Irish Water-Leadin Drinking WaterMitigation Plan

Screening for Appropriate Assessment

006 Inniscarra WTP - Zone 2 City and Harbour WSZ (0500PUB3401)

Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment 006 Cork Zone 2 City and Harbour (0500PUB3401) WSZ- Inniscarra WTP

Document Control Sheet

Client:	Irish Water
Project Title:	Lead in Drinking Water Mitigation Plan
Document Title:	Screening for Appropriate Assessment 006 Cork Zone 2 City and Harbour (0500PUB3401) WSZ – Inniscarra WTP
Document No:	MDW0766Rp_5.3_Screening_006_Cork Zone 2 City and Harbour_F02

Text Pages:	91	Appendices:	3

Rev	Status	Date	Author(s)		Reviewed By		Approved By	
A01	For Client Approval	13th April 2018	AD LC		BW		DC	
A02	For Client Approval	09th July 2018	CH		LC		PK	
A03	For Client Approval	14th May 2019	LE		LC		GJG	
A04	For Client Approval	08th July 2019	LC		LC		GJG	
F01	Final	18th July 2019	LC		LC		GJG	
F02	Final	27th March 2023	MM		MM		MM	

TABLE OF CONTENTS

APPENDICES

Appendix A **European Sites - Conservation Objectives**

Appendix B **Nutrient Sensitive Qualifying Interests**

Appendix C **EAM Summary Report for Zone 2 Cork City and Harbour WSZ**

LIST OF FIGURES

LIST OF TABLES

GLOSSARY OF TERMS & ABBREVIATIONS

Appropriate Assessment: An assessment of the effects of a plan or project on European Sites.

Biodiversity: Word commonly used for biological diversity and defined as assemblage of living organisms from all habitats including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.

Birds Directive: Council Directive of 2nd April 1979 on the conservation of wild birds (79/409/EEC) as codified by Directive 2009/147/EC.

Geographical Information System (GIS): A GIS is a computer-based system for capturing, storing, checking, integrating, manipulating, analysing and displaying data that are spatially referenced.

Habitats Directive: European Community Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Flora and Fauna and has been transposed into Irish law by the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011). It establishes a system to protect certain fauna, flora and habitats deemed to be of European conservation importance.

Mitigation measures: Measures to avoid/prevent, minimise/reduce, or as fully as possible, offset/compensate for any significant adverse effects on the environment, as a result of implementing a plan or project.

Natura 2000: European network of protected sites, which represent areas of the highest value for natural habitats and species of plants and animals, which are rare, endangered or vulnerable in the European Community. The Natura 2000 network of sites will include two types of area. Areas may be designated as Special Areas of Conservation (SAC) where they support rare, endangered or vulnerable natural habitats and species of plants or animals (other than birds). Where areas support significant numbers of wild birds and their habitats, they may become Special Protection Areas (SPA). SACs are designated under the Habitats Directive and SPAs are classified under the Birds Directive. In some situations, there may be overlap in extent of SAC and SPA.

Screening: The determination of whether implementation of a plan or project would be likely to have significant environmental effects on the Natura 2000 network.

Special Area for Conservation (SAC): An SAC designation is an internationally important site, protected for its habitats and species. It is designated, as required, under the EC Habitats Directive (1992).

Special Protection Area (SPA): An SPA is a site of international importance for breeding, feeding and roosting habitat for bird species. It is designated under the EC Birds Directive (1979).

Statutory Instrument: Any order, regulation, rule, scheme or byelaw made in exercise of a power conferred by statute.

1 INTRODUCTION

RPS was commissioned by Irish Water (IW) to undertake Screening for Appropriate Assessment (AA) for the proposed orthophosphate dosing (herein referred to as the proposed works) of drinking water supplied by Inniscarra Water Treatment Plant (WTP), Curraleigh, Inniscarra, Co. Cork.

This report comprises information to support the Screening for AA in line with the requirements 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 (hereafter referred to as the Habitats Directive). The report assesses the potential for likely significant effects resulting from the additional phosphorus (P) load to environmental receptors, resulting from orthophosphate dosing being undertaken to mitigate against consumer exposure to lead in drinking water. It is therefore necessary to consider the sources, pathways and receptors in relation to added phosphorus.

1.1 PURPOSE OF THIS REPORT

The overall purpose of the Screening for AA, as a first step in determining the requirement for AA, is to determine whether the project is likely to have a significant effect on any European Site within the zone of influence (ZoI) of the Water Supply Zone (WSZ), either individually or in combination with other plans or projects, in view of the site's conservation objectives. This Screening report complies with the requirements of Article 6 of the Habitats Directive transposed in Ireland principally through the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations, S.I. No. 477 of 2011 (as amended). In the context of the proposed project, the governing legislation is the EC Birds and Habitats Regulations 2011 (as amended).

1.2 THE PLAN

Irish Water, as the national public water utility, prepared a Lead in Drinking Water Mitigation Plan (LDWMP) in 2016 (here after referred to as the Plan). The Plan provides a framework of measures for implementation to effectively address the currently elevated levels of lead in drinking water experienced by some IW customers as a result of lead piping. The Plan was prepared in response to the recommendations in the *National Strategy to reduce exposure to Lead in Drinking Water* which was published by the Department of Environment, Community and Local Government[1] and Department of Health in June 2015.

The overall objective of the Plan is to effectively address the risk of failure to comply with the drinking water quality standard for lead due to lead pipework in as far as is practical within the areas of IW's responsibility. Lead in drinking water is derived from lead pipes that are still in place in the supply network. These pipes are mostly in old shared connections or in the short pipes connecting the (public) water main to the (private) water supply pipes (IW, 2016[2]). Problems can also be caused by lead leaching from domestic plumbing components made of brass and from lead-containing solder, with the most significant portion of the lead pipework lying outside of IW's ownership in private properties (IW, 2016). Lead can be dissolved in water as it travels through lead supply pipes and internal lead plumbing. When lead is in contact with water it can slowly dissolve, a process known as

[1] Now known as the Department of Housing, Planning and Local Government (DHPLG).
[2] Irish Water (IW) (2016) Lead in Drinking Water Mitigation Plan. https://www.water.ie/projects-plans/lead-mitigation-plan/Lead-in-Drinking-Water-Mitigation-Plan.pdf

plumbosolvency. The degree to which lead dissolves varies with the length of lead pipe, local water chemistry, temperature and the amount of water used at the property.

Health studies have identified risks to human health from ingestion of lead. In December 2013, the acceptable limit for lead in drinking water was reduced to 10 micrograms per litre (µg/l) as per the European Union (Drinking Water) Regulations. From 2003 to 2013, the limit was 25µg/l, which was a reduction on the previous limit (i.e. pre 2003) of 50µg/l.

The World Health Organisation (WHO), Environmental Protection Agency (EPA) and Health Service Executive (HSE) recommend lead pipe replacement (both lead service connections in the public supply, and lead supply pipes and internal plumbing in private properties) as the ultimate goal in reducing long-term exposure to lead. It is recognised that this will inevitably take a considerable period of time. In recognition of this, short to medium term proposals to mitigate the risk are being examined.

The Plan sets out the short, medium and longer term actions that IW intends to undertake, subject to the approval of the economic regulator, the Commission for Regulation of Utilities (CRU). It is currently estimated that 85% to 95% of properties meet the lead compliance standards when sampled at the customer's tap. The goal is to increase this compliance rate to 98% by end of 2021 and 99% by the end of 2027 (IW, 2016). This is subject to a technological alternative to lead replacement being deemed environmentally viable.

The permanent solution to the lead issue is to replace all water mains that contain lead. IW proposes that a national programme of replacement of public lead service pipes is required. However, replacing the public supply pipe or the private pipe on its own will not resolve the problem. Research indicates that unless both are replaced, lead levels in the drinking water could remain higher than the Regulation standards. Where lead pipework or plumbing fittings occur within a private property, it is the responsibility of the property owner to replace it.

The Plan assesses a number of other lead mitigation options available to IW. Other measures, including corrective water treatment in the form of pH adjustment and orthophosphate treatment, are being considered as an interim measure for the reduction of lead concentrations in drinking water in some WSZs.

IW initially assessed 400 water treatment plants for the introduction of corrective water treatment. Following this process 138 priority plants have been identified and corrective water treatment will be rolled out during the Lead in Drinking Water Mitigation programme, subject to site-specific environmental assessments. The corrective water treatment will reduce plumbosolvency risk over the short to medium term in high risk water supplies where it is technically, economically and environmentally viable to do so. This practice is now the accepted method of lead mitigation in many countries e.g. Great Britain and Northern Ireland. The dosing would be required to continue whilst lead pipework is still in use, subject to annual review on a scheme by scheme basis.

Orthophosphate is added in the form of Phosphoric acid, which is approved for use as a food additive (E338) in dairy, cereals, soft drinks, meat and cheese. The average adult person consumes between 1,000 and 1,500 milligrams (mg) of phosphorus every day as part of the normal diet. The quantity of orthophosphate that IW will be required to add to treated water is between 0.5 mg/l to 1.5 mg/l. At Inniscarra WTP orthophosphate will be added at a rate of 0.6 mg/l.

The typical concentration of phosphorus ingested from drinking 3 litres of water per day that has been treated with food grade phosphoric acid at 1.5 mg/l phosphorus, would be 4.5 milligrams.

The orthophosphate is dosed into the water at a rate which is dependent on raw water chemistry in a similar process to the addition of chlorine for disinfection. Orthophosphate dosing takes a period of 6-12 months to develop a full coating, after which dosing must be maintained in order to sustain the protective coating.

1.3 PROJECT BACKGROUND

Phosphorus can influence water quality status through the process of nutrient enrichment and promotion of excessive plant growth (eutrophication). It is therefore necessary to evaluate the significance of any potential environmental impact and the pathways by which the added orthophosphate may reach environmental receptors. To facilitate the assessment, an Environmental Assessment Methodology (EAM) has been developed based on a conceptual model of phosphorus transfer (from the water distribution and wastewater collection systems), using the source-pathway-receptor framework.

The first step of the EAM is to identify the European Sites that have a hydrological or hydrogeological connectivity to the WSZs affected by the proposed orthophosphate dosing. The EAM recognises that for those European Sites with nutrient sensitive Qualifying Interests (habitats and species) and connectivity to the WSZ indicates that pathways for effects exist. The project effects on these European Sites, and an evaluation as to whether these are potentially significant, are the subject of the Screening for AA. The Screening report applies objective scientific information from the EAM as outlined in this document in the context of the Site-Specific Conservation Objectives (SSCO) as published on the NPWS website.

