AAB Hangar - Soakaway				Start page no./Revision 1	
Calcs by MH	Calcs date 10/10/2024	Checked by EW	Checked date 10/10/2024	Approved by	Approved date

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = 411.0 m ²
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.210
5-year return period rainfall of 60 minutes duration	M5_60min = 16.5 mm
Increase of rainfall intensity due to global warming	p _{climate} = 20 %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = 1200 mm
Width of pit	w = 3000 mm
Length of pit	l = 13500 mm
Percentage free volume	V _{free} = 30 %
Soil infiltration rate	f = 44.0 × 10 ⁻⁶ m/s
Wetted area of pit 50% full	a _{s50} = l × d + w × d = 19800000 mm ²

Table equations

Inflow (cl.3.3.1)	I = M100 × A
Outflow (cl.3.3.2)	O = a _{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Note: The following Z2 table values are user defined.

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
5	0.29;	5.7;	1.88;	10.8;	4.43;	0.26;	4.17
10	0.43;	8.5;	1.94;	16.5;	6.78;	0.52;	6.26
15	0.54;	10.7;	1.97;	21.1;	8.66;	0.78;	7.88
30	0.73;	14.5;	1.98;	28.6;	11.76;	1.57;	10.19
60	1.00;	19.8;	1.93;	38.3;	15.72;	3.14;	12.59
120	1.33;	26.3;	1.88;	49.5;	20.34;	6.27;	14.07
240	1.77;	35.0;	1.81;	63.4;	26.07;	12.55;	13.52
360	2.21;	43.8;	1.75;	76.6;	31.49;	18.82;	12.68
600	2.62;	51.9;	1.71;	88.8;	36.51;	31.36;	5.15
1440	3.60;	71.3;	1.63;	116.5;	47.90;	75.27;	0.00

Required storage volume S_{req} = **14.07** m³

Soakaway storage volume S_{act} = l × d × w × V_{free} = **14.58** m³

PASS - Soakaway storage volume

Time for emptying soakaway to half volume t_{s50} = S_{req} × 0.5 / (a_{s50} × f) = 2hr 14min 36s

PASS - Soakaway discharge time less than or equal to 24 hours

Project Rathcoole Aerodrome				Job no. WK10672	
Calcs for AAB Heli-pad & Apron - Soakaway				Start page no./Revision 1	
Calcs by MH	Calcs date 24/09/2024	Checked by EW	Checked date 24/09/2024	Approved by	Approved date

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = 500.0 m ²
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.210
5-year return period rainfall of 60 minutes duration	M5_60min = 16.5 mm
Increase of rainfall intensity due to global warming	p _{climate} = 20 %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = 1200 mm
Width of pit	w = 3200 mm
Length of pit	l = 15500 mm
Percentage free volume	V _{free} = 30 %
Soil infiltration rate	f = 44.0 × 10 ⁻⁶ m/s
Wetted area of pit 50% full	a _{s50} = l × d + w × d = 22440000 mm ²

Table equations

Inflow (cl.3.3.1)	I = M100 × A
Outflow (cl.3.3.2)	O = a _{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Note: The following Z2 table values are user defined.

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
5	0.29;	5.7;	1.88;	10.8;	5.39;	0.30;	5.09
10	0.43;	8.5;	1.94;	16.5;	8.25;	0.59;	7.65
15	0.54;	10.7;	1.97;	21.1;	10.54;	0.89;	9.65
30	0.73;	14.5;	1.98;	28.6;	14.30;	1.78;	12.52
60	1.00;	19.8;	1.93;	38.3;	19.13;	3.55;	15.57
120	1.33;	26.3;	1.88;	49.5;	24.75;	7.11;	17.64
240	1.77;	35.0;	1.81;	63.4;	31.71;	14.22;	17.49
360	2.21;	43.8;	1.75;	76.6;	38.31;	21.33;	16.99
600	2.62;	51.9;	1.71;	88.8;	44.42;	35.54;	8.87
1440	3.60;	71.3;	1.63;	116.5;	58.27;	85.31;	0.00

Required storage volume S_{req} = **17.64** m³

Soakaway storage volume S_{act} = l × d × w × V_{free} = **17.86** m³

PASS - Soakaway storage volume

Time for emptying soakaway to half volume t_{s50} = S_{req} × 0.5 / (a_{s50} × f) = 2hr 28min 53s

PASS - Soakaway discharge time less than or equal to 24 hours

Project Rathcoole Aerodrome				Job no. WK10672	
Calcs for AAB Bldg - Soakaway				Start page no./Revision 1	
Calcs by MH	Calcs date 24/09/2024	Checked by EW	Checked date 24/09/2024	Approved by	Approved date

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = 135.0 m ²
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.210
5-year return period rainfall of 60 minutes duration	M5_60min = 16.5 mm
Increase of rainfall intensity due to global warming	p _{climate} = 20 %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = 1200 mm
Width of pit	w = 1500 mm
Length of pit	l = 7000 mm
Percentage free volume	V _{free} = 30 %
Soil infiltration rate	f = 44.0 × 10 ⁻⁶ m/s
Wetted area of pit 50% full	a _{s50} = l × d + w × d = 10200000 mm ²

Table equations

Inflow (cl.3.3.1)	I = M100 × A
Outflow (cl.3.3.2)	O = a _{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Note: The following Z2 table values are user defined.

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
5	0.29;	5.7;	1.88;	10.8;	1.45;	0.13;	1.32
10	0.43;	8.5;	1.94;	16.5;	2.23;	0.27;	1.96
15	0.54;	10.7;	1.97;	21.1;	2.85;	0.40;	2.44
30	0.73;	14.5;	1.98;	28.6;	3.86;	0.81;	3.05
60	1.00;	19.8;	1.93;	38.3;	5.16;	1.62;	3.55
120	1.33;	26.3;	1.88;	49.5;	6.68;	3.23;	3.45
240	1.77;	35.0;	1.81;	63.4;	8.56;	6.46;	2.10
360	2.21;	43.8;	1.75;	76.6;	10.34;	9.69;	0.65
600	2.62;	51.9;	1.71;	88.8;	11.99;	16.16;	0.00
1440	3.60;	71.3;	1.63;	116.5;	15.73;	38.78;	0.00

Required storage volume S_{req} = **3.55** m³

Soakaway storage volume S_{act} = l × d × w × V_{free} = **3.78** m³

PASS - Soakaway storage volume

Time for emptying soakaway to half volume t_{s50} = S_{req} × 0.5 / (a_{s50} × f) = 1hr 5min 55s

PASS - Soakaway discharge time less than or equal to 24 hours

Appendix 7-1

Site Specific Flood Risk Assessment

Rathcoole Aerodrome, Rathcool, Mallow, Co. Cork



July 2025

Site Specific Flood Risk Assessment

Client: Rathcool Flying Club

Location: Rathcool Aerodrome, Rathcoole, Mallow, Co. Cork

Date: 30th July 2025

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Appendices

Appendix A. Drawings

1. Introduction

IE Consulting was requested by McCutcheon Halley, on behalf of Rathcool Flying Club, to undertake a Site Specific Flood Risk Assessment (SSFRA) in support of a planning application for a proposed development at the Rathcool Aerodrome, Rathcoole, Mallow, Co. Cork.

The development as proposed comprises of the construction of a hard surfaced runway (740m in length) and taxiway (147.6m in length) with associated ground level lighting, associated interceptors, along with the demolition of an existing hangar to the east of the site and construction of a replacement hangar of approximately the same size and design to the west of the site; the demolition of the existing paramedic prefabricated base and crew prefabricated base to the east of the site, and construction of a replacement paramedic prefabricated base and crew prefabricated base to the west of the site; and the breaking up / removal of a helipad to the east of the site, and construction of a new helipad to the west of the site, all associated with the HSE Air Ambulance. The development is to be served by a new proprietary waste water treatment system and includes the closure of an existing vehicular entrance onto the L-5215-0 road and its relocation further west along the same road, site landscaping and all other associated site development works. An Environmental Impact Assessment Report (EIAR) has been prepared and will be submitted to the Planning Authority with the application. The EIAR will be available for inspection or purchase at a fee not exceeding the reasonable cost of making a copy during office hours at the offices of the Planning Authority. A Natura Impact Statement will be submitted to the planning authority with the application. The Natura Impact Statement will be available for inspection or purchase at a fee not exceeding the reasonable cost of making a copy during office hours at the offices of the Planning Authority.

The purpose of this SSFRA is to assess the potential flood risk to the proposed development site and to assess the impact that the development as proposed may or may not have on the hydrological regime of the area.

Quoted ground levels or estimated flood levels relate to Ordnance Datum (Malin) unless stated otherwise.

This flood risk assessment study has been undertaken in consideration of the following guidance document:

'The Planning System and Flood Risk Management – Guidelines for Planning Authorities' DOEHLG 2009.'

2. Site Description

2.1. General

The proposed development site is located at the Rathcool Aerodrome, Rathcoole, Mallow, Co. Cork. The site is bounded to the north by agricultural lands and the River Blackwater, to the south and east by local access roads and a wooded area and to the west by agricultural lands. The total area of the site is approximately 20.7 hectares.

The location of the proposed development site is illustrated on *Figure 1* below and shown on *Drawing Number IE2952-001-B, Appendix A*.

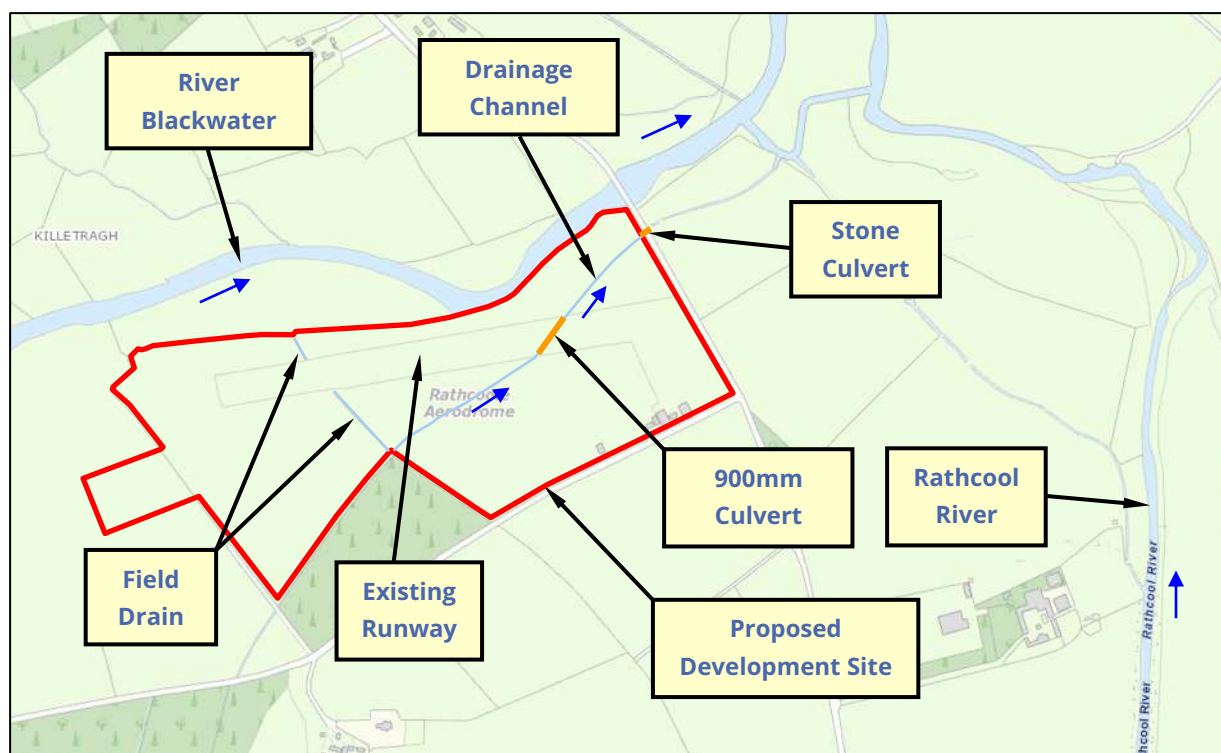


Figure 1 - Site Location

2.2. Existing Topography Levels at Site

The proposed development site slopes moderately in a south to north direction at an average gradient of approximately 1% (1 in 100). Existing ground elevations range from 85.3m (OD) along the southern boundary of the site to 80.5m (OD) along the northern boundary of the site.

2.3. Local Hydrology, Landuse & Existing Drainage

The most immediate hydrological features in the vicinity of the proposed development site are the River Blackwater located adjacent to the northern boundary of the site and the Rathcool River located 550m beyond the eastern boundary of the site.

At the location of the proposed development site the River Blackwater generally flows in a south-west to north-east direction as shown in *Figure 1* above. Utilising the OPW Flood Studies Update (FSU) Portal software, the catchment area for the River Blackwater was delineated and found to be approximately 347.86 km² to the point downstream of the proposed development site. An assessment of the upstream catchment area indicates a predominantly rural catchment with the urban fraction accounting for 0.6% of the upstream catchment area.

At the location of the proposed development site the Rathcool River generally flows in a south to north direction as shown in *Figure 1* above. Utilising the OPW Flood Studies Update (FSU) Portal software, the catchment area for the Rathcool River was delineated and found to be approximately 62.36 km² to the point downstream of the proposed development site. An assessment of the upstream catchment area indicates an entirely rural catchment with no urban development in the upstream catchment area.

As illustrated in *Figure 1* above, a drainage channel and field drain transverse the existing runway within the boundary of the site. The drainage channel is culverted under the existing runway via a 900mm pipe culvert and crosses under the local road at the northern corner of the site via a small rectangular stone culvert.

3. Initial Flood Risk Assessment

The flood risk assessment for the proposed development site is undertaken in three principal stages, these being 'Step 1 – Screening', 'Step 2 – Scoping' and 'Step 3 – Assessing'.

3.1. Possible Flooding Mechanisms

Table 1 below summarises the possible flooding mechanisms in consideration of the site:

Source/Pathway	Significant?	Comment/Reason
Tidal/Coastal	No	The site is not located within a tidally influenced region.
Fluvial	Yes	The River Blackwater and Rathcool River are located beyond the northern and eastern boundaries of the site. A drainage channel and field drain transverse the site.
Pluvial (urban drainage)	No	The site is located in a rural area. There is no significant urban drainage or water supply infrastructure located within or in the immediate vicinity of the site.
Pluvial (overland flow)	No	The site is not surrounded by significantly elevated lands and does not provide an important surface water discharge point to adjacent lands.
Blockage	Possible	There is a bridge (Colthurst Bridge) located on the River Blackwater adjacent to the north-eastern corner of the site. There is an existing 900mm culvert and small stone rectangular culvert on the drainage channel that crosses the site.
Groundwater	No	There are no significant springs or groundwater discharges mapped or recorded in the immediate vicinity of the site.

Table 1: Flooding Mechanisms

The primary and direct potential flood risk to the proposed development site can be attributed to an extreme fluvial event in the River Blackwater located adjacent to the northern boundary of the site. Secondary flood risk can be attributed to a fluvial event in the Rathcool River located 550m beyond the eastern boundary of the site and/or the drainage channel that transverses the site.

Secondary and residual flood risk can also be attributed to surcharge due to potential blockage of the bridge on the River Blackwater adjacent to the north-eastern corner of the site and/or the two culverts on the drainage channel that transverses the site.

In accordance with *The Planning System and Flood Risk Management – Guidelines for Planning Authorities - DOEHLG 2009* the potential flood risk to the site is analysed in the subsequent ‘Screening Assessment’ and “Scoping Assessment” section of this study report.

4. Screening Assessment

The purpose of the screening assessment is to establish the level of flooding risk that may or may not exist for a particular site and to collate and assess existing current or historical information and data which may indicate the level or extent of any flood risk.

If there is a potential flood risk issue then the flood risk assessment procedure should move to 'Step 2 – Scoping Assessment' or if no potential flood risk is identified from the screening stage then the overall flood risk assessment can end at 'Step 1'.

The following information and data were collated as part of the flood risk screening assessment for the proposed development site.

4.1. OPW/EPA/Local Authority Hydrometric Data

Existing sources of OPW, EPA and local authority hydrometric data were investigated. As illustrated in *Figure 2* below, this assessment has determined that there is one hydrometric gauging station located on the River Blackwater adjacent to the proposed development site and one located on the Rathcool River 1.2km south-east of the site.

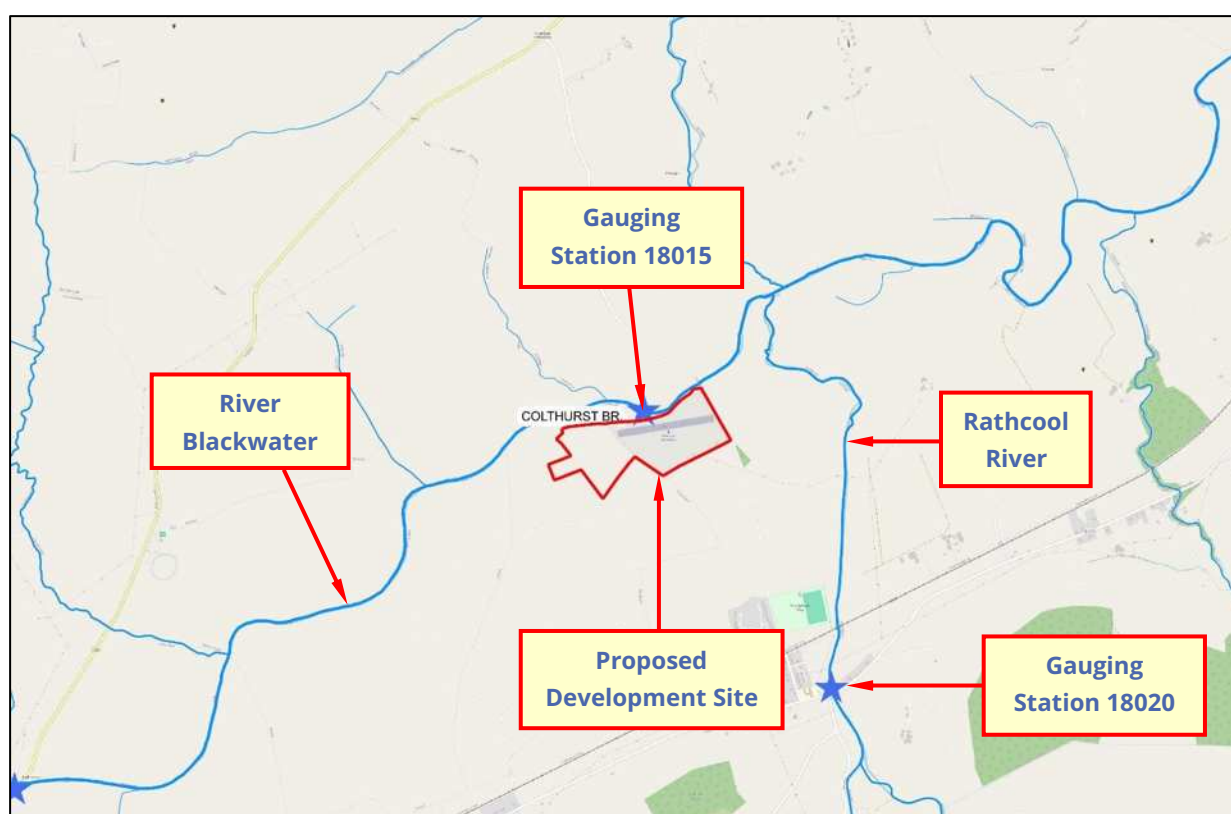


Figure 2 - Hydrometric Gauging Stations

Station 18015 is entered into the Register of Hydrometric Stations in Ireland as an inactive recorder with two year of data available from 1982 to 1984. This station is considered unsuitable to assist in the prediction of extreme flows and flood levels at the location of the proposed development site.

Station 18020 is entered into the Register of Hydrometric Stations in Ireland as an inactive staff gauge with no continuous water level of flow records available. This station is considered unsuitable to assist in the prediction of extreme flows and flood levels at the location of the proposed development site.

4.2. OPW PFRA Indicative Flood Mapping

Preliminary Flood Risk Assessment (PFRA) Mapping for Ireland was produced by the OPW in 2011. OPW PFRA flood map number 2019/MAP/62/A illustrates indicative flood zones within this area of County Cork. *Figure 3* below illustrates an extract from the above indicative flood map in the vicinity of the proposed development site.

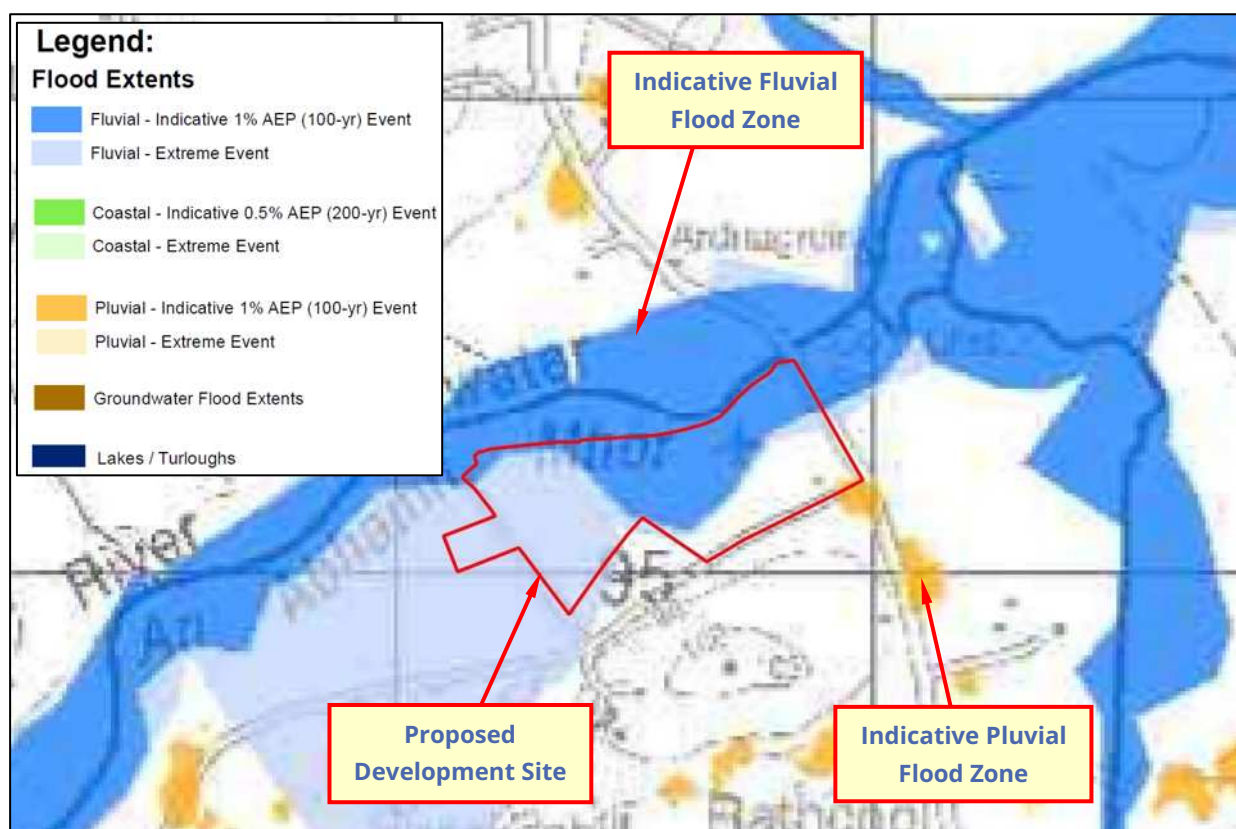


Figure 3 - OPW PFRA Mapping

The PFRA flood mapping indicates that the proposed development site partially falls within an indicative fluvial flood zone. There is also a small area of indicative pluvial flooding mapped with the eastern corner of the site.

The site does not fall within an indicative groundwater flood zone.

It should be noted that the indicated extent of flooding illustrated on these maps was developed using a low resolution digital terrain model (DTM) and illustrated flood extents are intended to be indicative only. The flood extents mapped on the PFRA maps are not intended to be used on a site specific basis.

4.3. OPW Flood Info Website

The OPW Flood Info Website (www.floodinfo.ie) was consulted in relation to available historical or anecdotal information on any flooding incidences or occurrences in the vicinity of the proposed development site. *Figure 4* below illustrates mapping from the Flood Info website in the vicinity of the site.

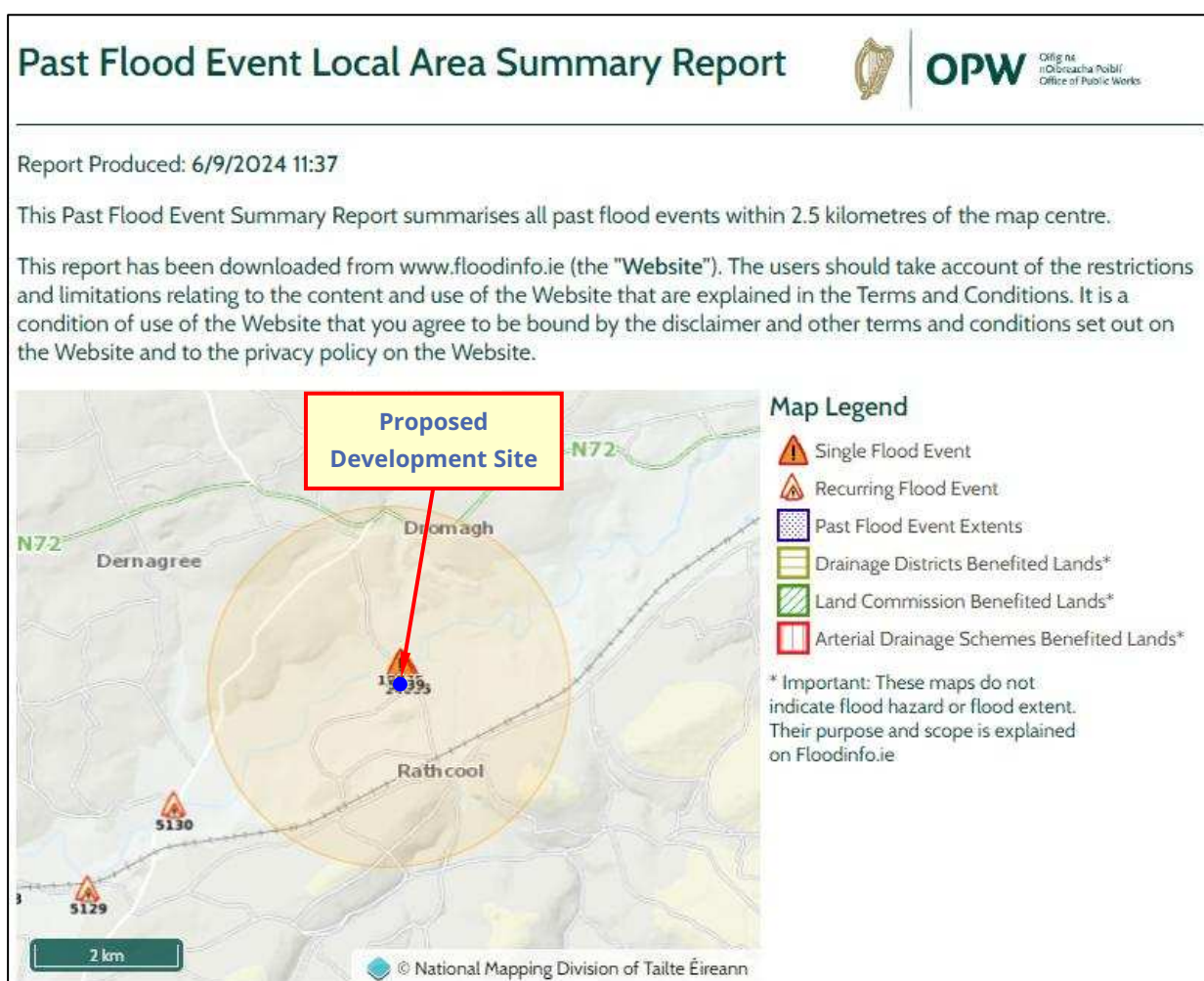


Figure 4 - OPW Flood Maps

Figure 4 above indicates that there are two single flood events and one recurring flood event recorded in the vicinity of the proposed development site. The relevant events located in proximity to the site are summarised below:

- **Flood IDs 5139:** Refers to an Area Engineer meeting minutes from April 2005, which describes how the road floods annually in vicinity of Colthurst Bridge due to flows in River Blackwater.
- **Flood ID 14055:** Refers to a flood event at Rathcool Aerodrome on the 23rd of February 2021. No further information is provided on the extent of flooding that occurred.
- **Flood ID 10835:** Refers to a flood event at Rathcool on the 19th of November 2009. An aerial photo identifies lands on the northern side of the River Blackwater were impacted this flood event. The proposed development site is not referred to as having flooded during this event.

4.4. Ordnance Survey Historic Mapping

Available historic mapping for the area was consulted, as this can provide evidence of historical flooding incidences or occurrences. The maps that were consulted were the historical 6-inch maps (pre-1900), and the historic 25-inch map series. Figure 5 and Figure 6 below show the historic mapping for the area of the proposed development site.

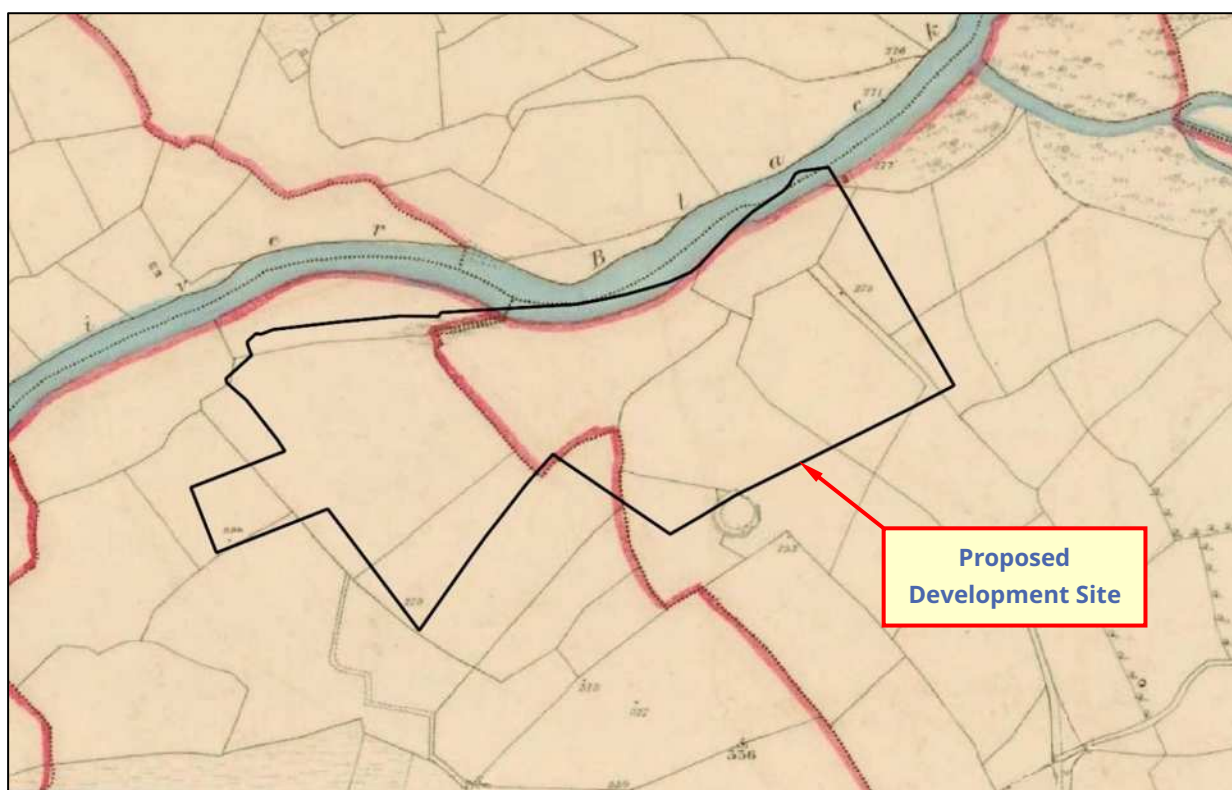


Figure 5 - Historic 6 Inch Mapping

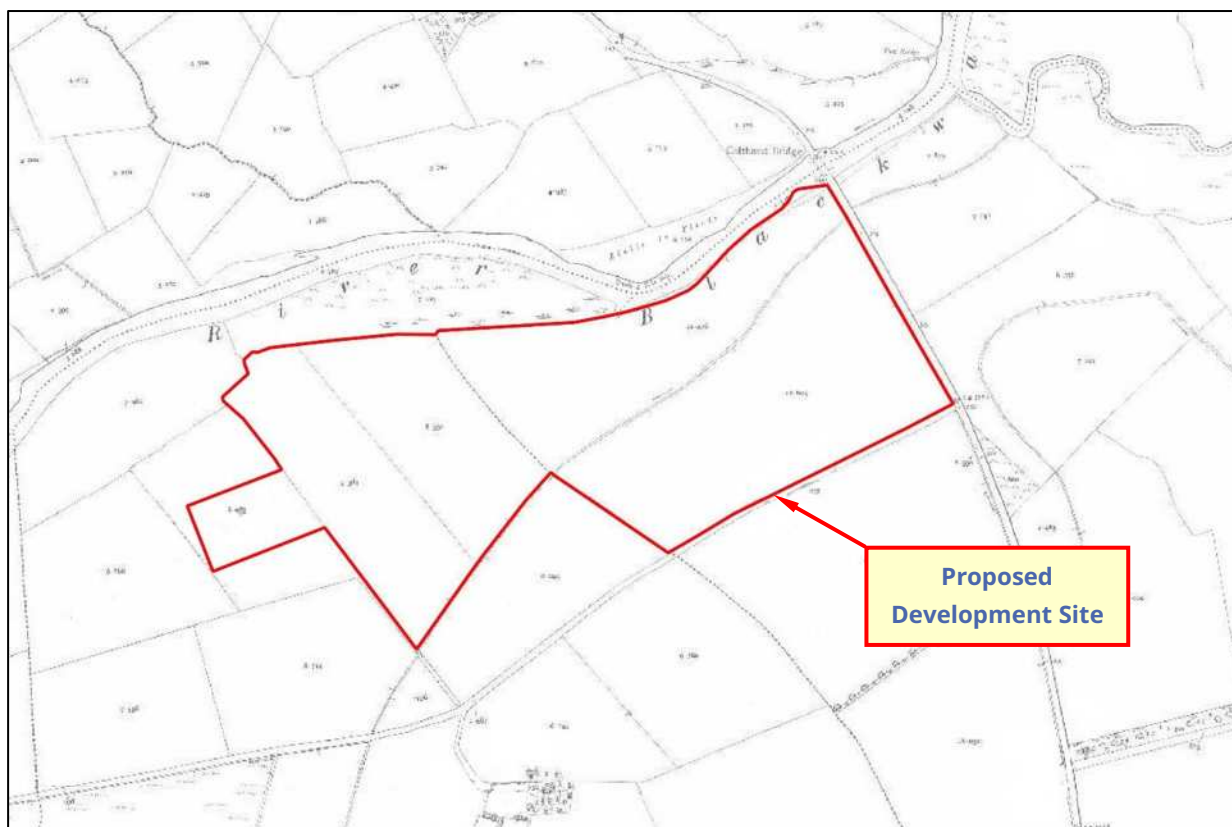


Figure 6 - Historic 25 Inch Mapping

The historic 6 inch and 25 inch mapping does not indicate any historical or anecdotal instances of flooding within or adjacent to the boundary of the proposed development site.

4.5. Geological Survey of Ireland Mapping

The alluvial deposit maps of the Geological Survey of Ireland (GSI) were consulted to assess the extent of any alluvial deposits in the vicinity of the proposed development site. Alluvial deposits can be an indicator of areas that have been subject to flooding in the recent geological past. *Figure 7* below illustrates the subsoil mapping for the general area of the site.



Figure 7 - GSI Subsoil Mapping

Figure 7 above indicates that the proposed development site is primarily underlain by Alluvium deposits and Sandstone Till.

4.6. Geological Survey of Ireland Groundwater Flood Mapping

Historic and Predictive Groundwater Mapping for Ireland was prepared by the GSI Department of Communication, Climate Action, and Environment in collaboration with Trinity College Dublin and the Institute of Technology Carlow.

Figure 8 below illustrates an extract from the above groundwater flood mapping in the vicinity of the proposed development site.

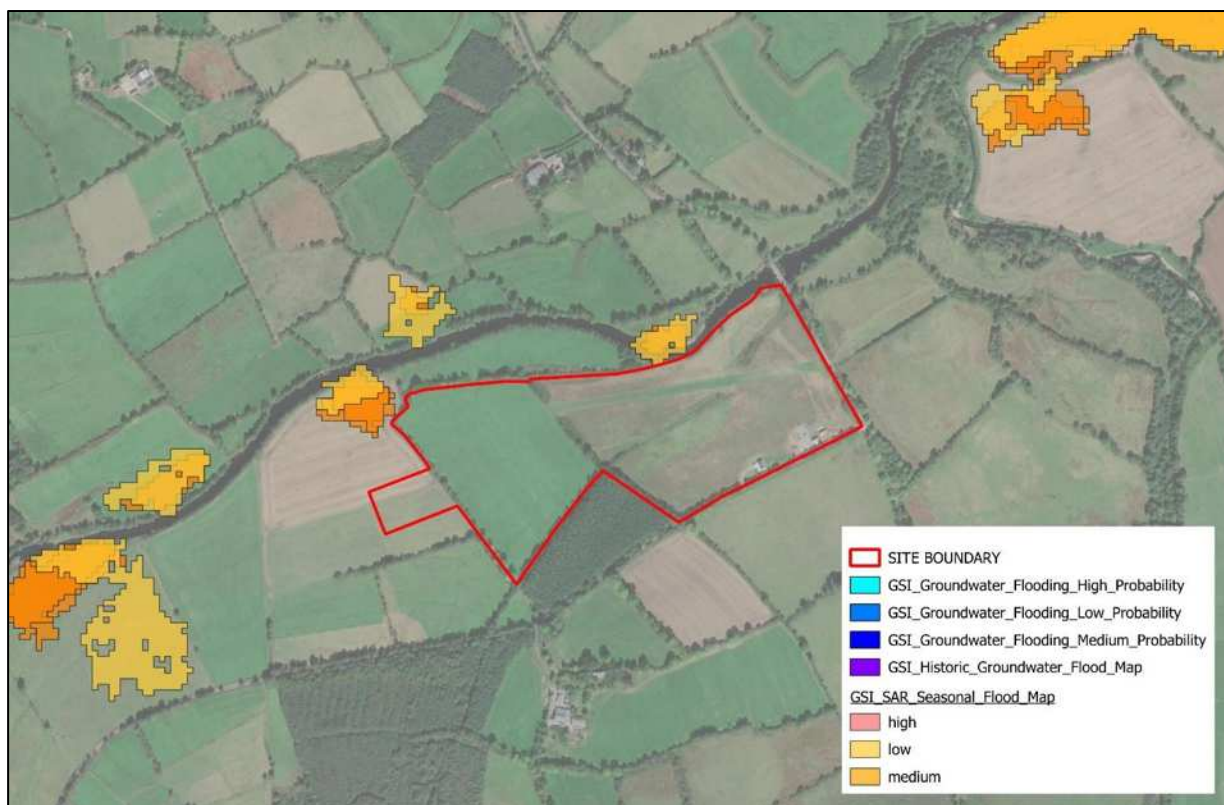


Figure 8 - GSI Groundwater Flood Mapping

The above GSI Groundwater Mapping indicates no areas of predictive or historical groundwater or surface water flooding located within or in the vicinity of the site. The GSI mapping shows areas of seasonal flooding mapped adjacent to northern boundary of the site, which is likely to be attributed to fluvial flooding from associated with the River Blackwater.

4.7. OPW South Western CFRAM Study

This area of County Cork has not been including as an Area of Further Assessment as part of the South Western CFRAM Study.

4.8. OPW National Indicative Flood Mapping

The OPW National Indicative Fluvial Mapping (NIFM) dataset was issued in 2021 for catchments greater than 5km² in areas for which flood maps were not produced under the OPW National CFRAM Programme. These maps indicate areas predicted to flood during a theoretical flood event. The OPW National Indicative Fluvial Mapping (NIFM) flood extent maps are based on the results of a more detailed and higher resolution hydraulic modelling exercise undertaken along watercourses (with

catchment areas $> 5\text{km}^2$) in comparison to the OPW PFRA indicative flood map and therefore provide a reasonably accurate delineation of extreme fluvial flood zones in the general vicinity of the site.

This mapping set is intended to supersede the OPW PFRA mapping set by producing a higher quality and higher resolution fluvial mapping set.

Figure 9 below illustrates an extract from the OPW NIFM dataset at and in the vicinity of the proposed development site for the present day scenario 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1000 year) fluvial flood events.



Figure 9 - OPW Present Day Scenario NIFM Fluvial Flood Extents

Figure 9 above indicates that a significant portion of the proposed development site falls within an OPW NIFM Present Day Scenario 1% AEP (1 in 100 year) and a 0.1% AEP (1 in 1000 year) fluvial flood zone.

Figure 10 below illustrates an extract from the OPW NIFM dataset at and in the vicinity of the proposed development site for the Mid-Range Future Climate Change Scenario (MRFS) 1% AEP+CC (1 in 100 year + climate change) and 0.1% AEP+CC (1 in 1000 year + climate change) fluvial flood events.



Figure 10 - OPW Mid-Range Future Climate Change Scenario Fluvial Flood Extents

Figure 10 above indicates that a significant portion of the proposed development site falls within an OPW NIFM Mid-Range Future Climate Change Scenario 1% AEP+CC (1 in 100 year + climate change) and a 0.1% AEP+CC (1 in 1000 year + climate change) fluvial flood zone.

4.9. Cork County Development Plan 2022- 2028 SFRA

As part of the Cork Development Plan (CDP) 2022-2028, a Strategic Flood Risk Assessment (SFRA) was prepared in accordance with the Guidelines for Planning Authorities 'The Planning System and Flood Risk Management'. The flood risk mapping produced as part of this assessment was collated from a number of sources and provides a delineation of Strategic Flood Zones 'A' and 'B' within the Rathcool area including the area of the proposed development site.

Figure 11 below illustrates the flood zone delineation mapping for the area of the proposed development site produced as part of this SFRA. It is noted that the OPW NIFM dataset mapping was utilised to produce the SFRA mapping at this location.