The EAM process identified 25 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Ballymacoda (Clonpriest and Pillmore) SAC, Bandon River SAC, Great Island Channel SAC, The Gearagh SAC, Courtmacsherry Estuary SAC, Clonakilty Bay SAC, Kilkeran Lake and Castlefreke Dunes SAC, Castletownshend SAC, Lough Hyne Nature Reserve and Environs SAC, Roaringwater Bay and Islands SAC, Barley Cove to Ballyrisode Point SAC, Blackwater River (Cork/ Waterford) SAC and Ardmore Head SAC; and
- SPA sites: Ballymacoda Bay SPA, The Gearagh SPA, Cork Harbour SPA, Sovereign Islands SPA, Old Head of Kinsale SPA, Courtmacsherry Bay SPA, Seven Heads SPA, Clonakilty Bay SPA, Galley Head to Duneen Point SPA, Sheep's Head to Toe Head SPA, Ballycotton Bay SPA and Blackwater Estuary SPA.

Each of these European Sites includes habitats and/or species identified as nutrient sensitive. Following the precautionary principle the potential for likely significant effects arising from the proposed project requires assessment, due to connectivity to each of the identified European Sites, in light of their nutrient sensitive Qualifying Interests.

2 APPROPRIATE ASSESSMENT METHODOLOGY

2.1 LEGISLATIVE CONTEXT

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. These are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/ECC) as codified by Directive 2009/147/EC.

The obligation to undertake appropriate assessment derives from Articles 6(3) and 6(4) of the Habitats Directive and both involve a number of steps and tests that need to be applied in sequential order. Article 6(3), which is concerned with the strict protection of sites, establishes the requirement for AA:

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to affect 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 [European] 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".

Article 6(4) states:

"If, in spite of a negative assessment of the implications for the [European] site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted".

The results of each step must be documented and recorded so there is full traceability and transparency of the decisions made.

Over time legal interpretation has been sought on the practical application of the legislation concerning AA, as some terminology has been found to be unclear. European and National case law has clarified a number of issues and some aspects of European Commission (EC) published guidance documents have been superseded by case law.

2.2 GUIDANCE FOR THE APPROPRIATE ASSESSMENT PROCESS

The assessment completed has had regard to the following legislation and guidance documents:

European and National Legislation:

- 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');
- European Communities (Birds and Natural Habitats) Regulations 2011 to 2015; and
- Planning and Development Act 2000 (as amended).

Guidance / Case Law:

- *Article 6 of the Habitats Directive – Rulings of the European Court of Justice*. Final Draft September 2014;
- *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities.* DEHLG (2009, revised 10/02/10);
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.* European Commission (2002);
- *Communication from the Commission on the Precautionary Principle*. European Commission (2000b);
- *EC study on evaluating and improving permitting procedures related to Natura 2000 requirements under Article 6.3 of the Habitats Directive 92/43/EEC*. European Commission (2013);
- *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*. European Commission (2007); and
- *Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. European Commission (2000a).

Departmental/NPWS Circulars:

- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities.* Circular NPWS 1/10 and PSSP 2/10. (DEHLG, 2010);
- *Appropriate Assessment of Land Use Plans*. Circular Letter SEA 1/08 & NPWS 1/08;
- *Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments*. Circular L8/08;
- *Guidance on Compliance with Regulation 23 of the Habitats Directive.* Circular Letter NPWS 2/07; and

- *Compliance Conditions in respect of Developments requiring (1) Environmental Impact Assessment (EIA); or (2) having potential impacts on Natura 2000 sites*. Circular Letter PD 2/07 and NPWS 1/07.

2.3 STAGES OF THE APPROPRIATE ASSESSMENT PROCESS

According to European Commission Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive, the assessment requirements of Article 6 establish a four-staged approach as described below. 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 as follows:

- Stage 1 – Screening of the proposed plan or project for AA;
- Stage 2 – An AA of the proposed plan or project;
- Stage 3 – Assessment of alternative solutions; and
- Stage 4 – Imperative Reasons of Overriding Public Interest (IROPI)/ Derogation.

Stages 1 and 2 relate to Article 6(3) of the Habitats Directive; and Stages 3 and 4 to Article 6(4).

Stage 1: Screening for a likely significant effect

The aim of screening is to assess firstly if the plan or project is directly connected with or necessary to the management of European Site(s); or in view of best scientific knowledge, if the plan or project, individually or in combination with other plans or projects, is likely to have a significant effect on a European site. This is done by examining the proposed plan or project and the conservation objectives of any European Sites that might potentially be affected. If screening determines that there is potential for likely significant effects or there is uncertainty regarding the significance of effects then it will be recommended that the plan is brought forward to full AA.

Stage 2: Appropriate Assessment (Natura Impact Statement or NIS):

The aim of stage 2 of the 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 should then be amended accordingly, thereby avoiding the need to progress to Stage 3.

Stage 3: Assessment of Alternative Solutions

If it is not possible during the stage 2 to reduce impacts to acceptable, non-significant levels by avoidance and/or mitigation, stage 3 of the process must be undertaken which is to objectively assess whether alternative solutions exist by which the objectives of the plan or project can be achieved. Explicitly, this means alternative solutions that do not have negative impacts on the integrity of a European Site. It should also be noted that EU guidance on this stage of the process states that, 'other assessment criteria, such as economic criteria, cannot be seen as overruling ecological criteria' (EC, 2002). In other words, if alternative solutions exist that do not have negative impacts on European Sites; they should be adopted regardless of economic considerations.

Stage 4: Imperative Reasons of Overriding Public Interest (IROPI)/Derogation

This stage of the AA process is undertaken where no alternative solutions exist and where adverse impacts remain. At this stage of the AA process, it is the characteristics of the plan or project itself that will determine whether or not the competent authority can allow it to progress. This is the determination of 'over-riding public interest'.

It is important to note that in the case of European Sites that include in their qualifying features 'priority' habitats or species, as defined in Annex I and II of the Directive, the demonstration of 'over-riding public interest' is not sufficient and it must be demonstrated that the plan or project is necessary for 'human health or safety considerations'. Where plans or projects meet these criteria, they can be allowed, provided adequate compensatory measures are proposed. Stage 4 of the process defines and describes these compensation measures.

2.4 INFORMATION SOURCES CONSULTED

To inform the assessment for the project and preparation of this Screening report, the following key sources of information have been consulted, however it should be noted that this is not an exhaustive list and does not reflect liaison and/ or discussion with technical and specialist parties from IW, RPS, NPWS, IFI, EPA etc. as part of Plan development.

- Information provided by IW as part of the project;
- Environmental Protection Agency – Water Quality www.epa.ie and www.catchments.ie;
- Geological Survey of Ireland – Geology, Soils and Hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- National Parks and Wildlife Service – online Natura 2000 network information www.npws.ie;
- National Biodiversity Action Plan 2017 - 2021 (DCHG 2017);
- Article 17 Overview Report Volume 1 (NPWS, 2013a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2013b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2013c);
- EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);
- River Basin Management Plan for Ireland 2018 - 2021 - www.housing.gov.ie;
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie;
- National Summary for Article 12 (NPWS, 2013d); and
- Format for a Prioritised Action Framework (PAF) for Natura 2000 (2014) www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf.

2.5 EVALUATION OF THE RECEIVING ENVIRONMENT

Ireland has obligations under EU law to protect and conserve biodiversity. This relates to habitats and species both within and outside designated sites. Nationally, Ireland has developed a National Biodiversity Plan (DCHG, 2017) to address issues and halt the loss of biodiversity, in line with international commitments. The vision for biodiversity is outlined: "*That biodiversity and ecosystems*

in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally".

Ireland aims to conserve habitats and species, through designation of conservation areas under both European and Irish law. The focus of this Screening report is on those habitats and species designated pursuant to the EU Birds and EU Habitats Directives in the first instance, however it is recognised that wider biodiversity features have a supporting role to play in many cases if the integrity of designated sites is to be maintained/restored.

In relation to protected water-dependent habitats and species under the Birds and Habitats Directive, the river basin management planning process contributes towards achieving water related environmental supporting conditions that support Favourable Conservation Status. In preparing the draft RBMP (2018-2021) (DHPLG, 2017[3]) the characterisation assessment carried out by the EPA for these water dependent European Site protected areas has focussed on looking at the risks to the water standards/objectives established for the purpose of supporting Good Ecological Status (GES), or High Ecological Status (HES) where required. GES, which is the default objective of the WFD, is considered adequate for supporting many water dependent European Site protected areas where site specific environmental supporting conditions have not been defined within SSCOs by the NPWS. A number of lake habitats (e.g. oligotrophic lakes) and species (e.g. the freshwater pearl mussel) will require a more stringent environmental objective i.e. high status. Where this applies, this has been taken into account in the EAM and evaluated within the context of this Screening report.

2.5.1 Identification of European Sites

Current guidance (DEHLG, 2010) on the ZoI to be considered during the Screening for AA process states the following:

"A distance of 15km is currently recommended in the case of plans, and derives from UK guidance (Scott Wilson et al., 2006). For projects, the distance could be much less than 15km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in-combination effects".

As stated above, a buffer of 15km is typically taken as the initial ZoI extending beyond the reach of the footprint of a plan or project, although there may be scientifically appropriate reasons for extending this ZoI further depending on pathways for potential impacts. With regard to the current project, the 15km distance is considered inadequate to screen all likely significant effects that might impact upon European Sites. This is primarily due to the need to consider the potential for likely significant effects on European Sites with regard to aquatic and water dependent receptors. Therefore, the ZoI for this project includes all of the hydrologically connected surface water sub catchments and groundwater bodies (**Figure 4-2**).

[3] DHPLG (2018) The River Basin Management Plan for Ireland (2018-2021). Available at: https://www.housing.gov.ie/water/water-quality/river-basin-management-plans/river-basin-management-plan-2018-2021-0

2.5.2 Conservation Objectives

Article 6(3) of the Habitats Directive states that:

Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications of the site in view of the site's ***conservation objectives****.*

Qualifying Interests (QIs)/ Special Conservation Interests (SCIs) are annexed habitats and annexed species of community interest for which an SAC or SPA has been designated respectively. The Conservation Objectives (COs) for European Sites are set out to ensure that the QIs/ SCIs of that site are maintained or restored to a favourable conservation condition. Maintenance of favourable conservation condition of habitats and species at a site level in turn contributes to maintaining or restoring favourable conservation status of habitats and species at a national level and ultimately at the Natura 2000 Network level.

In Ireland 'generic' COs have been prepared for all European Sites, while 'site specific' COs have been prepared for a number of individual Sites to take account of the specific QIs/ SCIs of that Site. Both the generic and site-specific COs aim to define favourable conservation condition for habitats and species at the site level.

Generic COs which have been developed by NPWS encompass the spirit of site specific COs in the context of maintaining and restoring favourable conservation condition as follows:

For SACs:

- '*To maintain or restore the favourable conservation condition of the Annex I habitats and/or Annex II species for which the SAC has been selected'.*

For SPAs:

- '*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for the SPA*'.

Favourable Conservation status of a habitat is achieved when:

- Its natural range, and area it covers within that range, are stable or increasing;
- The specific structure and functions which 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 is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats;

- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis.

A full listing of the COs and QIs/ SCIs for each European Site, as well as the attributes and targets to maintain or restore the QIs/ SCIs to a favourable conservation condition, are available from the NPWS website www.npws.ie. Web links for COs for the European Sites relevant for this Screening report, are included in **Appendix A**.

2.5.3 Existing Threats and Pressures to EU Protected Habitats and Species

Given the nature of the proposed project, a review has been undertaken of those QIs/SCIs which have been identified as having sensitivity to orthophosphate loading. Information has been extracted primarily from a number of NPWS authored reports, including recently available statutory assessments on the conservation status of habitats and species in Ireland namely; *The Status of EU Protected Habitats and Species in Ireland* (NPWS 2013a, b & c) and on information contained in Ireland's most recent Article 12 submission to the EU on *the Status and Trends of Birds Species* (NPWS 2013d). Water dependent habitats and species were identified as having the greatest sensitivity to the proposed dosing activities, and the Water Framework Directive SAC water dependency list (NPWS, December 2015), was used as part of the criteria for screening European Sites.

There are 60 habitats, 25 species and 68 bird species which are water dependent and / or where nutrients are a key pressure or threat and where compliance with the Environmental Quality Standards for nutrient levels (including orthophosphate) will contribute to achieving or maintaining favourable conservation status. These are listed in **Appendix B**.

3 DESCRIPTION OF THE PROJECT

3.1 OVERVIEW OF THE PROPOSAL

Inniscarra WTP supplies Cork Zone 2 City and Harbour (0500PUB3401). There is also a small remote area in the WSZ boundary that is located in the Cork rural area. The daily production for the WTP is 56,398 m^3/day but some of this is exported to Cork City Lee Road (0400PUB1001) WSZ which has been evaluated under its own EAM. The distribution input to Cork Zone 2 City and Harbour WSZ is 38,281 m^3/day (45% of which is accounted for) serving a population in excess of 78,000 as well as a non-domestic demand. The area is served by Cork City WWTP (D0033-01), Ballincollig (D0049-01), Blarney (D0043-01), Coachford (D04227-01) and Ringaskiddy (D0057-1), licensed in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended, and the potential impact of the orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There are no other WWTPs associated with the agglomeration. There are an estimated 3,221 properties across the WSZ that are serviced by domestic waste water treatment systems (DWWTS) (see **Appendix C**).

Inniscarra WTP lies in the vicinity of the River Lee, adjacent to the Inniscarra Reservoir in the Lee sub-catchment of the Lee catchment. The EAM process identified 25 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Ballymacoda (Clonpriest and Pillmore) SAC, Bandon River SAC, Great Island Channel SAC, The Gearagh SAC, Courtmacsherry Estuary SAC, Clonakilty Bay SAC, Kilkeran Lake and Castlefreke Dunes SAC, Castletownshend SAC, Lough Hyne Nature Reserve and Environs SAC, Roaringwater Bay and Islands SAC, Barley Cove to Ballyrisode Point SAC, Blackwater River (Cork/ Waterford) SAC and Ardmore Head SAC; and
- SPA sites: Ballymacoda Bay SPA, The Gearagh SPA, Cork Harbour SPA, Sovereign Islands SPA, Old Head of Kinsale SPA, Courtmacsherry Bay SPA, Seven Heads SPA, Clonakilty Bay SPA, Galley Head to Duneen Point SPA, Sheep's Head to Toe Head SPA, Ballycotton Bay SPA and Blackwater Estuary SPA.

3.2 CONSTRUCTION OF CORRECTIVE WATER TREATMENT WORKS

The corrective water treatment works at Inniscarra WTP will involve the provision of orthophosphate dosing, pH control works and associated safety equipment.

There are three possible locations for the orthophosphate dosing system at Inniscarra WTP all of which will be located within the confines of the existing WTP boundary. The surrounding landscape is dominated by agricultural grassland, some small assemblages of one-off residential housing and scrub habitat. The location of the works is shown on **Figure 3-1**.

The implementation of orthophosphate dosing at the Inniscarra WTP will require the following elements:

- Bulk Storage Tanks for phosphoric acid;
- Dosing pumps;
- Dosing pipework and carrier water pipework; and,
- Associated electrical installations.

CO. CORK

Inniscarra

Proposed 2 No. Static Mixers and 2 No. Flow Meters on Twin 1000mmØ Intake Pipes From Balancing Tanks

Existing Polyelectrolyte Dosing Point

Splitter Chamber

Existing PAC and Soda Ash Batching Tanks

Proposed Alum, PAC and Soda Ash Dosing Pipework

Existing Alum Dosing Pumps

Existing Alum Dosing Tanks

10Kv

Proposed Post Settlement Instrumentation and Soda Ash Dosing Point (Mn Removal)

Location of Proposed Coagulant Flash Mixers

Overflow Chamber

CONTRACTOR'S COMPOUND

Location of Proposed Fluoride Day Tank and Dosing Kiosk

Existing Fluoride Dosing System

CONTRACTOR'S COMPOUND

Existing Lime and Fluoride Dosing Point

Filtered Water Channel (2 metres wide)

Service Water Pump Sump (Supplies Service Water Tank)

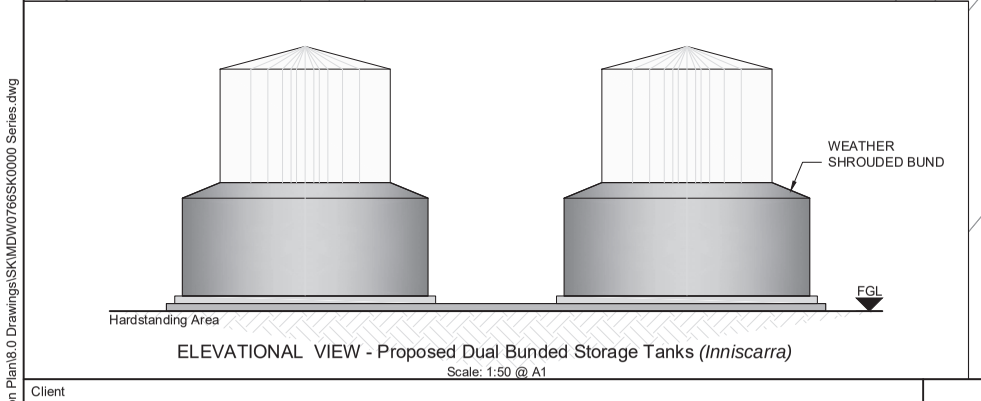
Existing Parking Lot

Gallán

Existing Bulk Fluoride Storage Tanks

Existing DN1500 Watermain Approx. Length 210m

N



ELEVATIONAL VIEW - Proposed Dual Bunded Storage Tanks *(Inniscarra)*

Scale: 1:50 @ A1

Proposed Power and Telemetry Duct

Proposed Orthophosphate Dosing Facility

Proposed Emergency shower

Proposed Orthophosphate Dosing Pipework Duct

Reservoir Outlet

Reservoir Inlet

Proposed Orthophosphate Dosing Point

10m

SCALE 1:500

R:\MDW0766_Lead Mitigation Plan\8.0 Drawings\SK\MDW0766SK0000 Series.dwg

Client

UISCE EIREANN WATER

No.	Date	Chk.	Amendment / Issue	App
A01	Mar'19	BL BR	Issue for CLient Approval	GJG
D01	Oct'18	BL BR	Draft	DC

RPS
West Pier Business Campus
Dun Laoghaire
Co Dublin
T +353 1 4882900
F +353 1 2835676
W www.rpsgroup.com/ireland
E ireland@rpsgroup.com

Drawn	BL
Checked	BR
Approved	GJG
Date	11/03/2019
Scale	1:500 @ A1
	1:1,000 @ A3
Job No.	MDW0766
File Ref.	MDW0766SK0000 Series.dwg
Drg. No.	SK0006 WTP
Rev.	F01

Project

LEAD MITIGATION PLAN

Title

INNISCARRA WATER TREATMENT PLANT

SITE LAYOUT

The bulk storage tanks (2 no. tanks, each with a working volume of 4,000 l) will sit upon an above ground reinforced concrete plinth, designed to support the combined weight of the storage tanks, equipment and total volume of chemical to be stored (**Figure 3-1**).

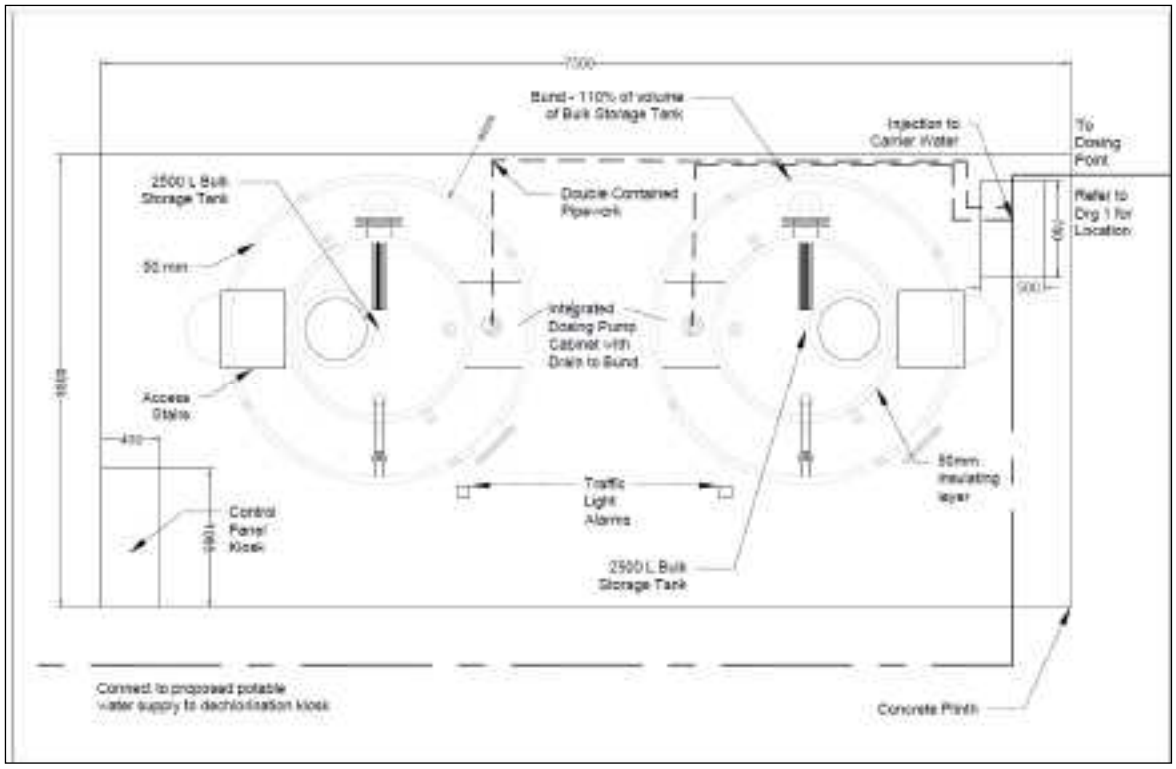
Each storage tank will be self-bunded to accommodate greater than 110% of the tank working volume. The tanks shall conform to Irish Water design guidelines and will include the following environmental safety design features; level detection sensors, visual level indicators and alarms and a bund leak detection system. All materials and associated equipment, fixtures and fittings shall be compatible with 75% phosphoric acid.