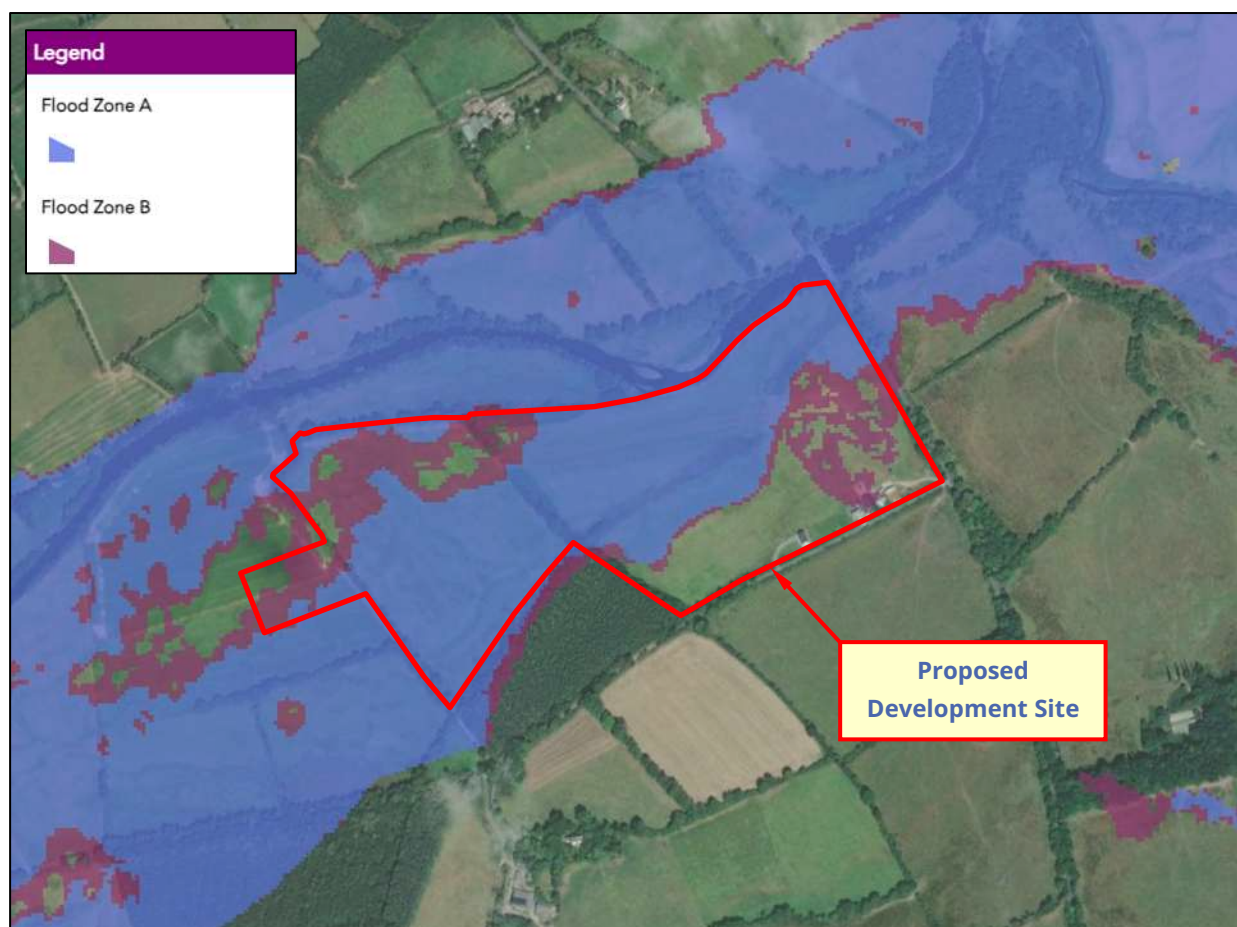


Figure 11 – Cork County Development Plan 2022-2028 SFRA Mapping

Figure 11 above indicates that a significant portion of the proposed development site falls within a Strategic Flood Zone 'A' and Flood Zone 'B'.

5. Scoping Assessment

The purpose of the scoping stage is to identify possible flood risks and to implement the necessary level of detail and assessment to assess these possible risks, and to ensure these can be adequately addressed in the flood risk assessment. The scoping exercise should also identify that sufficient quantitative information is already available to complete a flood risk assessment appropriate to the scale and nature of the development.

The screening assessment undertaken as part of this Site Specific Flood Risk Assessment indicates that the primary potential flood risk to the proposed development site can be attributed to an extreme fluvial flood event in the River Blackwater located adjacent to the northern boundary of the site. The site is not particularly at risk of pluvial or groundwater flooding. Secondary flood risk can be attributed to surcharge due to potential blockage of the bridge on the River Blackwater adjacent to the north-eastern corner of the site.

In consideration of the information collated as part of the screening exercise, and the availability of other information and data specific to the area of the proposed development site, it is considered that sufficient quantitative information to complete an appropriate flood risk assessment for the development as constructed can be derived from the information collated as part of the screening exercise alone. In particular, the flood extents map produced as part of the OPW National Indicative Fluvial Mapping (NIFM) are based on the results of a higher quality and higher resolution flood mapping exercise undertaken along this reach length of the River Blackwater in comparison to the OPW PFRA flood mapping, and therefore provide a reasonably accurate delineation of fluvial flood zones at and in the general vicinity of the proposed development site.

The specific flood risk to and from the proposed development site is assessed in the subsequent 'Assessing Flood Risk' stage of this study report.

6. Assessing Flood Risk

Fluvial flood risk from a particular watercourse is normally assessed for a 1% AEP (1 in 100 year) and a 0.1% AEP (1 in 1000 year) flood event, in accordance with most county development plans and in accordance with the DOEHLG guidelines 'The Planning System and Flood Risk Management Guidelines'.

The following sections present an analysis and assessment of the estimated extreme fluvial flood events in the River Blackwater in the vicinity of the proposed development site.

The OPW NIFM flood extent maps are utilised as the primary means of assessing potential flood risk to and from the development as proposed.

6.1. Topographical Survey & Contour Mapping

In order to assist in the assessment of any potential flooding in the general area of the proposed development site, topographical survey data was used to develop a Digital Terrain Model (DTM) of the proposed development site and the surrounding lands.

Development of a DTM allows the fluvial flood extents illustrated on the OPW NIFM dataset to be analysed in more detail and at the specific location of the proposed development site. The DTM and contour mapping developed for the area is illustrated in *Figure 12* below.



Figure 12 – DTM & Contour Mapping

6.2. Estimation of Extreme Flood Levels & Flood Zone Delineation

The OPW NIFM flood map dataset has been utilised to estimate the extreme flood levels within the boundary of the proposed development site by undertaking a comparative analysis of the OPW NIFM 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1000 year) flood extents in respect of the DTM and contour mapping. The 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1000 year) flood levels derived from the OPW NIFM flood extents are shown in *Figure 13* and *Figure 14* below and summarised in *Table 2*.

	1% AEP (1 in 100 Year) Estimated Site Flood Level (m OD)	0.1% AEP (1 in 1000 Year) Estimated Site Flood Level (m OD)
Upstream Site Boundary (Western Boundary)	82.75	83.10
Central Area of Site	82.10	82.70
Downstream Site Boundary (Eastern Boundary)	81.90	82.50

Table 2: Estimated 1% AEP & 0.1% AEP Site Flood Levels

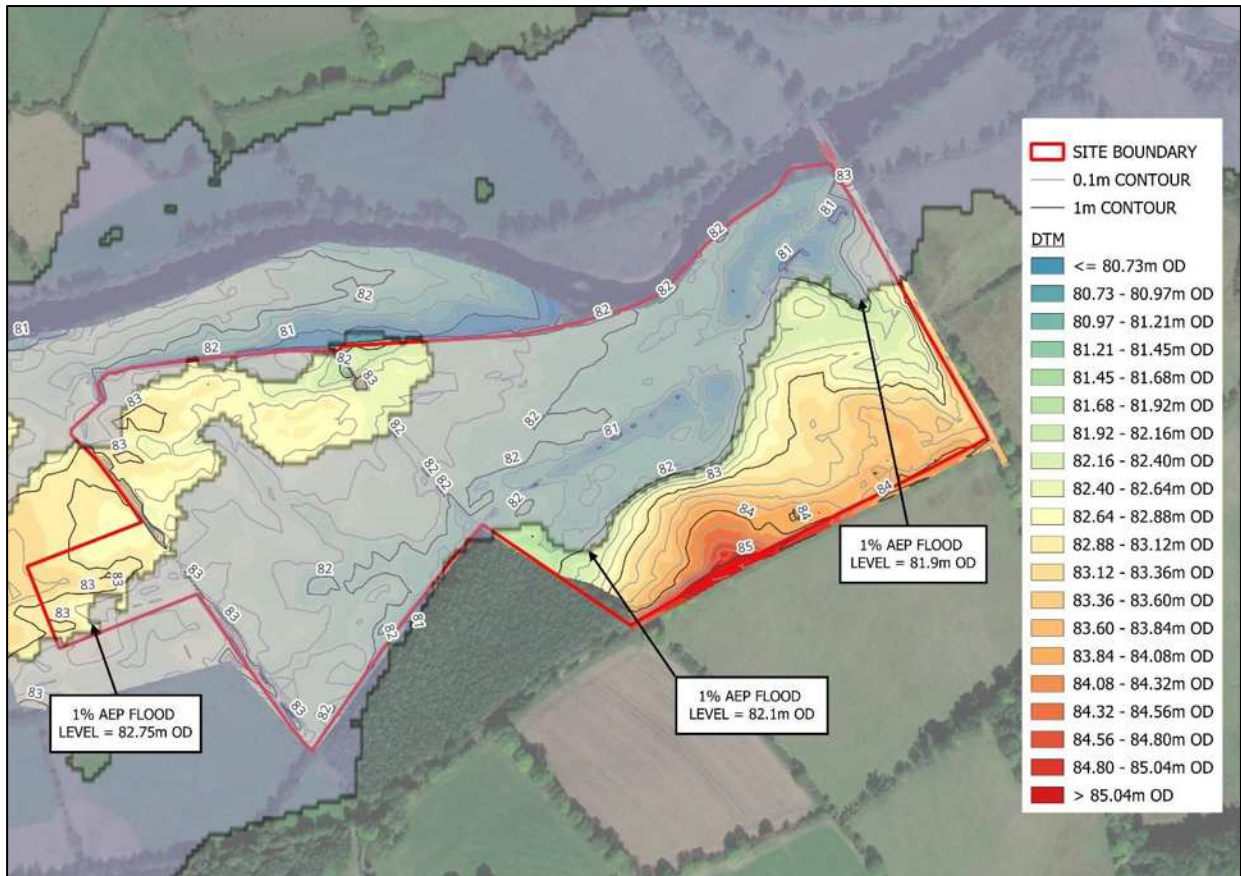


Figure 13 – 1% AEP Fluvial Flood Levels – Flood Zone A

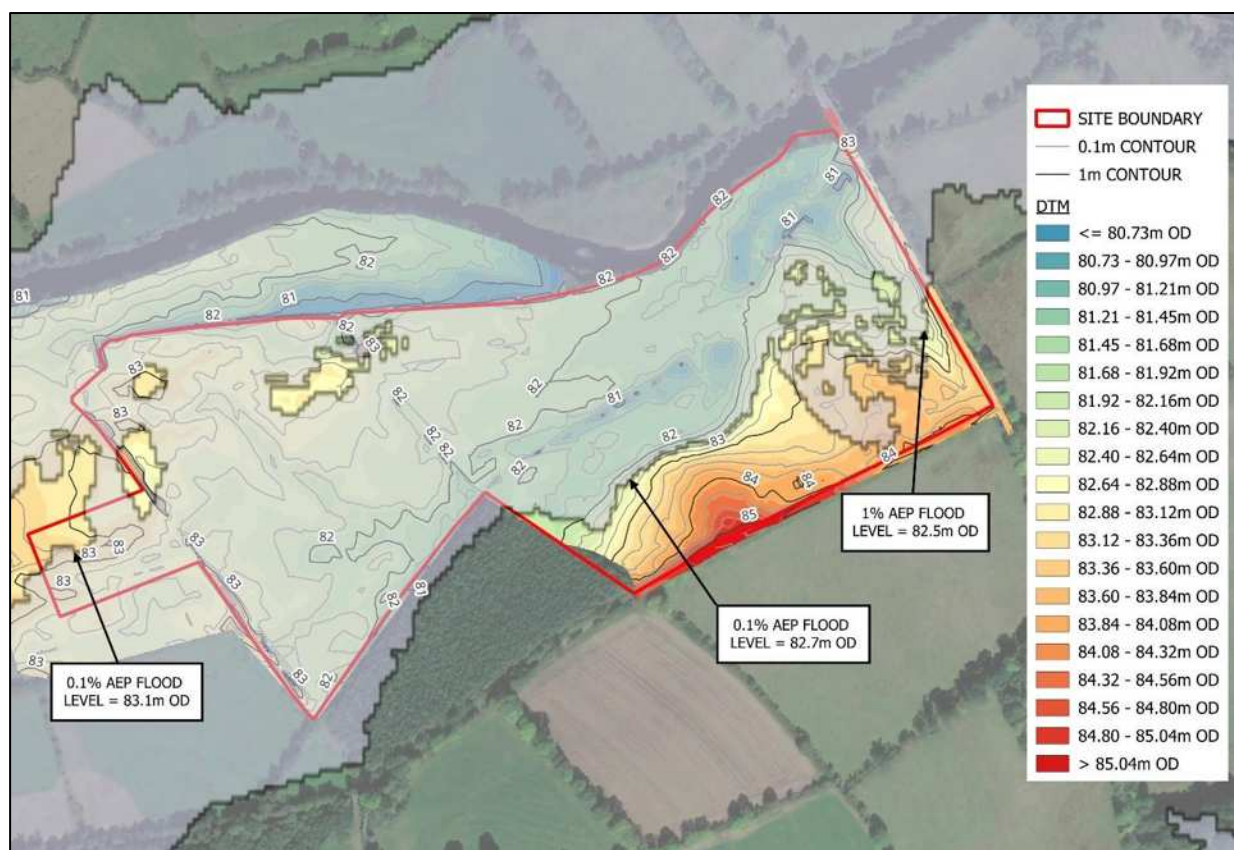


Figure 14 – 0.1% AEP Fluvial Flood Levels – Flood Zone B

As illustrated in *Figure 13* and *Figure 14* above, a significant portion of the proposed development site falls within an OPW NIFM 1% AEP (1 in 100 year - Flood Zone 'A') and a 0.1% AEP (1 in 1000 year - Flood Zone 'B') fluvial flood zone.

6.3. Assessment of Secondary Flood Risk

Secondary and residual flood risk can be attributed to surcharge due to potential blockage of the bridge on the River Blackwater adjacent to the north-eastern corner of the site and/or the two culverts on the drainage channel that transverses the site.

6.3.1. Bridge Blockage

Potential secondary or residual flood risk to the proposed development site can be attributed to a potential blockage of Colthurst Bridge located on the River Blackwater adjacent to the north-eastern corner of the site. In consideration of the existing topography of the site and adjacent lands, as illustrated in *Figure 15* below, it is predicted that if the water levels in the River Blackwater rise and

surcharge due to a blockage at this bridge, waters would eventually spill onto the adjacent banks. If the water levels continue to rise it is predicted that waters on the southern bank would spill across the road at a level of approximately 82.5m OD and flow in an easterly direction as shown in in *Figure 15* below. These waters would spill back into the river channel at the downstream end of the bridge. It is not anticipated that blockage of Colthurst Bridge would pose an additional flood risk to the site.

Overall, this secondary and residual flood risk to the site due to a potential bridge blockage is therefore considered to be low.

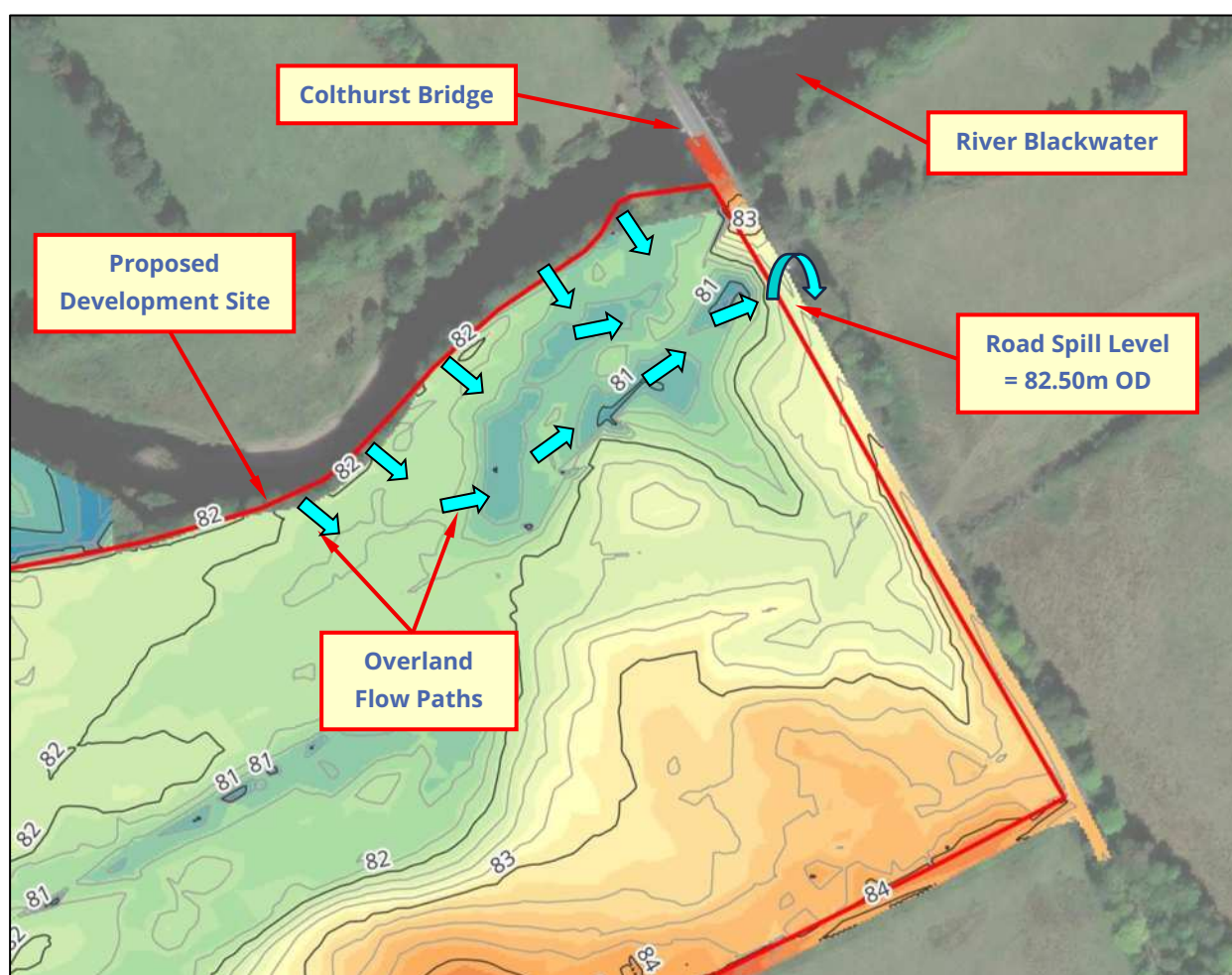


Figure 15 – Bridge Blockage Overland Flow Paths

6.3.2. Culvert Blockage

There are two existing culverts located on the drainage channel that transverse the proposed development site. There is a 900mm pipe culvert located in the middle of the site under the existing runway as shown in *Figure 16* below. There is also a rectangular stone culvert located under the adjacent local road adjacent to the north-eastern corner of the site as shown in *Figure 16* below.

It is predicted that if the water levels in the drainage channel rise and surcharge due to a blockage at the 900mm runway culvert waters would eventually spill onto the adjacent lands. If the water levels continue to rise it is predicted that waters would overtop a very small portion of the runway at the location of the culvert and spill back into the channel on the downstream end. It is not anticipated that blockage of the existing 900mm runway culvert would pose an additional flood risk to the site as the culvert is part of the River Blackwater flood zones.

It is predicted that if the rectangular stone culvert located under the local road becomes blocked waters would spill onto the adjacent banks and lands. If the water levels continue to rise it is predicted that waters would spill across the road at a level of approximately 82.5m OD and flow in an easterly direction in a similar fashion as the bridge blockage scenario as shown in in *Figure 16* below. These waters would spill back into the drainage channel and/or the River Blackwater at the downstream end of the culvert. It is not anticipated that blockage of the existing rectangular stone culvert would pose an additional flood risk to the site.

Overall, the potential secondary and residual flood risk to the site due to potential culvert blockages is therefore considered to be low.

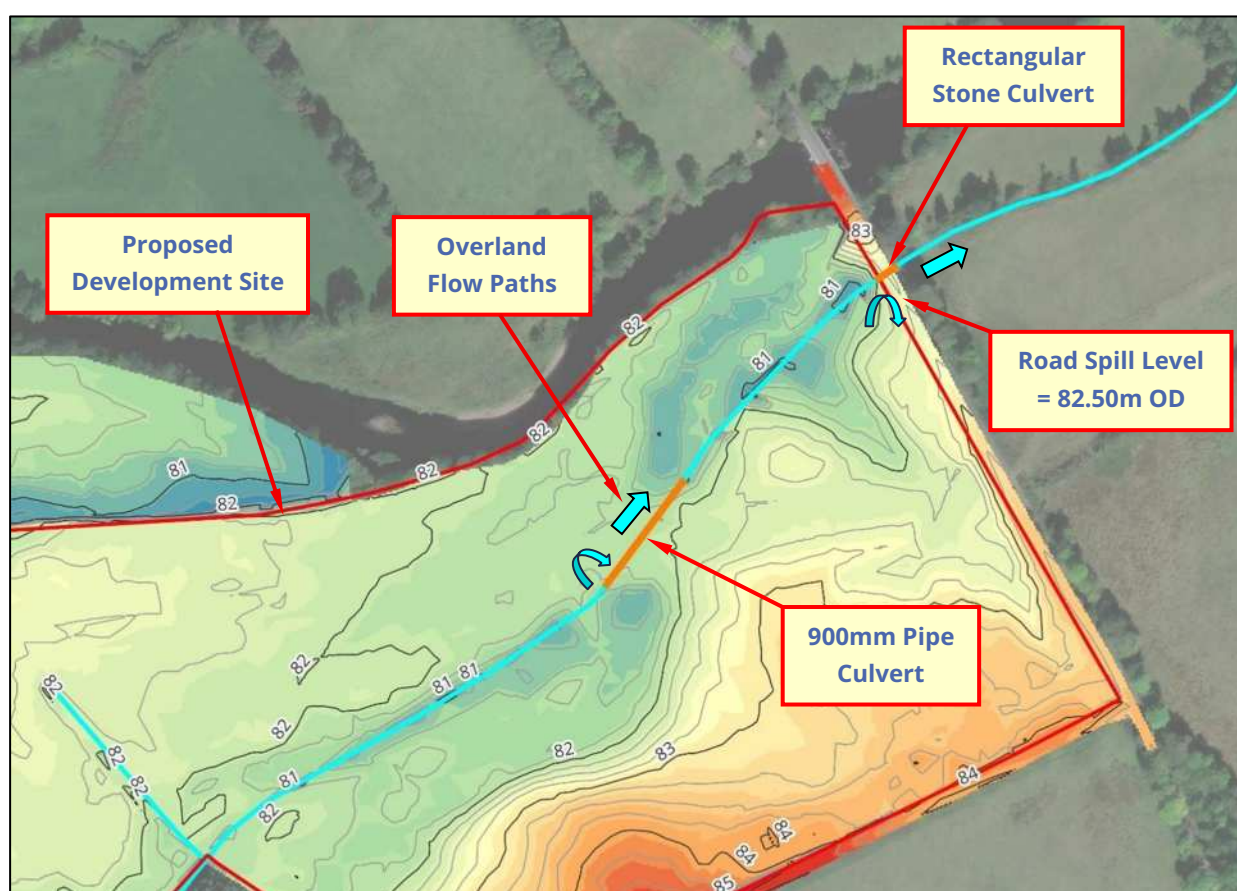


Figure 16 – Culvert Blockage Overland Flow Paths

7. Hydrological Impact of Proposed Development

The assessment and analysis undertaken as part of this Site Specific Flood Risk Assessment indicates that a significant portion of the proposed development site falls within an OPW NIFM 1% AEP (1 in 100 year – Flood Zone 'A') and a 0.1% AEP (1 in 1000 year – Flood Zone 'B').

The development as proposed comprises the construction of a hard surfaced runway, taxiway and helipad with associated ground level lighting, associated interceptors along with relocation of existing hanger, paramedic prefab base, crew prefab base all associated with the HSE Air Ambulance, all of which to be serviced by a new proprietary wastewater treatment, new vehicle entrance and associated site works. It is also proposed to extend the existing 900mm runway culvert by approximately 30m to facilitate the new runway alignment and construct a new 600mm pipe culvert where the proposed runway crosses the field drain in the western area of the site.

As illustrated in *Figure 17* below, the proposed new location of the HSE Air Ambulance hanger, paramedic prefab base, crew prefab base and new proprietary wastewater treatment system do not fall within an OPW NIFM 1% AEP (1 in 100 year – Flood Zone 'A') or a 0.1% AEP (1 in 1000 year – Flood Zone 'B'), and therefore fall within Flood Zone 'C'.

The proposed finished floor level of the buildings is 83.50 OD, which is 1.4m above the estimated 0.1% AEP flood level of 82.1m OD in the River Blackwater.

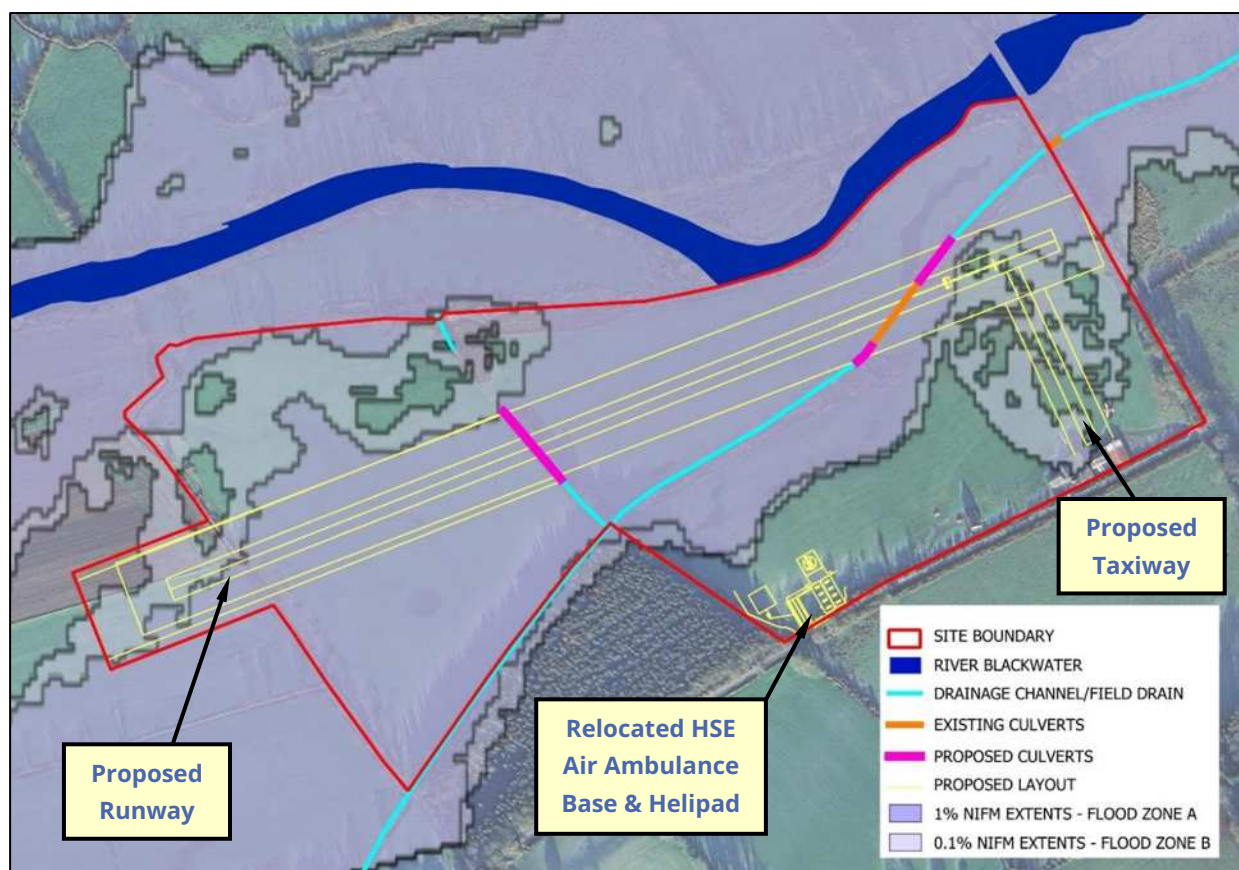


Figure 17 – Proposed Layout

The proposed runway and taxiway shall be constructed at existing ground levels and shall not involve any significant infilling or ground level raising. The proposed runway and taxiway shall therefore have no adverse impact on overland flow conveyance paths or the existing hydrological regime of fluvial flood waters associated with the River Blackwater. In addition, surface water runoff from the hard-standing runway shall be collected and attenuated on site in an underground infiltration system and will not result in an increased fluvial or pluvial flood risk elsewhere.

It is proposed to extend the existing 900mm culvert under the existing runway by approximately 30m to accommodate the proposed runway alignment as illustrated *Figure 17* above. It is also proposed to construct a 600mm pipe culvert under the proposed runway along the field drain in the western area of the site. Refer to drawings by Waterman Kelly Consulting Civil & Structural Engineers for further details. The proposed culverts fall within an OPW NIFM 1% AEP (1 in 100 year – Flood Zone 'A') and a 0.1% AEP (1 in 1000 year – Flood Zone 'B') associated with the River Blackwater. These culvert structures shall be constructed below existing ground levels and are therefore unlikely to result in any adverse impact to the exiting hydrological regime of the area during the occurrence of an extreme fluvial event in the River Blackwater.

8. Development in the Context of The Guidelines

In the context of the 'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009' three flood zones are designated in consideration of flood risk to a particular development site.

Flood Zone 'A' – where the probability of flooding from rivers and watercourses is the highest (greater than 1% or 1 in 100 year for river and watercourse flooding and 0.5% or 1 on 200 for coastal or tidal flooding).

Flood Zone 'B' – where the probability of flooding from rivers and watercourses is moderate (between 0.1% or 1 in 1000 year for river and watercourse flooding and 0.5% or 1 on 200 for coastal or tidal flooding).

Flood Zone 'C' – where the probability of flooding from rivers and watercourses is low or negligible (less than 0.1% or 1 in 1000 year for both river and watercourse and coastal flooding). Flood Zone 'C' covers all areas that are not in Zones 'A' or 'B'.

The 'Planning System and Flood Risk Management Guidelines' list the planning implications for each flood zone, as summarised below:

Zone A – High Probability of Flooding. Most types of development would not be considered in this zone. Development in this zone should only be considered in exceptional circumstances, such as in city and town centres, or in the case of essential infrastructure that cannot be located elsewhere, and where the 'Planning System and Flood Risk Management Guidelines' justification test has been applied. Only water-compatible development, such as docks and marinas, dockside activities that require a waterside location, amenity open space and outdoor sports and recreation would be considered appropriate in this zone.

Zone B – Moderate Probability of Flooding. Highly vulnerable development such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses, strategic transport and essential utilities infrastructure would generally be considered inappropriate in this zone, unless the requirements of the justification test can be met. Less vulnerable development such as retail, commercial and industrial uses and recreational facilities might be considered appropriate in this zone. In general however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in Zone 'C' and subject to a flood risk assessment to the appropriate level of detail to demonstrate that flood risk to the development can be adequately managed and that development in this zone will not adversely affect adjacent lands and properties.

Zone C – Low to Negligible Probability of Flooding. Development in this zone is appropriate from a flood risk perspective. Developments in this zone are generally not considered at risk of fluvial flooding and would not adversely affect adjacent lands and properties from a flood risk perspective.

In the context of the 'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009' the assessment and analysis undertaken as part of this Site Specific Flood Risk Assessment indicates that the area of the site where the new runway and new taxiway are proposed falls within a delineated fluvial Flood Zone 'A' and Flood Zone 'B'.

The area of the site where the new location of the HSE Air Ambulance hanger, new helipad, paramedic prefab base, crew prefab base and new proprietary wastewater treatment are proposed falls within Flood Zone 'C'.

In accordance with the 'Planning System & Flood Risk Management Guidelines, DOEGLG, 2009' the elements of the development as proposed which fall within Flood Zone 'A' and Flood Zone 'B' (proposed new runway and taxiway) may be subject to the requirements of the Justification Test.

9. Justification Test for Development Management

In the context of the 'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009' and in consideration of the scenario that the development as proposed is undefended, the assessment and analysis undertaken as part of this Site Specific Flood Risk Assessment indicates that the area of the site where the new runway and new taxiway are proposed falls within a delineated fluvial Flood Zone 'A' and Flood Zone 'B'.

The area of the site where the new location of the HSE Air Ambulance hanger, new helipad, paramedic prefab base, crew prefab base and new proprietary wastewater treatment are proposed falls within Flood Zone 'C'.

Table 3.1 of the guidelines lists the vulnerability class of various types of development. The proposed new runway and taxiway development is classified as 'Water Compatible' development. The HSE Air Ambulance hanger, new helipad, paramedic prefab base, crew prefab base and new proprietary wastewater treatment are classified as 'Highly Vulnerable' development.

Table 3.2 of the guidelines (duplicated below) provides a matrix of different vulnerability classes of development in relation to Flood Zones A, B and C, and lists if development is appropriate in each Zone and where the Justification Test should be applied.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable Development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less Vulnerable Development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test

With reference to the table above, the type and form of development proposed includes 'Water Compatible' development elements (sports and leisure activity – runway and taxiway used for Rathcool Flying Club) and 'Highly Vulnerable' development elements (HSE Air Ambulance hanger, new helipad, paramedic prefab base, crew prefab base and new proprietary wastewater treatment system). The use of the runway and taxiway for leisure activity associated with the Rathcool Flying Club are considered water compatible development and are therefore not subject to the requirements of the Justification Test.

The 'Highly Vulnerable' development is located within a delineated Flood Zone 'C', however the Air Ambulance will primarily operate using the runway and taxiway, which is located within a delineated Flood Zone 'A' or Flood Zone 'B'. In this regard, where the proposed runway and taxiway are utilised specifically by the Air Ambulance (as opposed to the Rathcool Flying Club) then the proposed runway and taxiway are considered as 'Highly Vulnerable' if utilised by the Air Ambulance and therefore these elements of the development as proposed are subject to the Justification Test.

Where 'Highly Vulnerable Development' is proposed within a delineated Flood Zone 'A' or Flood Zone 'B', the planning authority must be satisfied that the development satisfies the criteria of the Justification Test as described in Box 5.1 of the guidelines (duplicated below):

**Box 5.1 Justification Test for development management
(to be submitted by the applicant)**

When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied:

1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.
2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:
 - (i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;
 - (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;
 - (iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and
 - (iv) The development proposed addresses the above in a manner that is compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

Note: See section 5.27 in relation to major development on zoned lands where sequential approach has not been applied in the operative development plan.

Refer to section 5.28 in relation to minor and infill developments.

Each of the criteria listed in Box 5.1 above are considered as follows:

1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these guidelines.

Answer – Under the Cork County Development Plan 2022-2028, the site is not zoned for any particular use. However, direct reference is made to the Rathcoole Aerodrome in Section 2.2.10 of the Cork County Development Plan 2022-2028. It highlights the significance of the Aerodrome as a commercial asset in North Cork:

The Rathcoole Aerodrome, licensed since 1962 by the Irish Aviation Authority, represents a unique and important commercial asset in North Cork. The HSE Air Ambulance provide a dedicated Helicopter Emergency Service from the Aerodrome and favourable consideration will be given to appropriate proposals which seek to sustain its current and expand future functions subject to all relevant / normal planning considerations and taking account of its sensitive location relative to the Blackwater River.

The proposed hardstanding runway is located within Flood Zone 'A' and Flood Zone 'B' of the Cork County Development Plan. Under P.A Ref no. 22/6397, the first refusal reason outlined that the development would comprise a highly vulnerable use and would therefore be unsuitable within a flood zone. It should be noted that the Rathcool Flying Club is a sports and leisure activity, which is designated as 'water compatible development' within the Flood Risk Management Guidelines. Accordingly, the hardstanding runway is an acceptable use within Flood Zone A.

The 'Highly Vulnerable' elements of the development as proposed (HSE Air Ambulance hanger, new helipad, paramedic prefab base, crew prefab base and new proprietary wastewater treatment system) are located within a delineated Flood Zone 'C'. The Air Ambulance will

primarily operate using the runway and taxiway, which is located within a delineated Flood Zone 'A' or Flood Zone 'B'. In this regard, where the proposed runway and taxiway are utilised specifically by the Air Ambulance (as opposed to the Rathcool Flying Club) then the proposed runway and taxiway are considered as 'Highly Vulnerable' if utilised by the Air Ambulance. However, in the event of the occurrence of an extreme fluvial flood event, and where the proposed runway and taxiway may be impacted, in this instance the Air Ambulance would utilise the new helipad for vertical take-off/landing operations. The new helipad is located within Flood Zone 'C'. In summary, the Air Ambulance is not dependant on the use of the proposed runway and taxiway. In the event of the occurrence of an extreme fluvial flood event, the operation of the Air Ambulance would not be adversely impacted as Air Ambulance would utilise the new helipad which is located within Flood Zone 'C'.

2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:
- (i) The development proposed will not increase flood risk elsewhere and, if practical will reduce overall flood risk;

Answer –The proposed runway and taxiway and associated infrastructure shall be constructed at existing ground levels and shall not involve any significant infilling or ground level raising. The proposed runway and taxiway shall therefore have no adverse impact on overland flow conveyance paths or the existing hydrological regime of fluvial flood waters associated with the River Blackwater. In addition, surface water runoff from the hard-standing runway shall be collected and attenuated on site in an underground infiltration system and will not result in an increased fluvial or pluvial flood risk elsewhere.

- (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;

Answer – The proposed new HSE Air Ambulance hanger, paramedic prefab base, crew prefab base and proprietary wastewater treatment system do not fall within a delineated Flood Zone 'A' or Flood Zone 'B'.

Surface water runoff from the runway hardstanding areas shall be attenuated and infiltrate to ground, thereby mimicking greenfield conditions. The proposed development will therefore not result in an increased fluvial or pluvial flood risk elsewhere. In addition any potential hydrocarbons from the runway shall be collected and removed from the surface water runoff by a hydrocarbon separator.

- (iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding or any future flood risk management measures and provisions for emergency services access;

Answer – Access to the proposed development site during an extreme flood event is provided at the existing site entrance located in the south eastern corner of the site and also at the proposed HSE Air Ambulance, which are both located in Flood Zone 'C'.

Therefore, access to and egress from the site would not be impeded for emergency services during the occurrence of an extreme flood event.

- (iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes;

Answer – The development is consistent with the policies and provisions of the Cork County Development Plan 2022-2028 and improves the safety of operations for both the Rathcool Flying Club and the Air Ambulance Service.

10. Summary Conclusions & Recommendations

In consideration of the assessment, analysis and output of this Site Specific Flood Risk Assessment, the following conclusions and recommendations are made in respect of the development as proposed:

- A Site Specific Flood Risk (SSFRA) assessment, appropriate to the type and scale of the existing development, and in accordance with 'The Planning System and Flood Risk Management Guidelines – DoEHLG-2009' has been undertaken.
- The proposed development site has been screened, scoped and assessed for flood risk in accordance with the above guidelines.
- The primary potential flood risk to the proposed development site can be attributed to an extreme fluvial event in the River Blackwater. The site is not at risk of pluvial or groundwater flooding.
- In the context of the 'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009' the assessment and analysis undertaken as part of this Site Specific Flood Risk Assessment indicates that the area of the site where the new runway and new taxiway are proposed falls within a delineated fluvial Flood Zone 'A' and Flood Zone 'B'. The area of the site where the new HSE Air Ambulance hanger, paramedic prefab base, crew prefab base and new proprietary wastewater treatment system are proposed falls within Flood Zone 'C'.
- The use of the runway and taxiway for leisure activity are considered water compatible development and are therefore not subject to the requirements of the Justification Test.
- The HSE Air Ambulance hanger, new helipad, paramedic prefab base, crew prefab base and new proprietary wastewater treatment are classified as 'Highly Vulnerable' located within Flood Zone 'C'. The Air Ambulance will primarily operate using the runway and taxiway, which is located within a delineated Flood Zone 'A' or Flood Zone 'B'. In the event of the occurrence of an extreme fluvial flood event in the River Blackwater, and where the proposed runway and taxiway may be impacted, the Air Ambulance would utilise the new helipad for vertical take-off/landing operations, which is located in Flood Zone 'C'. The proposed runway and taxiway would not be utilised in this instance.
- Therefore the operation of this highly vulnerable development is not impacted by a potential extreme fluvial flood event in the River Blackwater. The proposed runway and taxiway and

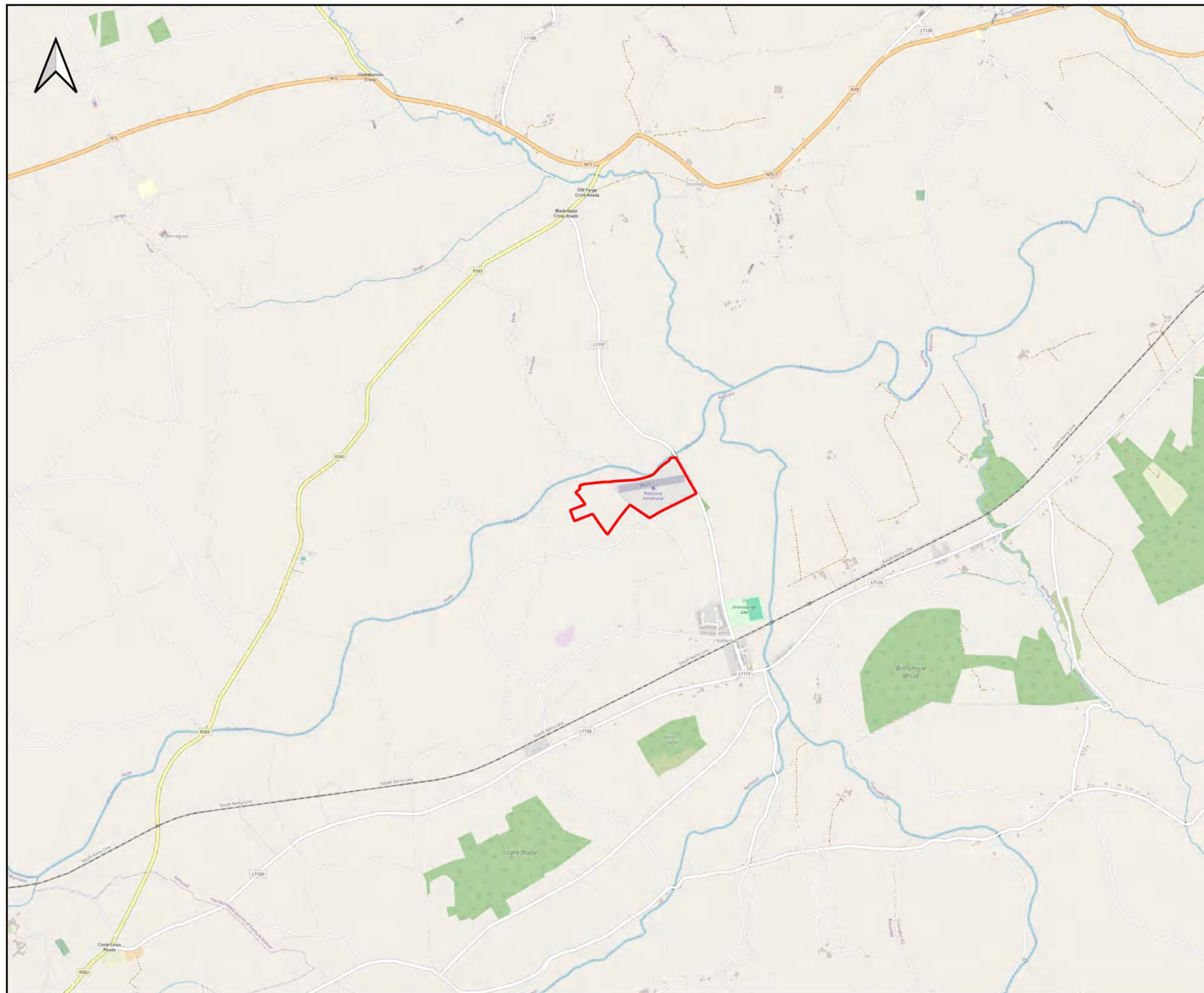
associated infrastructure shall be constructed at existing ground levels and shall not involve any significant infilling or ground level raising.