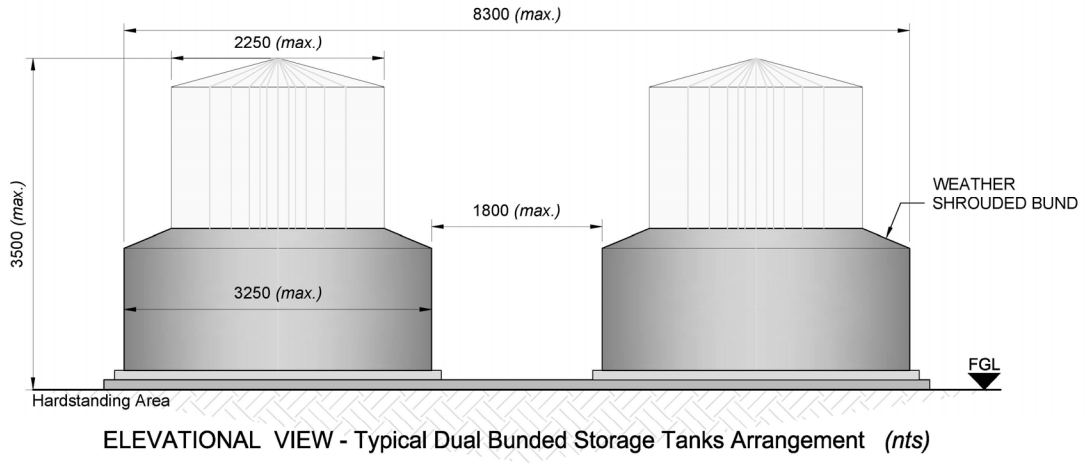
A stable pH is critical to facilitate effective plumbosolvency control. An upgrade to the existing pH control infrastructure is required at Inniscarra WTP. This includes the installation of a new caustic soda dosing system and planning permission has been granted (Planning Reference 16/04752). A screening AA report (Allan Barber Engineering Consultants, 2016) was submitted with the planning application to inform the AA. The conclusion of the screening report is as follows '*that the proposed works at the existing Irish Water treatment works at Inniscarra, Co. Cork would have no impacts, adverse or otherwise on any Natura 2000 sites within close proximity to the proposed location of the works.'* The Cork County Council Senior Executive Planners Report (19/05/18) made the following determination regarding AA, '*Requirement for Appropriate Assessment has been screened out for this proposed development having regard to the lack of ecological or hydrological connection between the development site and any European site.'*

Drainage sumps will be incorporated to capture any chemical spills from the proposed works in the event of a spill or fall in loading the new bund from delivery vehicles. All surface water drainage generated from the proposed footpath areas will drain to the existing surface water gullies in the area. There is more than sufficient capacity in this network to cater for surface water generated in this small area. Surface water within the bunds will be collected in drainage sumps within the bund and pumped out when necessary at regular intervals and transported off site.

Dosing pipelines, carrier water pipework and electrical cables shall be installed within 100mm diameter ducts, placed in trenches constructed within existing made ground at the Inniscarra WTP. The ducts will be installed at approximately 700mm below ground level and following installation the trench will be backfilled and the surface reinstated to match the existing surface. Where pipework and cables are routed through existing structures, they shall be surface mounted within trunking.

A suitable kiosk will be installed on an above ground concrete plinth to house all electrical and control equipment required for the orthophosphate system. This control system will be incorporated into the existing Supervisory Control and Data Acquisition (SCADA) system on site. The proposed automation solution will be managed using a new Programmable Logic Computer (PLC) / Human Machine Interface (HMI) controller.





ELEVATIONAL VIEW - Typical Dual Bunded Storage Tanks Arrangement *(nts)*

Figure 3-2: Plan and Elevation Drawings of a typical Orthophosphate Dosing Unit

3.3 CONSTRUCTION METHODOLOGY

The proposed works will be carried out by suitably qualified contractors. The proposed dosing unit will be located within the bounds of the existing Inniscarra WTP on an area of made ground.

3.4 OPERATION OF CORRECTIVE WATER TREATMENT WORKS

The operational stage for the corrective water treatment works will be a part of the day to day activities of the WTP and will be operated in accordance with the SOPs. Dosing will occur prior to distribution to the network and overflows from the reservoir will not contain orthophosphate.

The orthophosphate dosing system will be controlled by the site SCADA system, whereby, orthophosphoric acid will be dosed proportional to the flow of the water being distributed to the network. At Inniscarra WTP, orthophosphate will be added to treated water at a rate of 0.6 mg/l. The onsite storage tanks have been designed to provide 60 days of storage so it is anticipated that deliveries will be approximately once every two months. All deliveries will be via existing access roads within the boundary of the WTP.

3.5 LDWMP APPROACH TO ASSESSMENT

3.5.1 Work Flow Process

In line with the relevant guidance, the Screening report for AA comprises of two steps:

- **Impact Prediction** – where the likely potential impacts of this project (impact source and impact pathways) are examined.
- **Assessment of Effects** - where the significance of project effects are assessed on the basis of best scientific knowledge (the EAM); in order to identify whether they are likely to give rise to likely significant effects on any European Sites, in view of their conservation objectives.

At the early stages of consideration, IW identified the requirement to evaluate environmental impact and the pathways by which the added orthophosphate may reach and / or affect impact environmental receptors including European Sites. In order to carry out a robust and defensible environmental assessment and to ensure a transparent and consistent approach, IW devised a conceptual model based on the 'source – pathway – receptor' framework. This sets out a specific environmental risk assessment of any proposed orthophosphate treatment and provides a methodology to determine the risk to the receiving environment of this corrective water treatment.

This EAM conceptual model, has been discussed with the EPA and has been developed using EPA datasets including the orthophosphate susceptibility output mapping for subsurface pathways; the nutrient risk assessment for water bodies; water quality information; available low flow estimation for gauged and ungauged catchments; and a new methodology which has been developed for the assessment of water quality risk from domestic wastewater treatment systems (DWWTS).

The EAM will be the basis of the decision support matrix to inform any programmes developed as part of the LDWMP. Further detail on the model is presented in **Section 3.5.2** below.

3.5.2 Environmental Assessment Methodology

The EAM has been developed based on a conceptual model of phosphorus (P) transfer (see **Figure 3-3**) based on the source-pathway-receptor model, from the water distribution and wastewater collection systems.

- The source of phosphorus is defined as the orthophosphate dosing at the water treatment plant which will be dependent on the water chemistry of the raw water quality, the integrity of the distribution network and the extent of lead piping.
- Pathways include discharges from the wastewater collection system (WWTP discharges and intermittent discharges – Storm Water Overflows (SWOs)), leakage from the distribution system and small point source discharges from DWWTSs.
- Receptors refer to SACs and SPAs which may receive orthophosphate dosed water via the pathway examples outlined above. Receptors and their sensitivity, is of key consideration in the EAM. A water body may be more sensitive to additional phosphorus loadings where it has a low capacity for assimilating the load e.g. high status sites, such as the habitat of the freshwater pearl mussel or oligotrophic lakes. Where a SAC/SPA could receive orthophosphate dosing inputs at more than one WSZ, the cumulative effects are considered in the EAM.

A flow chart of the methodology applied in the EAM is provided in **Figure 3-4** and illustrates the importance of the European Sites in the process. In all instances where nutrient sensitive qualifying features within the Natura 2000 network are hydrologically linked with the WSZ, a Screening to inform AA will be required in the first instance.

For each WSZ where orthophosphate treatment is proposed the conceptual model allows the quantification of loads in a mass balance approach to identify potentially significant pathways, as part of the risk assessment process. A summary report outlining the EAM results is available in **Appendix C**, which further outlines P dynamics and the consideration of P trends and capacity in receiving waters and the risk to WFD objectives from any increase in P load from orthophosphate dosing.

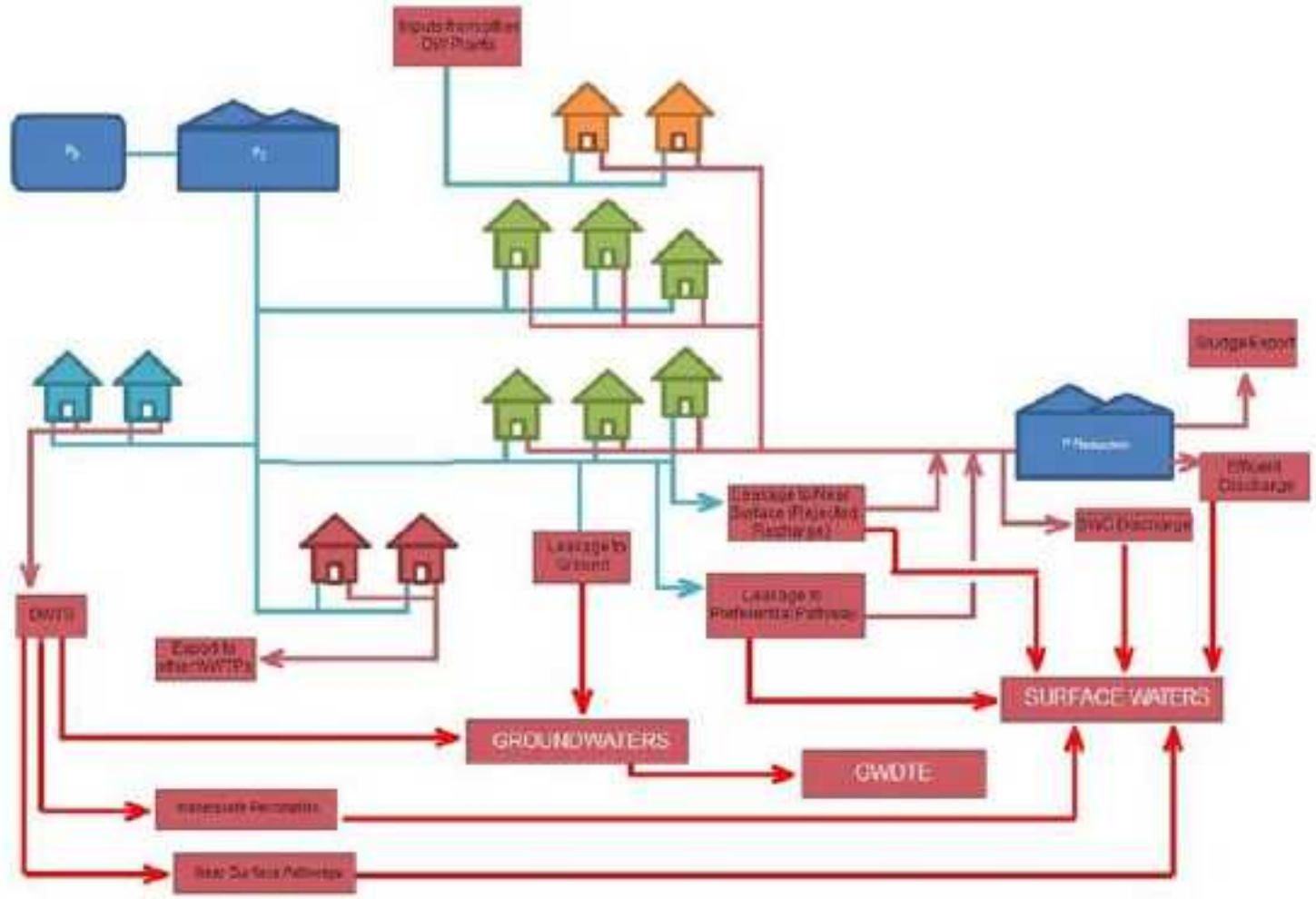


Figure 3-3: Conceptual Model of P Transfer

(Diagrammatic layout of P transfers from drinking water source (top left), through DW distribution (blue), wastewater collection (brown) and treatment systems to environmental receptors (red). P transfers that by-pass the WWTP (leakages, storm overflows, discharges to ground, and misconnections) are also indicated.)

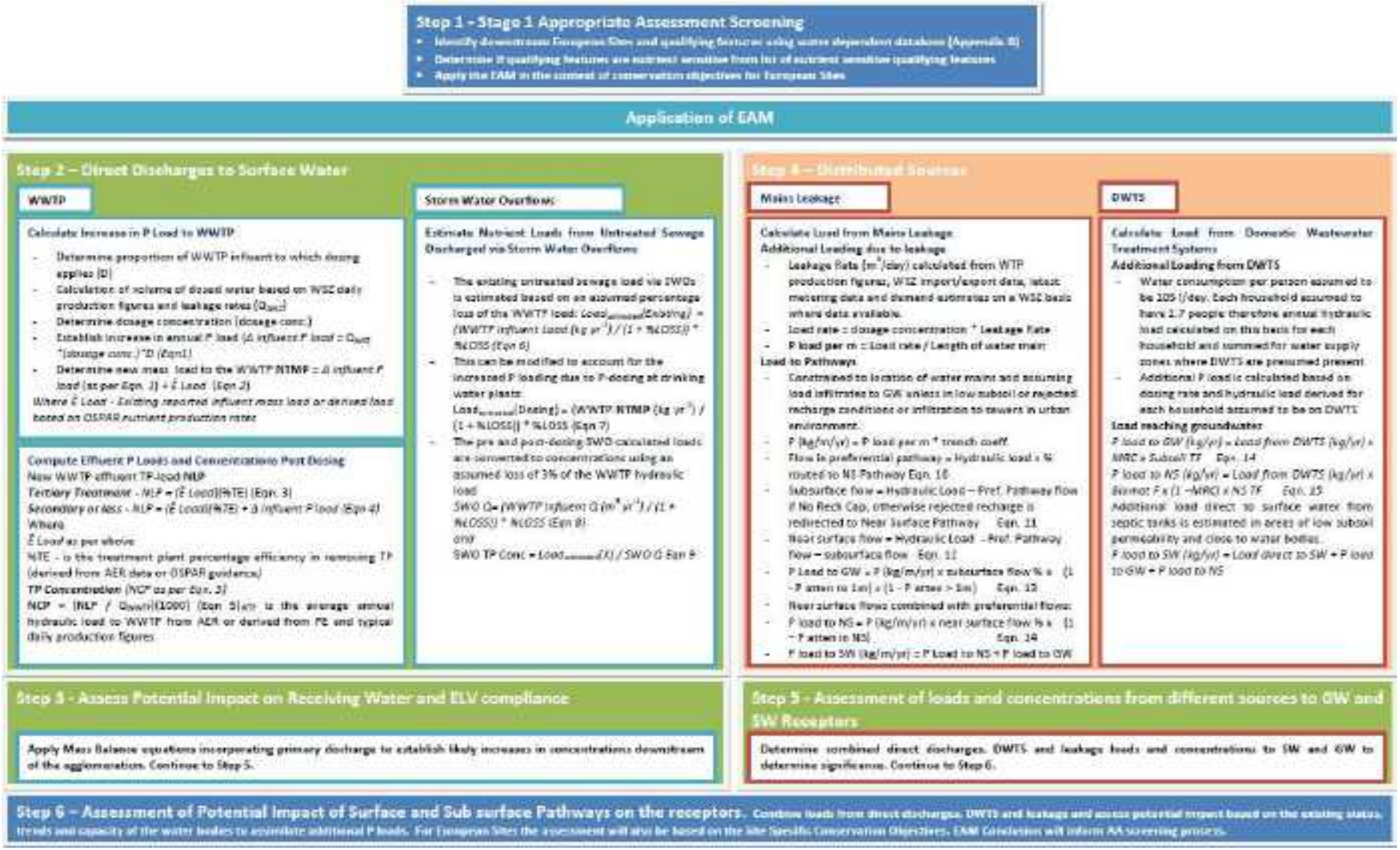


Figure 3-4: Stepwise Approach to the Environmental Assessment Methodology

4 PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

The construction phase of the proposed project will take place within the confines of the existing Inniscarra WTP. The WTP is not located within or directly adjacent to the boundary of any European Site. Given the small-scale nature of construction works, the ZoI was considered to include the footprint of the existing Inniscarra WTP followed by a review of hydrological and hydrogeological connectivity between the proposed development site and European Sites. The European Sites within ZoI for the construction phase of the project are listed in **Table 4-1** and displayed in **Figure 4-1**.

Table 4-1: European Sites within the ZoI of the Proposed Project – Construction Phase

	Site Name	SAC / SPA Code	Direct Impact	Water Dependent Species / Habitats	Surface Water Connectivity	Groundwater Connectivity[4]	Potential Source Pathway Receptor
1	Great Island Channel SAC	SAC 001058	No	Yes	Yes- TWB (Lough Mahon)	Yes (Ballinhassig East)	Yes
2	The Gearagh SAC	SAC 000108	No	Yes	Yes – LWB (Carrigdrohoid)	No	No[5]
3	The Gearagh SPA	SPA 004109	No	Yes	Yes – LWB (Carrigdrohoid)	No	No[5]
4	Cork Harbour SPA	SPA 004030	No	Yes	Yes- TWB (Lee Cork Estuary)	Yes (Ballinhassig East)	Yes

4.1.2 Operational Phase

The ZoI for the operational phase of the proposed project was determined by establishing the potential for hydrological and hydrogeological connectivity between the Inniscarra WTP and associated WSZ and European Sites. The ZoI was therefore defined by the surface and groundwater bodies that are hydrologically and hydrogeologically connected with the Project.

In the EAM, all water bodies linked to the WSZ have been identified. Downstream water bodies to the estuary and coastal water bodies have also been identified. Groundwater bodies touching or intersecting the WSZs are also included in the ZoI. Hydrogeological linkages in karst areas have also

[4] Inniscarra WTP overlies the Ballinhassig East (IE_SW_G_004) groundwater body. All European Sites overlying or supporting connectivity to this groundwater body have been assessed to determine potential source impact pathways. This groundwater body comprises poorly productive bedrock and owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater - surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low. As a result, potential interactions between the WTP site and the groundwater body can only be conveyed via the River Lee which provides connectivity with sites 1 & 4 downstream of the WTP site. Sites 2 & 3 are located upstream of the WTP site and not considered to result in likely significant effects during the construction phase.

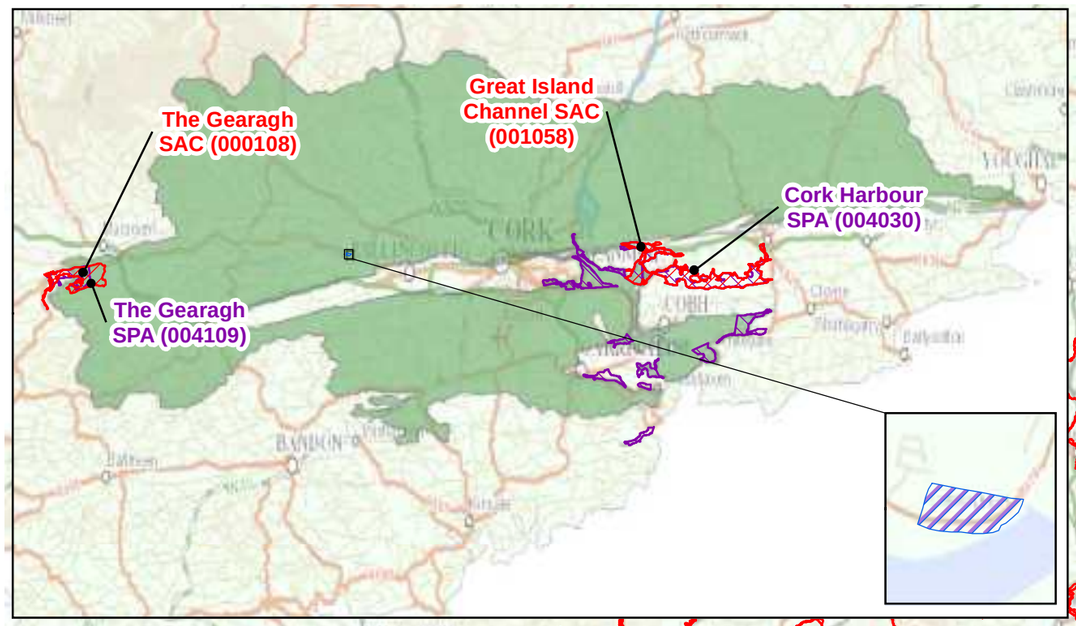
[5] The Gearagh SAC and The Gearagh SPA are located >40 km upstream of the WTP and therefore there is no potential for likely significant effects to these European Sites.

been taken into account. European Sites within the ZoI are listed in **Table 4-2** and are displayed in **Figure 4-1**.