- The proposed runway and taxiway shall therefore have no adverse impact on overland flow conveyance paths or the existing hydrological regime of fluvial flood waters associated with the River Blackwater.
- In addition, surface water runoff from the hard-standing runway shall be collected and attenuated on site in an underground infiltration system and will not result in an increased fluvial or pluvial flood risk elsewhere.
- The development as proposed satisfies the requirements of the Justification Test.
- It is recommended that any surface water drainage access covers associated with the proposed runway and taxiway be fitted with flood proof covers.
- It is recommended that any electrical equipment or cabling associated with the proposed runway and taxiway be fully sealed and flood proofed and capable of withstanding flood inundation.
- In summary, and in consideration of the findings of this Site Specific Flood Risk Assessment and the incorporation of the recommendations presented above, the development as proposed is not expected to result in an adverse impact to the existing hydrological regime of the area or increase flood risk elsewhere and is therefore considered to be appropriate from a flood risk perspective.

Appendices

Appendix A. Drawings

Drawing Number IE2952-001-B



LEGEND

 SITE BOUNDARY

B	21.11.24	INFORMATION	NOM	PMS
A	09.09.24	INFORMATION	NOM	PMS
rev.	date	amendment	drn	ckd

PROPOSED DEVELOPMENT SITE
RATHCOOL AERODROME
RATHCOOLE, MALLOW, CO. CORK

SITE SPECIFIC FLOOD RISK ASSESSMENT

LOCATION PLAN



CARLOW OFFICE:
INNOVATION CENTRE
GREEN ROAD
CARLOW R95 W248

NEWRY OFFICE:
7 LINENHALL
WIN BUSINESS PARK
NEWRY BT35 6PH

file location: N:\IE2952\DRAWINGS		scale: 1:25,000
drawing status:		datum: MALIN
PLANNING		drawn: NOM
		checked: PMS
		approved: PMS
drawing no.	rev:	date: 21/11/2024
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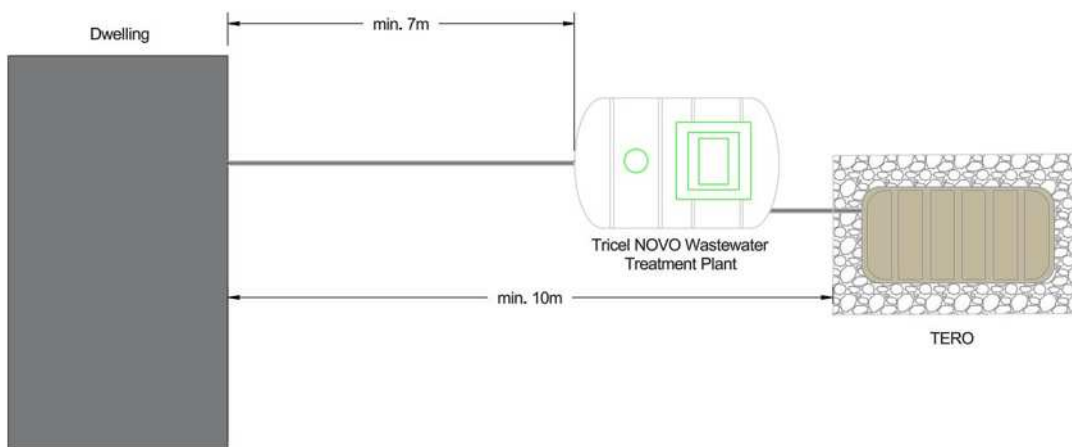
Appendix 7-2

Date	24/09/2024
Report No:	TSA_C_16232_1
Client Name	Rathcool Flying Club
Site Location & Townland	Rathcool Flying Club, Rathcool, Cork Tel: 083 829 9938 Email: dcrowley045@gmail.com

Thank you for choosing Tricel for your wastewater treatment requirements. This report contains the following information for your site and is based on a population of 10 and a subsurface/surface value of between 51-75.

Based on the information provided to us and using SR66 and the EPA Code of Practice: Wastewater Treatment and Disposal Systems Serving Single Houses (p.e. ≤ 10), the appropriate solution for treating wastewater on your site is a Tricel Novo Package Plant and Tricel Tero.

Typical layout of a Tricel Novo Package Plant and Tricel Tero:



Note:

In the above named site, a substitute wastewater treatment system may not be put in place of the following recommendation.

This recommendation only applies to the above named site based on the information supplied to Tricel.

A Site Characterisation Form should accompany this report. Tricel cannot be responsible for misinformation due to misleading information being received by us from clients.

Section 1: Information on the Novo Package Plant

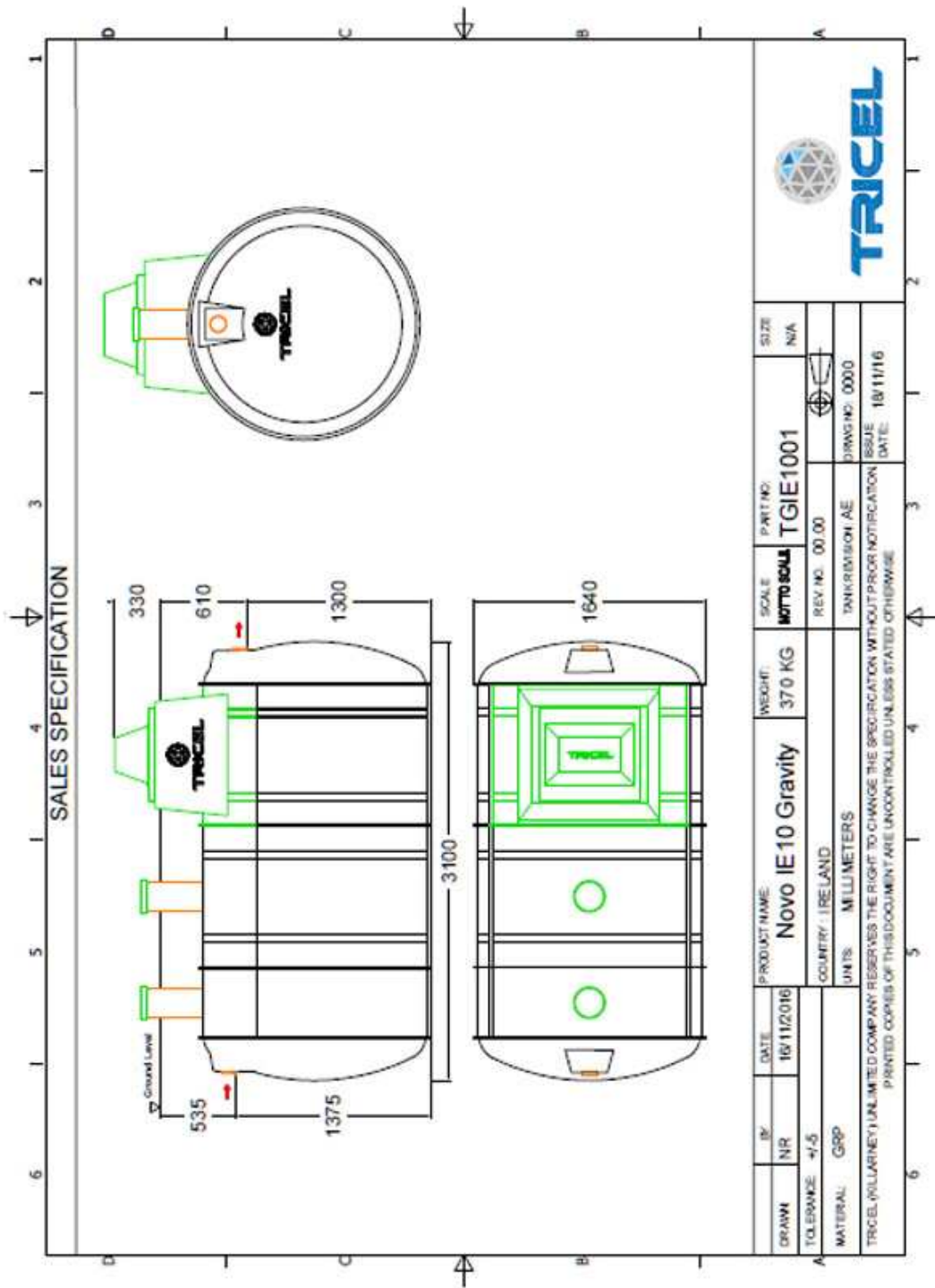
- Manufacturers report and sizing of the Tricel Novo Package Plant.
- Drawings of the Novo Package Plant.
- Pump selection and technical data
- Certification of the selected Novo Package Plant.
- Brochure on the Novo Package Plant.
- Optional Novo maintenance agreement.

For your site, we recommend a Novo IRL10 wastewater treatment plant which is designed to treat a maximum of 1500 litres of wastewater per day. The Tricel Novo range of wastewater treatment plants is fully in conformance with EN12566-3 and complies with SR66.

The Novo IRL10 has a capacity of 5550 litres, of which 2550 are in the primary chamber, this ensures a long desludging interval.

This solution contains a BEST FOUR pump based on an the Length of Rising Main 10 metres and Difference in Height of Rising Main 1.2 metres. A 38mm compression is supplied for connection to a rising main of 38mm internal bore pipework. Details and pump specifications are contained in Section 1.

Section 1



Rev.G

SUBMERSIBLE SUMP PUMPS

BEST 2-5

SPECIFICATIONS

50 Hz

PUMP		
Liquid Handled	Type of liquid	Clean / dirty water
	Max temperature [°C]	35
	Max solids size [mm]	10 (suspended particles)
Maximum immersion [m]		10
Construction	Impeller	Open centrifugal type
	Shaft seal type	Double mechanical seal
	Bearing	Sealed ball bearing
Pipe Connection	Suction-Flange	Strainer
	Discharge-Flange [inch]	G 1½ UNI ISO 228
Material	Casing	AISI 304
	Impeller	AISI 304
	Casing cover	AISI 304
	Shaft seal	Pump side : Sic/Sic/NBR Motor side : Carbon/Ceramic/NBR
	Seal cover	AISI 304
	Shaft	AISI 303 (wet extension)
	Lubricating liquid	White mineral oil ESSO MARCOL 172 (180 cc)
Applicable standard of test		ISO 9906 - Annex A

MOTOR		
Type	Submersible dry type	
	Single Phase	Three Phase
No. of Poles	2	
Rotation speed [min ⁻¹]	≈2800	
Insulation Class	F	
Protection degree	IP 68	
Power rating	[kW]	0.55 ÷ 1.1
	[HP]	0.75 ÷ 1.5
Frequency [Hz]	50	
Voltage [V]	230 ±10%	400 ±10%
Capacitor	Built in	-
Over load protection	Built in	-
Float Switch	Optional	-
Float Switch Cable	material	H07RN-F
	size	3G1
Casing material	AISI 304	
Base material/motor support	AISI 304	
Power cable	length [m]	10
	material	H07RN-F
	size	3G1 (Best 2) 3G1.5 (Best 3, 4) 4G1
Dimensions of cable entry		Cable Gland

200



EBARA PUMPS EUROPE S.p.A.

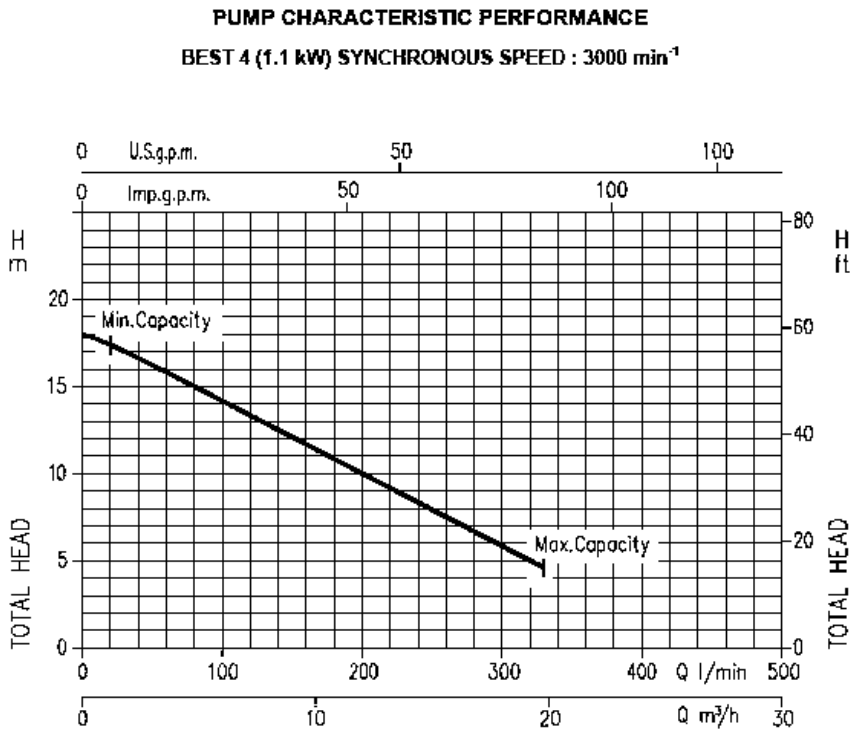
Rev.G

SUBMERSIBLE SUMP PUMPS

BEST 2-5

PERFORMANCE CURVE

50Hz



Temperature of water: 20°C
Impeller diameter = 125 mm
Applicable standard of test: ISO 9906 – Annex A

Certificate in accordance with SR66 for EN12566-Part 3



Prüfinstitut für
Abwassertechnik
GmbH

TREATMENT PERFORMANCE RESULTS

Tricel (Killarney)
Ballyspillane Industrial Est., Killarney, Co. Kerry, Ireland

EN 12566-3
Results corresponding to EN 12566-3 and S.R. 66
PIA-SR66-1512-1062

Novo
Submerged fixed film

Nominal organic daily load	0.26 kg/d															
Nominal hydraulic daily load	0.90 m ³ /d															
Material	Glass reinforced plastic															
Watertightness	Pass															
Structural behaviour (Calculation)	Pass (also wet conditions)															
Durability	Pass															
Treatment efficiency (nominal sequences)																
	<table><thead><tr><th></th><th>Efficiency</th><th>Effluent</th></tr></thead><tbody><tr><td>COD</td><td>91.6 %</td><td>52 mg/l</td></tr><tr><td>BOD₅</td><td>95.9 %</td><td>11 mg/l</td></tr><tr><td>NH₄-N</td><td>79.9 %</td><td>8 mg/l</td></tr><tr><td>SS</td><td>95.3 %</td><td>16 mg/l</td></tr></tbody></table>		Efficiency	Effluent	COD	91.6 %	52 mg/l	BOD ₅	95.9 %	11 mg/l	NH ₄ -N	79.9 %	8 mg/l	SS	95.3 %	16 mg/l
	Efficiency	Effluent														
COD	91.6 %	52 mg/l														
BOD ₅	95.9 %	11 mg/l														
NH ₄ -N	79.9 %	8 mg/l														
SS	95.3 %	16 mg/l														
Number of desludging	Not more than once															
Electrical consumption	1.1 kWh/d															

Performance tested by:

PIA – Prüfinstitut für Abwassertechnik GmbH
(PIA GmbH)
Hergenrather Weg 30
52074 Aachen, Germany

This document replaces neither the declaration
of performance nor the CE marking.



Notified Body
No.: 1739



Certified according to
ISO 9001:2008



ILAC-MRA



DAkkS
Deutsche
Akkreditierungsstelle
D-PL 17712-01-00



Prüfinstitut für Abwassertechnik GmbH
geprüft - tested - testé

Elmar Lancé July 2016

NOVO BROCHURE

Homeowners: Individual domestic installation



- The lightweight nature of the system makes for easy on-site delivery.



- No need for big excavators and large holes that disrupt and disturb your garden.



- Very low visual impact from fully installed units.

Larger projects: Commercial installations up to 50PE



- These units are suitable for installation at housing estates, camping sites, hotels etc., and have low maintenance and running costs.



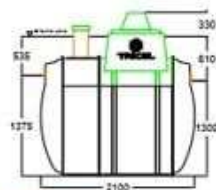
- Each WWTP unit is constructed of lightweight SMC and is easy to maneuver which simplifies the installation process.



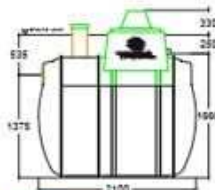
- Example of a fully installed 50PE Novo wastewater treatment unit in a 5-star hotel.

Technical characteristics/ Plant dimensions

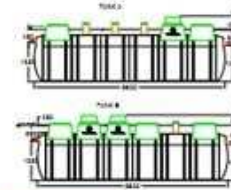
Form	Design Population	No. of people	Length	Width	Height	Horizontal inlet/outlet diameter	Weight empty	Inlet Invert to base	Outlet Invert to base	Inlet Invert to ground level	Air blower rating
			m			mm	kg		m		Watts
IE6		1-6	2.1	1.64	2.24	110	270	1.375	1.3	0.535	60
IE6+		2-6	2.6	1.64	2.24	110	300	1.375	1.3	0.535	60
IE8		2-8	2.6	1.64	2.24	110	300	1.375	1.3	0.535	80
IE10		3-10	3.1	1.64	2.24	110	370	1.375	1.3	0.535	80
IE11		4-12	3.6	1.64	2.27	110	400	1.375	1.3	0.535	100
IE18		6-18	4.6	1.64	2.27	110	500	1.375	1.3	0.535	200
IE24		8-24	6.6	1.64	2.27	150	700	1.35	1.3	0.56	200
IE30	Tank A	10-30	2.6	1.64	1.99	150	300	1.35	1.3	0.46	
	Tank B		5.6	1.64	2.27	150	600	1.35	1.3	0.56	200 + 80
IE36	Tank A	12-36	3.6	1.64	1.99	150	400	1.35	1.3	0.46	
	Tank B		6.6	1.64	2.27	150	700	1.35	1.3	0.56	200 + 80
IE42	Tank A	14-42	5.6	1.64	2.27	150	600	1.35	1.3	0.46	
	Tank B		5.6	1.64	2.27	150	600	1.35	1.3	0.56	200 x 2
IE50	Tank A	16-50	6.6	1.64	2.27	150	700	1.35	1.3	0.46	
	Tank B		6.6	1.64	2.27	150	700	1.35	1.3	0.56	200 + 120 + 80



- **IE6 gravity outlet**
Up to 6PE domestic gravity flow outlet.



- **IE6 pumped outlet**
1-6 domestic pumped unit. Suitable for pumping to a raised discharge area (over).



- **Gravity IE50 outlet**
Suitable for commercial installation, caters for up to 50 people.

Tricel Novo riser options for deep installation

Tricel offer 3 different manhole riser heights to suit different Invert/Inlet levels. Manhole risers allow for the positioning of the treatment plants at the depth which is optimum to each individual installation. Wastewater is gravity fed from the home to your treatment plant. The inlet pipe's position from the premises determines the excavation depth for the WWT plant. Tricel offer a choice of manhole risers 150mm/500mm/750mm to help with installation where site conditions require a flexible solution.

Tricel Novo: Wastewater Treatment System
Service Agreement

Establishing a regime of yearly inspections and maintenance is advised to ensure that your Tricel Novo continues to perform to the same high standards throughout its lifetime. The service agreement covers travel, the service and the labour cost of servicing only. Other labour costs are excluded, as are all replacement parts.

Tricel (Killarney) Unlimited Company, Ballyspillane Industrial Estate, Killarney, Co. Kerry, V93 X253, Ireland ("the Company") enter this Tricel Novo service agreement with the Customer named below:

<u>Customer Details:</u>			
Name:			
Address:		Address of Site: (If other)	
Telephone No.:			
Date of Tricel Novo Order:			
Work Order No.:			
Date of Delivery of Tricel Novo:			
Date of System Commissioning:			
Service Agreement Fee Paid:			
Date of Service Agreement Commencement:			
Unit Serial No.:			

During routine servicing, the service technician will perform a series of checks and procedures:

Checks:

- The air-diffuser is monitored to check for sufficient dispersion of air.
- The sludge return system is functioning correctly.
- The covers and locks are in place and in good condition.
- General appearance and condition of the treatment system is good.

Procedures:

- The blower is tested.
- The blower filter is replaced.
- The system alarm is tested.
- The pump and float-switch are tested (If applicable).
- The vents are cleared of any blockages.
- The sludge level in the primary chamber is measured.

Notes:

- Full inspection labour is covered (including any immediate minor system adjustment required). This service agreement does not cover the cost of any labour or materials that may arise as a result of this inspection.
- Components that require replacing will incur additional charges.
- All service agreements exclude de-sludging.

Tricel (Killarney) Unlimited Company trading as Tricel

March 2017

Section 2: Information on Tertiary Treatment and Disposal route

The proposed solution to use on site is a Tero module.

This system will provide tertiary treatment a total of 2 modules are required to ensure the loading rate of the coconut coir filter per day is not exceeded.

The tertiary treated liquids is disposed into the ground through a gravel distribution layer required underneath the Tero module. The gravel distribution layer must be 300mm thick and should be 250m² based on a population of 10 and a Subsurface/surface Value of 51-75.

The location and construction of the Tertiary infiltration area is the responsibility of the site engineer. A full site layout drawing should accompany this report.

The EPA CoP 2021 outlines the design, siting and construction requirements for tertiary polishing filters. The tables below outline some of the key factors to take into consideration when designing and locating a tertiary polishing filter.

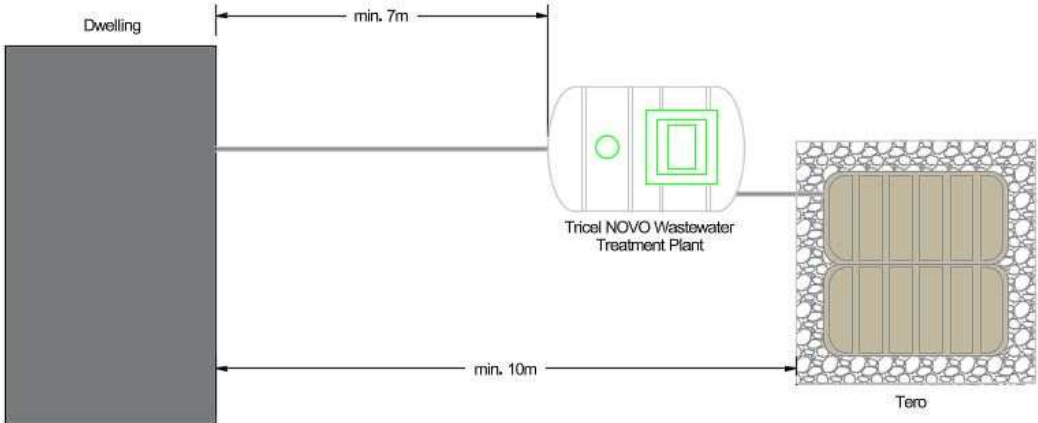
Table 6.2: Minimum separation distances from the entire DWWTS

Features			DWWTS – periphery of tank/plant and infiltration/ treatment area (m)
Public/group water supply abstraction points/wells			60
Down-gradient domestic well	3 ≤ PV ≤ 10 (usually SAND- or GRAVEL-dominated material)	Depth of soil/subsoil > 2.0 m between invert level and bedrock, and water table 1.2–2.0 m	60
		Depth of soil/subsoil 2.0–8.0 m between invert level and bedrock, and water table > 2.0 m	40
		Depth of soil/subsoil > 8.0 m between invert level and bedrock, and water table > 2.0 m	30
	10 < PV ≤ 30 (usually SILT- or SAND- or silty GRAVEL-dominated material)	Depth of soil/subsoil 1.2–8.0 m between invert level and bedrock	45
		Depth of soil/subsoil > 8.0 m between invert level and bedrock	30
	30 < PV ≤ 120 (usually SILT/ CLAY- or CLAY-dominated material)	Depth of soil/subsoil 1.2–3.0 m between invert level and bedrock	40
		Depth of soil/subsoil ≥ 3.0 m between invert level and bedrock	30
Alongside domestic well			25
Up-gradient domestic well			15
Karst feature			15
Lake or foreshore			50
Watercourse/stream			10
Open drain or drainage ditch			10
Adjacent tank/plant and percolation area, polishing filter or infiltration area			10
On-site dwelling house			7 (tank/plant) 10 (free water surface constructed wetland) 10 (infiltration/ treatment area)
Neighbouring dwelling house			7 (tank/plant) 25 (free water surface constructed wetland) 10 (infiltration/ treatment area)
Surface water soakaway ^a			5
Road			4
Slope break/cuts			4
Trees ^b			3
Site boundary			3
Heritage features, NHA/SAC/SPA ^c			See note
PV, percolation value.			
^a The soakaway for surface water drainage should be located down-gradient of the infiltration/treatment area; it should also be ensured that this distance is maintained from neighbouring storm water disposal areas or soakaways.			
^b Tree roots may lead to PFPs developing. The canopy spread indicates potential root coverage.			
^c The distances required depend on the importance of the feature. Therefore, advice should be sought from the local authority and/or from the the Department of Housing, Local Government and Heritage, specifically the National Monuments Service and the National Parks and Wildlife Service.			

Table 6.1 EPA CoP 2021: Minimum separation distances

Please see attached the accompanying documents in Section 2 for the Tricel Tero

- Separation Distances
- Tero Drawing
- Tero Technical Specification
- Technical information on the Tero



The Tricel Tero modules are filled with coconut coir. The wastewater is distributed over the top of the coir filter using a specially designed pipe network. Through a combination of biological, chemical and physical processes the coir treats the wastewater as it filters through. At the outlet of the Tero modules the tertiary treated wastewater is discharged into the in situ subsoil through a gravel distribution area.

TERO BROCHURE

TERO module

The Tricel TERO tertiary wastewater system further purifies the treated effluent from a packaged wastewater treatment plant resulting in a reduced area and depth of discharge bed.

Stage One:

TERO receives secondary treated effluent from a wastewater treatment plant. The TERO is designed to work seamlessly with the Tricel NOVO but can also be used with third-party products, providing that a pumped discharge with a dose limit is utilised.

Stage Two:

The pre-treated effluent is dispersed using an easily serviceable distribution network which ensures the effluent is distributed evenly and uniformly onto natural filter media. The effluent filters through the media and is treated by a combination of biological, chemical and physical processes. The treated water is transported to the soil at the base of the tank.

DIAGRAM INDEX

1. Tricel NOVO wastewater treatment plant
2. TERO Module
3. Inlet Pipe
4. Distribution Pipework
5. Coconut Fibre
6. Outlets
7. Gravel Bed

Tricel TERO Tertiary Treatment System

The environmental advantages of TERO

- Improved E.coli treatment efficacy. Test results show less than 1000 cfu/100mL, reducing soil depth requirements to 600mm.
- TERO is an Environmentally friendly system that utilises natural, long-life renewable media. The remarkable filtration properties of coconut fibre requires no chemical additives in achieving exceptional results.
- The closed system design of TERO greatly reduces odour whilst ensuring high treatment efficiency of the wastewater.

Advantages for you

- Compact system - one module meets requirements for 6PE.
- The modular design of TERO makes it ideal for retrofit upgrades, extensions etc., and can be used with many existing treatment systems.
- The shallow profile of TERO makes it easy to incorporate into landscape design.
- Simple maintenance. No desludging required.
- No electrical components or power consumption used in the TERO system.

Advantages for installation

- Easy installation - Flat base for easy installation, one inlet connection from wastewater plant. Reduced discharge depth and area, thus reducing contractor expense and costs.
- Plug and play system - assembled module with single input connector.

The TERO system has undergone a rigorous performance testing regime to achieve the highest results required. The tables below show the sizes and the wastewater treatment capability of a TERO. If you have any specific requirements, please contact the Tricel sales team who will be able to assist you with your enquiry.

Tertiary Treatment Performance	
ESSENTIAL CHARACTERISTICS	PERFORMANCE
Nominal Organic Design Load	0.01 kg BOD/d
Nominal Hydraulic Daily Design Load	0.90 l/d
COD	34 mg/l
BOD5	5 mg/l
SS	4 mg/l
NH4+	0.2 mg/l
Electrical Power Consumption	0.2 kWh/d
Number of desludging	0

* determined at temperatures of > 12°

TERO module dimensions	
Length	2.444m
Height	1.078m
Width	1.012m
Weight (one TERO module)	315kg

SEWAGE TREATMENT SIMPLIFIED

Sewage Treatment: Combination of physical and biological processes which break down the organic and inorganic sewage content which cause pollution to receiving waters.

Receiving Waters: All groundwaters and watercourses such as streams and rivers.

Population Equivalent (PE): A measure of the number of people the treatment plant serves.

Media: Coconut fibre.

Sludge: The solids that settle to the bottom of the tank chambers.

BOD: Biological Oxygen Demand measured in milligrams per litre (mg/l) is a relative measure of how polluting the sewage is.

SS: Suspended Solids measured in milligrams per litre (mg/l) includes all suspended matter both organic and inorganic.

E.Coli bacteria: commonly used as an indicator microorganism for faecal pollution, and the sanitary quality of foods and water, measured in (cfu/100mL).

Pathogenic Bacteria: Pathogenic bacteria such as Streptococcus are bacteria which cause disease in humans and animals.

Simple installation, minimum maintenance

Easily installed by your contractor with full commissioning provided by qualified Technician. Annual maintenance recommended to extend life and performance of the system.

Complementary products for the TERO residential system

- High Level Alarm(s)
- Sample Chambers
- Weatherproof GRP Enclosures & Kiosks

The Tero modules are a tertiary treatment filter. They can be located above or below ground depending on the existing bedrock or subsoil. According to the EPA Code 2021 the tertiary treated effluent can be discharge to ground through a gravel distribution area. As outlined below in table 10.1 the area required per person of this distribution bed is dependent on the Subsurface value of the receiving subsoil. It is compulsory that the percolation test is carried out at the infiltration level which is located at the base of the proposed distribution layer. This distribution bed should comprise of a 300mm layer of 12 -32mm gravel

Table 10.1: Infiltration/treatment area and trench length design for tertiary treatment, per PE

Percolation values (PVs)	Pumped or underlying gravity discharge (Options 1 and 2)	Gravity discharge into 500 mm wide trenches (Option 3)	Low-pressure pipe distribution into 300 mm wide trenches (Option 4)	Drip dispersal system (Option 5)	Tertiary infiltration area (Option 6)
	Area required per person (m ²)	Trench length required per person (m)	Trench length required per person (m)	Area required per person (m ²)	Area required per person (m ²)
$3 \leq PV \leq 20$	≥ 7.5	≥ 6	≥ 6	≥ 5	≥ 3.75
$21 < PV \leq 40$	≥ 15	≥ 12	≥ 12	≥ 14	≥ 7.5
$41 < PV \leq 50$	≥ 30	≥ 17	≥ 17	≥ 16	≥ 15
$51 < PV \leq 75$	≥ 50	≥ 19	≥ 19	≥ 22	≥ 25
$76 < PV \leq 90$	–	–	≥ 28	≥ 34	–
$91 < PV \leq 120$	–	–	–	≥ 54	–

Table 10.1 from EPA CoP 2021 - Loading rates for infiltration/treatment area

Terms and conditions:

Tricel cannot accept responsibility for incorrect site details or calculations as these are based on user inputs which are outside of Tricel control.

Full terms of website use are available at www.tricelsiteassessor.ie/TermsOfWebsiteUse

Appendix 8-1

TOWNLAND OF RATHCOOL, CO. CORK

Air Emissions Assessment

Rathcool Flying Club

Report no.: 1.0, Rev. 2.0

Date: 21/10/2025



DOCUMENT CONTROL SHEET

Client	Rathcool Flying Club
Project Title	Rathcool Aerodrome
Document Title	Air Emissions Assessment

Rev.	Status	Author(s)	Reviewed by	Approved by	Issue Date
01	Draft	Aoife Grogan <i>Senior Environmental Consultant</i>	Aoife Gillen <i>Principal Sustainability Consultant</i>	Aoife Gillen <i>Principal Sustainability Consultant</i>	02/10/2025
02	Final	Aoife Grogan <i>Senior Environmental Consultant</i>	Aoife Gillen <i>Principal Sustainability Consultant</i>	Aoife Gillen <i>Principal Sustainability Consultant</i>	21/10/2025

REPORT LIMITATIONS

Synergy Environmental Ltd. T/A DNV (hereafter referred to as “DNV”) has prepared this report for the sole use of Rathcool Flying Club in accordance with the Agreement under which our services were performed. No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by DNV.

The information contained in this Report is based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by DNV has not been independently verified by DNV, unless otherwise stated in the Report.

The methodology adopted and the sources of information used by DNV in providing its services are outlined in this Report.

The work described in this Report is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

All work carried out in preparing this report has used, and is based upon, DNV’s professional knowledge and understanding of the current relevant national legislation. Future changes in applicable legislation may cause the opinion, advice, recommendations or conclusions set-out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, DNV has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, DNV will have no obligation to advise the client of any such changes, or of their repercussions.

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Certain statements made in the Report that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the Report, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. DNV specifically does not guarantee or warrant any estimate or projections contained in this Report.

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If the scope of work includes subsurface investigation such as boreholes, trial pits and laboratory testing of samples collected from the subsurface or other areas of the site, and environmental or engineering interpretation of such information, attention is drawn to the fact that special risks occur whenever engineering, environmental and related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in accordance with best practice and a professional standard of care may fail to detect certain conditions. Laboratory testing results are not independently verified by DNV and have been assumed to be accurate. The environmental, ecological, geological, geotechnical, geochemical and hydrogeological conditions that DNV interprets to exist between sampling points may differ from those that actually exist. Passage of time, natural occurrences and activities on and/or near the site may substantially alter encountered conditions.

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Appendix A	Wind Rose for Worst-case year (2020) at Moorepark Meteorological Station.
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1 INTRODUCTION

DNV was commissioned by Rathcool Flying Club (hereinafter “the Client”) to undertake an air dispersion modelling assessment for the proposed development at the Client’s existing aerodrome at Rathcool, County Cork. The proposed works comprise the realignment and hard-surfacing of the runway, construction of a taxiway, a helipad, and associated supporting infrastructure.

This assessment has been prepared to support the Environmental Impact Assessment Report (EIAR) and was specifically requested as part of a Request for Further Information (RFI) on planning application reference 254538.

The operational profile at Rathcool Aerodrome is characterised by light general-aviation activity dominated by a Cessna 172 with Continental CD-155 (Jet-A/diesel) engine. Two representative operating scenarios for this aircraft type have been assessed for planning purposes:

- Scenario A (typical hour): 1 landing–take-off (LTO) cycle per hour (2 movements/h).
- Scenario B (busiest hour): 5 LTO cycles per hour (10 movements/h; occurs during training);

The LTO cycle refers to the sequence of aircraft operations that occur close to the ground, specifically including taxiing, idling, take-off, climb-out, approach, landing roll, and taxi-in. These phases are the primary source of aircraft emissions that impact ground-level air quality near aerodromes.

The objective of this Air Emissions Assessment is to predict ground-level concentrations (GLCs) of key pollutants associated with aircraft ground and low-altitude operations, at sensitive receptors and across the study area, and to compare the predicted concentrations (project increments and, where relevant, totals including background) against the applicable Irish/EU ambient air quality standards for the protection of human health and ecosystems. The pollutants modelled are as follows:

- Oxides of Nitrogen (NO_x);
- Nitrogen Dioxide (NO₂);
- Particulate Matter with aerodynamic diameter ≤ 10 micrometres (PM₁₀);
- Particulate Matter with aerodynamic diameter ≤ 2.5 micrometres (PM_{2.5}); and
- Sulphur Dioxide (SO₂)

The modelling has been completed in accordance with the EPA Air Dispersion Modelling Guidance Note (AG4, 2020) using AERMOD v13.0 (with AERMET meteorological processing based on a five-year dataset for Moorepark, Co. Cork, and AERMAP terrain processing).

Model configuration reflects the local airfield layout and operations: International Civil Aviation Authority (ICAO) LTO modes with locally realistic taxi times (short taxiway), area-source representations for runway/taxiway/low-altitude segments, and Tier-3 NO_x to NO₂ conversion using AERMOD’s Ozone Limiting Method (OLM) with an hourly ozone file. Results are post-processed in accordance with the legislative thresholds (e.g., NO₂ 1-hour 99.8th percentile, PM₁₀ daily mean exceedances, annual means) and are reported for the worst-case year.

1.1 Quality Assurance and Competency of Experts

This Air Emissions Assessment Report has been prepared by Aoife Grogan, Senior Environmental Consultant at DNV. Aoife holds a BA (Hons) in Geography and English, as well as an MSc in Climate Change, both from Maynooth University. She has also undertaken two additional Professional and Advanced Diplomas in Geographic Information Science (TU Dublin) and Planning and Environmental Law (King's Inns).

Aoife specialises in air quality, climate change, and sustainability, providing technical expertise across a wide range of projects in these fields. In her role, she has developed strong analytical skills, particularly in air quality assessment. She has completed formal training in the U.S. EPA-approved AERMOD dispersion modelling software with Trinity Consultants and is highly proficient in applying Air Dispersion Models to evaluate the impacts of pollutants across industrial, commercial, and waste processing facilities.

This report has been quality assured by Aoife Gillen. Aoife holds a Master of Science (Hons) degree, is a Chartered Environmental Health Practitioner, and Certified Energy Manager. Aoife has worked as a Principal Sustainability Consultant with DNV since March 2024 and has built up experience preparing Climate Change Impact Assessments, Environmental Impact Assessment (EIA) Reports, Climate Chapters, Climate Impact Statements, Air Dispersion Models and Carbon assessments.

1.2 Project Scope

The scope of work undertaken for this assessment included the following tasks:

- Review of relevant site information required for the modelling study: Aerodrome layout, proposed runway/taxiway works, aircraft type used by Rathcool Flying Club (Cessna 172 with Continental Diesel 155), operating scenarios (landing/take-off cycles per hour), taxi times, and source areas/heights.
- Emission estimation and inputs: Derivation of fuel-based emission factors using the EMEP/EEA Air Pollutant Emission Inventory Guidebook (2019), Aviation Chapter, Tier-1 fuel-based method, per-mode/hour-average emission rates, and creation of hourly emissions (HOUREMIS) flux files for 'Runway', 'Taxiway', 'Climb-out, and 'Approach'.
- Calibration of AERMOD pre-processors: AERMOD Meteorological Preprocessor (AERMET) using a five-year dataset for Moorepark, Co. Cork, and AERMOD Terrain Preprocessor (AERMAP) for receptor/source elevations; screening for building downwash.
- Dispersion modelling: Set up and execution in AMS/EPA Regulatory Model (AERMOD) (v13.0) with Ozone Limiting Method (OLM) chemistry using an hourly ozone file; modelling of oxides of nitrogen (NO_x)/nitrogen dioxide (NO₂), particulate matter ≤10 µm (PM₁₀), particulate matter ≤2.5 µm (PM_{2.5}), and sulphur dioxide (SO₂).
- Post-processing and analysis: Per-year extraction of required statistics (means, percentiles, and exceedance counts) in BREEZE 3D Analyst, generation of receptor

tables and contour plots, reporting of increments and totals (increment + background), and identification of the worst-case year for compliance.

- Compliance assessment: Comparison against current Irish/EU ambient air-quality standards (Directive 2008/50/EC; S.I. No. 739/2022), with the 2030 recast directive noted for context.

This assessment is performed in accordance with the Environmental Protection Agency's Air Dispersion Modelling from Industrial Installations Note (AG4, 2020).

2 FACILITY DESCRIPTION

2.1 Site Location

The site is located in the townland of Knockcahill as well as Rathcool, Co. Cork and sits approximately 1.5km northwest of Rathcool village. The site includes the existing aerodrome facility used by the Rathcool Flying Club and the HSE Air Ambulance service. The site contains three warehouse hangers, two of which belong to the Rathcool Flying Club and one to the HSE Air Ambulance. There is a clubhouse on the site which is used by the Rathcool Flying Club. Additionally on the site is a paramedic prefabricated base, crew prefabricated bases and a helipad which are used by the HSE Air Ambulance Service. Designated parking for Air Ambulance employees is provided adjacent to the paramedic prefabricated base. There is a grass runway which is used by Rathcool Flying Club and the Air Ambulance in dry weather. The remainder of the site is made up of grassland.

The site is situated within a predominantly agricultural setting, with farmland extending in all directions. It is bounded by the River Blackwater to the north, woodland to the south-west, the L-5215 local road to the south, the L-1117 local road to the east, and open greenfields to the west. There are three access points to the site. The primary access point is at the southeastern corner of the site and is used by members of the Rathcool Flying Club. There is a separate access point further south which is designated for members of the Air Ambulance Service and the most southerly access point is used as an emergency exit. These access points adjoin the L-5215 road. The R583 is the nearest regional road and N72 is the nearest National Road to the site. The L1117 Local Road runs north-south from the R583 (south of the N72) to Rathcool Town. The N72 runs east-west from Mallow to Killarney.

The existing runway, licensed by the Irish Aviation Authority, is actively used by both the Rathcool Flying Club and the HSE Air Ambulance Service.

2.2 Site Layout

The Proposed Development will consist of a hard surfaced runway (740m in length) and taxiway (147.6m in length) with associated ground level lighting, associated interceptors, along with the demolition of an existing hangar to the east of the site and construction of a replacement hangar of approximately the same size and design to the west of the site; the demolition of the existing operations building and paramedic base building to the east of the site, and construction of a new operations and paramedic base building to the west of the site; and the demolition of an existing helipad to the east of the site, and construction of a new helipad to the west of the site, all associated with the HSE Air Ambulance.