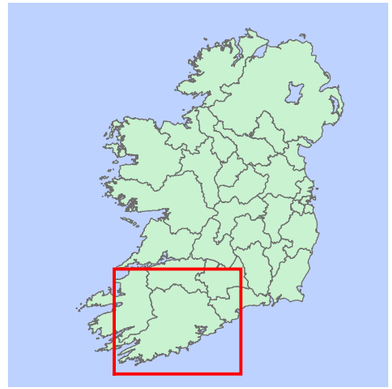
Table 4-2: European Sites within the ZoI of the Proposed Project – Operational Phase

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive Species/ Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
1	Ballymacoda (Clonpriest and Pillmore) SAC	SAC 000077	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
2	Bandon River SAC	SAC 002171	Yes	Yes	Yes (upstream)	No	No
3	Great Island Channel SAC	SAC 001058	Yes	Yes	Yes- RWB/TWB	Yes - Ballinhassig East	Yes
4	The Gearagh SAC	SAC 000108	Yes	Yes	Yes - LWB	Yes (Carrigdrohid)	Yes
5	Courtmacsherry Estuary SAC	SAC 001230	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
6	Clonakilty Bay SAC	SAC 000091	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
7	Kilkeran Lake and Castlefreke Dunes SAC	SAC 001061	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
8	Castletownshend SAC	SAC 001547	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
9	Lough Hyne Nature Reserve and Environs SAC	SAC 000097	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
10	Roaringwater Bay and Islands SAC	SAC 000101	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
11	Barley Cove to Ballyrisode Point SAC	SAC 001040	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
12	Blackwater River (Cork / Waterford) SAC	SAC 002170	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
13	Ardmore Head SAC	SAC 002123	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
14	Ballymacoda Bay SPA	SPA 004023	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
15	The Gearagh SPA	SPA 004109	Yes	Yes	Yes - LWB	Yes (Carrigdrohid)	Yes
16	Cork Harbour SPA	SPA 004030	Yes	Yes	Yes- RWB/TWB	Yes - Ballinhassig East	Yes

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive Species/ Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
17	Sovereign Islands SPA	SPA 004124	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
18	Old Head of Kinsale SPA	SPA 004021	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
19	Courtmacsherry Bay SPA	SPA 004219	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
20	Seven Heads SPA	SPA 004191	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
21	Clonakilty Bay SPA	SPA 004081	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
22	Galley Head to Duneen Point SPA	SPA 004190	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
23	Sheep's Head to Toe Head SPA	SPA 004156	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
24	Ballycotton Bay SPA	SPA 004022	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
25	Blackwater Estuary SPA	SPA 004028	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes



Zone of Influence (ZoI) for Construction Phase



Legend

LEMA Emission Type

- Primary Discharge Point
- Secondary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- Inniscarra WTP
- Water Supply Zone Boundary (WSZ)
- Additional WSZ considered for dosing
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Zone of Influence

Data Source:
Irish Water
NPWS (June 2019)
EPA

N

0 5 10 20 Kilometres

Client

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Zone 2
Cork City and Harbour
European Sites within the ZoI of the Proposed Project

Scale: 1:500,000 @ A3	Date: 25/07/2019
File Ref: MDW0766Arc0001aF05	Map Projection: Irish National Grid (TM65)

Zone of Influence (ZoI) for Operational Phase

4.2 IDENTIFICATION OF RELEVANT EUROPEAN SITES

For the construction and operational phase of the project, each European Site was assessed for the presence of water dependent habitats and species, their associated nutrient sensitivity, together with the hydrological/hydrogeological connectivity of each site to the proposed project. A number of sites are excluded from further assessment in Section 6 at this stage of the process and those included are detailed in **Table 4-3**and are displayed in **Figure 4-2**. Two sites are included for further assessment, with justification below.

The construction phase of the proposed project will take place within the confines of the existing Inniscarra WTP. There is potential for surface water connectivity to Great Island Channel SAC, The Gearagh SAC, The Gearagh SPA and Cork Harbour SPA. However, The Gearagh SAC and The Gearagh SPA are located > 40 km upstream of the WTP and therefore there is no potential for likely significant effects to these European Sites. The WTP is located within the Ballinhassig East groundwater body (IE_SW_G_004) and there is also potential hydrogeological connectivity between the proposed development site and Great Island Channel SAC and Cork Harbour SPA.

The WSZ for the operational phase in Zone 2 Cork City and Harbour is located adjacent to the Lee (Cork) Estuary Upper (IE_SW_060_0950), Lee (Cork) Estuary Lower (IE_SW_060_0900), Lough Mahon (IE_SW_060_0750), Owenboy Estuary (IE_SW_060_1200) transitional water bodies and Cork Harbour (IE_SW_060_0000) and coastal water bodies. Cork Harbour SPA is hydrologically connected to the WSZ via these surface water pathways (**Table 5-1**). In addition, Great Island Channel SAC is also hydrologically connected to the WSZ via these surface water pathways excluding Outer Cork Harbour (IE_SW_050_0000). Cork Harbour SPA and Great Island Channel are also hydrogeologically connected to the WSZ via the Ballinhassig East GWB (IE_SW_G_004). On this basis, these sites have been included for further assessment in the Section 5 and Section 6. Bandon River SAC is located greater than 40 km upstream of the WSZ, therefore does not receive any surface water flow from the WSZ. As it is located upstream of the WSZ it is considered that there is no pathway for impact to this SAC. On this basis the site has been excluded from further assessment.

The WSZ also intersects eight groundwater bodies; Ballincollig (IE_SW_G_002), Ballinhassig East (IE_SW_G_004), Ringaskiddy (IE_SW_G_072), Bandon (IE_SW_G_086), Lee Valley Gravels (IE_SW_G_094), Hawbowline Island (IE_SW_G_083), Industrial Facility (P0016-02) (IE_SW_G_089) and Waste Facility (W0012-03) (IE_SW_G_091) (**Table 17, Appendix C**). For European sites which are hydrogeologically connected (via groundwater) to the WSZ, an assessment was made on the direction of flow in the groundwater body forming the connection.

Groundwater flows through voids such as connected pore spaces in sand and gravel aquifers and through fissures, faults, joints and bedding planes in bedrock aquifers. Regional groundwater flows tend to follow the regional topography and generally discharge towards main surface water bodies including rivers, lakes and coastal water bodies. In areas of karstified limestones, high permeability zones give rise to rapid groundwater velocities with more complex flow directions, which may vary seasonally and are difficult to predict with certainty. In this case the assumption is that of groundwater flow direction is from areas of higher elevations to lower elevations, unless groundwater specific information indicates otherwise. Groundwater body specific information relating to flow and discharge is available from Geological Survey Ireland (GSI)[6], and was consulted in making the assessment.

[6]https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx

The Gearagh SAC and Gearagh SPA are located upstream of the WSZ and therefore do not receive any surface water flow from the WSZ. There is a groundwater connection via the Ballinhassig East groundwater body[7]. Ballinhassig East is a large poorly productive groundwater body with groundwater flow paths expected to be relatively short, typically from 30-300 m. Groundwater discharges to small springs, or to the streams that traverse the aquifer. Flow directions are expected to approximately follow the local surface water catchments. Groundwater is generally unconfined. These European sites are approximately 16.5 km upstream from the WSZ. Given distance from the WSZ to the European sites, short flow path for groundwater and that groundwater follows surface water flow; the Gearagh SAC and Gearagh SPA were excluded from further assessment.

The Western Celtic Sea HAs 18;19;20 (IE_SW_010_0000) coastal water body is downstream of the WSZ. The WSZ is hydrologically connected to this coastal water body via surface water bodies discharging into transitional and coastal water bodies. These water bodies immediately upstream include: Moneygurney_010 (IE_SW_19M300900), Hilltown_010 (IE_SW_19H050470), Owenboy (Cork)_040 (IE_SW_19O011400), Kilnaglery_010 (IE_SW_19K620850), Minane (Cork)_010 (IE_SW_20M010200), Tibbotstown_010 (IE_SW_19T250870), Glashaboy (Lough Mahon)_030 (IE_SW_19G010600), Martin_040 (IE_SW_19M010600), Bride (Cork City)_020 (IE_SW_19B140300, Lee (Cork)_090 (IE_SW_19L030800), Curragheen (Cork City)_010 (IE_SW_19C120740) and Glasheen (Cork City)_010 (IE_SW_19G040700) rivers which discharge into the following transitional and coastal water bodies: Lee (Cork) Estuary Upper (IE_SW_060_0950), Lee (Cork) Estuary Lower (IE_SW_060_0900), Lough Mahon (IE_SW_060_0750), Owenboy Estuary (IE_SW_060_1200), Cork Harbour (IE_SW_060_0000) and Outer Cork Harbour (IE_SW_050_0000).

The modelled cumulative increase in orthophosphate concentration associated with the in combination effects of the 004 Lee Road WTP - Cork City Water Supply (0400PUB1001) and 026 Glashaboy WTP - Zone3 Glashaboy (0500PUB3303) have been assessed with the Inniscarra WTP (see **Table 5, Appendix C**). The modelled concentration is insignificant at Lee (Cork) Estuary Upper (IE_SW_060_0950), Lee (Cork) Estuary Lower (IE_SW_060_0900), Lough Mahon (IE_SW_060_0750), Owenboy Estuary (IE_SW_060_1200), Cork Harbour (IE_SW_060_0000) and finally Outer Cork Harbour (IE_SW_050_00000) before it discharges into the Western Celtic Sea HAs 18;19;20 (IE_SW_010_0000) coastal water body. The concentration becomes undetectable at Cork Harbour in terms of cumulative assessment (0.0000 mg/l). In light of this, 20 European Sites hydrologically connected to the WSZ via remote connectivity to the Western Celtic Sea HAs 18;19;20 (IE_SW_010_0000) coastal water body downstream of Cork Harbour are excluded from further assessment of potential impacts. The European Sites excluded from further assessment are: Ballymacoda (Clonpriest and Pillmore) SAC, Courtmacsherry Estuary SAC, Clonakilty Bay SAC, Kilkeran Lake and Castlefreke Dunes SAC, Castletownshend SAC, Lough Hyne Nature Reserve and Environs SAC, Roaringwater Bay and Islands SAC, Barley Cove to Ballyrisode Point SAC, Blackwater River (Cork/ Waterford) SAC, Ardmore Head SAC, Ballymacoda Bay SPA, Sovereign Islands SPA, Old Head of Kinsale SPA, Courtmacsherry Bay SPA, Seven Heads SPA, Clonakilty Bay SPA, Galley Head to Duneen Point SPA, Sheep's Head to Toe Head SPA, Ballycotton Bay SPA and Blackwater Estuary SPA.