2.3 Facility Processes and Activities

Once the construction phase is complete, the Proposed Development will continue to operate as an aerodrome, and it is expected that the Proposed Development will increase the number of members from 43 to 60 people by 2029.

The current recorded movements at the Proposed Development have averaged approximately 2500 movements per annum over the past 3 years. It is expected that the use of the Proposed Development by Rathcool Flying Club will increase by approximately 1,940 flight movements

per annum by 2029, the use by the air ambulance service is projected to remain broadly in line with current patterns. The club will continue to operate for the purpose of aviation leisure and recreation.

3 BACKGROUND TO AIR DISPERSION MODELLING OF AIRCRAFT EMISSIONS

AERMOD modelling software is approved by the Irish EPA for air quality assessments. It was developed by the United States EPA and the American Meteorological Society and is the official near-field regulatory dispersion model used by the US EPA. AERMOD is a steady-state Gaussian plume model designed to estimate pollutant concentrations from industrial and infrastructure sources. The modelling system includes two regulatory pre-processors: AERMET, which generates meteorological inputs based on planetary boundary layer turbulence and scaling concepts, and AERMAP, which incorporates terrain data using USGS Digital Elevation Models.

In aviation contexts, emissions primarily occur during the landing and take-off cycle, which includes taxiing, idling, take-off, climb-out, approach, and landing. These phases take place close to ground-level receptors, making near-field dispersion modelling essential for evaluating compliance with ambient air quality standards. Aircraft operations release pollutants such as nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter (PM₁₀ and PM_{2.5}), volatile organic compounds (VOCs), and sulphur dioxide (SO₂). The dispersion of these pollutants depends on aircraft type, engine characteristics, operational frequency, and meteorological conditions.

The Environmental Protection Agency's Air Dispersion Modelling Guidance Note (AG4, 2020) outlines best practice for model selection, input preparation, quality assurance, and reporting. This study follows AG4 and applies AERMOD version 13.0 with AERMET and AERMAP pre-processing.

AERMOD has also been integrated into the Federal Aviation Administration's (FAA) Aviation Environmental Design Tool (AEDT), which supports airport emissions modelling and provides AERMOD-ready inputs. FAA documentation confirms the use of AERMOD for estimating pollutant concentrations from aircraft operations, particularly in the vicinity of runways and taxiways.

Recent literature and regulatory practice reflect the suitability of using area sources in AERMOD to represent aircraft emissions across all operational segments, including taxiing, idling, take-off, climb-out, and approach. The FAA's AEDT models aircraft emissions as area sources throughout the entire landing and take-off cycle in its public implementation. This approach reflects the spatial distribution of aircraft operations and aligns with established modelling practices in airport assessments. Comparative studies at major airports, such as those by Pandey et al. (2024), have shown that both area and volume source representations can overestimate peak concentrations unless plume rise and meander effects are explicitly accounted for. These findings suggest that source type alone does not determine model accuracy and that conservative assumptions, such as omitting plume rise, can be applied consistently across source types. For small-scale aerodromes with light aircraft and minimal vertical exhaust momentum, the use of area sources remains a practical and regulator-accepted method for representing emissions across all flight segments while maintaining spatial realism and computational efficiency.

4 ASSESSMENT METHODOLOGY

An air dispersion model was carried out in order to assess the impacts of aircraft emissions from Rathcool Flying Club. An air dispersion model is a tool that is used to assess the air quality impact of an emission source within a defined modelling domain. Rather than replicating atmospheric processes in detail, the purpose of a dispersion model is to perform a mathematical approximation of dispersion and to provide a means for estimating ambient pollutant concentrations at a given location (EPA, 2020). The U.S. EPA approved AERMOD dispersion modelling software (ver. 13.0), incorporating steady state Gaussian plume modelling, was used to determine the overall impact of the Proposed Development. This software programme uses a host of specified input parameters to model hourly ground level concentrations (GLC) of pollutants at and beyond the facility boundary. The results of the air dispersion model were extracted and interpreted in order to assess the likely pollutant impact on the receiving environment from the Site.

The air dispersion modelling undertaken for the Rathcool Aerodrome development focuses on nitrogen oxides (NO_x and NO_2), SO_2 , and particulate matter (PM_{10} and $\text{PM}_{2.5}$). These pollutants were selected based on their relevance to the aircraft types and operational profile at the site, their regulatory significance under Irish and EU legislation in the context of human and ecological health, and their potential to impact sensitive receptors in the surrounding rural environment.

Aircraft operations at Rathcool Aerodrome are limited to light fixed-wing aircraft and HSE air ambulance helicopters, with no commercial jet traffic. Emissions are primarily generated during the landing and take-off (LTO) cycle, which includes taxiing, idling, take-off, climb-out, approach, and landing. These phases occur close to ground-level receptors and are associated with combustion-related pollutants. NO_x and SO_2 are direct products of aviation fuel combustion and are routinely modelled in aviation-related assessments due to their potential to exceed ambient air quality standards. PM_{10} and $\text{PM}_{2.5}$ are emitted from both exhaust and non-exhaust sources and are of particular concern for human health.

These pollutants are subject to legally binding limit values under the Air Quality Standards Regulations 2022 (S.I. No. 739 of 2022), which transpose the Ambient Air Quality Directive (2008/50/EC) into Irish law. The selected pollutants are also consistent with the Irish EPA's Air Dispersion Modelling Guidance Note (AG4, 2020), which recommends focusing on those with the greatest potential to exceed ambient standards and affect nearby receptors.

Other pollutants such as carbon monoxide (CO), benzene, and volatile organic compounds (VOCs) were not included in this assessment. This approach is consistent with FAA's Air Quality Handbook and ACRP Report 179, which identify nitrogen oxides (NO_x), particulate matter (PM), and sulphur dioxide (SO_2) as the primary pollutants of concern for turbine and diesel aircraft. Lead was not considered because the aircraft operate on Jet-A fuel using Continental CD-155 diesel engines, which do not contain lead. CO emissions from Jet-A/diesel aircraft engines such as the Continental CD-155 are significantly lower than those from Avgas-fuelled piston engines due to lean-burn operation and higher combustion efficiency. ICAO certification data and FAA guidance confirm that CO emission indices for Jet-A engines are substantially reduced compared to Avgas engines. CO emissions from these engines Also have limited spatial impact in open-air environments. Therefore, CO is a low-priority pollutant

for near-field dispersion modelling in this context. Benzene, while regulated on an annual basis, is not a primary combustion product of Jet-A fuel and is more associated with evaporative losses during fuel storage and handling. Similarly, VOC emissions from aircraft operations are minimal and primarily relevant for secondary pollutant formation (e.g., ozone), which is beyond the scope of local dispersion modelling. Therefore, excluding these pollutants is considered appropriate for this assessment.

Given the scale and nature of operations at Rathcool Aerodrome, the selected pollutants provide a robust and regulator-accepted basis for assessing compliance with ambient air quality standards and evaluating potential environmental impacts on nearby receptors, including residential dwellings and ecological features.

4.1 Air-Quality Limits (Ireland/EU) for Human Health and Vegetation

In Ireland, ambient air-quality objectives are set by Directive 2008/50/EC and transposed by S.I. No. 739/2022. For planning assessments, modelled project increments are combined with measured backgrounds of the same averaging time and compared with the statutory limit values (human health) and critical levels (vegetation/ecosystems), reported per calendar year with the worst year used for compliance, as per EPA AG4 (2020).

Table 4-1 details the relevant pollutants and associated limit values utilised in this assessment.

Table 4-1: Ambient Air Quality Standards for Human Health and Vegetation

Metric type	Pollutant	Averaging Period	Limit Value	Permitted Exceedances
Human health – limit values	NO ₂	1-hour (peak distribution)	200 µg/m ³	≤18 hours/yr (≈ 99.8th percentile).
		Annual mean	40 µg/m ³	—
	PM ₁₀	24-hour (daily mean)	50 µg/m ³	≤35 days/yr (≈ 90.4th percentile).
		Annual mean	40 µg/m ³	—
	PM _{2.5}	Annual mean	25 µg/m ³	—
	SO ₂ Sulphur dioxide (SO ₂)	1-hour	350 µg/m ³	≤24 hours/yr (≈ 25th-highest hour).
24-hour (daily mean)		125 µg/m ³	≤3 days/yr (≈ 4th-highest day).	
Ecological – critical levels	NO _x	Annual mean	30 µg/m ³	Protection of vegetation/ecosystems.
	SO ₂	Annual mean	20 µg/m ³	Protection of ecosystems.

The recast Ambient Air Quality Directive (Directive (EU) 2024/2881) tightens several human-health values and introduces new metrics (e.g., NO₂ daily 50 µg/m³ ≤18 days, PM_{2.5} daily 25

$\mu\text{g}/\text{m}^3 \leq 18$ days), approaching World Health Organisation guidance. These do not replace current compliance criteria until transposed; they are noted here for planning context.

4.2 Background Concentration

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland by the EPA for air quality management and assessment purposes.

The proposed development site falls into 'Zone B' of Ireland which is described by the EPA as 'Cork Conurbation'. It is expected that existing ambient air quality in the vicinity of the site is characteristic of a rural/suburban location with the primary source of air emissions such as particulate matter, NO_2 , and hydrocarbons likely to be of traffic, combustion and agriculture, and domestic fuel burning.

In conjunction with individual local authorities, the EPA undertakes ambient air quality monitoring at specific locations throughout the country in the urban and rural environment; an Air Quality Report based on data from monitoring stations and a number of mobile air quality units is developed on an annual basis.

The closest representative background monitoring to the site which continuously monitors for concentrations of nitrogen oxides (NO_2), PM_{10} , and $\text{PM}_{2.5}$ is located in Mallow (ca. 23km east of the site). The closest background monitoring to the site which continuously monitors for concentrations of sulphur dioxide (SO_2) is located at South Link Road, Co. Cork (ca. 40km southeast of the site). Air quality monitoring carried out at these locations is considered to be broadly representative of conditions that may be experienced at the site, with actual concentrations in the vicinity of the site likely to be lower. Therefore, this provides a conservative approach.

Table 4-2 provides a summary of background concentrations for relevant pollutants.

Table 4-2: Summary of Pollutant Background Concentrations (2024)

Monitoring Station	Pollutant	Averaging time	Concentration / exceedence	Limit
Mallow, Cork	NO ₂	Annual mean	13.4 µg/m ³	40 µg/m ³
		1-hour (values above 200 µg/m ³)	0	≤ 18 exceedances/year
	NO _x	Annual mean (Protection of vegetation/ecosystems)	28 µg/m ³ (2023 background)	30 µg/m ³
	PM ₁₀	Annual mean	10.1 µg/m ³	50 µg/m ³
		24-hour (values above 50 µg/m ³)	1	≤ 35 exceedances/year
	PM _{2.5}	Annual mean	6.4 µg/m ³	25 µg/m ³
	Ozone	Annual mean	47 µg/m ³	-
		24-hour (values above 120 µg/m ³)	0	≤ 25 exceedances/year
South Link Road, Cork	SO ₂	1-hour (values above 350 µg/m ³)	0	≤ 24 exceedances/year
		24-hour (values above 125 µg/m ³)	0	≤ 3 exceedances/year
		Annual mean (Protection of vegetation/ecosystems)	2.3	25 µg/m ³

4.3 Model Inputs

4.3.1 Source Information

4.3.1.1 Scenarios

Operations are dominated by light general-aviation movements (training/pleasure flights) by a Cessna 172 fitted with a Continental CD-155 (Jet-A/diesel) engine. Emissions were evaluated for two representative activity scenarios:

- **Scenario A** (typical hour): 1 LTO cycle per hour (2 movements/h)
- **Scenario B** (busiest hour): 5 LTO cycles per hour (10 movements/h; occurs during flight training)

The LTO cycle refers to the sequence of aircraft operations that occur close to the ground, specifically including taxiing, idling, take-off, climb-out, approach, landing roll, and taxi-in.

These phases are the primary source of aircraft emissions that impact ground-level air quality near aerodromes.

4.3.1.2 Landing-take-off (LTO) modes

The assessment utilised ICAO LTO modes with the default times-in-mode as a planning-grade basis (take off 0.7 min, climb-out 2.2 min, approach 4.0 min, taxi/idle 26 min in total). For Rathcool Aerodrome, which is a small aerodrome, the local taxi times were shortened to reflect the 145 m taxiway, with taxi-out set to 5 min and taxi-in set to 2 min (replacing the 26 min default). These time fractions drive the hour-average duty factors used in AERMOD. Duty factor calculation is completed using the following equation:

$$\frac{\text{LTO per hour} \times \text{time per LTO mode (min)}}{60}$$

Table 4-3 details the calculated duty factors for each LTO mode.

Table 4-3: LTO Operation Times

LTO mode	Time per LTO (min)	Duty factor @ 5 LTO/h	Duty factor @ 1 LTO/h
Taxi-out	5	0.4167	0.0833
Take-off	0.7	0.0583	0.0117
Climb-out	2.2	0.1833	0.0367
Approach	4	0.3333	0.0667
Landing roll	0.7	0.0583	0.0117
Taxi-in	2	0.1667	0.0333

4.3.1.2.1 Fuel Flow and Operating Modes

Emissions were estimated using the EMEP/EEA Air Pollutant Emission Inventory Guidebook (2019), Aviation Chapter, Tier-1 fuel-based method, which is the accepted approach for planning-grade studies. This method calculates pollutant mass as:

$$\text{Emission (g/s)} = \text{Emission Index (g/kg fuel)} \times \text{Fuel Burn (kg/s)}$$

Fuel flow by mode was based on manufacturer and handbook data for C172-class aircraft (C152/C172/C182) as compiled in the Guidebook, adjusted for the Continental CD-155 Jet-A/diesel engine. Power settings typical of LTO segments were applied:

- Take-off: 100% power
- Climb-out: 85% power
- Approach: 30% power

- Taxi/idle: 7% power

For a single average fuel consumption figure, 31 litres per hour (L/h) was utilised, which is consistent with small Jet-A piston/diesel engines. This was then scaled by the power fraction for each LTO mode to determine the fuel mass rate for each mode:

- Take-off: 31 L/h
- Climb-out: 26 L/h
- Approach: 9 L/h
- Taxi/idle: 2 L/h

Volume rates were converted to fuel mass rates using the Jet-A density of 0.80 kg/L. See Table 4-4 for this conversion:

Table 4-4: Fuel Mass Rate Calculation

Mode (power)	Volume rate (L/h)	Jet-A density	Fuel mass rate (kg/h)	Fuel mass rate (kg/s)
Take-off (100%)	31	0.8	24.8	0.006889
Climb-out (85%)	26.35		21.08	0.005856
Approach (30%)	9.3		7.44	0.002067
Taxi/idle (7%)	2.17		1.736	0.000482
Landing roll (7%)	2.17		1.736	0.000482

4.3.1.2.2 Pollutant Emission Rates

Fuel-based emission indices were adopted for each pollutant (grams of pollutant per kilogram of fuel consumed (g/kg fuel)). Table 4-5 details the emission index used and the basis for its use:

Table 4-5: Emission Indices

Pollutant	Emission index used	Basis and justification
NO_x (modelled as NO _x , converted to NO ₂ in-model)	32.6 g/kg	Aircraft studies show the NO _x emission index increases with power; in-use take-off plume measurements report roughly 10–22 g per kg fuel (Herndon 2008: Commercial aircraft engine emissions characterisation of in-use aircraft at Hartsfield–Jackson Atlanta International Airport). A comprehensive review documents higher values at high thrust and substantial variability across engines and modes (Masiol and Harrison, 2014: Aircraft engine exhaust emissions and other airport-related contributions to ambient air pollution: A review). The NO _x value (32.6 g/kg) is at the upper end of the

Pollutant	Emission index used	Basis and justification
		measured range for piston engines and slightly above the measured value for modern diesel aircraft engines, providing a conservative estimate for regulatory compliance. NO₂ is not assigned an EI. NO_x has been converted to NO₂ in AERMOD using OLM with hourly ozone measurements sourced from Mallow, Co. Cork monitoring station, per regulatory guidance
PM ₁₀	1.395 g/kg	Aviation inventories commonly treat aircraft exhaust PM as PM ₁₀ , with PM _{2.5} approximately equal to PM ₁₀ (ratio of approx. 1.0) in the EMEP/EEA aviation chapter. The chosen value is within diesel exhaust ranges making it conservative for a small aviation diesel engine.
PM _{2.5}	1.300 g/kg	Set approximately equal to PM ₁₀ in line with the EMEP/EEA aviation convention. Using a slightly lower value than PM ₁₀ is a cautious implementation.
SO ₂	1.20 g/kg	SO₂ is calculated directly from the fuel's sulphur content because, on combustion, sulphur is assumed to oxidise completely to SO₂. Using the EMEP/EEA default value of 600 ppm sulphur for Jet-A, the fuel-based SO₂ emission index is: $(2 \times 600) / 1000 = 1.20 \text{ g SO}_2 \text{ per kg fuel.}$

Emission indices in Table 4-5 were then applied to the fuel mass rates (as calculated in Table 4-4) to obtain instantaneous emission rates (g/s). Finally, hour-average rates were formed by applying the Table 4-3 duty factor for each LTO mode.

Table 4-6 and 4-7 details the subsequent calculated pollutant emission rates for each scenario, based on the methodology as detailed above.

Table 4-6: **Scenario A (1LTO)** – Emission Rates

Mode	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Unit
Taxi-out	0.001296	0.000056	0.000052	0.000048	g/s
Take-off	0.002586	0.000111	0.000103	0.000095	g/s
Climb-out	0.006909	0.000296	0.000276	0.000255	g/s
Approach	0.004433	0.00019	0.000177	0.000163	g/s
Landing roll	0.000181	0.000008	0.000008	0.000007	g/s
Taxi-in	0.000519	0.000022	0.000021	0.000019	g/s

Table 4-7: **Scenario B (5LTO)** – Emission Rates

Mode	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Unit
Taxi-out	0.006482	0.000278	0.000259	0.000239	g/s
Take-off	0.012931	0.000554	0.000517	0.000477	g/s

Mode	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Unit
Climb-out	0.034543	0.00148	0.001382	0.001273	g/s
Approach	0.022167	0.00095	0.000887	0.000817	g/s
Landing roll	0.000907	0.000039	0.000036	0.000033	g/s
Taxi-in	0.002593	0.000111	0.000104	0.000095	g/s

4.3.2 Source Parameters

For AERMOD, the aircraft LTO modes were combined into four practical AREA sources reflecting where emissions occur on the airfield. 'Runway' combines take-off and landing roll (ground-roll phases on the paved strip). 'Taxiway' combines taxi-out and taxi-in (idle/taxi movement on the taxiway). The airborne segments closest to the runway are kept separate: 'Climb-out' represents the initial departure segment beyond the runway end, and 'approach' represents the final arrival segment before the threshold. The 'climb-out' and 'approach' segments were extended to 500m beyond each runway end to capture the near-field LTO fraction that drives ground-level concentrations at receptors, which is consistent with AG4 practice for local impacts.

An hourly emission flux for each AREA source was then generated, with units $\text{g s}^{-1} \text{m}^{-2}$, suitable for generating an hourly emissions (HOUREMIS) file. Note that NO₂ is obtained from model chemistry (OLM) rather than a fixed EI.

Assumptions were made for the following, to provide a worst-case scenario:

- 365 days per year operation; and
- 16 hours per day operation.

Under Scenario A, this equates to 11,680 aircraft movements per annum, based on one LTO cycle per hour. Under Scenario B, this equates to 58,400 movements per annum, based on 10 LTO cycles per hour. These scenarios significantly exceed the actual expected flight activity of 4,440 movements per year.

Table 4-8 and Table 4-9 detail the source parameters for each scenario:

Table 4-8: **Scenario A (1 LTO)** - Source Parameters

Input Type	Value			
Source ID	Runway	Taxiway	Climb out	Approach
Type of source	Area			
Coordinates X	501327	501345.9	500619.1	501802.5
Coordinates Y	5772865	5772715.1	5772642.9	5773025.5
NO _x emission rate ($\text{g s}^{-1} \text{m}^{-2}$)	2.077327E-07	1.229675E-06	4.606000E-07	2.955333E-07
PM ₁₀ emission rate ($\text{g s}^{-1} \text{m}^{-2}$)	8.933934E-09	5.284553E-08	1.973333E-08	1.266667E-08

Input Type	Value			
PM _{2.5} emission rate (g s ⁻¹ m ⁻²)	8.333333E-09	4.948916E-08	1.840000E-08	1.180000E-08
SO ₂ emission rate (g s ⁻¹ m ⁻²)	7.657658E-09	4.609785E-08	1.700000E-08	1.086667E-08
Release height (m) Generally, up to 50% of the source height:	2m	0.5m	23m	28m
Initial Vertical Dimension AERMOD modelling guidance defines initial vertical dimension for a surface-based source as the vertical dimension of a source divided by 2.15:	0.93m	0.23m	10.7m	13.02m
Elevation	74.75m	84.82m	71.96m	86.63m
X Length	740m	147.6m	500m	500m
Y Length	18m	10m	30m	30m
Area	13320 m ²	1476 m ²	15000 m ²	15000 m ²

Table 4-9: **Scenario B (5 LTO)** - Source Parameters

Input Type	Value			
Source ID	Runway	Taxiway	Climb out	Approach
Type of source	Area			
Coordinates X	501327	501345.9	500619.1	501802.5
Coordinates Y	5772865	5772715.1	5772642.9	5773025.5
NO _x emission rate (g s ⁻¹ m ⁻²)	1.038889E-06	6.148374E-06	2.302867E-06	1.477800E-06
PM ₁₀ emission rate (g s ⁻¹ m ⁻²)	4.451952E-08	2.635501E-07	9.866667E-08	6.333333E-08
PM _{2.5} emission rate (g s ⁻¹ m ⁻²)	4.151652E-08	2.459350E-07	9.213333E-08	5.913333E-08
SO ₂ emission rate (g s ⁻¹ m ⁻²)	3.828829E-08	2.262873E-07	8.486667E-08	5.446667E-08

Input Type	Value			
Release height (m)	2m	0.5m	23m	28m
Initial Vertical Dimension	0.93m	0.23m	10.7m	13.02m
Elevation	74.75m	84.82m	71.96m	86.63m
X Length	740m	147.6m	500m	500m
Y Length	18m	10m	30m	30m
Area	13320 m ²	1476 m ²	15000 m ²	15000 m ²

4.3.2.1 *NO_x to NO₂ Conversion (OLM with hourly ozone)*

AERMOD directly predicts concentrations of total NO_x, whereas health-based air quality standards apply specifically to NO₂. Near emission sources, NO_x is predominantly nitric oxide (NO), which rapidly reacts with ambient ozone (O₃) to form NO₂. However, this conversion is constrained by the availability of ozone.

To account for this chemistry, AERMOD's Tier-3 Ozone Limiting Method (OLM) was applied. OLM simulates hour-by-hour mixing of plume NO with ambient O₃ and limits conversion based on available ozone. The hourly O₃ dataset used for this purpose was sourced from the Mallow air quality monitoring station in Co. Cork. AERMOD ensures that NO₂ does not exceed total NO_x and includes any directly emitted NO₂.

OLM is a widely accepted approach for near-field assessments and is more conservative than fixed-fraction methods. The resulting hourly NO₂ concentrations support compliance checks against both short-term (1-hour 99.8th percentile) and long-term (annual mean) air quality standards.

4.3.3 AERMET

AERMOD incorporates a meteorological pre-processor called AERMET which screens and processes essential meteorological and surface data. AERMET utilises surface characteristics such as surface roughness(z0), Bowen ratio, and Albedo, along with hourly meteorological observations of wind speed, wind direction, temperature, precipitation, relative humidity, and cloud cover. Additionally, twice-daily upper air soundings are employed. This data is essential for estimating boundary layer parameters, which are crucial for accurate air dispersion modelling.

4.3.3.1 *Meteorological Data*

Moorepark, Co. Cork was chosen as the most representative meteorological station to simulate weather conditions at the Proposed Development site. Five full years of hourly sequential meteorological data from Moorepark (2020-2024) were extracted and screened within AERMET.

A wind rose for the worst-case year is provided in Appendix A.

4.3.3.2 Surface Parameters

Surface roughness is a measure of the aerodynamic roughness of the surface and is associated with the height of the roughness element. Albedo is a measure of the reflectivity of the surface, whilst the Bowen ratio is a measure of the availability of surface moisture (EPA AG4, 2020).

Table 4-10 and Table 4-11 provide the surface characteristics utilised in the model for the lands surrounding Moorepark meteorological station:

Table 4-10: Surface Roughness within a 1km radius of Moorepark Meteorological Station

Sector (degrees)	Land use description	Surface roughness (m)
305-75	Grassland	0.04025
75-135	Urban	1.00
135-255	Grassland	0.04025
255-305	Urban	1.00

Table 4-11: Albedo and Bowen Ratio based on a 10km x 10km grid centred on Moorepark Meteorological Station

Area weighed land-use classification	Albedo	Bowen ratio
90% Grassland; 10% Urban	0.28175	0.995

4.3.4 Geophysical Data

Building Downwash

Any physical structure that is in close proximity to an emission point may hinder the dispersion characteristics through an occurrence known as 'building downwash'. The potential for building downwash is dependent on the relevant differences in height between the stack and the building. Building downwash occurs when pollutants emitted from a stack are influenced by nearby structures, causing them to be drawn down to ground level more quickly. BPIP processes the dimensions and orientations of buildings to determine how they affect pollutant dispersion. This information is then used by the AERMOD dispersion model to accurately simulate the impact of buildings on pollutant behaviour. By incorporating BPIP's downwash calculations, AERMOD can provide more precise predictions of pollutant concentrations.

The AERMOD BPIP processor can only be applied to account for building downwash from point sources; therefore, where area sources have been included, building downwash has been manually applied to the model by calculating the initial vertical dimension (height of side divided by 2.15). If the source is located on or near a building, the initial vertical dimension should be based on the adjacent building height.

Terrain

The presence of terrain can lead to significantly higher ambient concentrations than would occur in the absence of the terrain feature. In particular, where there is significant relative difference in elevation between the source and off-site receptors, large ground level concentrations can result. Thus, the accurate determination of terrain elevation in air dispersion models is vital (EPA AG4, 2020).

Complex terrain is defined as terrain above the effective stack height (which is the stack height plus an additional height due to the buoyancy of a hotter than ambient air plume). Intermediate terrain is defined as terrain above stack height but below the effective stack height. Simple terrain is terrain below the top of the stack. According to AG4, when modelling in a region of flat terrain, no digital mapping of terrain will be necessary. However, in Ireland, areas of flat terrain will be quite rare and digital mapping of terrain may be necessary in many cases. Therefore, to account for the presence of terrain in the current assessment, the AERMOD terrain pre-processor (AERMAP) has been applied using terrain data for the area which has been sourced in the USGS Digital Elevation Model (DEM) format.

4.3.5 Receptors

A refined receptor grid with dense spacing around the aerodrome and discrete receptors at the nearest dwellings, ecologically sensitive areas, and amenity areas were used to model impacts.

Two receptor grids of a variable density were created around the Site as shown in Figure 4-1. These grids were based on Cartesian grids with the Site at the centre. An outer grid extended to 3000m with concentrations calculated at 100m intervals. A smaller grid was also created which extended to 1000m with concentrations calculated at 50m intervals. Boundary receptor locations were also placed along the boundary of the Site at 25m intervals, and a series of receptor points were created along the boundary of Blackwater River (Cork/Waterford) Special Area of Conservation (SAC). This gave a total of 5280 calculation points for the model.

Figure 4-1 displays the receptor grids around the Site of the Proposed Development:

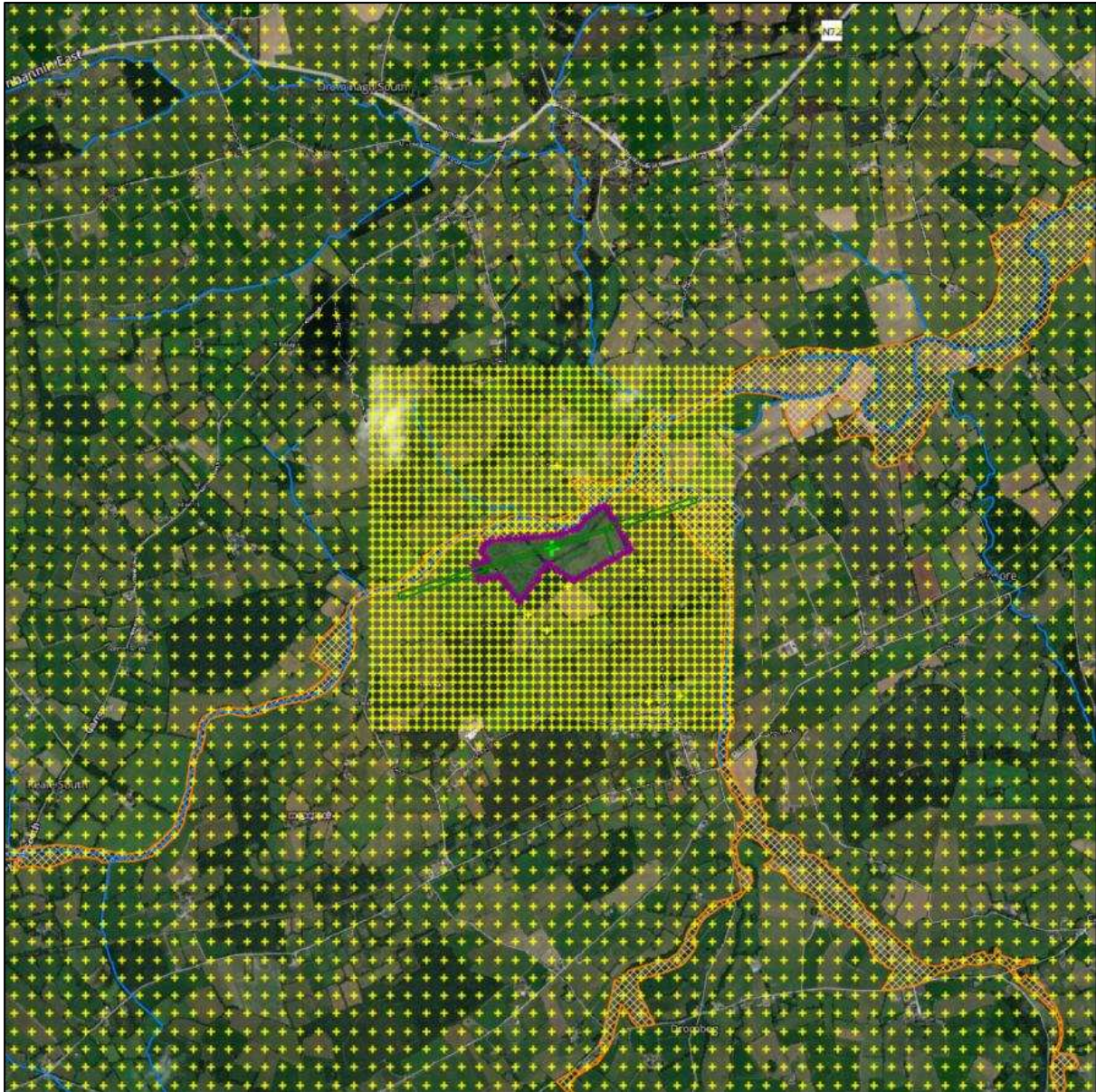


Figure 4-1: Receptor Grid

The area around the Site is predominantly rural with surrounding land uses of agriculture, forestry, and a number of one-off residential dwellings. Blackwater River (Cork/Waterford) SAC is also located in close proximity to the site.

Figure 4-2 shows the location of each sensitive receptor within the study area. Four (4 No.) discrete sensitive receptors were identified in the surrounding area for the purpose of assessing human health impacts; three (3 No.) of which are residential dwellings and one (1 No.) has been identified as a football pitch (this has been labelled R4 in Figure 4-2).

To assess ecological impacts, spatial data for Blackwater River (Cork/Waterford) SAC boundary were sourced as GIS shapefiles from the National Parks and Wildlife Service (NPWS) and imported into the mapping environment to ensure precise georeferencing and delineation of the SAC extent. The area of the SAC in close proximity to the site is highlighted

orange in Figure 4-2. A receptor line (highlighted yellow) has been created along the boundary of the SAC, closest to the Proposed Development Site.

For human health impacts, results have been provided for the worst-case year (2020) at each of the 4 No. sensitive receptors, along with the highest overall ground-level concentration (GLC) experienced within the receptor grid. For ecological impacts, results have been provided for the highest GLC experienced within Blackwater River (Cork/Waterford) SAC in the worst-case year (2020).

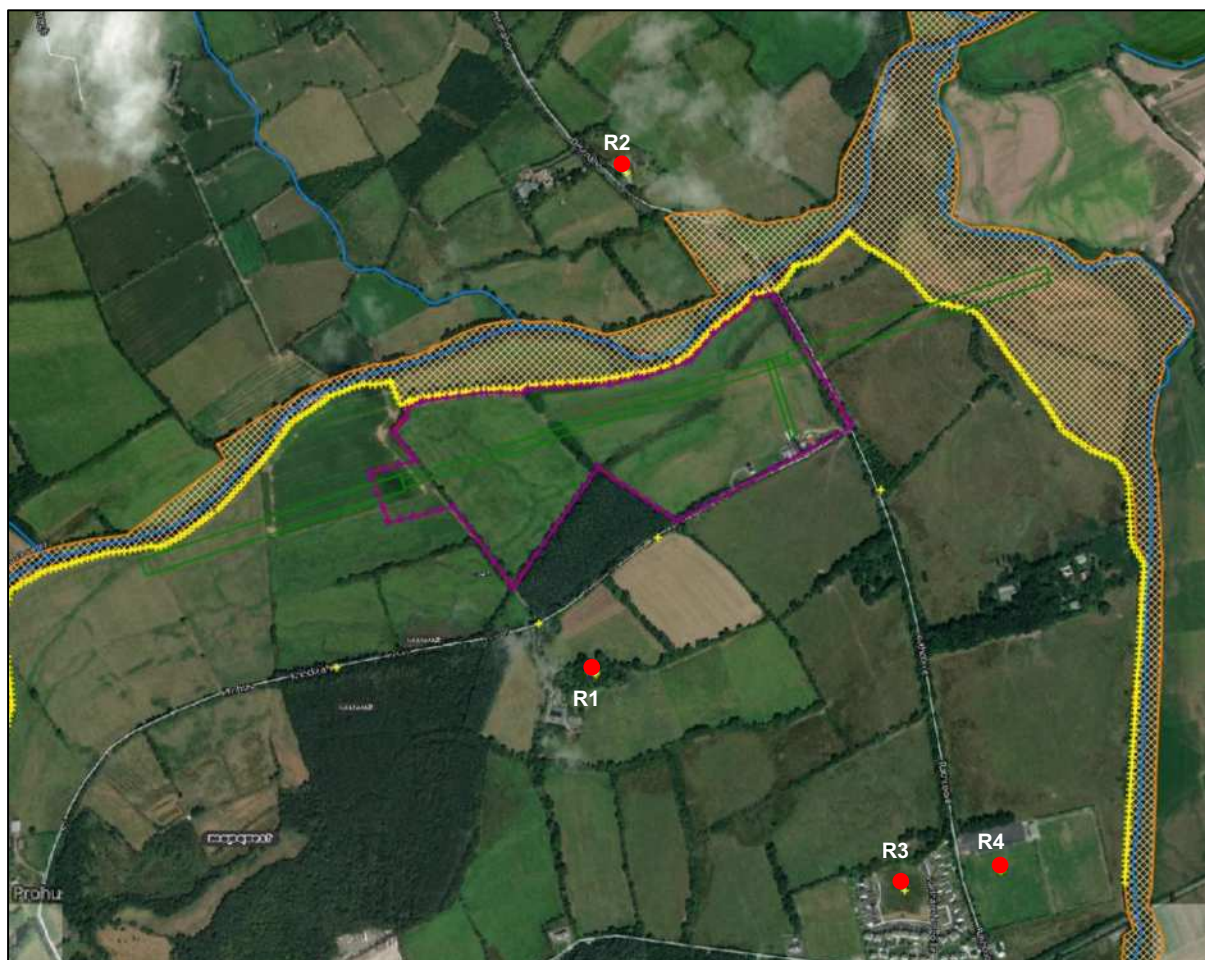


Figure 4-2: Discrete Sensitive Receptors

5 RESULTS

The dispersion modelling results are presented in the following tables. Results are provided for each sensitive receptor (SR) to illustrate the spatial distribution of impacts across the study area. In addition, the highest GLC observed across all receptors and modelled periods is reported for each pollutant and scenario, to clearly identify the maximum potential impact.

Two operational scenarios are assessed:

- **Scenario A:** Typical hour (1 LTO per hour);
- **Scenario B:** Busy training hour (5 LTO per hour).

For regulatory compliance, the following statistics are reported:

- **Nitrogen dioxide (NO₂):** 1-hour 99.8th percentile (equivalent to no more than 18 exceedances per year) and annual mean, with NO_x-to-NO₂ conversion performed using AERMOD's Ozone Limiting Method (OLM) and an hourly ozone dataset.
- **Nitrogen oxides (NO_x, as NO + NO₂):** Annual mean, for assessment against the vegetation and ecosystem protection standard (30 µg/m³ annual mean), in line with EU and national air quality regulations and EMEP/EEA guidance.
- **Particulate matter ≤10 µm (PM₁₀):** 24-hour statistic equivalent to no more than 35 exceedances of 50 µg/m³ per year (i.e., the 36th-highest daily mean or 90.4th percentile), and annual mean.
- **Particulate matter ≤2.5 µm (PM_{2.5}):** 24-hour 95th-percentile daily mean (where relevant) and annual mean.
- **Sulphur dioxide (SO₂):** 1-hour 99.73rd percentile (no more than 24 exceedances per year) and annual mean.

Results are presented both with and without the inclusion of background concentrations; compliance is assessed against the total (modelled increment plus background). The worst-case year from the five-year meteorological dataset (Moorepark, Co. Cork) is identified as the year producing the highest value of the relevant regulatory statistic at the most impacted sensitive receptor (2020).

Table 5-1: Air Dispersion Modelling Results: **Scenario A (1LTO)**

Pollutant	Averaging Period	Limit	Receptor ID	Coordinates (UTM)		Modelled Increment ($\mu\text{g}/\text{m}^3$)	Background	Total ($\mu\text{g}/\text{m}^3$) (increment + background)	% of Concentration Limit
				X	Y				
NO ₂	1-hour (peak distribution)	200 $\mu\text{g}/\text{m}^3$ Exceedances: ≤18 hours/yr (≈ 99.8th percentile).	R1	500978.1	5772278.7	0.7454312	52.3 $\mu\text{g}/\text{m}^3$	53.0454312	26.5%
			R2	501033.9	5773196.7	0.9084382		53.2084382	26.6%
			R3	501545.9	5771879.6	0.340668		52.640668	26.3%
			R4	501721.6	5771916.2	0.2942737		52.5942737	26.3%
			Highest Overall GLC (Site boundary)	501352.9	577268	10.51133		62.81133	31.4%
	Annual Mean	40 $\mu\text{g}/\text{m}^3$	R1	500978.1	5772278.7	0.01228789	13.4 $\mu\text{g}/\text{m}^3$	13.41228789	33.5%
			R2	501033.9	5773196.7	0.02518852		13.42518852	33.6%

Pollutant	Averaging Period	Limit	Receptor ID	Coordinates (UTM)		Modelled Increment ($\mu\text{g}/\text{m}^3$)	Background	Total ($\mu\text{g}/\text{m}^3$) (increment + background)	% of Concentration Limit
				X	Y				
PM₁₀	24-hour (daily mean)	50 $\mu\text{g}/\text{m}^3$ ≤35 days/yr (≈ 90.4th percentile).	R3	501545.9	5771879.6	0.005074042		13.40507404	33.5%
			R4	501721.6	5771916.2	0.00378229		13.40378229	33.5%
			Highest Overall GLC (Site boundary)	501363.1	5772876	0.193064		13.593064	34.0%
			R1	500978.1	5772278.7	0.001724882	17.7 $\mu\text{g}/\text{m}^3$	17.70172488	35.4%
			R2	501033.9	5773196.7	0.002750582		17.70275058	35.4%
			R3	501545.9	5771879.6	0.000812589		17.70081259	35.4%
			R4	501721.6	5771916.2	0.000792209		17.70079221	35.4%
			Highest Overall GLC	501374.8	5772693	0.02528907		17.72528907	35.5%

Pollutant	Averaging Period	Limit	Receptor ID	Coordinates (UTM)		Modelled Increment ($\mu\text{g}/\text{m}^3$)	Background	Total ($\mu\text{g}/\text{m}^3$) (increment + background)	% of Concentration Limit
				X	Y				
			(Site boundary)						
	Annual Mean	40 $\mu\text{g}/\text{m}^3$	R1	500978.1	5772278.7	0.0005858660	10.1 $\mu\text{g}/\text{m}^3$	10.10058587	25.3%
			R2	501033.9	5773196.7	0.0012020800		10.10120208	25.3%
			R3	501545.9	5771879.6	0.0002420012		10.100242	25.3%
			R4	501721.6	5771916.2	0.0002324172		10.10023242	25.3%
			Highest Overall GLC (Site boundary)	501363.1	5772876	0.009218238		10.10921824	25.3%
PM _{2.5}	Annual Mean	25 $\mu\text{g}/\text{m}^3$	R1	500978.1	5772278.7	0.0005466821	6.4 $\mu\text{g}/\text{m}^3$	6.400546682	25.6%
			R2	501033.9	5773196.7	0.001122049		6.401122049	25.6%

Pollutant	Averaging Period	Limit	Receptor ID	Coordinates (UTM)		Modelled Increment ($\mu\text{g}/\text{m}^3$)	Background	Total ($\mu\text{g}/\text{m}^3$) (increment + background)	% of Concentration Limit
				X	Y				
SO ₂	1-hour	350 $\mu\text{g}/\text{m}^3$ ≤ 24 hours/yr ($\approx$ 25th-highest hour).	R3	501545.9	5771879.6	0.000225804	18.4 $\mu\text{g}/\text{m}^3$	6.400225804	25.6%
			R4	501721.6	5771916.2	0.000216885		6.400216885	25.6%
			Highest Overall GLC (Site boundary)	501363.1	5772876	0.008615718		6.408615718	25.6%
			R1	500978.1	5772278.7	0.02320721	18.4 $\mu\text{g}/\text{m}^3$	18.43320721	5.3%
			R2	501033.9	5773196.7	0.02890717		18.43890717	5.3%
SO ₂	1-hour	350 $\mu\text{g}/\text{m}^3$ ≤ 24 hours/yr ($\approx$ 25th-highest hour).	R3	501545.9	5771879.6	0.01031247		18.42031247	5.3%
			R4	501721.6	5771916.2	0.01101406	18.4 $\mu\text{g}/\text{m}^3$	18.42101406	5.3%
			Highest Overall GLC	501352.9	5772681	0.3669984		18.7769984	5.4%

Pollutant	Averaging Period	Limit	Receptor ID	Coordinates (UTM)		Modelled Increment ($\mu\text{g}/\text{m}^3$)	Background	Total ($\mu\text{g}/\text{m}^3$) (increment + background)	% of Concentration Limit
				X	Y				
			(Site boundary)						
NO _x (Protection of vegetation/ ecosystems)	Annual mean	30 $\mu\text{g}/\text{m}^3$	Highest GLC in Blackwater River (Cork/Waterford) SAC	501058	5772829	0.1160304	28 $\mu\text{g}/\text{m}^3$	28.1160304	93.7%
SO ₂ Protection of vegetation/ ecosystems)	Annual mean	20 $\mu\text{g}/\text{m}^3$	Highest GLC Blackwater River (Cork/Waterford) SAC	501058	5772829	0.004277535	2.3 $\mu\text{g}/\text{m}^3$	2.30427754	11.5%

Table 5-2 Air Dispersion Modelling Results: **Scenario B (5LTO)**

Pollutant	Averaging Period	Limit	Receptor ID	Coordinates (UTM)		Modelled Increment ($\mu\text{g}/\text{m}^3$)	Background	Total ($\mu\text{g}/\text{m}^3$) (increment + background)	% of Concentration Limit
				X	Y				
NO ₂	1-hour (peak distribution)	200 $\mu\text{g}/\text{m}^3$ Exceedance s: ≤ 18 hours/yr (≈ 99.8 th percentile).	R1	500978.1	5772278.7	3.7273	52.3 $\mu\text{g}/\text{m}^3$ (No exceedances)	56.027255	28.0%
			R2	501033.9	5773196.7	4.5424		56.842369	28.4%
			R3	501545.9	5771879.6	1.7034		54.003402	27.0%
			R4	501721.6	5771916.2	1.4714		53.771424	26.9%
			Highest Overall GLC (Site boundary)	501352.9	5772681	52.5569		104.8569	52.4%
	Annual Mean	40 $\mu\text{g}/\text{m}^3$	R1	500978.1	5772278.7	0.06144157	13.4 $\mu\text{g}/\text{m}^3$	13.46144157	33.7%
			R2	501033.9	5773196.7	0.12594920		13.5259492	33.8%

Pollutant	Averaging Period	Limit	Receptor ID	Coordinates (UTM)		Modelled Increment ($\mu\text{g}/\text{m}^3$)	Background	Total ($\mu\text{g}/\text{m}^3$) (increment + background)	% of Concentration Limit
				X	Y				
			R3	501545.9	5771879.6	0.02537182		13.42537182	33.6%
			R4	501721.6	5771916.2	0.02436301		13.42436301	33.6%
			Highest Overall GLC (Site boundary)	501363.1	5772876	0.9650868		14.3650868	35.9%
PM ₁₀	24-hour (daily mean)	50 $\mu\text{g}/\text{m}^3$ ≤ 35 days/yr (≈ 90.4 th percentile).	R1	500978.1	5772278.7	0.0086	17.7 $\mu\text{g}/\text{m}^3$	17.70861423	35.4%
			R2	501033.9	5773196.7	0.0137		17.71371731	35.4%
			R3	501545.9	5771879.6	0.0041		17.70405839	35.4%
			R4	501721.6	5771916.2	0.004		17.70395421	35.4%

Pollutant	Averaging Period	Limit	Receptor ID	Coordinates (UTM)		Modelled Increment ($\mu\text{g}/\text{m}^3$)	Background	Total ($\mu\text{g}/\text{m}^3$) (increment + background)	% of Concentration Limit
				X	Y				
	Annual Mean	40 $\mu\text{g}/\text{m}^3$	Highest Overall GLC (Site boundary)	501374.8	5772693	0.1261163	10.1 $\mu\text{g}/\text{m}^3$	17.8261163	35.7%
			R1	500978.1	5772278.7	0.002925444		10.10292544	25.3%
			R2	501033.9	5773196.7	0.005997906		10.10599791	25.3%
			R3	501545.9	5771879.6	0.001208054		10.10120805	25.3%
			R4	501721.6	5771916.2	0.001160052		10.10116005	25.3%
			Highest Overall GLC (Site boundary)	501363.1	5772876	0.04597586		10.14597586	25.4%

Pollutant	Averaging Period	Limit	Receptor ID	Coordinates (UTM)		Modelled Increment ($\mu\text{g}/\text{m}^3$)	Background	Total ($\mu\text{g}/\text{m}^3$) (increment + background)	% of Concentration Limit
				X	Y				
PM _{2.5}	Annual Mean	25 $\mu\text{g}/\text{m}^3$	R1	500978.1	5772278.7	0.002730463	6.4 $\mu\text{g}/\text{m}^3$	6.402730463	25.6%
			R2	501033.9	5773196.7	0.005596622		6.405596622	25.6%
			R3	501545.9	5771879.6	0.001127401		6.401127401	25.6%
			R4	501721.6	5771916.2	0.001082554		6.401082554	25.6%
			Highest Overall GLC (Site boundary)	501363.1	5772876	0.04289815		6.44289815	25.85%
SO ₂	1-hour	350 $\mu\text{g}/\text{m}^3$ ≤24 hours/yr (≈ 25th-highest hour).	R1	500978.1	5772278.7	0.1158133	18.41 $\mu\text{g}/\text{m}^3$	18.5258133	5.3%
			R2	501033.9	5773196.7	0.1443903		18.5543903	5.3%
			R3	501545.9	5771879.6	0.0515361		18.4615361	5.3%

Pollutant	Averaging Period	Limit	Receptor ID	Coordinates (UTM)		Modelled Increment ($\mu\text{g}/\text{m}^3$)	Background	Total ($\mu\text{g}/\text{m}^3$) (increment + background)	% of Concentration Limit
				X	Y				
			R4	501721.6	5771916.2	0.0550457		18.4650457	5.3%
			Highest Overall GLC (Site boundary)	501352.9	5772681	1.829633		20.239633	5.8%
NO _x (Protection of vegetation/ ecosystems)	Annual mean	30 $\mu\text{g}/\text{m}^3$	Highest GLC in Blackwater River (Cork/Waterford) SAC	501057.7	5772829	0.5802585	28 $\mu\text{g}/\text{m}^3$	28.5802585	95%
SO ₂ Protection of vegetation/ ecosystems)	Annual mean	20 $\mu\text{g}/\text{m}^3$	Highest GLC Blackwater River (Cork/Waterford) SAC	501058	5772829	0.0213835	2.3 $\mu\text{g}/\text{m}^3$	2.3213835	11.6%

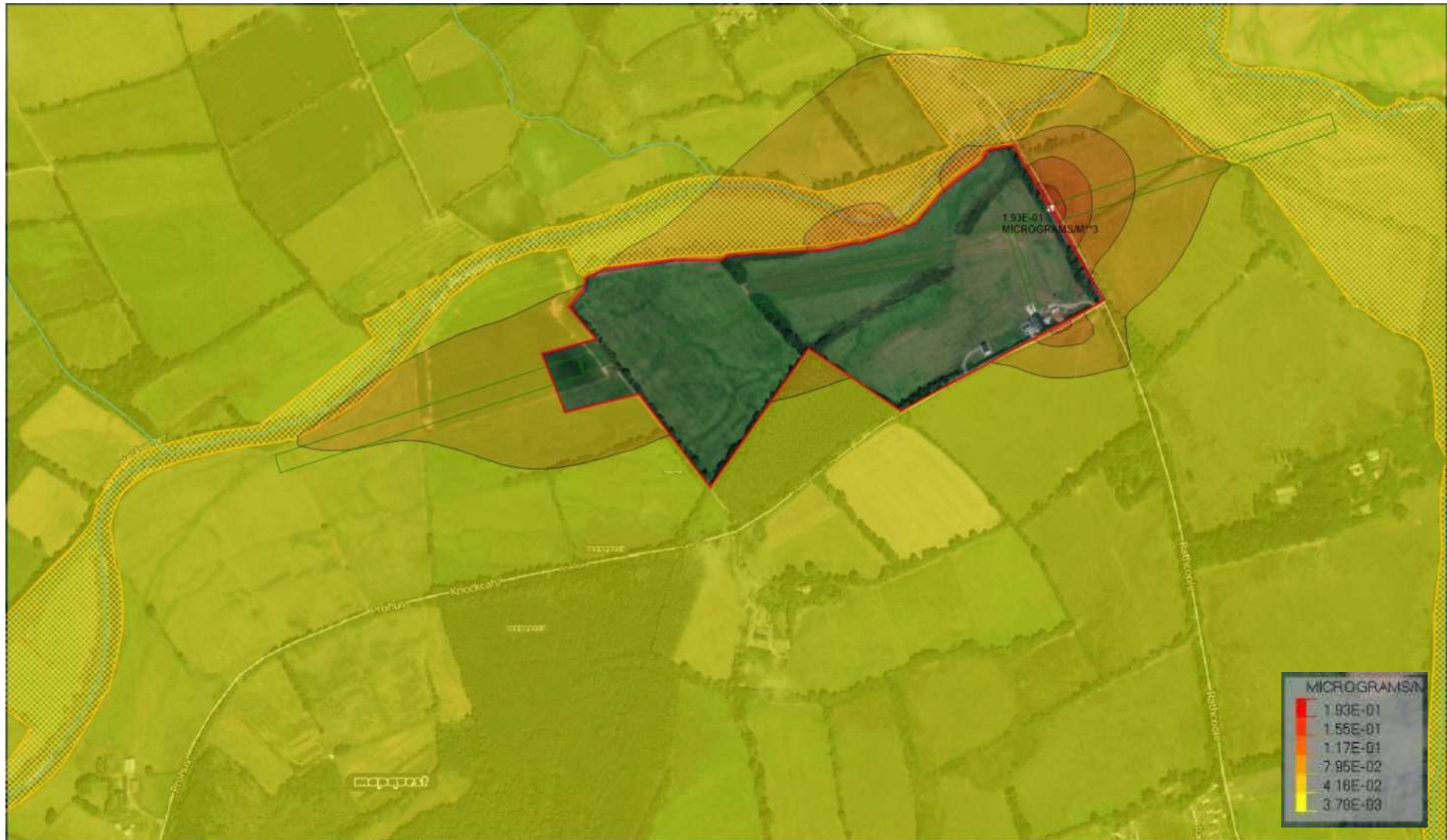


Figure 5-1: NO₂ Annual Average Spatial Distribution (Scenario A)

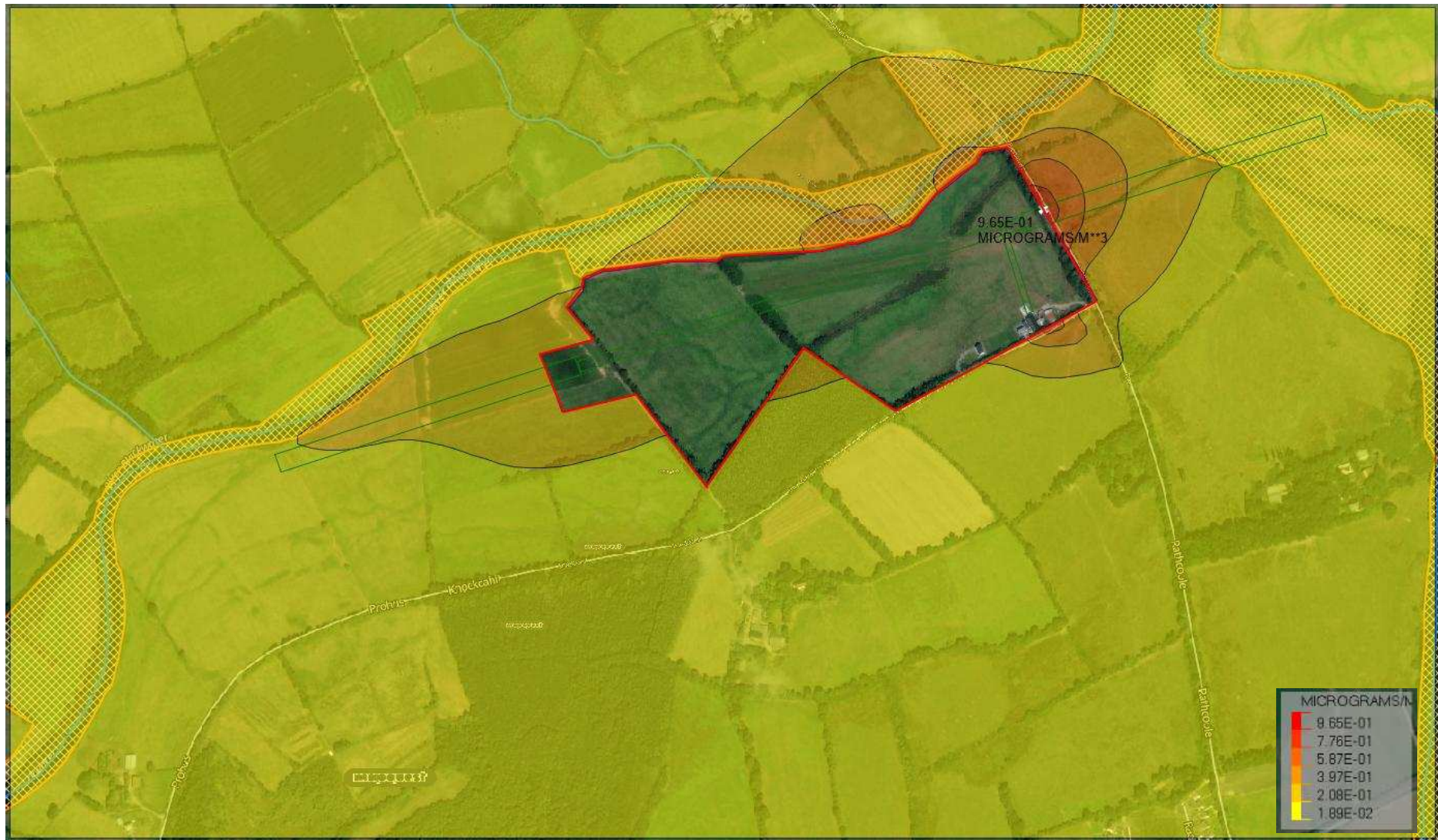


Figure 5-2: NO₂ Annual Average Spatial Distribution (Scenario B)

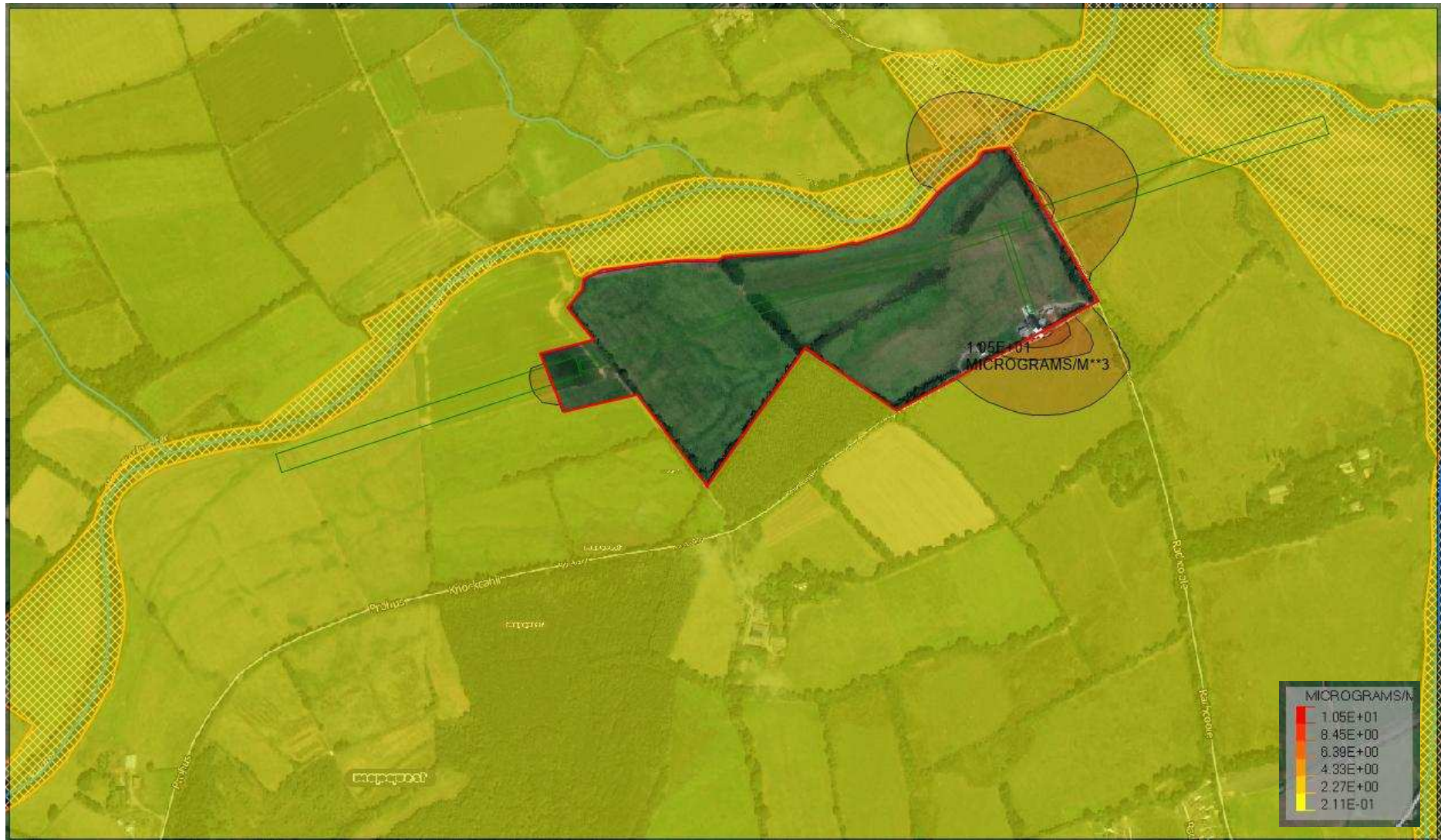


Figure 5-3: NO₂ 1-hour Spatial Distribution (Scenario A)

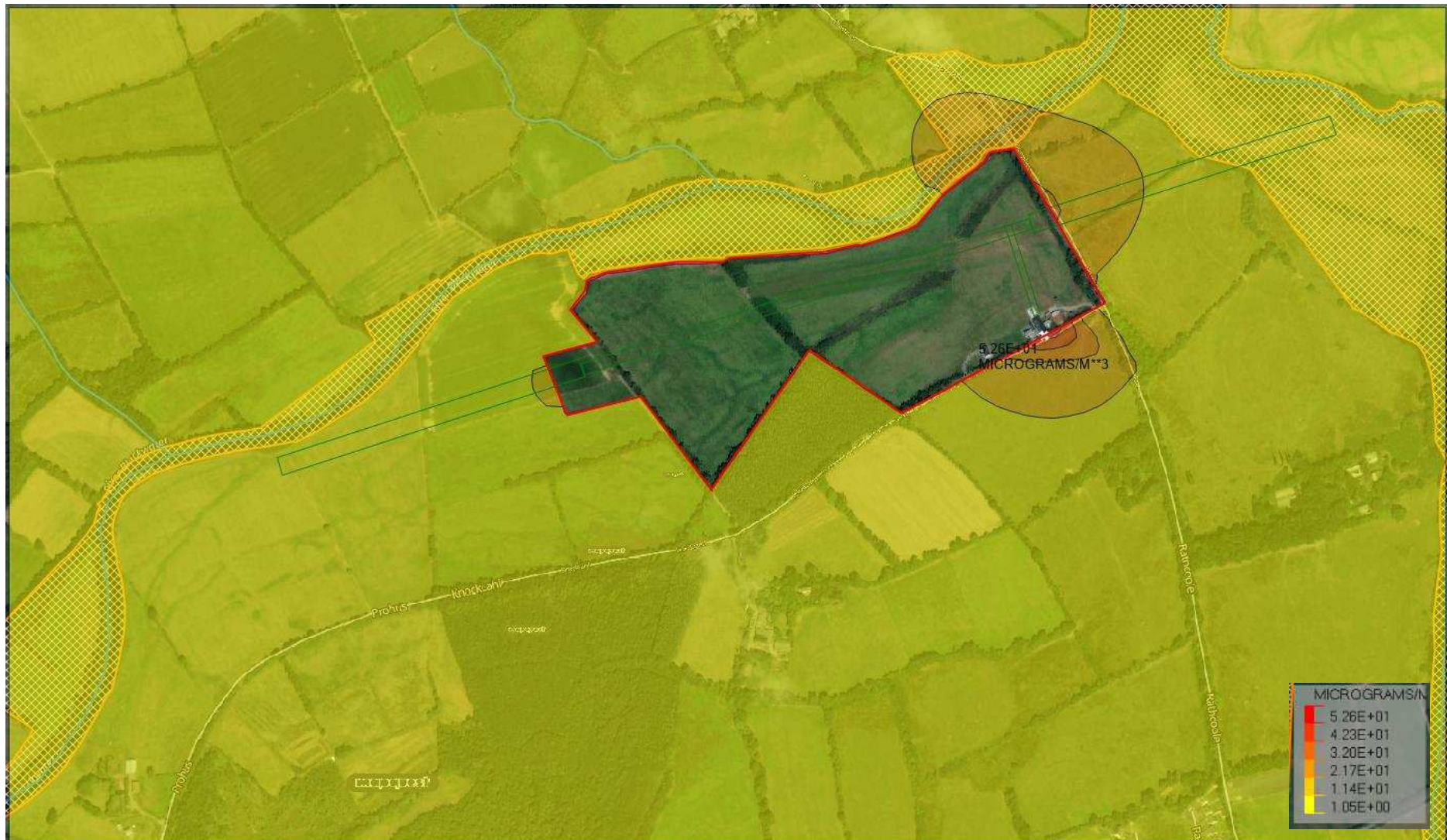


Figure 5-4: NO₂ 1-hour Spatial Distribution (Scenario B)



Figure 5-5: PM₁₀ 24-hour Spatial Distribution (Scenario A)



Figure 5-6: PM₁₀ 24-hour Spatial Distribution (Scenario B)



Figure 5-7: PM₁₀ Annual Average Spatial Distribution (Scenario A)



Figure 5-8: PM₁₀ Annual Average Spatial Distribution (Scenario B)



Figure 5-9: PM_{2.5} Annual Average Spatial Distribution (Scenario A)



Figure 5-10: PM_{2.5} Annual Average Spatial Distribution (Scenario B)

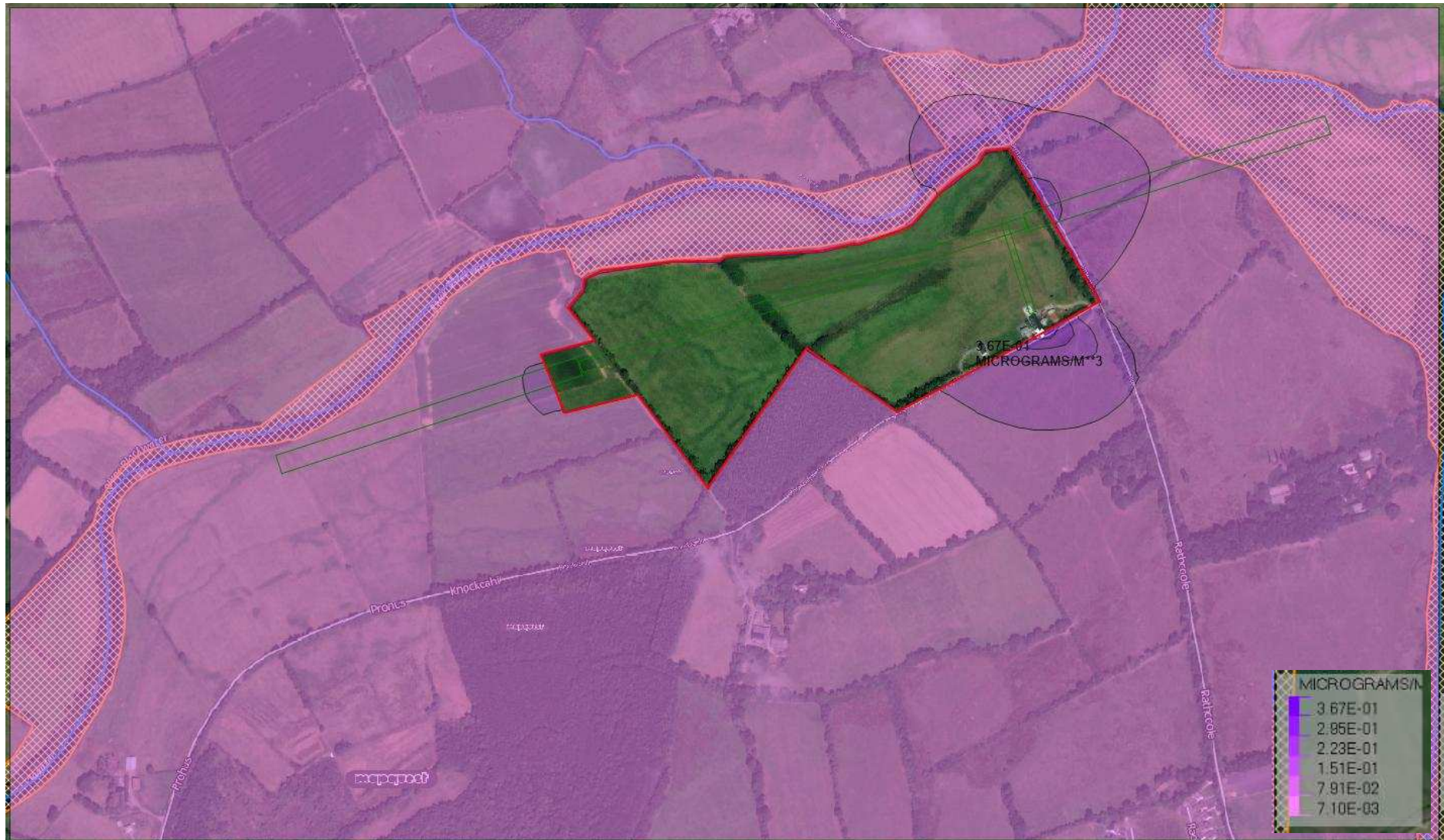


Figure 5-11: SO₂ 1-hour Spatial Distribution (Scenario A)

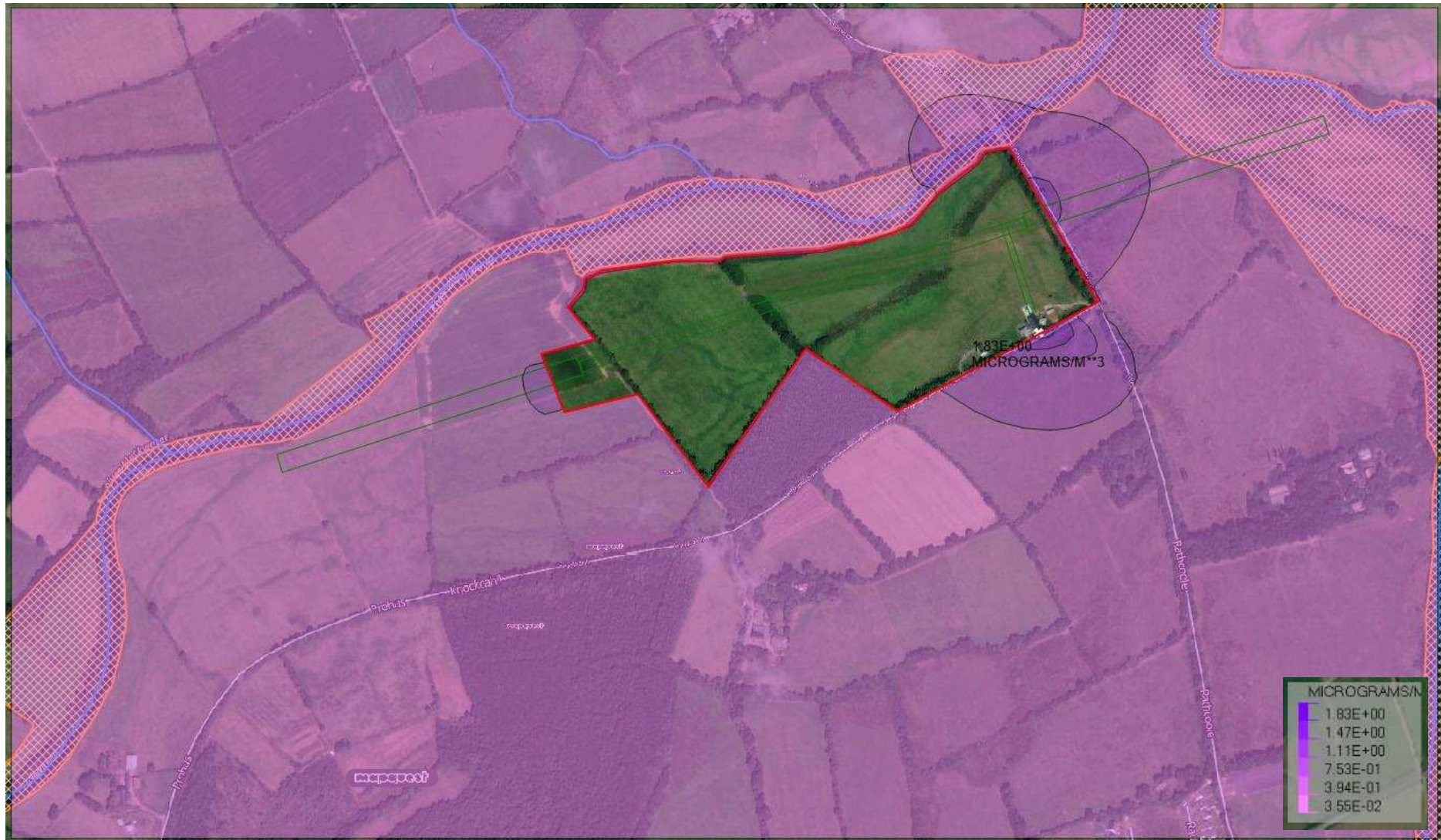


Figure 5-12: SO₂ 1-hour Spatial Distribution (Scenario B)

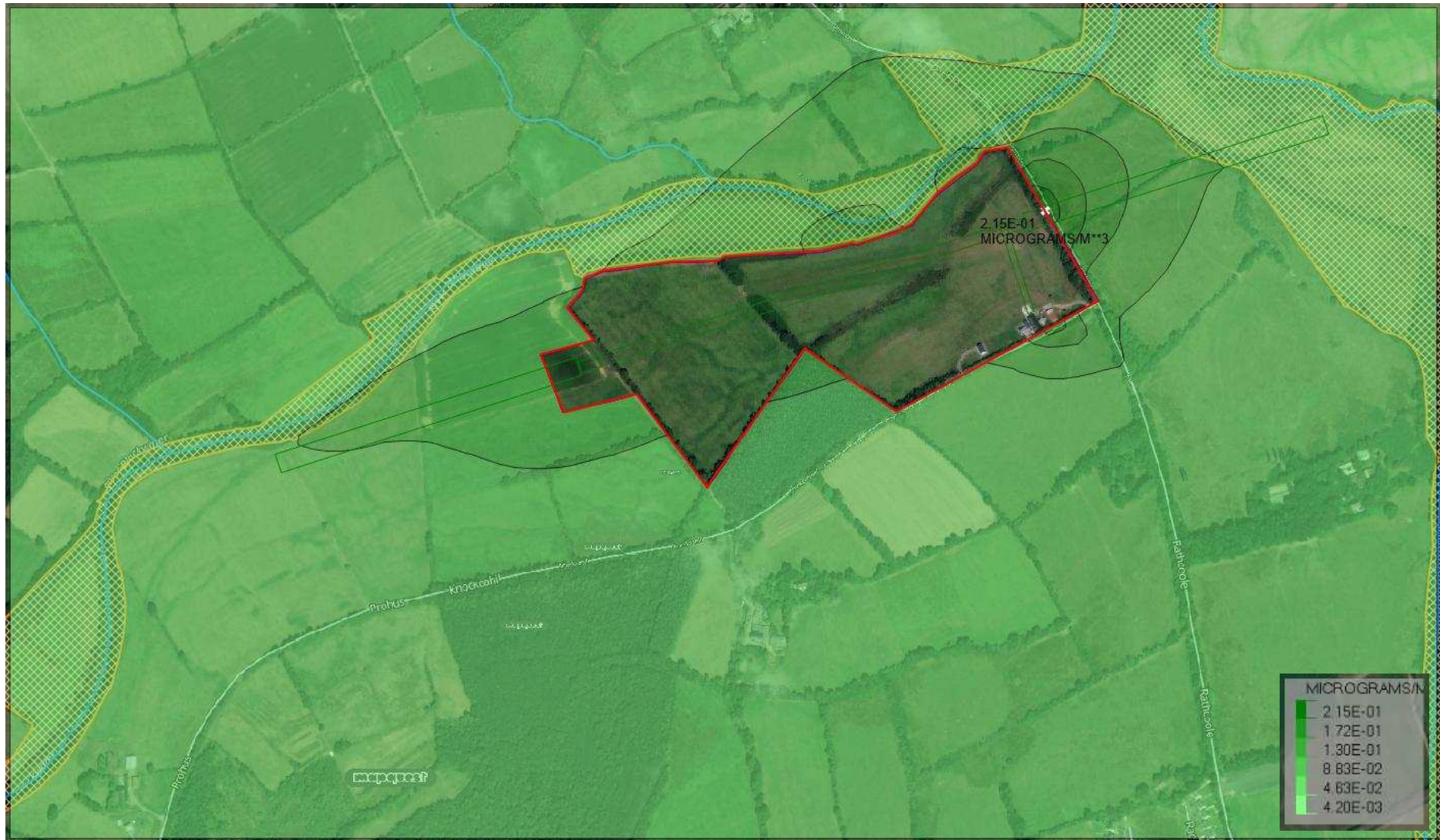


Figure 5-13: NOx Annual Average – Ecosystems (Scenario A)

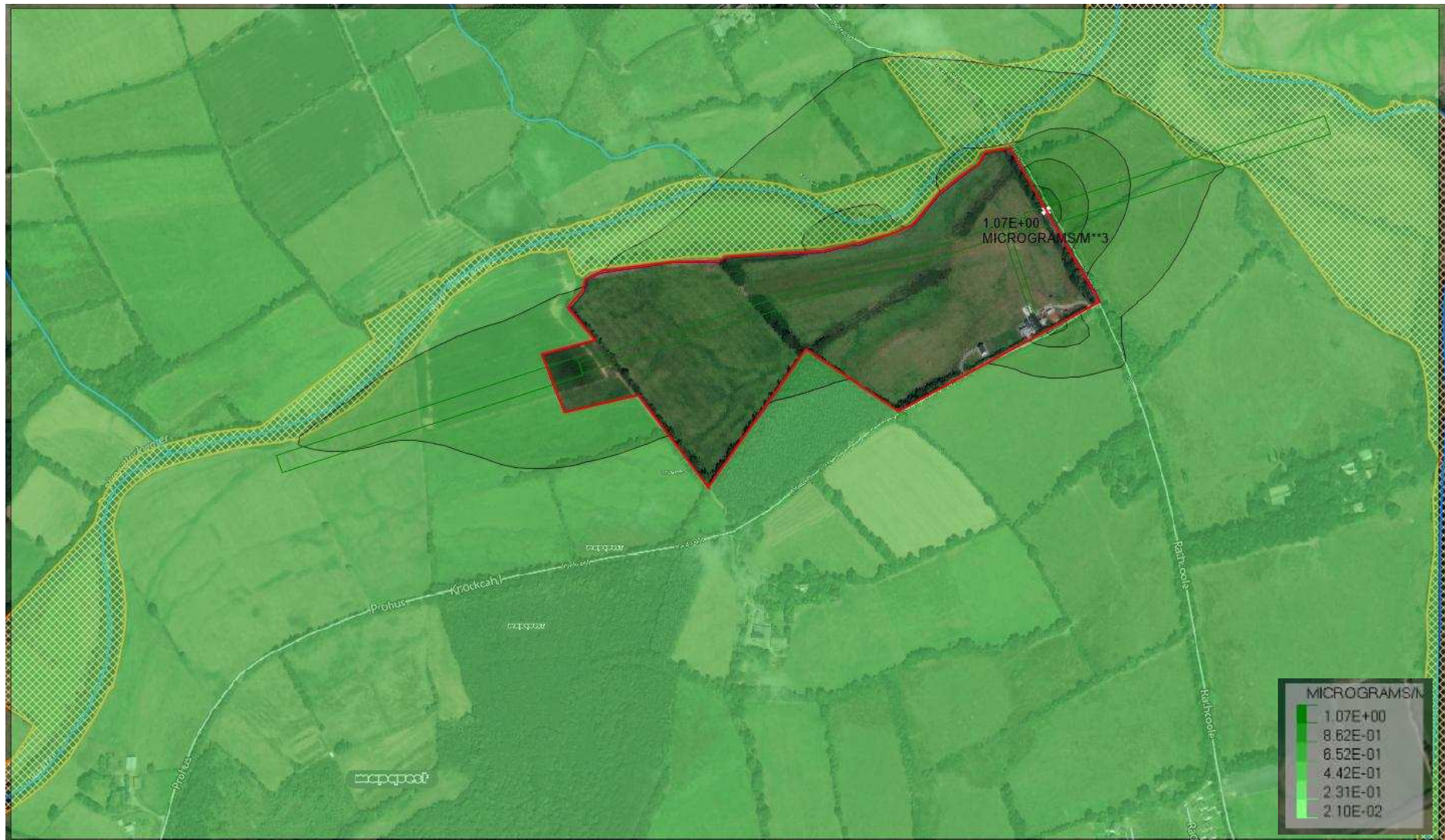


Figure 5-14: NOx Annual Average – Ecosystems (Scenario B)

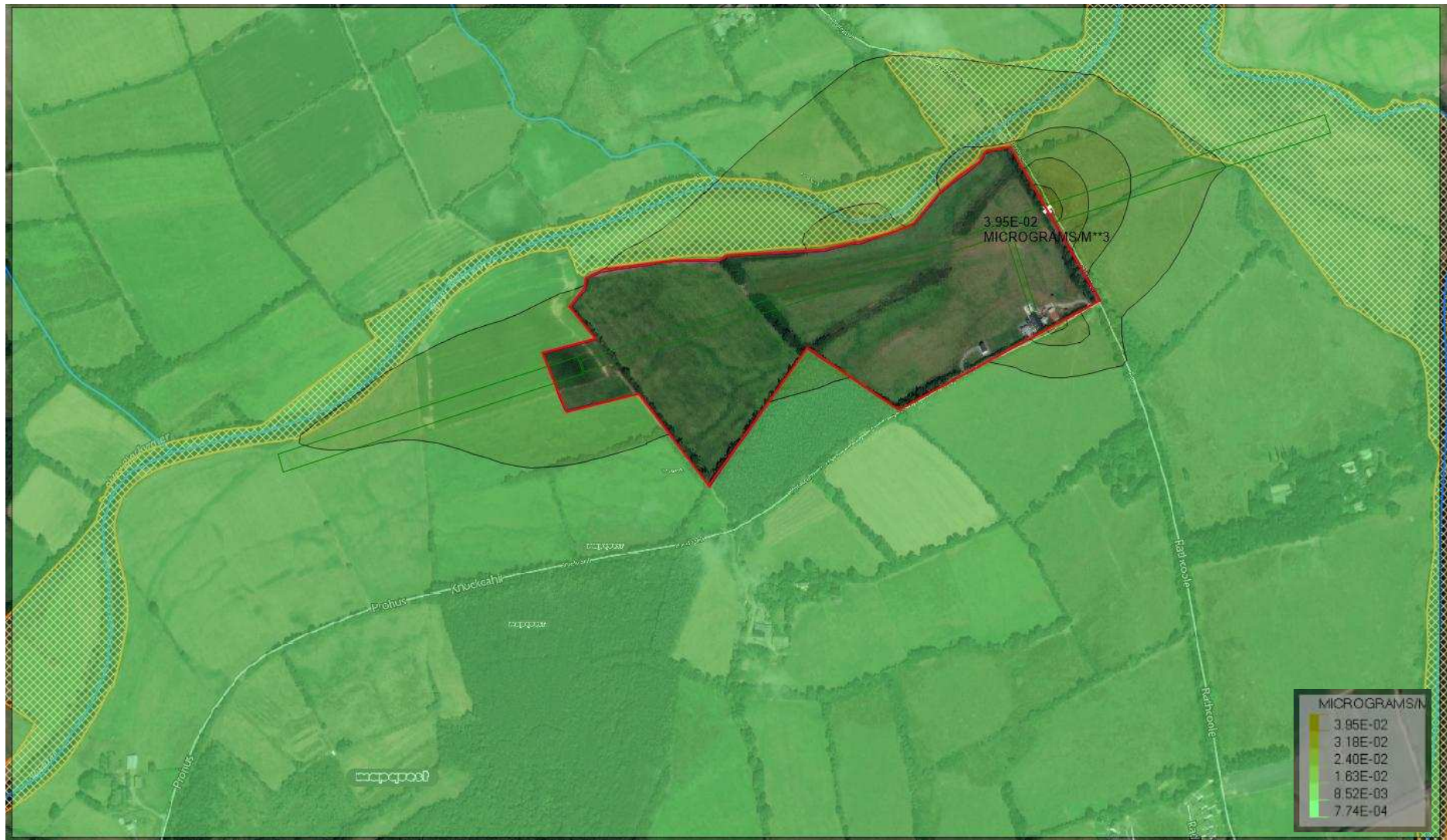


Figure 5-15: SO2 Annual Average – Ecosystems (Scenario A)

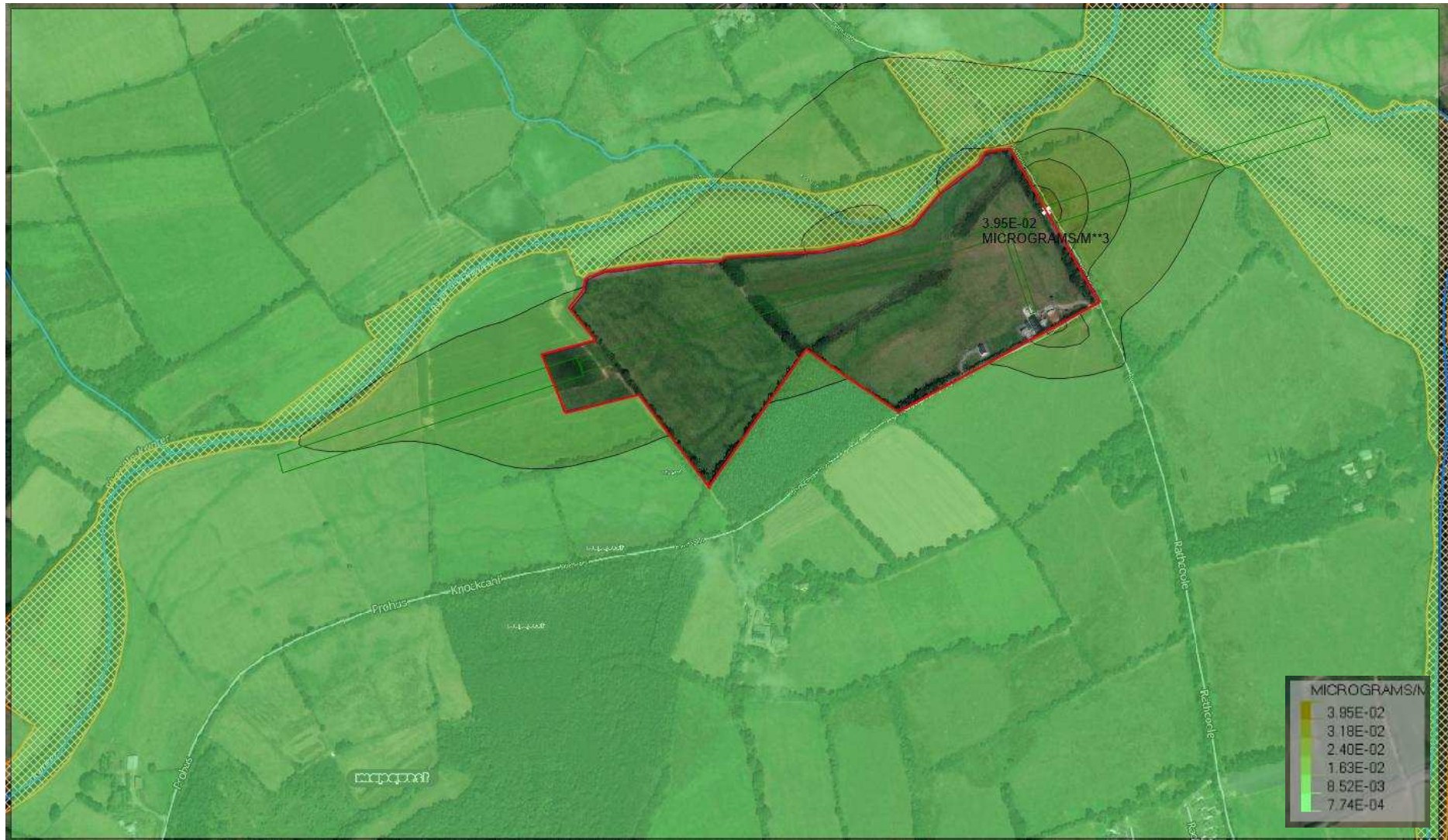


Figure 5-16: SO2 Annual Average – Ecosystems (Scenario B)

6 DISCUSSION

The air dispersion modelling results demonstrate that emissions from Rathcool Aerodrome will not result in exceedances of any Irish or EU ambient air quality standards for human health or ecological protection under either typical or worst-case operational scenarios.