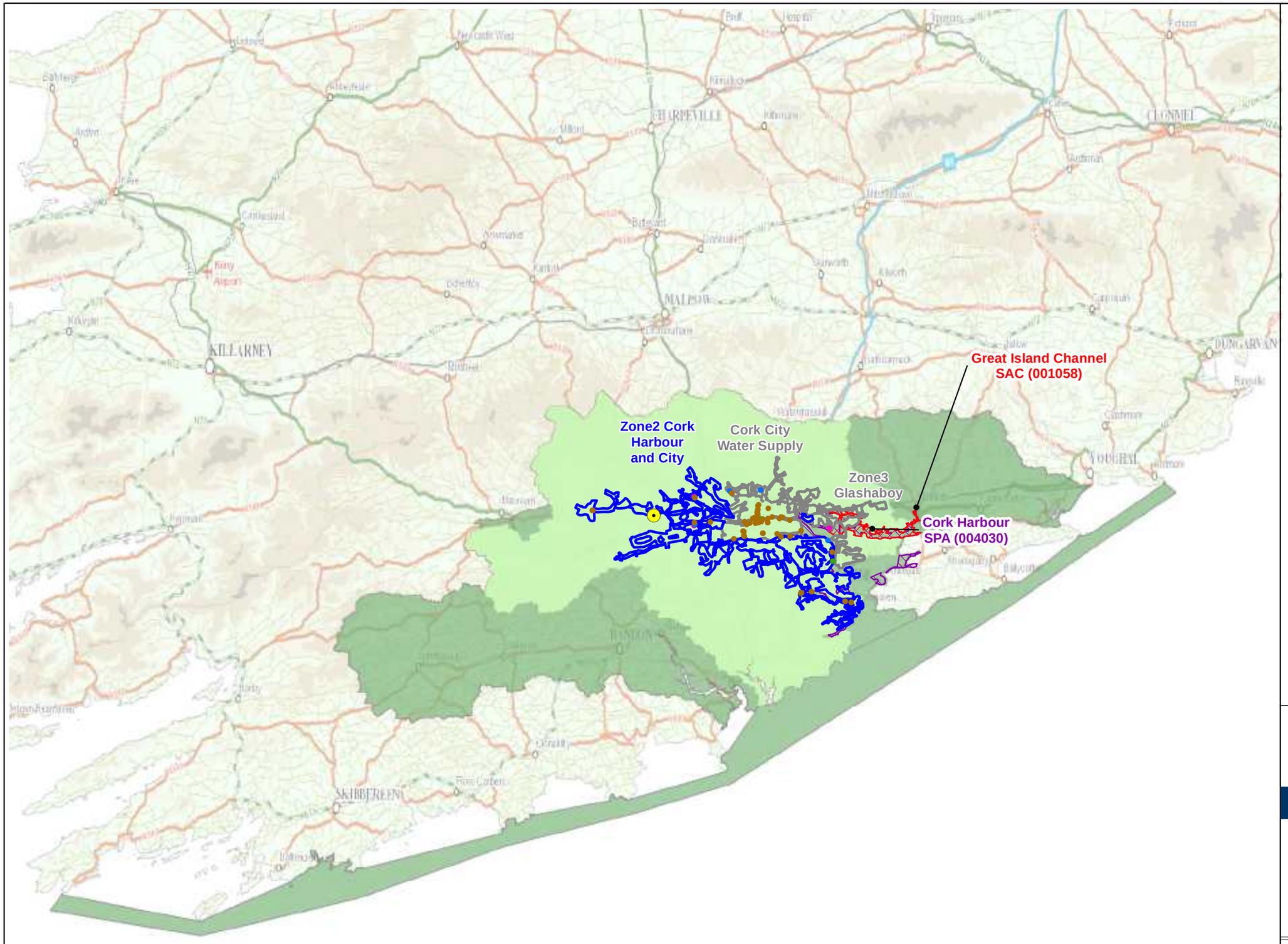
On this basis, two sites have been included for further assessment in order to evaluate the significance of potential effect arising during construction phase in Section 5 below i.e. Great Island Channel SAC and Cork Harbour SPA. Two sites have been included for further assessment for the operational phase in Sections 5 and 6 below i.e. Great Island Channel SAC and Cork Harbour SPA.

[7] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/BallinhassigGWB.pdf

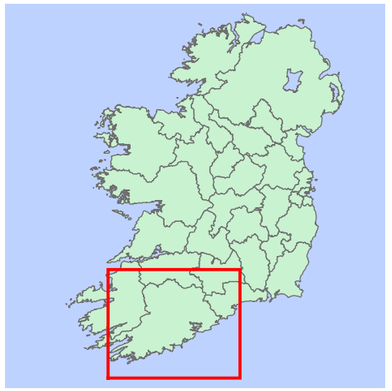
Table 4-3: European Sites Hydrologically or Hydrogeologically Connected to or Downstream of the WTP and WSZ

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
Construction and Operation Phase								
Great Island Channel SAC	SAC 001058	06th Jun 2014 Version 1	1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	Yes	Yes
			1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes		
Cork Harbour SPA	SPA 004030	16th Dec 2014 Version 1	A004	Little Grebe (*Tachybaptus ruficollis*)	Yes	Yes	Yes	Yes
			A005	Great Crested Grebe (*Podiceps cristatus*)	Yes	Yes		
			A017	Cormorant (*Phalacrocorax carbo*)	Yes	Yes		
			A028	Grey Heron (*Ardea cinerea*)	Yes	Yes		
			A048	Shelduck (*Tadorna tadorna*)	Yes	Yes		
			A050	Wigeon (*Anas penelope*)	Yes	Yes		
			A052	Teal (*Anas crecca*)	Yes	Yes		
			A054	Pintail (*Anas acuta*)	Yes	Yes		
			A056	Shoveler (*Anas clypeata*)	Yes	Yes		
			A069	Red-breasted Merganser (*Mergus serrator*)	Yes	Yes		
			A130	Oystercatcher (*Haematopus ostralegus*)	Yes	Yes		
			A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes		
			A141	Grey Plover (*Pluvialis squatarola*)	Yes	Yes		
			A142	Lapwing	Yes	Yes		

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
				(*Vanellus vanellus*)				
			A149	Dunlin (*Calidris alpina alpina*)	Yes	Yes		
			A156	Black-tailed Godwit (*Limosa limosa*)	Yes	Yes		
			A157	Bar-tailed Godwit (*Limosa lapponica*)	Yes	Yes		
			A160	Curlew (*Numenius arquata*)	Yes	Yes		
			A162	Redshank (*Tringa totanus*)	Yes	Yes		
			A164	Greenshank (*Tringa nebularia*)	Yes	Yes		
			A179	Black-headed Gull (*Chroicocephalus ridibundus*)	Yes	Yes		
			A182	Common Gull (*Larus canus*)	Yes	Yes		
			A183	Lesser Black-backed Gull (*Larus fuscus*)	Yes	Yes		
			A193	Common Tern (*Sterna hirundo*)	Yes	No		
			A999	Wetlands	Yes	Yes		



Zone of Influence (ZoI) for Operational Phase



Legend

LEMA Emission Type

- Primary Discharge Point
- Secondary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- Inniscarra WTP
- Water Supply Zone Boundary (WSZ)
- Additional WSZ considered for dosing
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Subcatchments intersecting Water Supply Zone(s) related to the WTP
- Zone of Influence

Data Source:
Irish Water
NPWS (June 2019)
EPA

N

0 5 10 20 Kilometres

Client UISCE EIREANN WATER

Project Lead Mitigation Plan
Corrective Water Treatment Works

Title

Zone 2
Cork City and Harbour
European Sites within the ZoI which are hydro(geo)logically connected

RPS

Scale: 1:500,000 @ A3	**Date:** 25/07/2019
File Ref: MDW0766Arc0001bF04	**Map Projection:** Irish National Grid (TM65)

5 EVALUATION OF POTENTIAL IMPACTS

5.1 CONTEXT FOR IMPACT PREDICTION

The methodology for the assessment of impacts is derived from the *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites* (EC, 2002). When describing changes/activities and impacts on ecosystem structure and function, the types of impacts that are commonly presented include:

- Direct and indirect effects;
- Short and long-term effects;
- Construction, operational and decommissioning effects; and
- Isolated, interactive and cumulative effects.

5.2 IMPACT IDENTIFICATION

In considering the potential for impacts from implementation of the project, a "source–pathway–receptor" approach has been applied.

The Screening for AA has considered the potential for the following likely significant effects:

- Altered structure and functions relating to the physical components of a habitat ("structure") and the ecological processes that drive it ("functions"). For aquatic habitats these include attributes such as vegetation and water quality;
- Altered species composition due to changes in abiotic conditions such as water quality;
- Reduced breeding success (e.g. due to disturbance, habitat alteration, pollution) possibly resulting in reduced population viability; and
- Impacts to surface water and groundwater and the species they support (changes to key indicators).

5.2.1 Construction Phase

The source-pathway-receptor approach has identified a number of impact pathways associated with the construction of orthophosphate treatment works at Inniscarra WTP. These will be evaluated with regard to the potential for likely significant effects on European Sites. These are potential effects and in the absence of pathways (which is evaluated in **Section 5.3.1** below) the construction phase may not give rise to these effects.

- Sediment laden run-off from excavation areas (trenches for dosing pipelines, carrier water pipework and electrical cables) and the introduction of fine sediments to watercourses connected to the works area causing a deterioration in water quality;
- Dust and noise emissions from excavation (trenches for dosing pipelines, carrier water pipework and electrical cables and transportation of material and equipment close to watercourses causing a deterioration in water quality or disturbance to species (e.g. birds);

- Environmental incident or accident during the construction phase e.g. spillage of a contaminant such as diesel or phosphoric acid causing a deterioration in water quality; and
- Groundwater level drawdown through the excavation of trenches for dosing pipelines, carrier water pipework and electrical cables.