Key findings:

- **Human Health:** Predicted concentrations of NO₂, PM₁₀, PM_{2.5}, and SO₂ at all sensitive receptors are well below statutory limits, with the highest values typically less than 40% of the relevant thresholds. The maximum short-term NO₂ and SO₂ concentrations occur at the site boundary, not at sensitive, and remain comfortably within compliance margins.
- **Ecosystem Protection:** The annual mean NO_x at the Blackwater River SAC approaches, but does not exceed, the ecosystem protection standard (95% of the 30 µg/m³ limit in Scenario B). It is noted that background concentrations of NO_x at Mallow Air Quality Monitoring Station are likely to be higher than what is experienced in the vicinity of the site. This reflects the conservative nature of the modelling (worst-case meteorology, continuous operation, and maximum activity rates). SO₂ levels at the SAC are very low relative to the ecosystem standard.
- **Spatial Distribution:** The highest concentrations are confined to the immediate vicinity of the runway and taxiway, with rapid dispersion and dilution resulting in much lower concentrations at residential and ecological receptors.
- **Background Air Quality:** The area is characterised by good background air quality, with low measured concentrations of NO₂, PM₁₀, PM_{2.5}, and SO₂ at the nearest EPA monitoring stations. The incremental impact of the proposed development is therefore minor relative to existing conditions.
- **Model Conservatism:** The assessment incorporates conservative assumptions, including continuous operation, maximum hourly activity, and worst-case meteorological years. Under Scenario A, this equates to 11,680 aircraft movements per annum, based on one LTO cycle per hour. Under Scenario B, this equates to 58,400 movements per annum, based on 10 LTO cycles per hour. These scenarios significantly exceed the actual expected flight activity of 4,440 movements per year. Therefore, actual impacts are likely to be lower in practice.

Conclusion:

The proposed development will not cause or contribute to any exceedance of ambient air quality standards for human health or ecosystems. The predicted impacts are minor and localised, with no significant risk to nearby residents or sensitive ecological sites. Ongoing compliance with air quality legislation is expected.

Looking ahead, Rathcool Flying Club is also committed to a robust sustainability roadmap that builds on these positive findings. Central to this strategy is the planned transition of the club's Cessna aircraft fleet to Sustainable Aviation Fuel (SAF) by 2030, supported by the availability of SAF at Cork airport from 2025. This shift is expected to deliver substantial environmental

benefits, including up to a 90% reduction in CO₂ emissions, a 40% decrease in noise levels, and a 40% increase in aircraft range, thereby reducing the frequency of refuelling stops.

In the longer term (2040–2050), the club aims for all aircraft to operate exclusively on SAF or to transition to fully electric models. These advancements will further reduce noise and significantly lower operating costs, reinforcing the club's commitment to sustainable and responsible aviation.

Complementing these measures, the club intends to install solar panels on the hangar roof to generate clean, renewable power for onsite operations. This initiative will not only reduce reliance on grid electricity but also support the club's broader environmental objectives.

Together, these actions constitute a comprehensive approach to reducing the club's overall impact on ambient air quality. Through these ongoing and future initiatives, Rathcool Flying Club demonstrates its leadership in environmental stewardship and its commitment to sustainable growth.

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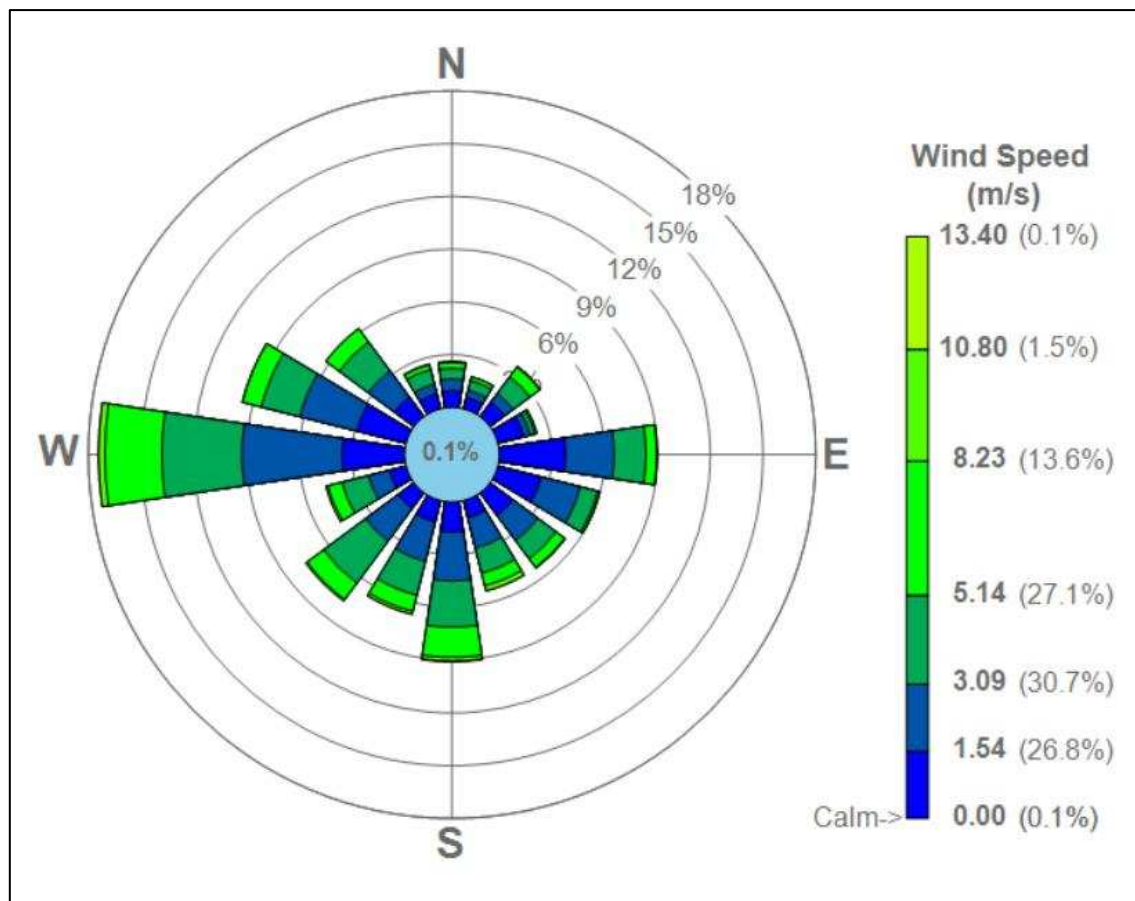
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Appendix A. Windrose for worst-case year (2020) at Moorepark Meteorological Station



Appendix 10-1

Appendix 10-1

Location A -Eircode P51T9PK

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
60'	2023-08-22 11:00:00	00:03:34	59.0	72.6	63.1	49.0
60'	2023-08-22 12:00:00	01:00:00	42.3	71.5	38.8	30.7
60'	2023-08-22 13:00:00	01:00:00	37.8	66.9	39.5	32.9
60'	2023-08-22 14:00:00	01:00:00	39.1	61.1	40.6	31.9
60'	2023-08-22 15:00:00	01:00:00	40.3	66.4	39.6	31.3
60'	2023-08-22 16:00:00	01:00:00	40.5	66.6	42.0	31.7
60'	2023-08-22 17:00:00	01:00:00	39.5	60.5	41.9	30.9
60'	2023-08-22 18:00:00	01:00:00	37.4	66.0	39.7	29.8
60'	2023-08-22 19:00:00	01:00:00	40.7	69.9	37.6	28.6
60'	2023-08-22 20:00:00	01:00:00	53.6	86.4	38.5	27.6
60'	2023-08-22 21:00:00	01:00:00	44.8	82.5	34.4	24.9
60'	2023-08-22 22:00:00	01:00:00	40.8	71.4	31.8	23.6
60'	2023-08-22 23:00:00	01:00:00	32.8	58.2	34.1	24.1
60'	2023-08-23 00:00:00	01:00:00	28.0	57.1	29.1	23.7
60'	2023-08-23 01:00:00	01:00:00	40.8	70.0	26.2	23.5
60'	2023-08-23 02:00:00	01:00:00	32.4	64.2	24.3	23.6
60'	2023-08-23 03:00:00	01:00:00	67.6	97.0	28.2	23.6
60'	2023-08-23 04:00:00	01:00:00	28.1	54.9	28.9	23.6
60'	2023-08-23 05:00:00	01:00:00	31.9	51.8	34.9	24.1
60'	2023-08-23 06:00:00	01:00:00	46.6	75.6	46.1	28.1
60'	2023-08-23 07:00:00	01:00:00	36.8	62.3	37.9	28.4
60'	2023-08-23 08:00:00	01:00:00	37.5	66.1	39.3	29.6
60'	2023-08-23 09:00:00	01:00:00	45.7	73.1	42.2	28.0
60'	2023-08-23 10:00:00	01:00:00	42.3	68.8	42.1	27.7
60'	2023-08-23 11:00:00	01:00:00	39.1	69.4	38.1	27.4
60'	2023-08-23 12:00:00	01:00:00	36.3	59.7	39.1	29.6
60'	2023-08-23 13:00:00	00:39:37	36.8	58.8	39.3	31.2

Figure 11-1: Ambient and baseline noise measurements at Location A -Eircode P51T9PK

Location B -Eircode P51VY47

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	LAFmin [dB]	L 10.0 % [dB]	L
60'	2023-08-22 12:00:00	00:44:16	49.1	86.1	28.3	45.6	
60'	2023-08-22 13:00:00	01:00:00	40.8	63.9	28.1	44.1	
60'	2023-08-22 14:00:00	01:00:00	44.5	70.9	28.0	43.5	
60'	2023-08-22 15:00:00	00:59:20	42.7	77.8	27.7	43.8	
Type	Start	Duration	LAeq [dB]	LAFmax [dB]	LAFmin [dB]	L 10.0 % [dB]	L
60'	2023-08-22 18:00:00	00:10:04	50.8	67.4	31.7	53.4	
60'	2023-08-22 19:00:00	01:00:00	49.8	74.0	29.1	52.6	
60'	2023-08-22 20:00:00	01:00:00	46.2	73.9	25.9	49.3	
60'	2023-08-22 21:00:00	01:00:00	39.0	58.7	24.3	42.3	
60'	2023-08-22 22:00:00	01:00:00	36.4	63.5	24.1	37.3	
60'	2023-08-22 23:00:00	01:00:00	33.7	54.0	24.4	37.0	
60'	2023-08-23 00:00:00	01:00:00	31.2	56.7	24.3	31.9	
60'	2023-08-23 01:00:00	01:00:00	33.1	60.3	25.0	33.6	
60'	2023-08-23 02:00:00	01:00:00	28.7	55.9	23.9	29.1	
60'	2023-08-23 03:00:00	01:00:00	32.2	59.0	24.7	31.1	
60'	2023-08-23 04:00:00	01:00:00	33.2	59.3	24.5	34.8	
60'	2023-08-23 05:00:00	01:00:00	37.4	60.1	24.6	37.3	
60'	2023-08-23 06:00:00	01:00:00	42.8	67.2	25.8	44.9	
60'	2023-08-23 07:00:00	01:00:00	45.6	64.3	27.0	49.5	
60'	2023-08-23 08:00:00	01:00:00	45.8	68.4	27.8	49.1	
60'	2023-08-23 09:00:00	01:00:00	45.2	66.2	25.4	48.6	
60'	2023-08-23 10:00:00	01:00:00	44.0	66.5	25.1	47.7	
60'	2023-08-23 11:00:00	01:00:00	49.1	76.3	24.8	47.1	
60'	2023-08-23 12:00:00	01:00:00	42.6	66.1	25.4	43.6	
60'	2023-08-23 13:00:00	00:52:41	41.2	61.7	27.7	44.5	

Figure10-2: Ambient and baseline noise measurements at Location B -Eircode P51VY47

Location C -Eircode P51FWP9

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	LAFmin [dB]	L 10.0 % [dB]	L 90 % [dB]
10'	2023-08-22 13:30:00	00:10:00	44.6	56.2	32.2	47.8	
10'	2023-08-22 13:40:00	00:10:00	40.6	53.6	32.0	43.6	
10'	2023-08-22 13:50:00	00:10:00	41.2	54.4	33.0	44.7	
10'	2023-08-22 14:00:00	00:10:00	48.0	68.1	31.8	46.6	
10'	2023-08-22 14:10:00	00:10:00	59.5	82.7	34.6	52.7	
10'	2023-08-22 14:20:00	00:10:00	42.0	54.0	35.1	45.2	
10'	2023-08-22 14:30:00	00:10:00	42.7	53.2	34.1	46.1	
10'	2023-08-22 14:40:00	00:10:00	42.6	56.0	35.1	46.2	
10'	2023-08-22 14:50:00	00:10:00	41.1	51.9	32.0	45.0	
10'	2023-08-22 15:00:00	00:10:00	42.1	53.8	32.1	45.9	
10'	2023-08-22 15:10:00	00:10:00	40.8	52.9	31.8	44.9	
10'	2023-08-22 15:20:00	00:10:00	41.5	55.0	32.7	45.4	
10'	2023-08-22 15:30:00	00:10:00	41.8	54.9	32.4	45.8	
10'	2023-08-22 15:40:00	00:10:00	42.2	52.4	33.0	45.8	
10'	2023-08-22 15:50:00	00:10:00	42.0	57.3	32.7	44.6	
10'	2023-08-22 16:00:00	00:10:00	43.9	61.6	32.2	47.0	
10'	2023-08-22 16:10:00	00:10:00	44.0	55.7	32.6	47.5	
10'	2023-08-22 16:20:00	00:10:00	44.3	58.0	32.8	47.9	
10'	2023-08-22 16:30:00	00:10:00	42.3	53.1	34.0	45.7	
10'	2023-08-22 16:40:00	00:10:00	58.3	77.5	32.2	58.9	
10'	2023-08-22 16:50:00	00:10:00	58.7	76.3	32.8	60.2	
10'	2023-08-22 17:00:00	00:10:00	46.1	65.3	31.2	48.4	
10'	2023-08-22 17:10:00	00:10:00	44.3	57.7	31.5	47.7	
10'	2023-08-22 17:20:00	00:10:00	46.6	55.7	34.7	50.1	
10'	2023-08-22 17:30:00	00:10:00	43.6	56.4	32.7	47.0	
10'	2023-08-22 17:40:00	00:10:00	45.4	59.7	33.3	49.1	
10'	2023-08-22 17:50:00	00:10:00	44.4	54.2	34.7	47.4	
10'	2023-08-22 18:00:00	00:10:00	43.8	53.5	32.7	47.6	
10'	2023-08-22 18:10:00	00:10:00	45.4	57.6	32.1	49.2	
10'	2023-08-22 18:20:00	00:10:00	42.7	50.7	33.4	45.6	

Figure10-3: Ambient and baseline noise measurements at Location C -Eircode P51FWP9

Location D - Eircode P51VP80

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	L 10.0 % [dB]	L 90.0 % [dB]
60'	2023-08-22 12:00:00	00:25:42	43.8	67.2	44.9	32.4
60'	2023-08-22 13:00:00	01:00:00	38.9	54.1	42.2	33.2
60'	2023-08-22 14:00:00	01:00:00	45.7	70.5	43.7	34.5
60'	2023-08-22 15:00:00	01:00:00	38.6	62.9	40.5	32.1
60'	2023-08-22 16:00:00	01:00:00	43.0	64.1	45.2	31.9
60'	2023-08-22 17:00:00	01:00:00	41.2	59.5	42.4	30.8
60'	2023-08-22 18:00:00	01:00:00	36.3	57.0	39.3	29.8
60'	2023-08-22 19:00:00	01:00:00	35.8	56.6	38.5	31.1
60'	2023-08-22 20:00:00	01:00:00	39.4	62.9	38.9	29.9
60'	2023-08-22 21:00:00	01:00:00	31.8	56.8	33.5	26.6
60'	2023-08-22 22:00:00	01:00:00	26.7	43.0	29.1	23.9
60'	2023-08-22 23:00:00	01:00:00	25.7	45.8	27.3	23.7
60'	2023-08-23 00:00:00	01:00:00	25.0	49.8	26.6	23.3
60'	2023-08-23 01:00:00	01:00:00	24.3	47.3	24.8	23.2
60'	2023-08-23 02:00:00	01:00:00	25.1	43.2	26.6	23.7
60'	2023-08-23 03:00:00	01:00:00	25.4	44.5	26.3	23.5
60'	2023-08-23 04:00:00	01:00:00	24.6	37.0	26.0	23.4
60'	2023-08-23 05:00:00	01:00:00	31.9	54.2	33.2	23.3
60'	2023-08-23 06:00:00	01:00:00	41.1	61.9	44.3	27.4
60'	2023-08-23 07:00:00	01:00:00	39.5	62.7	42.2	31.4
60'	2023-08-23 08:00:00	01:00:00	43.9	63.7	47.0	33.3
60'	2023-08-23 09:00:00	01:00:00	41.0	69.8	41.8	31.0
60'	2023-08-23 10:00:00	01:00:00	39.2	61.1	42.5	29.5
60'	2023-08-23 11:00:00	01:00:00	41.1	67.3	39.1	27.9
60'	2023-08-23 12:00:00	01:00:00	37.5	57.8	39.3	29.1
60'	2023-08-23 13:00:00	01:00:00	39.1	61.1	41.9	30.9
60'	2023-08-23 14:00:00	00:30:40	42.8	64.1	42.6	30.5

Figure10-4: Ambient and baseline noise measurements at Location D -Eircode P51VP80.

Appendix 10-2

Terminology.

Decibel (dB): The decibel is a unit of level, which denotes the ratio between two quantities that are proportional to the power; the number of decibels corresponding to the ratio of two powers is ten times the logarithm to the base 10 of this ratio.

dB(A): A weighted sound pressure level (SPL) approximately equivalent to the human ear frequency response to noise.

The "A" suffix denotes that the sound levels have been "A-weighted" to account for the non-linear frequency response of human hearing. This report's sound levels are expressed in decibels (dB) relative to 2×10^{-5} Pa.

Equivalent Continuous (A) Weighted Sound Level [$L_{Aeq T}$]:

This can be regarded as a notional level, which would, in the course of the measuring period (T), cause the same (A) weighted sound energy to be received as that due to the actual sound over the actual measuring period.

LAFmax : It is the maximum A-weighted sound pressure level captured at the assessment position.

LAF10 is the "A weighted" noise levels that are exceeded for 10% of each sample period.

LAF90 is the "A weighted" noise levels that are exceeded for 90% of each sample period. This is the term used to measure the background noise level in an area.

LAe or ASEL: Single event level. SEL is the sound exposure level of an aircraft event, measured in dBA as a one-second capture of noise that contains the same total A-weighted sound energy as the whole event.

Hertz (Hz): The unit of frequency equivalent to one cycle per. Second.

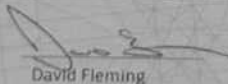
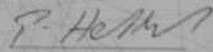
Sound pressure level (SPL) or **sound level L_p** is a **logarithmic measure** of the root-mean-square sound **pressure** of a sound relative to a reference value (at the threshold of hearing). It is measured in **decibel (dB)**.

HEMS: Helicopter Emergency Medical Service

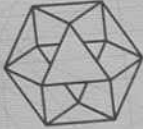
Appendix 10-3

Instrument Calibration Certification

Logging Type Approved Measurement Instrument SLM1 (S/N: A2A-10976-EO)

	
NSAI	
National Metrology Laboratory	
Certificate of Calibration	
Issued to	ICAN Acoustics 9 St. Mary's Road Galway City Co. Galway
Attention of	Diarmuid Keaney
Certificate Number	214146
Item Calibrated	NTi Audio XL2-TA Sound Level Meter with NTi Audio MC230A Microphone
Serial Number	A2A-10976-EO (SLM) and A14398 (Microphone)
ID Number	None
Order Number	Diarmuid Keaney
Date Received	11 Oct 2021
NML Procedure Number	AP-NM-09
Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), <i>Periodic tests, specification for the verification of sound level meters</i> . This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
Calibration Standards	Norsonic 1504A Calibration System incorporating: SR DS360 Signal Generator, No. 0735 [Cal Due Date: 10 Jun 2022] Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 10 Jun 2022] B&K 4134 Measuring Microphone, No. 0744 [Cal Due Date: 03 Jun 2023] B&K 4228 Pistonphone, No. 0740 [Cal Due Date: 04 Jun 2023] B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 07 Oct 2022]
Calibrated by	 David Fleming
Approved by	 Paul Hetherington
Date of Calibration	20 Oct 2021
Date of Issue	20 Oct 2021
	
This certificate is consistent with Calibration and Measurement Capabilities (CMCs) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org).	
Glas Naíon Baile Átha Cliath 11 Éire Glasnevin Dublin 11 Ireland T+ 353 1 808 2609 F+ 353 1 808 2603 NSAI.ie	
Page 1 of 7	

Logging Type Approved Measurement Instrument SLM2 (S/N A2A-16940-E0)

**NSAI**
National Metrology Laboratory

Certificate of Calibration

Issued to	ICAN Acoustics 9 St. Mary's Road Galway City Co. Galway
Attention of	Diarmuid Keaney

Certificate Number	214147
Item Calibrated	NTi Audio XL2-TA Sound Level Meter with NTi Audio MC230A Microphone
Serial Number	A2A-16940-E0 (SLM) and 9261 (Microphone)
ID Number	None
Order Number	Diarmuid Keaney
Date Received	11 Oct 2021
NML Procedure Number	AP-NM-09

Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), <i>Periodic tests, specification for the verification of sound level meters</i> . This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
Calibration Standards	Norsonic 1504A Calibration System incorporating: SR D5360 Signal Generator, No. 0735 [Cal Due Date: 10 Jun 2022] Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 10 Jun 2022] B&K 4134 Measuring Microphone, No. 0744 [Cal Due Date: 03 Jun 2023] B&K 4228 Pistonphone, No. 0740 [Cal Due Date: 04 Jun 2023] B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 07 Oct 2022]

Calibrated by	 David Fleming	Approved by	 Paul Hetherington
Date of Calibration	20 Oct 2021	Date of Issue	20 Oct 2021

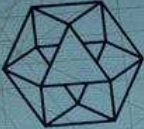


This certificate is consistent with Calibration and Measurement Capabilities (CMCs) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

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Glasnevin | Dublin 11 | Ireland | T+ 353 1 808 2609 | F+353 1 808 2603 | NSAI.ie

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Logging Type Approved Measurement Instrument SLM3 (S/N A2A-11106-E0)



NSAI

National Metrology Laboratory

Certificate of Calibration

Issued to ICAN Acoustics
9 St. Mary's Road
Galway City
Co. Galway

Certificate Number	224634
Item Calibrated	NTi Audio XL2-TA Sound Level Meter with NTi Audio MC230A Microphone
Serial Number	A2A-11106-E0 (SLM) and A17745 (Microphone)
ID Number	None
Order Number	Diarmuid Keaney
Date Received	19 Oct 2022
NML Procedure Number	AP-NM-09

Method The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters*. This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).

Calibration Standards Norsonic 1504A Calibration System incorporating:
SR DS360 Signal Generator, No. 0735 [Cal Due Date: 11 Aug 2023]
Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 16 Aug 2023]
B&K 4134 Measuring Microphone, No. 0744 [Cal Due Date: 03 Jun 2023]
B&K 4228 Pistonphone, No. 0740 [Cal Due Date: 04 Jun 2023]
B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 10 Oct 2023]

Calibrated by	 David Fleming	Approved by	 Paul Hetherington
Date of Calibration	03 Nov 2022	Date of Issue	03 Nov 2022



This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

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Page 1 of 7



Manufacturer Calibration Certificate

The following instrument has been tested and calibrated to the manufacturer specifications.
The calibration is traceable in accordance with ISO/IEC 17025 covering all instrument functions.

- Device Type: **XL2 Audio and Acoustic Analyzer**
- Serial Number: **A2A-19921-E0**

- Certificate Issued: **29 October 2021**
- Certificate Number: **44498-A2A-19921-E0**
- Results: **PASSED**
(for detailed report see next page)

Tested by: **M. Frick**

Signature:

Stamp:


NTi Audio AG
Im alten Riet 102
LI-9494 Schaan
www.nti-audio.com

NTi Audio AG • Im alten Riet 102 • 9494 Schaan • Liechtenstein • Europe • Tel: +423 239 6060
www.nti-audio.com • HR-Nr: 2.012.557 • MwStINr: 54306 • Bank: VP Bank, Vaduz, Acc No: 322.235.015

1/2

Field Calibration Unit



NSAI

National Metrology Laboratory

Certificate of Calibration

Issued to
ICAN Acoustics
9 St. Mary's Road
Galway City
Co. Galway

Certificate Number	224633
Item Calibrated	Bruel & Kjaer Type 4231 Sound Level Calibrator
Serial Number	2499109
ID Number	None
Order Number	Diarmuid Keaney
Date Received	19 Oct 2022
NML Procedure Number	AP-NM-13

Method

The above calibrator was allowed to stabilize for a suitable period in laboratory conditions. It was then calibrated by measuring the sound pressure level generated in its measuring cavity (half-inch configuration). The calibrator's operating frequency was also measured.

Calibration Standards

Norsonic 1504A Calibration System incorporating:
Agilent 34401A Digital Multimeter, File No. 0736 [Cal due: 16 Aug 2023]
B & K 4134 Measuring Microphone, File No. 0744 [Cal due: 03 Jun 2023]
B & K 4228 Pistonphone, File No. 0740 [Cal due: 04 Jun 2023]

Calibrated by


David Fleming

Approved by


Paul Hetherington

Date of Calibration

03 Nov 2022

Date of Issue

03 Nov 2022



This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

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Appendix 10-4

Weather Data (22nd/23rd Aug 2023)

Date	Time	Temp	Wind	Wind	Bar	Rain	Rain
		Out	Speed	Dir			
22/08/2023	10:15	19.4	0.4	SSE	753.2	0	0
22/08/2023	10:30	18.2	1.3	SSE	755.3	0	0
22/08/2023	10:45	18.1	0.4	SE	756.4	0	0
22/08/2023	11:00	18.7	0	NE	756.7	0	0
22/08/2023	11:15	19.2	0	---	756.7	0	0
22/08/2023	11:30	19.9	0	---	756.8	0	0
22/08/2023	11:45	18.3	0.9	W	756.8	0	0
22/08/2023	12:00	17.1	2.7	W	757	0	0
22/08/2023	12:15	17.5	2.2	W	756.7	0	0
22/08/2023	12:30	18.1	3.1	W	756.8	0	0
22/08/2023	12:45	18.6	3.6	W	756.9	0	0
22/08/2023	13:00	18.8	3.6	W	756.8	0	0
22/08/2023	13:15	18.2	4	WNW	756.9	0	0
22/08/2023	13:30	19.3	4	W	756.9	0	0
22/08/2023	13:45	19.2	4	W	757	0	0
22/08/2023	14:00	19.6	3.6	W	756.9	0	0
22/08/2023	14:15	19.7	3.6	WNW	757	0	0
22/08/2023	14:30	19.6	3.6	WNW	757.1	0	0
22/08/2023	14:45	19.6	4	WNW	757	0	0
22/08/2023	15:00	19.3	3.6	WNW	757	0	0
22/08/2023	15:15	19.3	3.6	WNW	757	0	0
22/08/2023	15:30	19.6	3.6	WNW	756.9	0	0
22/08/2023	15:45	20.1	4	WNW	756.8	0	0
22/08/2023	16:00	20.2	3.6	WNW	756.9	0	0
22/08/2023	16:15	19.8	2.7	W	756.9	0	0
22/08/2023	16:30	19.7	3.1	W	756.9	0	0
22/08/2023	16:45	19.6	2.7	W	756.9	0	0
22/08/2023	17:00	19.6	2.2	WSW	757	0	0
22/08/2023	17:15	19.3	2.2	W	757.1	0	0
22/08/2023	17:30	19.7	2.7	W	757.1	0	0
22/08/2023	17:45	19.6	2.7	W	757.1	0	0
22/08/2023	18:00	18.8	2.7	W	757.1	0	0
22/08/2023	18:15	18.4	1.8	WSW	757.1	0	0
22/08/2023	18:30	18.4	1.3	WSW	757.1	0	0
22/08/2023	18:45	18.2	1.3	WSW	757	0	0
22/08/2023	19:00	18.1	0.9	SW	757	0	0
22/08/2023	19:15	17.8	0.9	WSW	757.1	0	0
22/08/2023	19:30	17.6	1.3	W	757	0	0
22/08/2023	19:45	17.3	1.3	W	757.2	0	0
22/08/2023	20:00	17.1	0.9	W	757.2	0	0

22/08/2023	20:15	16.9	0.9	WSW	757.3	0	0
22/08/2023	20:30	16.7	0.9	WSW	757.2	0	0
22/08/2023	20:45	16.2	0.9	W	757.3	0	0
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22/08/2023	22:00	14.7	0.4	W	757.5	0	0
22/08/2023	22:15	14.6	0.4	W	757.5	0	0
22/08/2023	22:30	14.6	0.9	SW	757.5	0	0
22/08/2023	22:45	14.5	0	SW	757.4	0	0
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22/08/2023	23:30	13.7	0.4	SSW	757.3	0	0
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23/08/2023	00:00	13.5	0	SSW	757.2	0	0
23/08/2023	00:15	13.2	0	SSW	757.2	0	0
23/08/2023	00:30	13.2	0.4	SSW	757.1	0	0
23/08/2023	00:45	13.2	0	SSW	757	0	0
23/08/2023	01:00	13	0	SSW	757	0	0
23/08/2023	01:15	12.8	0	SSW	756.9	0	0
23/08/2023	01:30	12.7	0	SSW	756.9	0	0
23/08/2023	01:45	12.7	0	SSW	756.8	0	0
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23/08/2023	07:15	14.3	0	SW	756	0	0
23/08/2023	07:30	14.4	0.4	SW	756	0	0

23/08/2023	07:45	14.4	0.4	SW	756	0	0
23/08/2023	08:00	14.4	0.4	SW	755.9	0	0
23/08/2023	08:15	14.4	0.9	E	755.9	0.2	0
23/08/2023	08:30	14.6	0.4	E	755.8	0.2	0.8
23/08/2023	08:45	14.8	0.9	NE	755.9	0	0
23/08/2023	09:00	14.8	0.9	NE	755.7	0	0
23/08/2023	09:15	14.9	0.9	NE	755.7	0	0
23/08/2023	09:30	15.3	0.9	E	755.7	0	0
23/08/2023	09:45	15.6	0.4	E	755.7	0	0
23/08/2023	10:00	15.5	0.9	NNE	755.7	0	0
23/08/2023	10:15	15.7	0.4	NNE	755.6	0	0
23/08/2023	10:30	15.8	0.9	NNE	755.5	0	0
23/08/2023	10:45	16.1	0.4	NNE	755.5	0	0
23/08/2023	11:00	16.3	0.4	NNE	755.5	0	0
23/08/2023	11:15	16.5	0	NNW	755.4	0	0
23/08/2023	11:30	16.9	0.4	NNW	755.4	0	0
23/08/2023	11:45	17.6	0.9	SW	755.2	0	0
23/08/2023	12:00	18.4	0.9	S	755.2	0	0
23/08/2023	12:15	18.4	1.3	W	755.2	0	0
23/08/2023	12:30	17.7	2.2	W	755.3	0	0
23/08/2023	12:45	17.7	2.7	W	755.3	0	0
23/08/2023	13:00	18.6	2.2	WNW	755.3	0	0
23/08/2023	13:15	18.7	2.7	W	755.2	0	0
23/08/2023	13:30	18.8	3.1	W	755.2	0	0
23/08/2023	13:45	18.5	4	WNW	755.3	0	0
23/08/2023	14:00	18.4	3.1	W	755.2	0	0
23/08/2023	14:15	18.6	2.2	WNW	755.1	0	0
23/08/2023	14:30	19.1	1.8	W	755	0	0
23/08/2023	14:45	19.7	1.3	WNW	754.9	0.4	17

Appendix 11-1

Description of existing vegetation where maintenance is required	
Location	Requirement
Group A	Lower vegetation to 2m tall and maintain at 2m tall at all times
Group B	Remove sod and stone ditch and existing vegetation
Group C	Lower vegetation to 2m tall and maintain at 2m tall at all times
Group D	Lower vegetation to 2m tall and maintain at 2m tall at all times
Group E	Remove sod and stone ditch and existing vegetation
Group F	Lower vegetation to 2m tall and maintain at 2m tall at all times
Group G	Lower vegetation to 2m tall and maintain at 2m tall at all times
Group H	Remove existing vegetation to allow for new entrance



LANDSCAPE KEY:

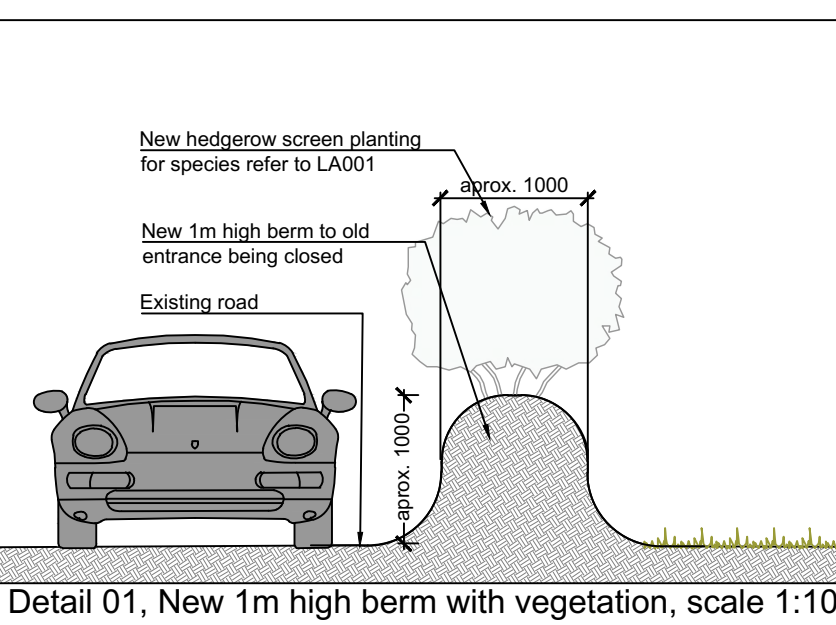
- Existing vegetation to be removed (167 Lin. M.)
- Polarding any existing Mature trees to 2m tall. Existing Hedgerows to be pruned back to 2m above ground level. To be kept at 2m high at all times to allow for approaching into the runway. Supplementary Crataegus monogyna (Hawthorn), Prunus spinosa (Blackthorn), Malus sylvestris (Crab apple), Salix caprea (Willow), Ilex aquifolium (Holly) 100-1200mm high, bare root 2+2, planted @ 50cm centres where space allows to fill potential gaps on the existing hedgerow. (50Lin. M.)
- Existing entrance to be closed, 10m wide, 1m high berm to be constructed and native hedgerow Crataegus monogyna (Hawthorn) to be planted at 50cm centres to match existing hedgerow on site. Please see detail section 01.
- Old grassed runway to be disused and allowed to regrow as managed meadow.
- Transition zone, 30m from runway centre line each side, to be cleared of any obstacles for plane take off and landing. Grass only.
- Grassland meadow sown with native seed mix as follows managed as meadow Sowing of a simple grassland mix of Creeping Bent (Agrostis stolonifera), Red Fescue (Festuca rubra) and Sheep's Fescue (Festuca ovina) from indigenous seed sources - sown treated in this manner will be colonised naturally, over time, by species from adjacent plant communities.
- Proposed area for compensatory planting (101M2). To be planted with native species. No ash planting. Proposed 100% native screen woodland planting including 20% evergreen species, at a rate of 1 per M2, all white 40-50cm tall. Planting mix to be used. Planting mix as follows: 30% Pinus sylvestris, 20% Ilex aquifolium, 15% Anax galeata, 15% Betula pendula, 10% Salix alba, 5% Prunus avium, 5% Quercus robur.
- 1.2M high Stock Proof Fencing. With timber stakes and chain link wire.

Planting Notes

- All trees and shrubs to be supplied and planted following BS 5396.
- All existing vegetation to be removed and cleared of site.
- Shrub planting beds to be 450mm good quality topsoil to BS 3882 (Certs required). LA to inspect prior to commencement on site, break up to a further 350mm deep of existing.
- Tree pits shall be excavated not more than 2 days prior to planting.
- All tree pits to maintain horizontal base and vertical sides, sides to be scarified, pit bottom to be broke up to a depth of 200mm with slightly raised centre.
- Trees to be planted upright with collar at finished soil level and back filled with previously prepared planting material.

Time scale for implementation:

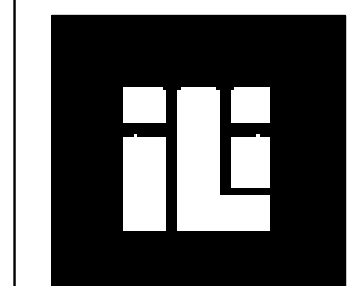
- Deciduous trees and shrubs - Late October to late March



THIS IS NOT FOR CONSTRUCTION

This drawing is the copyright of the Landscape Architect unless otherwise stated. All dimensions are in millimetres. Where dimensions are not given, drawings must not be scaled and the reader must be referred to the Landscape Architect. If the drawing includes conflicting dimensions, the reader must be referred to the Landscape Architect. All dimensions must be checked on site. The Landscape Architect must be informed, by the contractor, of any discrepancies before work proceeds.

Cathal O'Meara
Landscape Architects
087 9202549
2 Mc Sweeney St,
Fermoy, Co. Cork



Chartered member of
the Irish Landscape
Institute

Client: Rathcool
Aerodrome, Mallow,
Co. Cork

Project: Rathcool
Aerodrome

Drawing: Landscape
Layout

Date: 12/12/2024

Drawn By:
Luis Medeiros
Checked By:
Cathal O'Meara

Issue: Planning
Dwg No: 2411_LA001

Rev Date Note

Rev	Date	Note



Scale 1:1000, @ A0

Appendix 11-2

Chapter 11: Landscape and Visual

Appendix 11.2 Views

Views 1-12



View 1



View 2



View 3



View 4



View 5



View 6



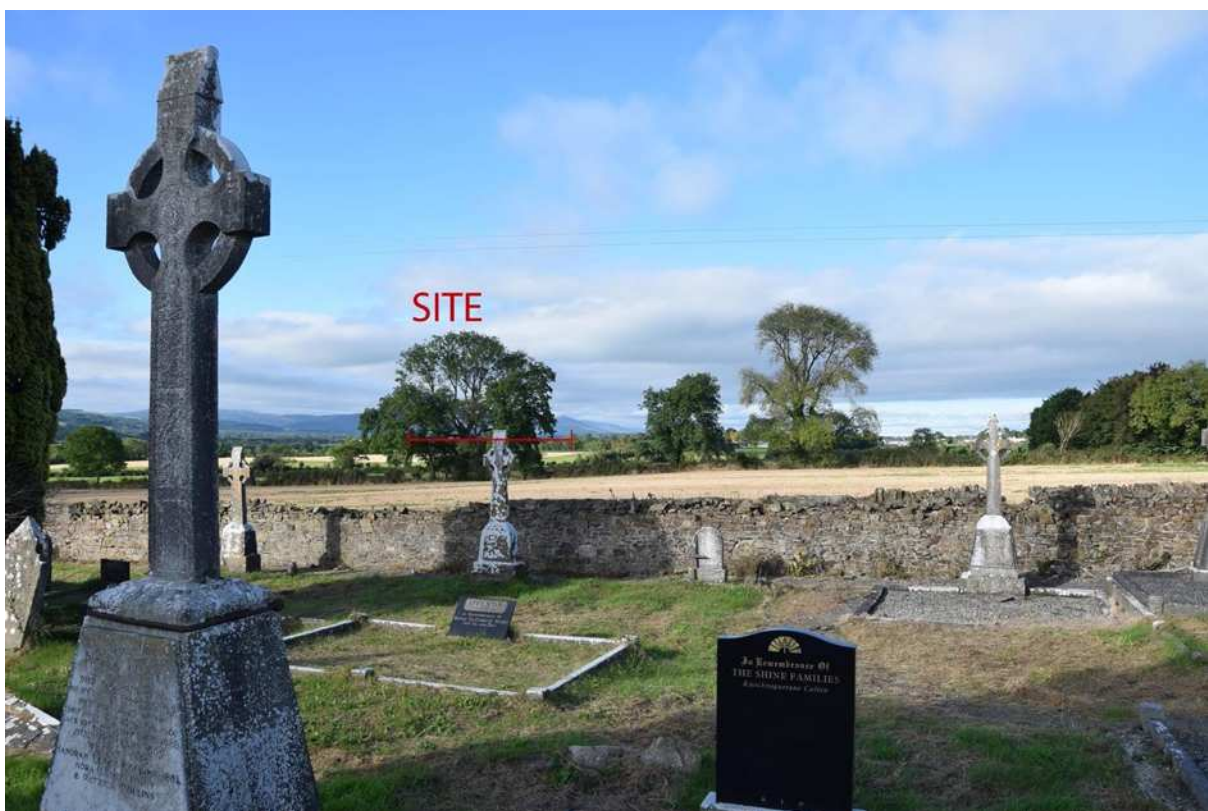
View 7



View 8



View 9



View 10



View 11



View 12

Appendix 12-1

Archaeological Test Trenching Report
Proposed development, Rathcool Aerodrome, Rathcool
and Knockcahill, Millstreet, County Cork



(Excavation Licence No. 23E0159 / Detection Device Licence 23R0092)
(Cork County Council planning ref.: 22/06397)

Prepared by
David Murphy
John Cronin & Associates
3a Westpoint Trade Centre
Ballincollig
Cork

On behalf of
Rathcool Flying Club
Rathcool Aerodrome
Rathcool
County Cork

March 2023

Contents

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1. Introduction 1

2. Context 2

3. Archaeological testing programme..... 7

4. Conclusions and recommendations..... 9

5. References/sources..... 10

Appendix 1: Description of test trenches 11

Appendix 2: Photographic record 14

Core data

<i>Excavation Licence Number</i>	22E0159
<i>Detection Device Licence</i>	23R0092
<i>Licence Holder</i>	David Murphy
<i>Site Type</i>	Rural, greenfield
<i>Testing Commenced</i>	21/03/23
<i>Testing Completed</i>	22/03/23
<i>ITM Reference</i>	532590, 595280
<i>Townland(s)</i>	Rathcool and Knockcahill
<i>County</i>	Cork
<i>OS 6" Sheet</i>	C0030
<i>Planning Authority</i>	Cork County Council
<i>Planning Ref. No's</i>	22/06397
<i>Archaeological Contractor</i>	John Cronin & Associates
<i>Client</i>	Rathcool Flying Club
<i>Reason for testing</i>	In order to satisfy <i>Item 26</i> of Cork County Council's RFI and as the proposed development site contains a recorded archaeological monument (C0030-145----: Ringfort – rath)
<i>Summary of findings</i>	Seven 2m-wide linear test trenches, totalling 470m in length, were excavated across areas of the aerodrome that will be impacted by the proposed development during the testing programme, nothing of an archaeological nature was revealed. The spoil excavated from the trenches in proximity to recorded ringfort (C0030-145----) was scanned with a discriminating detection device (Detection Device Licence No. 23R0092), however, no responses were returned. The testing programme revealed that much of the site was likely subject to land improvement efforts during the 19th-century. This was likely undertaken under the stewardship of the Colthurst family of Blarney Castle. The Colthurst's owned large tracts of land in this area at that time and also constructed Colthurst Bridge (C0030-247----) to the immediate northwest of the subject site in 1858. The testing programme also demonstrated that the lower lying portions of the site, which in effect represent the southern flood plain of the River Blackwater, have had much alluvially derived silts and gravels deposited upon them. The trenches excavated across the proposed alignment of the hard-surfaced runway also indicated that the water table is quite high in this area.

1. Introduction

John Cronin & Associates were commissioned by Rathcool Flying Club to undertake a programme of archaeological testing at the site of a proposed development at Rathcool Aerodrome, which straddles the townlands of Rathcool and Knockcahill, northwest of Millstreet, County Cork.

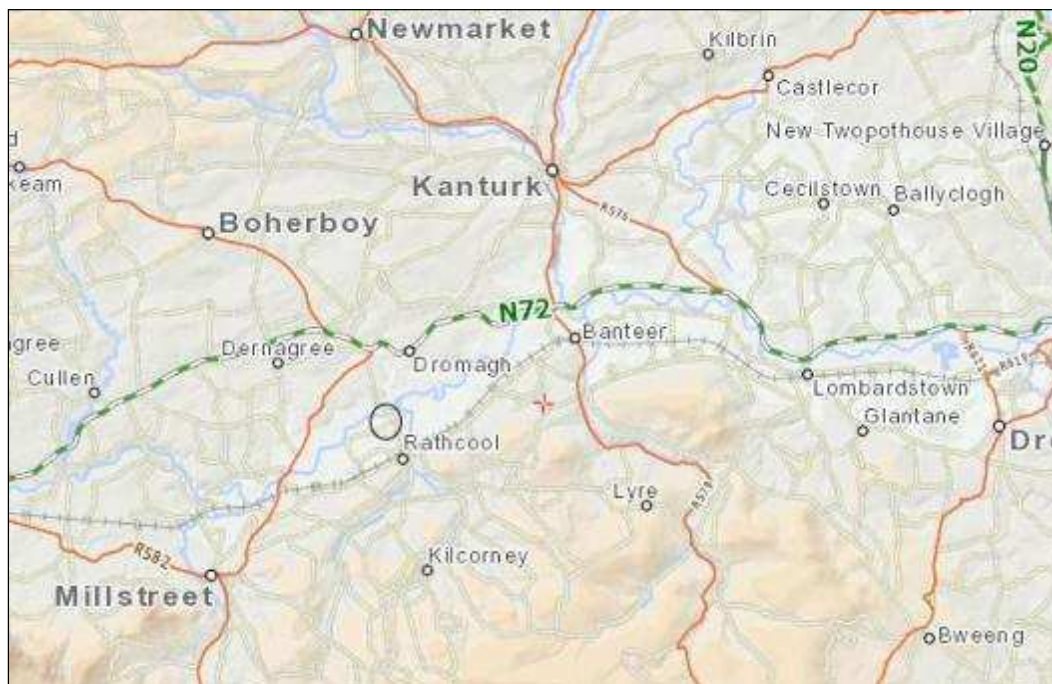


Figure 1: General location of subject site (circled)

The proposed development comprises the construction of a 779m long and 18m wide hard-surfaced runway, a taxiway, helipad and associated interceptors along with the relocation of an existing hanger, paramedic prefab base, crew prefab base serviced by a proprietary wastewater treatment plant, new entrance and associated site works. Rathcool Aerodrome is used as the emergency helicopter base for the Health Service Executive (HSE). The subject testing programme was undertaken in response to *Item 26* of a Cork County Council Request for Further Information (RFI) (22/06397).

The archaeological testing programme was carried out on Tuesday 21 and Wednesday 22 March 2023 under Excavation Licence 23E0159 and Detection Device Licence 23R0092. Seven 2m-wide linear test trenches, totalling 470m in length, were excavated across areas of the aerodrome that will be impacted by the proposed development during the testing programme, **nothing of an archaeological nature was revealed.**

2. Context

Location

The proposed development site (PDS) is located *circa* 1km north of Rathcool village, near Millstreet in northwest County Cork (**Figure 2**). The existing aerodrome comprises a large area of open, level, grassland which is situated on the southern bank of the River Blackwater. The existing grass landing strip is located in the northern portion of the aerodrome and is aligned in an east-northeast to west-southwest direction, while the existing facilities of the Rathcool Flying Club and the HSE Air Ambulance are located in the south-eastern corner of the airfield. The red line boundary of the proposed development extends into two additional, relatively level, pasture fields to the west of the main portion of the site. This extension is to facilitate a proposed hard-surfaced runway of additional length. The PDS is bound by the River Blackwater to the north, local third-class public roads to the east and south, a plantation of coniferous forestry to the southwest and agricultural land (generally pasture) to the west.



Figure 2: Location of proposed development area (red circle)

Archaeological & historical background

There is one recorded archaeological site located within the red line boundary of the proposed development and this comprises the site of a levelled ringfort (C0030-145----) situated in the south-western portion of the overall landholding. However, no development works are proposed to be undertaken on the footprint of this recorded site or within 20m of its indicative external edge. There is only one other archaeological site recorded by the ASI within 500m of the PDS and this comprises a mid-19th century stone-built road bridge which spans the River Blackwater to the immediate northeast of the development site (see **Table 1** and **Figure 3** below). The townland name Rathcool is an Anglicisation of the Irish name *Ráth Cúile*, which has been translated as 'rath/fort of the corner or angle' (www.logainm.ie).

The levelled ringfort (CO030-145----) recorded within the development site was inspected by the Cork Archaeological Survey in 1987 and is described as follows in the *Archaeological Inventory of County Cork – Volume 4* (Power *et al* 2000):

In pasture, on gentle N-facing slope. Depicted as hachured circular enclosure (diam. c. 40m) on 1842 OS 6-inch map. Levelled roadway running NE-SW transects enclosure. On NW side of road is raised area (c. 22m NE-SW), scarp most clearly defined to W; no visible surface trace of site to SE of roadway. Recorded by Bowman (1934, 357) as one of two levelled single-ramparted forts (CO030-147---) on Mr McCarthy's land; (diam. '39 yards and 34 yards').

An inspection of the location of the ringfort was undertaken as part of this programme of work and the slight raised area noted by the Cork Archaeological Survey is still discernible at ground level, however, no surface traces of a bank or ditch were visible. It is possible that the raised area was created by upcast material from the construction of the road through the south end of the site.

Table 1: Recorded archaeological sites located within 500m of the subject site

Monument No.	Class	Townland	ITM E, N	Distance
CO030-145----	Ringfort - rath	Rathcool	532713, 595166	Within site
CO030-247----	Bridge	Rathcool, Dromahoe	532787, 595525	c.5m to northeast

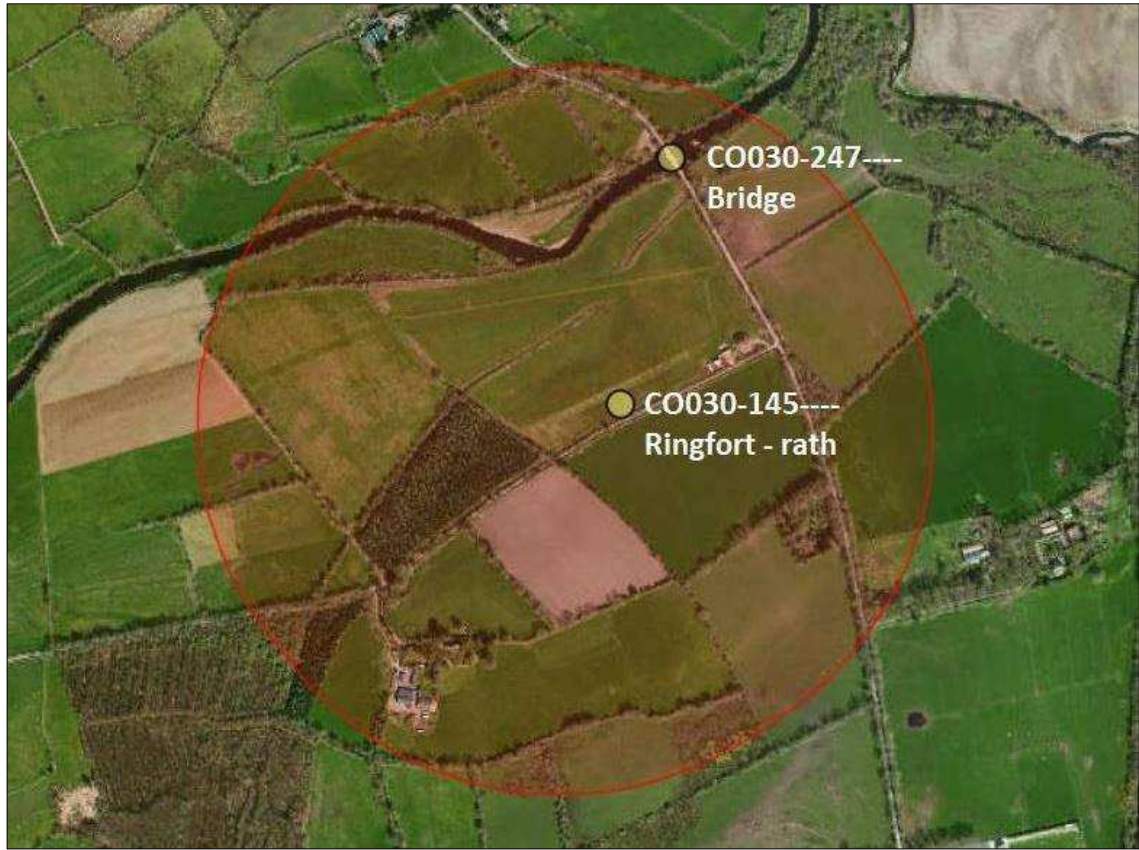


Figure 3: Recorded archaeological sites within a 500m radius of the proposed development area

The Excavations Database

The Excavation Database contains summary accounts of all licensed archaeological excavations carried out in Ireland (North and South) from 1969 to present. The database gives access to over 30,000 reports and can be browsed or searched using multiple fields, including year, county, site type, grid reference, license number, Sites and Monuments Record number and author. The Database records only two programmes of archaeological investigation as having been undertaken within the study area (see **Table 2** below). Of most relevance is the programme of archaeological test trenching (Licence No. 15E0446) which was undertaken within the subject site prior to the construction of an airfield administration building in 2015. The subject area was located *circa* 30m to the west of levelled ringfort (CO030-145---). Six test trenches were excavated on the footprint of the proposed structure and ancillary services. No archaeological finds, features or deposits were identified (Cummins, 2015).

Table 2: Excavation Database summaries for licensed investigations undertaken within study area

Site name	Licence and author	Summary
Killetragh, County Cork	04E1380 Linda Hegarty	Testing was undertaken as part of a planning application. The proposed house was within the zone of archaeological potential surrounding a ringfort. Two trenches were excavated. The same sequence was identified in both areas. Topsoil was removed to an average depth of 0.2m to reveal orange/brown sandy clay with pockets of shale bedrock. No features of archaeological significance were identified.
Rathcool, County Cork	15E0446 Tony Cummins	Test trenching was undertaken prior to the construction of an airfield administration hut within a green field area 30m to the west of a levelled ringfort (CO030-145---). Six test trenches were excavated on the footprint of the proposed structure and ancillary services. No archaeological finds, features or deposits were identified.

Cartographic and aerial review

The detail on historic cartographic sources demonstrates the nature of past settlements and land use patterns in recent centuries and can also highlight the impacts of modern developments and agricultural practices. This information can aid in the identification of the location and extent of unrecorded or partially levelled features of archaeological or architectural heritage interest. The cartographic sources examined for the study area include the First Edition 6-inch Ordnance Survey (OS) map (surveyed *c.*1840) (**Figure 4**), and the 25-inch OS map (surveyed *c.*1900) (**Figure 5**).

The First Edition map depicts the proposed development site as straddling an enclosed pastoral landscape formed by irregularly shaped fields. Ringfort (CO030-145---) was still extant at the time of survey and is depicted as a univallate enclosure with an internal diameter of *circa* 38m. An irregularly shaped field to the west of the ringfort may be a remnant of the ringfort's outfield system. The small local road which bounds the subject site to the south is not depicted on the First Edition map nor is Colthurst Bridge to the northeast of the PDS.

By the time of the production of the 25-inch map, both the ringfort and the surrounding field boundaries had been levelled, while the road to the south and the bridge to the northeast had been constructed. A large amount of field boundaries had also been removed and the area had

been consolidated into five larger fields. A drainage channel, which is depicted extending across the main body of the site in a southwest to northeast direction on the 25-inch map, is still largely extant within the PDS.

The outline of the northern portion of the enclosing ditch of the levelled ringfort is visible on aerial imagery of the area (**Figure 6**). No obvious potentially unrecorded archaeological features were noted within the proposed development area during the review of the aerial imagery.

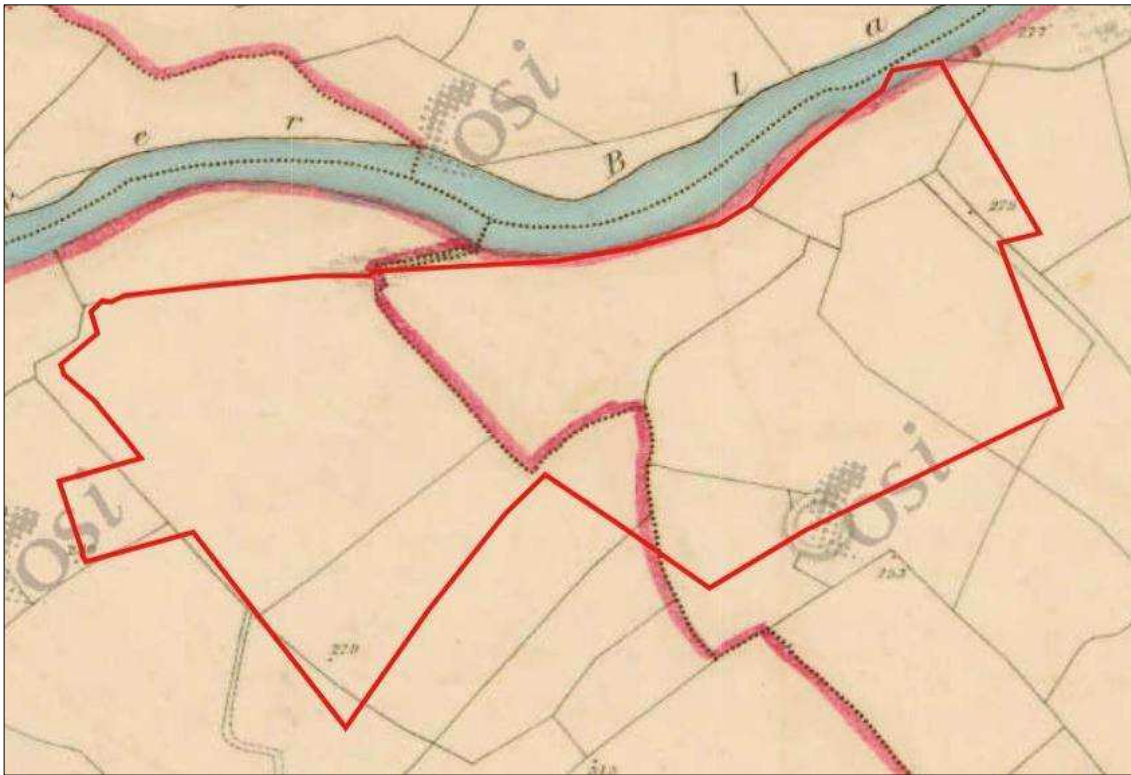
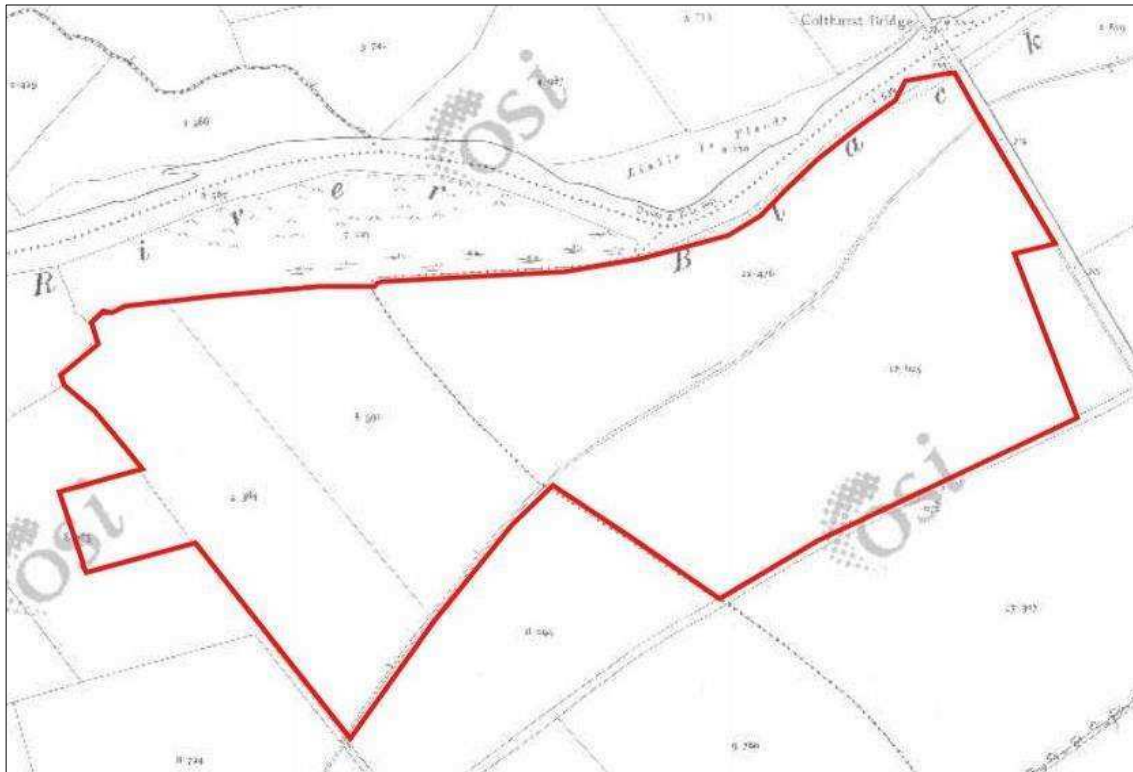


Figure 4: Extract from the First Edition 6-inch OS map with the boundary of the development area outlined



3. Archaeological testing programme

Overview

Archaeological testing of proposed development areas (**Figures 7 & 8**) within Rathcool Aerodrome, Rathcool and Knockcahill, County Cork was undertaken on Tuesday 21 and Wednesday 22 March 2023. Seven archaeological test trenches, measuring 2m in width, ranging in length between 20m and 200m, and totaling 470m in overall length, were excavated across the footprint of accessible proposed development areas (see **Figure 7** below). The trenches were excavated by a 13-tonne mechanical excavator which operated under constant archaeological direction. The north-eastern end of the proposed runway extends across the existing grass runway of the aerodrome. As the grass runway is in continual use, it was not possible to test the north-eastern end of the proposed runway. If the project is consented, any works undertaken across the untested area will be subject to archaeological monitoring.

Please consult **Appendix 1** for detailed descriptions of each individual test trench and **Appendix 2** for extracts from the photographic record of the testing programme.

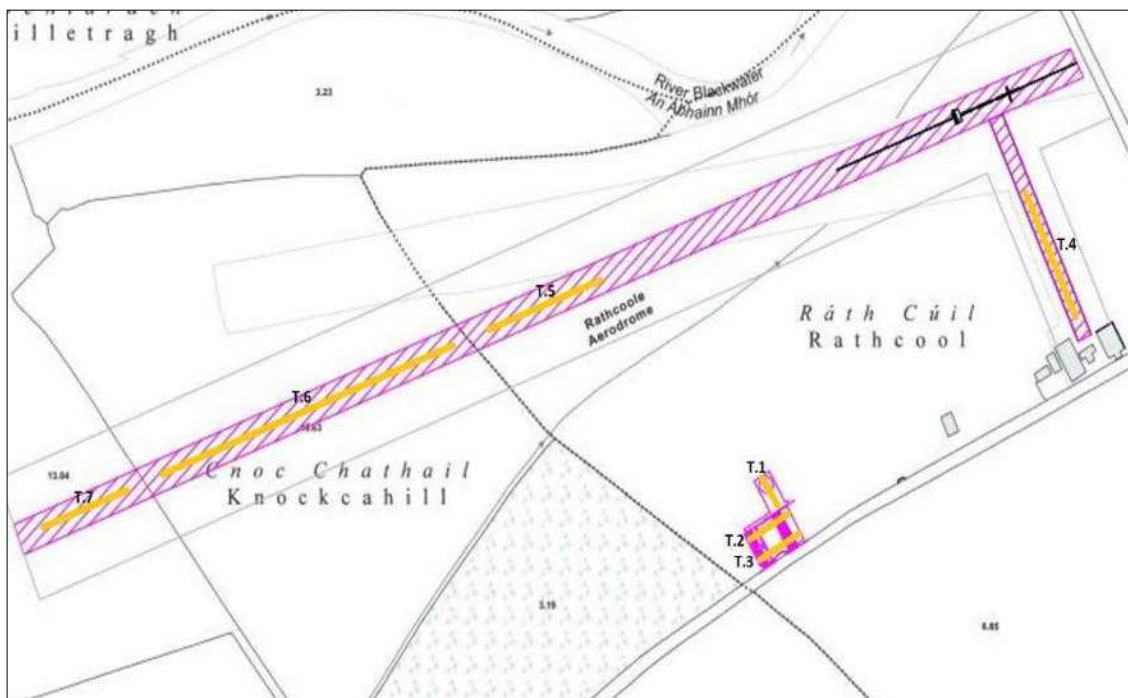


Figure 7: Layout of the proposed test trenches (orange lines) at subject site

Summary

The excavated test trenches targeted the location of the proposed air ambulance hangar/helipad/facilities area in the southern portion of the site (*Trenches 1, 2 & 3*), the alignment of a proposed taxiway in the eastern portion of the site (*Trench 4*) and the alignment of the proposed hard surface runway in areas that are not currently in use as grass runway (*Trenches 5, 6 & 7*).

The stratigraphy revealed within *Trenches 1, 2 & 3* was relatively consistent with between 0.3m and 0.4m of a mid-greyish brown sandy, clayey silt overlying a light yellowish brown to light bluish grey sandy silt with occasional small to medium sized natural stone inclusions. The subsoil also contained occasional decaying stones and manganese-like mineral concentrations and was dissected by a number of modern land drains. There was also evidence of modern disturbance (likely as a result of land improvement efforts) particularly within *Trench 2*. There was no evidence of any activity associated with the nearby ringfort (CO030-145----) within these trenches.

Trench 4 targeted the route of the proposed taxiway leading from the existing hangar facilities to the north-eastern end of the proposed runway. This alignment extends from the slightly higher ground along the southern margin of the site towards the lower lying runway area. This was reflected in the revealed stratigraphy with 0.3m of a mid-brown silty topsoil overlying a mid-orangish brown stony, sandy silt at the southern end of the trench, this transitioned to 0.45m of a siltier topsoil overlying a mixed stony, light grey to brown sandy clayey silt in the lower lying northern portion of the trench.

The trenches which targeted the proposed runway alignment extended in an east-northeast to west-southwest direction across areas of grassland and pasture which form the floodplains on the southern bank of the River Blackwater. The stratigraphy revealed within the three test trenches was reflective of this topographical and geological situation in that thick deposits of silty soil (up to 1.2m in places) overlay alluvially derived natural silt and gravel deposits which were revealed around the level of the natural water table.

Nothing of an archaeological nature was revealed in any of the excavated test trenches.

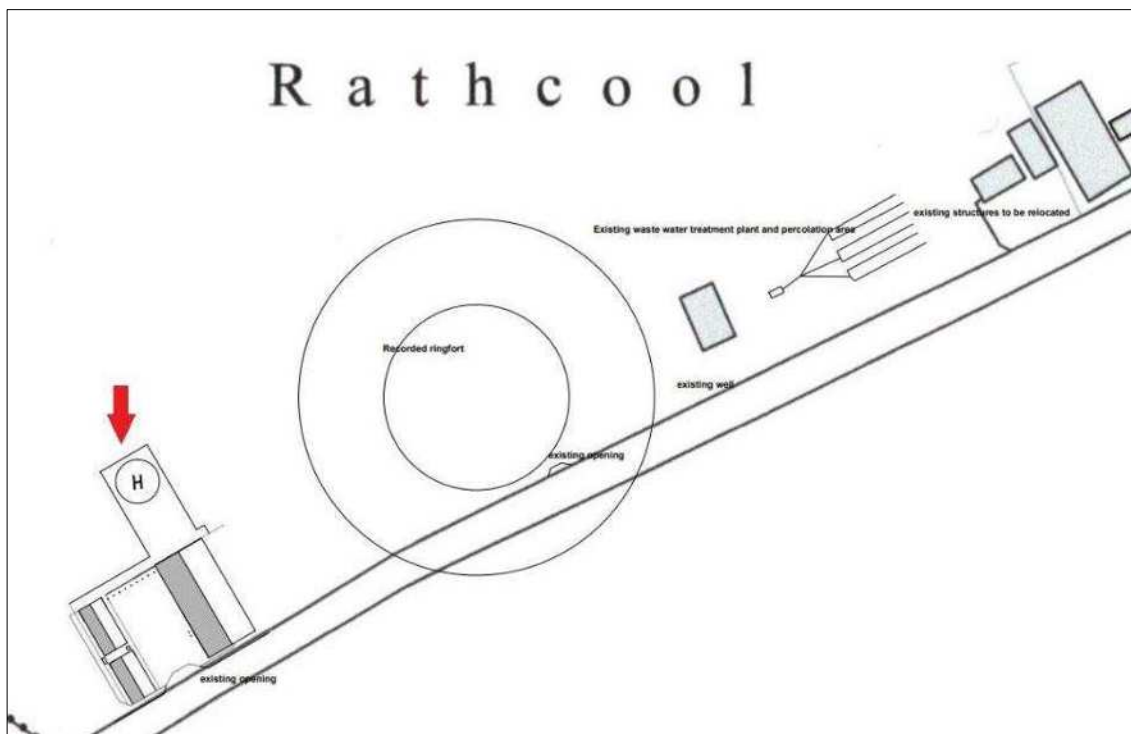


Figure 8: Project drawing showing the layout of the proposed new helipad and hangar development (indicated by red arrow), with the locations of ringfort (CO030-145----) and existing structures and ancillary features also shown

4. Conclusions and recommendations

Conclusions

Archaeological testing of the site of a proposed development within Rathcool Aerodrome, Rathcool and Knockcahill, County Cork was undertaken in order to comply with *Item 26* of Cork County Council's Request for Further Information (22/06397). The archaeological testing programme was carried out on Tuesday 21 and Wednesday 22 March 2023 under Excavation Licence 23E0159 and Detection Device Licence 23R0092. Seven 2m-wide linear test trenches, totalling 470m in length, were excavated across areas of the aerodrome that will be impacted by the proposed development during the testing programme, **nothing of an archaeological nature was revealed**. The spoil excavated from the trenches in proximity to recorded ringfort (CO030-145---) was scanned with a discriminating detection device (Detection Device Licence No. 23R0092), however, no responses were returned.

The testing programme revealed that much of the site was likely subject to land improvement efforts during the 19th-century. These were likely undertaken under the stewardship of the Colthurst family of Blarney Castle. The Colthurst's owned large tracts of land in this area at that time and also constructed Colthurst Bridge (CO030-247----) to the immediate northwest of the subject site in 1858. The testing programme also demonstrated that the lower lying portions of the site, which in effect represent the southern flood plain of the River Blackwater, have had much alluvially derived silts and gravels deposited upon them. The trenches excavated across the proposed alignment of the hard-surfaced runway indicated that the water table is quite high in this area.

Recommendations

While nothing of an archaeological nature was revealed within any of the excavated test trenches, in the interests of thoroughness, should the proposed development be consented, it is recommended that the portions of the proposed hard-surfaced runway which were not tested (*e.g.* the east-north-eastern end) be subject to a programme of **archaeological monitoring** when groundworks are undertaken in this area.

Furthermore, it is recommended that, prior to commencement of any development related activity at the subject site, **a 15-metre radius fenced protective zone** be erected around the identifiable external extent of ringfort (CO030-145----). This should be undertaken in order to prevent any accidental encroachment of construction related plant or materials into the recorded location of the ringfort.

5. References/sources

Published works

Lewis, S. 1837 *A Topographical Dictionary of Ireland*. London

Power, D. *et al* 2000 *Archaeological Inventory of County Cork Volume 4*. Dublin: The Stationary Office

Stout, M. 1997 *The Irish Ringfort*, Dublin: Four Courts Press

Waddell, J. 1998 *The Prehistoric Archaeology of Ireland*, Galway: Galway University Press

Internet resources

Database of Irish Archaeological Excavations,
<http://www.excavations.ie/>

Department of Culture, Heritage and the Gaeltacht's Historic Environment Viewer
<http://webgis.archaeology.ie/historicenvironment/>

Heritage Map Viewer - various interactive heritage maps
<https://heritagemaps.ie/WebApps/HeritageMaps/index.html>

Geohive Mapviewer Resource
<http://www.geohive.ie/>

Irish placename resource
<https://www.logainm.ie/en>

Appendix 1: Description of test trenches

Trench 1

Trench 1 (T.1) measured 20m in length and was excavated in a northwest to southeast direction across the area of the proposed helipad in the southern portion of the overall site. The stratigraphy within the trench comprised 0.3m to 0.4m of a mid-greyish brown sandy, clayey silt which overlay a light yellowish brown to light bluish grey natural sandy silt subsoil. The subsoil contained occasional small to medium sized natural stone inclusions and also occasional decaying stones and manganese-like mineral concentrations. A northwest to southeast aligned land drain dissected the centre of the trench. It's cut was evident extending downwards through the overlying topsoil. The drain measured 0.3m wide and only *circa* 0.1m deep (as measured from the upper surface of the subsoil).

Trench 2

Trench 2 (T.2) measured 35m in length and was excavated in a northeast to southwest direction across the proposed air ambulance facilities and hangar area in the southern portion of the site. The stratigraphy evident in the north-eastern and central portions of the trench were similar to that observed within T.1 with 0.3m to 0.4m of a mid-greyish brown sandy, clayey silt overlying a light yellowish brown to light bluish grey natural sandy silt subsoil. A NE-SW orientated modern land drain which was uncovered at the north-eastern end of the trench measured *circa* 0.45m wide and 0.15m deep.

Towards the south-western end of the trench, the subsoil transitioned to a light grey to yellow sandy clayey silt. An area of disturbance was also uncovered at this end of the trench with a mix of dark grey to black soil and stones mixed into both the topsoil and subsoil (although it only extended *circa* 0.15m into the subsoil). This area was subject to ground water seepage and the disturbance was likely related to land improvement efforts.

Trench 3

Trench 3 (T.3) measured 35m in length and was excavated in a northeast to southwest direction across the proposed air ambulance facilities and hangar area in the southern portion of the site (to the south of T.2). The topsoil conditions within the trench mirrored those described for T.2 which was excavated 10m to the north. The subsoil within the trench predominantly consisted of a light yellowish brown sandy silt with lesser amounts of light bluish grey sandy silt and occasional varying sized natural stone inclusions. The subsoil was subject to a degree ofurbation due to its proximity to the adjacent field boundary to the south and its associated vegetation.

Trench 4

Trench 4 (T.4) measured 70m in length and was excavated in a north-northwest to south-southeast direction along the alignment of the proposed taxiway which will link the existing aerodrome facilities with the eastern end of the proposed hard-surfaced runway. This alignment extends from the slightly higher ground along the southern margin of the site towards the lower lying runway area. This was reflected in the revealed stratigraphy with 0.3m of a mid-brown silty

topsoil overlying a mid-orangish brown stony, sandy silt at the southern end of the trench, this transitioned to 0.45m of a siltier topsoil overlying a mixed stony, light grey to brown sandy clayey silt in the lower lying northern portion of the trench. Towards the northern end of the trench, field clearance activity in the form of a number of burnt root channels was noted.

Trench 5

Trench 5 (T.5) measured 60m in length and was excavated in an east-northeast to west-southwest direction along the easternmost accessible portion of the proposed hard-surfaced runway. The trench was excavated within the same field as the existing runway but commenced a safe distance to the southwest of the margin of the runway. Underlying the upper sod layer was a light grey silt of between 0.25m and 0.4m thickness. It had the appearance of being an introduced layer and overlay a dark reddish brown peaty silt of *circa* 0.2m to 0.3m thickness which likely represented a buried sod layer. According to local information (Denis Crowley pers. comm.), the proposed development lands were subject to extensive land improvement efforts in the late-19th-century by the Colthurst's of Blarney Castle who owned large tracts of land in this area. The revealed stratigraphy would correspond with same.

A further silt layer underlay the buried sod layer with the trench depth being over 1m deep in places. Subsoil comprised a mix of light yellowish to orangish brown silt and sandy alluvial gravel which was revealed at, or just above, the level of the water table.

Trench 6

Trench 6 (T.6) measured 200m in length and was excavated in an east-northeast to west-southwest direction along the central accessible portion of the proposed hard-surfaced runway. At the south-western end of the trench, the stratigraphy comprised 0.3m to 0.4m of a mid-yellowish brown clayey silt which overlay a light yellowish brown silty clay subsoil with contained frequent manganese-like mineral concentrations and occasional land clearance in the form of burnt root channels. At a point 20m from the south-western end of the trench, a large 6m-wide stone-filled drainage channel dissected the trench in a north to south direction. A light grey marl clay defined either side of the drainage channel. To the north-northeast of the drain, the subsoil had a higher alluvial gravel content and a more orangish grey hue.

Towards the north-eastern end of the trench, a buried peaty layer, likely the original sod layer became more prevalent and was revealed underlying up to 0.5m of clayey silt. The silt was likely derived from a combination of land improvement efforts and alluvial deposition. The peaty layer measured between 0.25m and 0.5m in thickness. At the north-eastern end of the trench, it's base was essentially at level of the water table with rapid ground water seepage occurring through the natural alluvial gravels and clayey silts revealed on the trench base.

Trench 7

Trench 7 (T.7) measured 50m in length and was excavated in an east-northeast to west-southwest direction along the south-westernmost portion of the proposed hard-surfaced runway. The stratigraphy within the trench comprised 0.3m to 0.4m of a mid-yellowish brown clayey silt which overlay a further 0.3m of a light yellowish brown alluvially derived silt. The upper clayey silt layer may have been introduced during land improvement efforts. The subsoil consisted of a

light yellowish to orangish brown silty clay with occasional concentrations of sandy alluvial gravel, as well as occasional evidence of land clearance in the form of burnt root channels.

Appendix 2: Photographic record



Plate 1: Trenching commences in Trench 1, facing northwest



Plate 2: View across T.1, land drain evident in centre of frame, facing northwest



Plate 3: View of shallow land drain which dissected the central portion of T.1



Plate 4: View of the excavation of T.2 in progress, land drain evident in centre of frame, facing southwest



Plate 5: View of sectioned shallow land drain revealed in the central portion of T.2



Plate 6: View of area of modern disturbance uncovered at south-western end of T.2



Plate 7: View across T.1 from its south-western end



Plate 8: View of the start of shallow land drain which was also revealed within T.2



Plate 9: View of the excavation of T.4 in progress, facing north-northwest



Plate 10: View along T.4 From its lower lying north-north-western end



Plate 11: View of the excavation of T.5 in progress, facing east-northeast



Plate 12: View of the stratigraphy evident within T.5



Plate 13: View to west southwest along T.5, manganese-like mineral concentration evident on base of trench



Plate 14: View of the excavation of T.6 in progress, facing west-southwest



Plate 15: View of the area of the large land drain revealed at the west-south-western end of T.6



Plate 16: View of the stratigraphy revealed within T.6, buried old sod layer evident



Plate 17: View to west-southwest along the excavated T.6



Plate 18: View of the excavation of T.7 in progress, facing east-northeast



Plate 19: View of the stratigraphy evident within T.7



Plate 20: View of the remnants of vegetation root channels -evidence of land clearance, revealed within T.7

Appendix 12-2

Rathcoole Aerodrome, Co. Cork
Archaeological Impact Assessment



Excavation Licence: 15E0446
Cork County Council ref: 15/05370

Tony Cummins

John Cronin & Associates
Unit 3A Westpoint Trade Centre
Ballincollig
Co. Cork

On behalf of:

Rathcoole Flying Club

c/o Martin Fitzpatrick: Architectural Development
8 Carmichael Lane, Mallow,
Co. Cork

October 2015

PROJECT DETAILS

Project type:	Archaeological Test Trenching
Archaeologist:	Tony Cummins
Excavation Licence:	15E0446
Townland:	Rathcoole
County:	Cork
OS Sheet:	CO030
ITM	532746, 595176
RMP	Vicinity of levelled ringfort (CO030-145----)
Local Authority:	Cork County Council
Planning Ref.	15/05370
Development Type:	Flying Club administration building

Contents

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3. Archaeological Test Trenching	8
4. Conclusions.....	9
5. References.....	10
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1. Introduction

John Cronin & Associates have been commissioned by Rathcoole Flying Club to undertake a program of archaeological test trenching on the footprint of a proposed building to be developed within a green field site. The structure will comprise a utility/admin building measuring approx. 15m x 10m with an associated septic tank / percolation area and all associated site works.

A levelled ringfort (CO030-145---) is located within the same field as the proposed development site (approx. 30m to the west). The test trenching investigation on the footprint of the proposed development was undertaken in order to comply with a Request for Further Information (RFI) issued by Cork County Council (ref. 15/05370) which includes the following requirement:

1. You are required to engage the services of a suitably qualified archaeologist to establish the full extent of ringfort CO030-145 and create a buffer zone of 20m from the outer extent of the monument. The archaeologist shall examine all relevant sources (such as maps, aerial photographs) and, if necessary, carry out archaeological testing to establish, to the satisfaction of the Local Authority, the location of the ringfort and to establish that the proposed development is outside the buffer zone, and that no subsurface archaeology is within the development site.



Figure 1: General location map (subject site circled)

2. Context

The proposed development site is within Rathcool townland and within a large level field located to the north of Rathcool village in northwest County Cork (see **Figure 1**). The village and the surrounding farmland are within the parish of Dromtariffe, the barony of Duhallow and formed part of the Colhurst landholdings in County Cork during the post-medieval and early modern periods. The townland name Rathcoole is an Anglicisation of the Irish name *Ráth Cúile*, which has been translated as 'rath/fort of the corner or angle' (www.logainm.ie). While the levelled ringfort (CO030-145----) within the field is the only recorded monument within 200m of the proposed development site, the name may also have been associated with one of a pair of adjacent levelled ringforts within the same townland (CO030-146 & CO030-147), both located 650m to the southeast. The ringfort (CO030-145----) adjacent to the proposed development area was inspected by the Cork Archaeological Inventory in 1987 and is described as follows in the *Archaeological Inventory of County Cork – Volume 4* (Power et al 2000):

Ringfort: CO030-145----

In pasture, on gentle N-facing slope. Depicted as hachured circular enclosure (diam. c. 40m) on 1842 OS 6-inch map. Levelled roadway running NE-SW transects enclosure. On NW side of road is raised area (c. 22m NE-SW), scarp most clearly defined to W; no visible surface trace of site to SE of roadway. Recorded by Bowman (1934, 357) as one of two levelled single-ramparted forts (CO030-147---) on Mr McCarthy's land; (diam. '39 yards and 34 yards').

The lands within Dromtariffe Parish were described as of middling quality in the early 19th century although efforts to improve farming conditions were enhanced following the construction of the new government road and the state of agriculture greatly improved (Lewis 1837). As noted in the inventory entry, the ringfort is depicted as a univallate enclosure within a system of small fields on the 1st edition 6-inch map (see **Figure 2**). The ringfort and adjacent field boundaries are absent on the 25-inch map, which also shows a new road extending through its location (**Figure 3**), indicating that the ringfort was levelled during 19th century road construction and land improvement works.

An inspection of the field has been undertaken by the applicant and the slight raised area noted by the Cork Archaeological Survey is still discernible at the recorded location of the ringfort while no surface traces of a bank or ditch were visible. It is possible that the raised area has been created by upcast material from the construction of the road through the south end of the site. The proposed development area to the east is occupied by a flat area of ground adjacent to the south field boundary and no traces of any potential archaeological features were noted at this location. An inspection of aerial imagery has highlighted the location of the extent of the north end of the enclosure within the field and no potential features were observed at the location of the proposed development site which is approx. 30m west of the ringfort (see **Figure 4**).

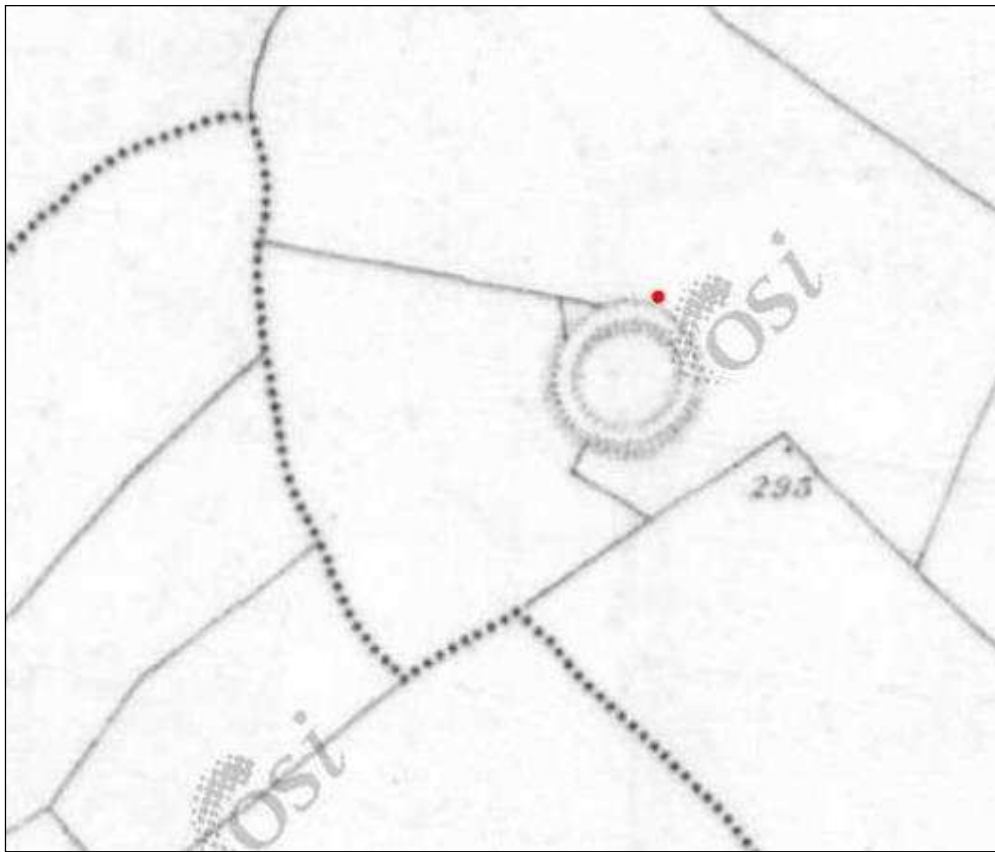


Figure 2: Extract from 1st edition 6-inch map

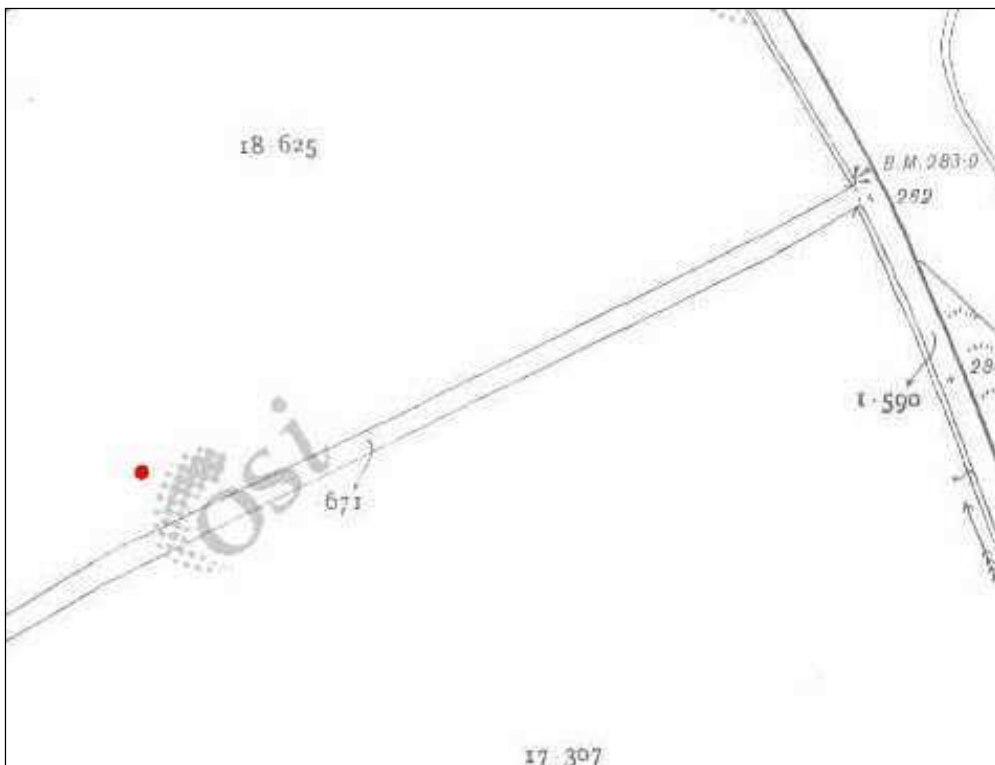


Figure 3: Extract from 25-inch map



Figure 4: Aerial image of subject site showing location of levelled ringfort and development site

3. Archaeological Test Trenching

The test trench excavations involved the excavation of six (6 no.) 10m long test trenches within the footprint of the proposed administration building and percolation area immediately to the east (see **Figure 5**). The proposed development area comprises a level area close to the south field boundary and the ground levels slope very gradually down towards the River Blackwater which flows west to east at a distance of 240m to the north. The proposed development will not require the construction of an access road as the ground surface in the south end of the field is firm and well-draining. All machine traffic will extend to the development site from the existing gateway in the southeast corner of the field (**Figure 5**) and will not extend within 20m of the levelled ringfort.

The six test trenches were excavated with a toothless grading bucket down to the surface of the undisturbed natural subsoil. The stratigraphy noted in all trenches was composed of a homogenous, sterile, mid greyish, silty clay with occasional inclusions of angular stones. The concave cuts of evenly spaced, earth cut field drains (0.7m wide by 0.2m deep) were noted on the surface of the subsoil in all of the trenches and their shared NW-SE orientation appear designed to channel ground water to the northwest towards a low-lying area in the centre of the field. There were no cultural inclusions of any date noted within any of the test trenches or during an inspection of the upcast topsoil and no potential archaeological features were identified in the exposed subsoil layer.

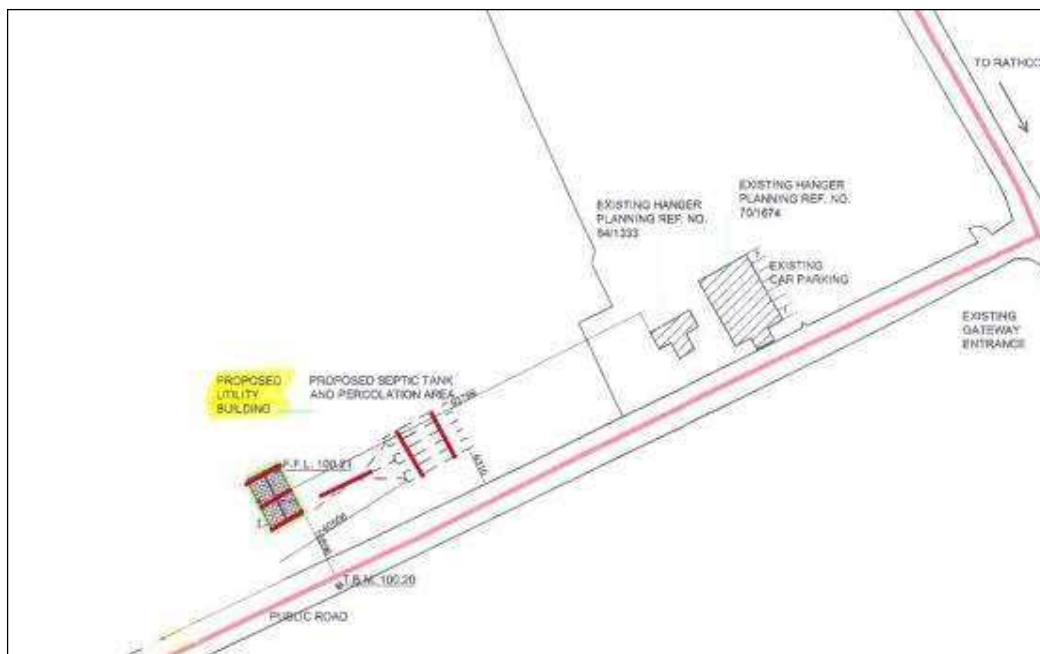


Figure 5: Layout of test trenches excavated in 2015

4. Conclusions

The test trenching investigation on the footprint of the proposed development was undertaken in order to comply with a RFI issued by Cork County Council (ref. 15/05370) which includes the following requirement:

1. You are required to engage the services of a suitably qualified archaeologist to establish the full extent of ringfort CO030-145 and create a buffer zone of 20m from the outer extent of the monument. The archaeologist shall examine all relevant sources (such as maps, aerial photographs) and, if necessary, carry out archaeological testing to establish, to the satisfaction of the Local Authority, the location of the ringfort and to establish that the proposed development is outside the buffer zone, and that no subsurface archaeology is within the development site.

The extent of the univallate ringfort enclosure appears to be discernible on a consulted aerial image and is located **30m to the west** of the nearest element of the proposed development (see **Figure 4** above). The proposed access to the development area will be via an existing gateway in the southeast corner of the field and this will ensure that no construction traffic will need to extend into the 20m buffer zone extending from the identified line of the ringfort enclosure. It is nonetheless recommended that the line of the 20m buffer zone should be clearly delimited and marked with 'no access' signs during the construction phase. The contractor should be made aware that the area is excluded from any ancillary uses such as parking, equipment storage, soil retention, etc. (It should be noted that officers of the Flying Club are fully aware of the presence of the site of the ringfort and understand their duty of care towards same).

To conclude there are no recorded archaeological monuments within the area to be impacted by ground works and no unrecorded archaeological deposits or artefacts were noted during the test trench excavations. It is therefore recommended that the proposed development should proceed without any further archaeological site investigations.

It should be noted that this recommendation is subject to the approval of Cork County Council and the National Monuments Service.

5. References

Lewis, S. 1837 *A Topographical Dictionary of Ireland*. London

Power, D. et al 2000 *Archaeological Inventory of County Cork Volume 4*. Dublin: The Stationary Office

Appendix: Extracts from Photographic Record



Plate 1: General view towards site of levelled ringfort from east



Plate 2: General view of proposed development area from west



Plate 3: General view of test trenching from east



Plate 4: View of section through the sterile topsoil layer



Plate 5: View of exposed subsoil from west with land drain indicated



Plate 6: View of section along edge of south field boundary with land drain indicated

Appendix 13-1

Junctions 9	
PICADY 9 - Priority Intersection Module	
Version: 9.5.1.7462 © Copyright TRL Limited, 2019	
For sales and distribution information, program advice and maintenance, contact TRL: +44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk	
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Filename: Junction 1 N72.j9 11092024.j9

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Report generation date: 11/09/2024 17:13:13

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- »N72/R583 - 2024, AM
 - »N72/R583 - 2024, PM
 - »N72/R583 - 2025 Without Development, AM
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 - »N72/R583 - 2025 Without Development, PM
 - »N72/R583 - 2025 With Development, PM
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 - »N72/R583 - 2040 With Development, AM
 - »N72/R583 - 2040 Without Development, PM
 - »N72/R583 - 2040 With Development, PM

Summary of junction performance

	AM						PM					
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	N72/R583 - 2024											
Stream B-C	D1	0.0	6.87	0.04	A	123 % [Stream B-A]	D2	0.1	8.23	0.11	A	68 % [Stream B-A]
Stream B-A		0.3	11.78	0.25	B			0.4	14.32	0.31	B	
Stream C-AB		0.1	5.76	0.08	A			0.1	6.46	0.09	A	
	N72/R583 - 2025 Without Development											
Stream B-C	D3	0.0	6.88	0.04	A	120 % [Stream B-A]	D5	0.1	8.27	0.11	A	67 % [Stream B-A]
Stream B-A		0.3	11.85	0.25	B			0.4	14.44	0.31	B	
Stream C-AB		0.1	5.76	0.08	A			0.1	6.46	0.09	A	
	N72/R583 - 2025 With Development											
Stream B-C	D4	0.0	6.88	0.04	A	120 % [Stream B-A]	D6	0.1	8.27	0.11	A	67 % [Stream B-A]
Stream B-A		0.3	11.85	0.25	B			0.4	14.44	0.31	B	
Stream C-AB		0.1	5.76	0.08	A			0.1	6.46	0.09	A	
	N72/R583 - 2030 Without Development											
Stream B-C	D7	0.0	6.94	0.04	A	109 % [Stream B-A]	D9	0.1	8.46	0.12	A	57 % [Stream B-A]
Stream B-A		0.4	12.22	0.27	B			0.5	15.23	0.34	C	
Stream C-AB		0.1	5.76	0.08	A			0.2	6.52	0.10	A	
	N72/R583 - 2030 With Development											
Stream B-C	D8	0.0	6.95	0.04	A	108 % [Stream B-A]	D10	0.1	8.53	0.13	A	55 % [Stream B-A]
Stream B-A		0.4	12.26	0.27	B			0.5	15.45	0.35	C	
Stream C-AB		0.1	5.77	0.09	A			0.2	6.52	0.10	A	
	N72/R583 - 2040 Without Development											
Stream B-C	D11	0.0	6.98	0.05	A	105 % [Stream B-A]	D13	0.1	8.54	0.12	A	55 % [Stream B-A]
Stream B-A		0.4	12.38	0.28	B			0.5	15.51	0.35	C	
Stream C-AB		0.1	5.76	0.09	A			0.2	6.52	0.10	A	
	N72/R583 - 2040 With Development											
Stream B-C	D12	0.0	6.99	0.05	A	104 % [Stream B-A]	D14	0.1	8.61	0.13	A	53 % [Stream B-A]
Stream B-A		0.4	12.42	0.28	B			0.5	15.74	0.35	C	
Stream C-AB		0.1	5.78	0.09	A			0.2	6.52	0.10	A	

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle. Network Residual Capacity indicates the amount by which network flow could be increased before a user-definable threshold (see Analysis Options) is met.

File summary

File Description

Title	
Location	
Site number	
Date	16/03/2023
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	MHL\bmurphy
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

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

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2024	AM	ONE HOUR	07:30	09:00	15
D2	2024	PM	ONE HOUR	16:45	18:15	15
D3	2025 Without Development	AM	ONE HOUR	07:30	09:00	15
D4	2025 With Development	AM	ONE HOUR	07:30	09:00	15
D5	2025 Without Development	PM	ONE HOUR	16:45	18:15	15
D6	2025 With Development	PM	ONE HOUR	16:45	18:15	15
D7	2030 Without Development	AM	ONE HOUR	07:30	09:00	15
D8	2030 With Development	AM	ONE HOUR	07:30	09:00	15
D9	2030 Without Development	PM	ONE HOUR	16:45	18:15	15
D10	2030 With Development	PM	ONE HOUR	16:45	18:15	15
D11	2040 Without Development	AM	ONE HOUR	07:30	09:00	15
D12	2040 With Development	AM	ONE HOUR	07:30	09:00	15
D13	2040 Without Development	PM	ONE HOUR	16:45	18:15	15
D14	2040 With Development	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	N72/R583	100.000

N72/R583 - 2024, 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	N25/L3806	T-Junction	Two-way		3.33	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	123	Stream B-A

Arms

Arms

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

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	6.50			165.0	✓	0.00

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

Minor Arm Geometry

Arm	Minor arm type	Lane Width (Left) (m)	Lane Width (Right) (m)	Visibility to left (m)	Visibility to right (m)
B	Two lanes	3.00	3.00	12	80

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	521	0.093	0.234	0.147	0.335
B-C	674	0.101	0.256	-	-
C-B	670	0.254	0.254	-	-

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

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

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

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2024	AM	ONE HOUR	07:30	09:00	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	144	100.000
B		✓	114	100.000
C		✓	194	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
		A	B	C
	A	0	70	74
	B	93	0	21
	C	158	36	0

Vehicle Mix

Heavy Vehicle Percentages

	To			
		A	B	C
	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
B-C	0.04	6.87	0.0	A
B-A	0.25	11.78	0.3	B
C-AB	0.08	5.76	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	16	569	0.028	16	0.0	6.502	A
B-A	70	429	0.163	69	0.2	9.997	A
C-AB	33	658	0.050	33	0.1	5.759	A
C-A	113			113			
A-B	53			53			
A-C	56			56			

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	19	560	0.034	19	0.0	6.651	A
B-A	84	420	0.199	83	0.2	10.692	B
C-AB	41	668	0.062	41	0.1	5.743	A
C-A	133			133			
A-B	63			63			
A-C	67			67			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	23	547	0.042	23	0.0	6.866	A
B-A	102	408	0.251	102	0.3	11.757	B
C-AB	53	682	0.078	53	0.1	5.725	A
C-A	160			160			
A-B	77			77			
A-C	81			81			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	23	547	0.042	23	0.0	6.867	A
B-A	102	408	0.251	102	0.3	11.783	B
C-AB	53	682	0.078	53	0.1	5.727	A
C-A	160			160			
A-B	77			77			
A-C	81			81			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	19	560	0.034	19	0.0	6.657	A
B-A	84	420	0.199	84	0.3	10.729	B
C-AB	41	668	0.062	41	0.1	5.749	A
C-A	133			133			
A-B	63			63			
A-C	67			67			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	16	569	0.028	16	0.0	6.509	A
B-A	70	429	0.163	70	0.2	10.055	B
C-AB	33	658	0.050	33	0.1	5.764	A
C-A	113			113			
A-B	53			53			
A-C	56			56			

N72/R583 - 2024, 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	N25/L3806	T-Junction	Two-way		3.17	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	68	Stream B-A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2024	PM	ONE HOUR	16:45	18:15	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	361	100.000
B		✓	152	100.000
C		✓	180	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	135	226
	B	102	0	50
	C	141	39	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
B-C	0.11	8.23	0.1	A
B-A	0.31	14.32	0.4	B
C-AB	0.09	6.46	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	38	532	0.071	37	0.1	7.268	A
B-A	77	398	0.193	76	0.2	11.129	B
C-AB	36	611	0.058	35	0.1	6.252	A
C-A	100			100			
A-B	102			102			
A-C	170			170			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	45	516	0.087	45	0.1	7.646	A
B-A	92	384	0.239	91	0.3	12.300	B
C-AB	44	612	0.072	44	0.1	6.336	A
C-A	118			118			
A-B	121			121			
A-C	203			203			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	55	493	0.112	55	0.1	8.222	A
B-A	112	364	0.309	112	0.4	14.261	B
C-AB	58	615	0.094	57	0.1	6.458	A
C-A	141			141			
A-B	149			149			
A-C	249			249			

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	55	492	0.112	55	0.1	8.229	A
B-A	112	364	0.309	112	0.4	14.319	B
C-AB	58	615	0.094	58	0.1	6.461	A
C-A	141			141			
A-B	149			149			
A-C	249			249			

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	45	515	0.087	45	0.1	7.655	A
B-A	92	384	0.239	92	0.3	12.371	B
C-AB	44	612	0.072	44	0.1	6.344	A
C-A	117			117			
A-B	121			121			
A-C	203			203			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	38	532	0.071	38	0.1	7.288	A
B-A	77	398	0.193	77	0.2	11.221	B
C-AB	36	611	0.058	36	0.1	6.263	A
C-A	100			100			
A-B	102			102			
A-C	170			170			

N72/R583 - 2025 Without Development, 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	N25/L3806	T-Junction	Two-way		3.34	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	120	Stream B-A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2025 Without Development	AM	ONE HOUR	07:30	09:00	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	146	100.000
B		✓	115	100.000
C		✓	196	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	71	75
	B	94	0	21
	C	160	36	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
B-C	0.04	6.88	0.0	A
B-A	0.25	11.85	0.3	B
C-AB	0.08	5.76	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	16	569	0.028	16	0.0	6.508	A
B-A	71	428	0.165	70	0.2	10.028	B
C-AB	33	658	0.050	33	0.1	5.754	A
C-A	114			114			
A-B	53			53			
A-C	56			56			

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	19	559	0.034	19	0.0	6.660	A
B-A	85	419	0.202	84	0.2	10.738	B
C-AB	41	669	0.062	41	0.1	5.738	A
C-A	135			135			
A-B	64			64			
A-C	67			67			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	23	547	0.042	23	0.0	6.877	A
B-A	103	407	0.254	103	0.3	11.830	B
C-AB	54	683	0.078	53	0.1	5.719	A
C-A	162			162			
A-B	78			78			
A-C	83			83			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	23	546	0.042	23	0.0	6.878	A
B-A	103	407	0.254	103	0.3	11.853	B
C-AB	54	683	0.078	54	0.1	5.721	A
C-A	162			162			
A-B	78			78			
A-C	83			83			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	19	559	0.034	19	0.0	6.663	A
B-A	85	419	0.202	85	0.3	10.776	B
C-AB	41	669	0.062	41	0.1	5.741	A
C-A	135			135			
A-B	64			64			
A-C	67			67			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	16	568	0.028	16	0.0	6.515	A
B-A	71	428	0.165	71	0.2	10.088	B
C-AB	33	659	0.050	33	0.1	5.761	A
C-A	114			114			
A-B	53			53			
A-C	56			56			

N72/R583 - 2025 With Development, 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	N25/L3806	T-Junction	Two-way		3.34	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	120	Stream B-A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2025 With Development	AM	ONE HOUR	07:30	09:00	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	146	100.000
B		✓	115	100.000
C		✓	196	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	71	75
	B	94	0	21
	C	160	36	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
B-C	0.04	6.88	0.0	A
B-A	0.25	11.85	0.3	B
C-AB	0.08	5.76	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	16	569	0.028	16	0.0	6.508	A
B-A	71	428	0.165	70	0.2	10.028	B
C-AB	33	658	0.050	33	0.1	5.754	A
C-A	114			114			
A-B	53			53			
A-C	56			56			

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	19	559	0.034	19	0.0	6.660	A
B-A	85	419	0.202	84	0.2	10.738	B
C-AB	41	669	0.062	41	0.1	5.738	A
C-A	135			135			
A-B	64			64			
A-C	67			67			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	23	547	0.042	23	0.0	6.877	A
B-A	103	407	0.254	103	0.3	11.830	B
C-AB	54	683	0.078	53	0.1	5.719	A
C-A	162			162			
A-B	78			78			
A-C	83			83			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	23	546	0.042	23	0.0	6.878	A
B-A	103	407	0.254	103	0.3	11.853	B
C-AB	54	683	0.078	54	0.1	5.721	A
C-A	162			162			
A-B	78			78			
A-C	83			83			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	19	559	0.034	19	0.0	6.663	A
B-A	85	419	0.202	85	0.3	10.776	B
C-AB	41	669	0.062	41	0.1	5.741	A
C-A	135			135			
A-B	64			64			
A-C	67			67			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	16	568	0.028	16	0.0	6.515	A
B-A	71	428	0.165	71	0.2	10.088	B
C-AB	33	659	0.050	33	0.1	5.761	A
C-A	114			114			
A-B	53			53			
A-C	56			56			

N72/R583 - 2025 Without Development, 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	N25/L3806	T-Junction	Two-way		3.19	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	67	Stream B-A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2025 Without Development	PM	ONE HOUR	16:45	18:15	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	364	100.000
B		✓	154	100.000
C		✓	182	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	136	228
	B	103	0	51
	C	143	39	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
B-C	0.11	8.27	0.1	A
B-A	0.31	14.44	0.4	B
C-AB	0.09	6.46	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	38	532	0.072	38	0.1	7.290	A
B-A	78	398	0.195	77	0.2	11.178	B
C-AB	36	611	0.058	35	0.1	6.248	A
C-A	101			101			
A-B	102			102			
A-C	172			172			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	46	515	0.089	46	0.1	7.676	A
B-A	93	383	0.242	92	0.3	12.371	B
C-AB	44	613	0.073	44	0.1	6.332	A
C-A	119			119			
A-B	122			122			
A-C	205			205			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	56	492	0.114	56	0.1	8.265	A
B-A	113	363	0.313	113	0.4	14.375	B
C-AB	58	616	0.094	58	0.1	6.454	A
C-A	143			143			
A-B	150			150			
A-C	251			251			

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	56	491	0.114	56	0.1	8.272	A
B-A	113	363	0.313	113	0.4	14.437	B
C-AB	58	616	0.094	58	0.1	6.455	A
C-A	143			143			
A-B	150			150			
A-C	251			251			

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	46	514	0.089	46	0.1	7.687	A
B-A	93	383	0.242	93	0.3	12.444	B
C-AB	44	613	0.073	45	0.1	6.340	A
C-A	119			119			
A-B	122			122			
A-C	205			205			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	38	531	0.072	38	0.1	7.308	A
B-A	78	398	0.195	78	0.2	11.269	B
C-AB	36	611	0.058	36	0.1	6.259	A
C-A	101			101			
A-B	102			102			
A-C	172			172			

N72/R583 - 2025 With Development, 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	N25/L3806	T-Junction	Two-way		3.19	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	67	Stream B-A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2025 With Development	PM	ONE HOUR	16:45	18:15	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	364	100.000
B		✓	154	100.000
C		✓	182	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	136	228
	B	103	0	51
	C	143	39	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
B-C	0.11	8.27	0.1	A
B-A	0.31	14.44	0.4	B
C-AB	0.09	6.46	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	38	532	0.072	38	0.1	7.290	A
B-A	78	398	0.195	77	0.2	11.178	B
C-AB	36	611	0.058	35	0.1	6.248	A
C-A	101			101			
A-B	102			102			
A-C	172			172			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	46	515	0.089	46	0.1	7.676	A
B-A	93	383	0.242	92	0.3	12.371	B
C-AB	44	613	0.073	44	0.1	6.332	A
C-A	119			119			
A-B	122			122			
A-C	205			205			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	56	492	0.114	56	0.1	8.265	A
B-A	113	363	0.313	113	0.4	14.375	B
C-AB	58	616	0.094	58	0.1	6.454	A
C-A	143			143			
A-B	150			150			
A-C	251			251			

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	56	491	0.114	56	0.1	8.272	A
B-A	113	363	0.313	113	0.4	14.437	B
C-AB	58	616	0.094	58	0.1	6.455	A
C-A	143			143			
A-B	150			150			
A-C	251			251			

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	46	514	0.089	46	0.1	7.687	A
B-A	93	383	0.242	93	0.3	12.444	B
C-AB	44	613	0.073	45	0.1	6.340	A
C-A	119			119			
A-B	122			122			
A-C	205			205			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	38	531	0.072	38	0.1	7.308	A
B-A	78	398	0.195	78	0.2	11.269	B
C-AB	36	611	0.058	36	0.1	6.259	A
C-A	101			101			
A-B	102			102			
A-C	172			172			

N72/R583 - 2030 Without Development, 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	N25/L3806	T-Junction	Two-way		3.42	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	109	Stream B-A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2030 Without Development	AM	ONE HOUR	07:30	09:00	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	154	100.000
B		✓	121	100.000
C		✓	207	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	75	79
	B	99	0	22
	C	169	38	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
B-C	0.04	6.94	0.0	A
B-A	0.27	12.22	0.4	B
C-AB	0.08	5.76	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	566	0.029	16	0.0	6.546	A
B-A	75	426	0.175	74	0.2	10.212	B
C-AB	35	661	0.054	35	0.1	5.747	A
C-A	120			120			
A-B	56			56			
A-C	59			59			

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	20	566	0.036	20	0.0	6.708	A
B-A	89	416	0.214	89	0.3	10.981	B
C-AB	44	672	0.066	44	0.1	5.734	A
C-A	142			142			
A-B	67			67			
A-C	71			71			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	24	543	0.045	24	0.0	6.942	A
B-A	109	404	0.270	109	0.4	12.189	B
C-AB	57	687	0.084	57	0.1	5.714	A
C-A	170			170			
A-B	83			83			
A-C	87			87			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	24	543	0.045	24	0.0	6.944	A
B-A	109	404	0.270	109	0.4	12.221	B
C-AB	58	687	0.084	58	0.1	5.716	A
C-A	170			170			
A-B	83			83			
A-C	87			87			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	20	556	0.036	20	0.0	6.712	A
B-A	89	416	0.214	89	0.3	11.023	B
C-AB	44	672	0.066	44	0.1	5.735	A
C-A	142			142			
A-B	67			67			
A-C	71			71			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	566	0.029	17	0.0	6.554	A
B-A	75	426	0.175	75	0.2	10.269	B
C-AB	35	661	0.054	36	0.1	5.755	A
C-A	120			120			
A-B	56			56			
A-C	59			59			

N72/R583 - 2030 With Development, 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	N25/L3806	T-Junction	Two-way		3.44	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	108	Stream B-A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2030 With Development	AM	ONE HOUR	07:30	09:00	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	156	100.000
B		✓	121	100.000
C		✓	209	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	77	79
	B	99	0	22
	C	169	40	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
B-C	0.04	6.95	0.0	A
B-A	0.27	12.26	0.4	B
C-AB	0.09	5.77	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	566	0.029	16	0.0	6.548	A
B-A	75	425	0.175	74	0.2	10.215	B
C-AB	37	661	0.056	37	0.1	5.768	A
C-A	120			120			
A-B	58			58			
A-C	59			59			

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	20	556	0.036	20	0.0	6.711	A
B-A	89	416	0.214	89	0.3	11.007	B
C-AB	47	672	0.069	46	0.1	5.759	A
C-A	141			141			
A-B	69			69			
A-C	71			71			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	24	542	0.045	24	0.0	6.946	A
B-A	109	403	0.271	109	0.4	12.228	B
C-AB	61	687	0.088	60	0.1	5.748	A
C-A	170			170			
A-B	85			85			
A-C	87			87			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	24	542	0.045	24	0.0	6.948	A
B-A	109	403	0.271	109	0.4	12.261	B
C-AB	61	687	0.088	61	0.1	5.751	A
C-A	170			170			
A-B	85			85			
A-C	87			87			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	20	556	0.036	20	0.0	6.718	A
B-A	89	416	0.214	89	0.3	11.049	B
C-AB	47	672	0.069	47	0.1	5.761	A
C-A	141			141			
A-B	69			69			
A-C	71			71			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	566	0.029	17	0.0	6.556	A
B-A	75	425	0.175	75	0.2	10.288	B
C-AB	37	661	0.057	37	0.1	5.773	A
C-A	120			120			
A-B	58			58			
A-C	59			59			

N72/R583 - 2030 Without Development, 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	N25/L3806	T-Junction	Two-way		3.34	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	57	Stream B-A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2030 Without Development	PM	ONE HOUR	16:45	18:15	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	385	100.000
B		✓	162	100.000
C		✓	192	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	144	241
	B	109	0	53
	C	150	42	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
B-C	0.12	8.46	0.1	A
B-A	0.34	15.23	0.5	C
C-AB	0.10	6.52	0.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	40	527	0.076	40	0.1	7.385	A
B-A	82	393	0.209	81	0.3	11.489	B
C-AB	39	611	0.063	38	0.1	6.284	A
C-A	106			106			
A-B	108			108			
A-C	181			181			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	48	509	0.094	48	0.1	7.804	A
B-A	98	378	0.259	98	0.3	12.836	B
C-AB	48	613	0.079	48	0.1	6.379	A
C-A	124			124			
A-B	129			129			
A-C	217			217			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	58	484	0.121	58	0.1	8.450	A
B-A	120	356	0.337	119	0.5	15.156	C
C-AB	63	616	0.103	63	0.2	6.516	A
C-A	148			148			
A-B	159			159			
A-C	265			265			

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	58	484	0.121	58	0.1	8.460	A
B-A	120	356	0.337	120	0.5	15.229	C
C-AB	63	616	0.103	63	0.2	6.522	A
C-A	148			148			
A-B	159			159			
A-C	265			265			

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	48	508	0.094	48	0.1	7.817	A
B-A	98	378	0.259	99	0.4	12.926	B
C-AB	49	613	0.079	49	0.1	6.385	A
C-A	124			124			
A-B	129			129			
A-C	217			217			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	40	526	0.076	40	0.1	7.404	A
B-A	82	393	0.209	82	0.3	11.595	B
C-AB	39	611	0.064	39	0.1	6.296	A
C-A	106			106			
A-B	108			108			
A-C	181			181			

N72/R583 - 2030 With Development, 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	N25/L3806	T-Junction	Two-way		3.44	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	55	Stream B-A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2030 With Development	PM	ONE HOUR	16:45	18:15	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	385	100.000
B		✓	167	100.000
C		✓	192	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	144	241
	B	112	0	55
	C	150	42	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
B-C	0.13	8.53	0.1	A
B-A	0.35	15.45	0.5	C
C-AB	0.10	6.52	0.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	41	526	0.079	41	0.1	7.420	A
B-A	84	393	0.214	83	0.3	11.570	B
C-AB	39	611	0.063	38	0.1	6.284	A
C-A	106			106			
A-B	108			108			
A-C	181			181			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	49	508	0.097	49	0.1	7.848	A
B-A	101	378	0.267	100	0.4	12.959	B
C-AB	48	613	0.079	48	0.1	6.381	A
C-A	124			124			
A-B	129			129			
A-C	217			217			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	61	483	0.125	60	0.1	8.519	A
B-A	123	356	0.346	123	0.5	15.364	C
C-AB	63	616	0.103	63	0.2	6.518	A
C-A	148			148			
A-B	159			159			
A-C	265			265			

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	61	483	0.125	61	0.1	8.529	A
B-A	123	356	0.346	123	0.5	15.447	C
C-AB	63	616	0.103	63	0.2	6.520	A
C-A	148			148			
A-B	159			159			
A-C	265			265			

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	49	507	0.097	50	0.1	7.863	A
B-A	101	378	0.267	101	0.4	13.055	B
C-AB	49	613	0.079	49	0.1	6.385	A
C-A	124			124			
A-B	129			129			
A-C	217			217			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	41	525	0.079	41	0.1	7.443	A
B-A	84	393	0.214	85	0.3	11.681	B
C-AB	39	611	0.064	39	0.1	6.296	A
C-A	106			106			
A-B	108			108			
A-C	181			181			

N72/R583 - 2040 Without Development, 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	N25/L3806	T-Junction	Two-way		3.47	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	105	Stream B-A

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)
D11	2040 Without Development	AM	ONE HOUR	07:30	09:00	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	157	100.000
B		✓	124	100.000
C		✓	211	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	76	81
	B	101	0	23
	C	172	39	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
B-C	0.05	6.98	0.0	A
B-A	0.28	12.38	0.4	B
C-AB	0.09	5.76	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	565	0.031	17	0.0	6.568	A
B-A	76	425	0.179	75	0.2	10.277	B
C-AB	36	662	0.055	36	0.1	5.749	A
C-A	122			122			
A-B	57			57			
A-C	61			61			

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	21	555	0.037	21	0.0	6.735	A
B-A	91	415	0.219	91	0.3	11.090	B
C-AB	46	673	0.068	45	0.1	5.736	A
C-A	144			144			
A-B	68			68			
A-C	73			73			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	25	541	0.047	25	0.0	6.978	A
B-A	111	402	0.277	111	0.4	12.340	B
C-AB	59	689	0.086	59	0.1	5.720	A
C-A	173			173			
A-B	84			84			
A-C	89			89			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	25	541	0.047	25	0.0	6.980	A
B-A	111	402	0.277	111	0.4	12.376	B
C-AB	59	689	0.086	59	0.1	5.723	A
C-A	173			173			
A-B	84			84			
A-C	89			89			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	21	555	0.037	21	0.0	6.739	A
B-A	91	415	0.219	91	0.3	11.129	B
C-AB	46	673	0.068	46	0.1	5.738	A
C-A	144			144			
A-B	68			68			
A-C	73			73			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	565	0.031	17	0.0	6.578	A
B-A	76	425	0.179	76	0.2	10.344	B
C-AB	37	662	0.055	37	0.1	5.757	A
C-A	122			122			
A-B	57			57			
A-C	61			61			

N72/R583 - 2040 With Development, 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	N25/L3806	T-Junction	Two-way		3.48	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	104	Stream B-A

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)
D12	2040 With Development	AM	ONE HOUR	07:30	09:00	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	160	100.000
B		✓	124	100.000
C		✓	213	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	79	81
	B	101	0	23
	C	172	41	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
B-C	0.05	6.99	0.0	A
B-A	0.28	12.42	0.4	B
C-AB	0.09	5.78	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	565	0.031	17	0.0	6.571	A
B-A	76	424	0.179	75	0.2	10.298	B
C-AB	38	662	0.058	38	0.1	5.772	A
C-A	122			122			
A-B	59			59			
A-C	61			61			

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	21	555	0.037	21	0.0	6.740	A
B-A	91	414	0.219	91	0.3	11.120	B
C-AB	48	673	0.071	48	0.1	5.761	A
C-A	144			144			
A-B	71			71			
A-C	73			73			

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	25	541	0.047	25	0.0	6.984	A
B-A	111	401	0.277	111	0.4	12.385	B
C-AB	62	688	0.091	62	0.1	5.753	A
C-A	172			172			
A-B	87			87			
A-C	89			89			

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	25	541	0.047	25	0.0	6.986	A
B-A	111	401	0.277	111	0.4	12.421	B
C-AB	62	688	0.091	62	0.1	5.758	A
C-A	172			172			
A-B	87			87			
A-C	89			89			

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	21	554	0.037	21	0.0	6.746	A
B-A	91	414	0.219	91	0.3	11.158	B
C-AB	48	673	0.071	48	0.1	5.765	A
C-A	143			143			
A-B	71			71			
A-C	73			73			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	564	0.031	17	0.0	6.579	A
B-A	76	424	0.179	76	0.2	10.368	B
C-AB	38	662	0.058	39	0.1	5.777	A
C-A	122			122			
A-B	59			59			
A-C	61			61			

N72/R583 - 2040 Without Development, 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	N25/L3806	T-Junction	Two-way		3.38	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	55	Stream B-A

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)
D13	2040 Without Development	PM	ONE HOUR	16:45	18:15	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	393	100.000
B		✓	165	100.000
C		✓	195	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	147	246
	B	111	0	54
	C	153	42	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
B-C	0.12	8.54	0.1	A
B-A	0.35	15.51	0.5	C
C-AB	0.10	6.52	0.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	41	525	0.077	40	0.1	7.424	A
B-A	84	392	0.213	83	0.3	11.596	B
C-AB	39	611	0.064	39	0.1	6.285	A
C-A	108			108			
A-B	111			111			
A-C	185			185			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	49	507	0.096	48	0.1	7.856	A
B-A	100	376	0.265	99	0.4	12.996	B
C-AB	49	613	0.080	49	0.1	6.382	A
C-A	127			127			
A-B	132			132			
A-C	221			221			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	59	481	0.124	59	0.1	8.526	A
B-A	122	354	0.345	122	0.5	15.429	C
C-AB	64	616	0.104	64	0.2	6.518	A
C-A	151			151			
A-B	162			162			
A-C	271			271			

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	59	481	0.124	59	0.1	8.536	A
B-A	122	354	0.345	122	0.5	15.513	C
C-AB	64	616	0.104	64	0.2	6.522	A
C-A	151			151			
A-B	162			162			
A-C	271			271			

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	49	506	0.096	49	0.1	7.868	A
B-A	100	376	0.265	100	0.4	13.091	B
C-AB	49	613	0.080	49	0.1	6.386	A
C-A	126			126			
A-B	132			132			
A-C	221			221			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	41	524	0.078	41	0.1	7.446	A
B-A	84	392	0.213	84	0.3	11.709	B
C-AB	39	611	0.064	39	0.1	6.297	A
C-A	108			108			
A-B	111			111			
A-C	185			185			

N72/R583 - 2040 With Development, 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	N25/L3806	T-Junction	Two-way		3.48	A

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	53	Stream B-A

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)
D14	2040 With Development	PM	ONE HOUR	16:45	18:15	15

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

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	393	100.000
B		✓	170	100.000
C		✓	195	100.000

Origin-Destination Data

Demand (Veh/hr)

	To			
	A	B	C	
From	A	0	147	246
	B	114	0	56
	C	153	42	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
B-C	0.13	8.61	0.1	A
B-A	0.35	15.74	0.5	C
C-AB	0.10	6.52	0.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	42	524	0.080	42	0.1	7.459	A
B-A	86	392	0.219	85	0.3	11.673	B
C-AB	39	611	0.064	39	0.1	6.285	A
C-A	108			108			
A-B	111			111			
A-C	185			185			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	50	506	0.100	50	0.1	7.902	A
B-A	102	376	0.273	102	0.4	13.122	B
C-AB	49	613	0.080	49	0.1	6.382	A
C-A	127			127			
A-B	132			132			
A-C	221			221			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	62	480	0.128	62	0.1	8.597	A
B-A	126	354	0.354	125	0.5	15.646	C
C-AB	64	616	0.104	64	0.2	6.518	A
C-A	151			151			
A-B	162			162			
A-C	271			271			

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	62	480	0.128	62	0.1	8.607	A
B-A	126	354	0.354	125	0.5	15.737	C
C-AB	64	616	0.104	64	0.2	6.524	A
C-A	151			151			
A-B	162			162			
A-C	271			271			

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	50	505	0.100	50	0.1	7.917	A
B-A	102	376	0.273	103	0.4	13.224	B
C-AB	49	613	0.080	49	0.1	6.386	A
C-A	126			126			
A-B	132			132			
A-C	221			221			

18:00 - 18:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	42	524	0.081	42	0.1	7.482	A
B-A	86	392	0.219	86	0.3	11.795	B
C-AB	39	611	0.064	39	0.1	6.297	A
C-A	108			108			
A-B	111			111			
A-C	185			185			



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