5.2.2 Operational Phase

The source-pathway-receptor approach has identified a number of impact pathways associated with the operation of orthophosphate treatment works at Inniscarra WTP. These will be evaluated with regard to the potential for likely significant effects on European Sites in relation to:

- Excessive phosphate within an aquatic ecosystem may lead to eutrophication with a corresponding reduction in oxygen levels, reduction in species diversity and subsequent impacts on animal life;
- Groundwater dependent habitats include both surface water habitats (e.g. hard oligo-mesotrophic lakes) and Groundwater Dependent Terrestrial Ecosystems (GWDTEs, e.g. alkaline fens). Any change in the water quality of these systems may have subsequent impacts for these habitats and species;
- The discharge of additional orthophosphate loads to the environment (through surface and sub surface pathways) may have potentially negative effects on nutrient sensitive species such as the freshwater pearl mussel, Atlantic salmon and the white-clawed crayfish;
- Phosphorus in wastewater collection systems is the result of drinking water and derived from a number of other sources, including phosphorus imported from areas outside the agglomeration through import of sludges or leachates for treatment at the plant. The disposal and use of phosphorus removed in wastewater sludge is regulated (i.e. through nutrient management plans) and should not pose further threat of environmental impact;
- Leakage of phosphates from the drinking water supply network to the environment from use of orthophosphate;
- Direct discharges of increased phosphorus to water bodies from the wastewater treatment plant licensed discharges; and
- Potential discharges to water bodies of untreated effluent potentially high in orthophosphate from Storm Water Overflows (SWOs).

5.3 ASSESSMENT OF IMPACTS

Article 6 of the Habitats Directive states that:

Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications of the site in view of the site's conservation objectives.

The focus of this Screening to inform AA is the evaluation of the potential for likely significant effects associated with the additional orthophosphate load due to orthophosphate dosing and the construction of treatment works at Inniscarra WTP.

5.3.1 Construction Phase

There are three possible locations for the orthophosphate dosing system all of which will be located within the confines of the existing WTP boundary. The assessment of potential significant effects associated with construction of the corrective water treatment works was conducted taking the whole Inniscarra WTP into account and therefore included all possible locations. The assessment of impacts associated with the construction of the corrective water treatment works at Inniscarra WTP is presented in **Table 5.1** and is based on a desktop study using the following information:

- Design descriptions and drawings for the proposed corrective water treatment works at Inniscara WTP;
- A review of hydrological connectivity between the proposed works and European sites using the EPA Mapping Resources: http://gis.epa.ie/; www.Catchments.ie;
- Ordnance Survey Ireland Map viewer: http://maps.osi.ie/publicviewer/#V1,591271,743300,0,10; and
- Site synopses, conservation objectives and qualifying interest data for European Sites.

Table 5-1: Likely significant effects to European Sites arising as a result of the construction of the corrective water treatment works

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Evaluation of Potential Significant Effects
Great Island Channel SAC (001058)	Lee (Cork)_090 (IE_SW_19L030800)	RWB	The construction works will be located within the confines of the existing Inniscarra WTP. Inniscarra WTP is not located within or directly adjoins a European Site. **Surface water** There are no surface water bodies within the confines of Inniscarra WTP. However, the WTP lies adjacent to the River Lee which flows into the Lee (Cork) Estuary Upper (IE_SW_060_0950), Lee (Cork) Estuary Lower (IE_SW_060_0900) & Lough Mahon (IE_SW_060_0750). There is a mix of one-off housing buildings, roadways and agricultural grasslands buffering the boundaries of the Inniscarra WTP and the River Lee which travels through the Lee (Cork) Estuary Upper (IE_SW_060_0950) and Lee (Cork) Estuary Lower (IE_SW_060_0900) transitional water bodies before discharging into the Lough Mahon (IE_SW_060_0750) transitional water body. The River Lee flows eastwards of the Inniscarra WTP for over 30 km (>30 km channel length; 29.5 km '*as the crow flies*') to Lough Mahon, which comprises the closest segment of the Cork Harbour SPA. Lough Mahon also provides connectivity to the Great Island Channel SAC, located just downstream from this point. Lough Mahon also adjoins the Cork Harbour (IE_SW_060_0000) coastal water body which is 31km downstream of the WTP site and has three transitional water bodies discussed above separating it from the Inniscarra WTP.
	Lee (Cork) Estuary Upper (IE_SW_060_0950)	TWB	
	Lee (Cork) Estuary Lower (IE_SW_060_0900)	TWB	
	Lough Mahon (IE_SW_060_0750)	TWB	
Cork Harbour SPA (004030)	Lee (Cork) Estuary Upper (IE_SW_060_0950)	TWB	
	Lee (Cork) Estuary Lower (IE_SW_060_0900)	TWB	
	Lough Mahon (IE_SW_060_0750)	TWB	
	Cork Harbour (IE_SW_060_0000)	CWB	

[8] Monitoring period is annual unless specified.

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Evaluation of Potential Significant Effects
			The proposed construction works are small scale in nature and will be undertaken within the confines of the existing built infrastructure associated with Inniscarra WTP. There will be no aspects of the proposed works that will result in the release of potential impacts sources identified in **Section 5.2.1.** The works will be localised and contained to the immediate development area which supports amenity grassland / buildings and artificial surfaces. Works such as excavations will be contained to the defined working area and necessary works with cast in place concrete will be undertaken within sealed shuttered units. Such works practices will retain all potential construction related pollutants at source. Owing to the small scale nature of the proposed works and the large distance between the WTP and the European Sites (>22km to >27km downstream) there is no potential for likely significant effects upon Great Island Channel SAC and Cork Harbour SPA through sediment laden run-off, dust emissions or environmental incidents. Therefore, there is no potential for likely significant effects to these European sites. **Groundwater** The WTP overlies the Ballinhassig East (IE_SW_G_004) groundwater body a sizeable groundwater body which encapsulates much of middle and west Co. Cork. The excavation of trenches to install dosing pipelines, carrier water pipework and electrical cables to 700mm below ground level has the potential to interfere with the water table potentially causing groundwater drawdown. The Ballinhassig East (IE_SW_G_004) groundwater body is comprised of poorly productive bedrock. There is no further water body-specific information on Ballinhassig East (IE_SW_G_004) available from the GSI website. As with the adjacent groundwater bodies Ballincollig[9] IE_SW_G_002 (moderately productive bedrock only in local zones) and Lee Valley Gravels[10] IE_SW_G_094 flow direction is expected to mimic the surface water pattern and flow westwards towards the Lough Mahon/Cork Harbour area. The Bandon[11] IE_SW_G_086 (also poor productivity), groundwater body is also adjoining the Ballinhassig East (IE_SW_G_004) groundwater body and also expected to follow the surface water pattern, though in this case flow radially out towards the coast. As the excavation works will not be extensive (up to c. 75m for pipework and to an approximate depth of 700mm) and upon made ground, interference with water table will be unlikely to

[9] GSI - Ballincollig GWB: Summary of Initial Characterisation
[10] No groundwater body description is available for the Lee Valley Gravels.
[11] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/BandonGWB.pdf

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Evaluation of Potential Significant Effects
			occur. Any interference would be localised, minor and temporary. Therefore, there is no potential for likely significant effects to the underlying groundwater body, or the receiving surface water features and subsequently those European Sites screened in for further assessment, as a result of the construction of the corrective water treatment works at Inniscarra WTP.

5.3.2 Operational Phase

In the case of the additional orthophosphate load due to dosing at Inniscarra WTP, the EAM conceptual model developed for orthophosphate transfer identified the surface and groundwater bodies that have the potential to be affected by the orthophosphate dosing and for which hydrological or hydrogeological pathways to the European Sites exist. These water bodies are listed in **Table 5-2.** The table identifies the following:

- European Sites included for assessment;
- Water bodies hydrologically or hydrogeologically connected to the European Sites;
- Existing orthophosphate indicative quality and trend of each water body as presented in the EPA's WFD App;
- The baseline orthophosphate concentration of each water body;
- 75% of the upper threshold for the indicative quality;
- Cumulative orthophosphate load to surface from leakage, DWWTS and agglomerations;
- The modelled orthophosphate concentration following dosing at the WTP; and,
- The orthophosphate potential baseline concentration (mg/l) following dosing at the WTP.

The EAM has been undertaken assuming the capacity of a water body is a measure of its ability to absorb extra pressures before its indicative quality changes. In order to do this the indicative quality as presented in the EPA's WFD APP is used as the baseline concentration for the different monitoring points within a water body. For example, a river water body with Good orthophosphate indicative quality will have mean orthophosphate value in the range 0.025 to 0.035 mg/l. River water bodies with mean orthophosphate concentrations of 0.0275 mg/l have 75% capacity left, i.e. high capacity, while river water bodies with a mean of 0.0325 mg/l have lower capacity (25%) as the baseline concentrations are closer to the Good/Moderate indicative quality boundary.

When assessing the increase in orthophosphate concentrations as a result of proposed dosing, an increase which is <5% of the Good / High indicative quality boundary, i.e. 0.00125mg/l, is excluded from further assessment and is assumed to result in no significant impact to a water body. If the baseline orthophosphate concentration in addition to the potential increase in orthophosphate concentration as a result of dosing is less than the 75% upper threshold of the indicative quality band for a water body, this also results in no significant impact.

For significance threshold band (i.e. 75% of the upper threshold for the indicative quality band) in transitional and coastal water bodies, a sliding linear scale is used depending on median salinity. The

EAM determines if the dosing will result in a baseline concentration that exceeds the relevant 75% threshold for the indicative quality bands (based on salinities) in order to evaluate whether there could be an increased risk of deterioration in indicative quality.

Where a water body is unassigned and therefore does not have monitored orthophosphate concentrations or salinity levels, a conservative approach is used whereby the surrogate indicative quality is calculated based on inputting water bodies or pressures acting on the water body but the more conservative freshwater orthophosphate limits for the different indicative quality bands are applied[12].

Therefore, in assessing the additional loads from the proposed orthophosphate dosing, the capacity of the water body will be assessed. This information is available on the WFD App on a national basis using the "Distance to Threshold" parameter, where water bodies with high capacity are termed "Far" from the threshold and those with low capacity are "Near" the threshold.

It is predicted that orthophosphate dosing will not have a significant effect on water bodies (or the Conservation Objectives of a European Site) where it does not cause the P concentration to increase to a level within 25% of the remaining capacity left within the existing orthophosphate indicative quality band, i.e. cause a change in the distance to threshold from far to near. This assessment will be supported by trend analysis as outlined below to ensure the additional orthophosphate dosing and statistically significant trends for a water body will not result in deterioration in status by 2021 even where the distance to threshold is currently assessed to be far. Where the water body baseline indicative quality concentration is "Near" to the threshold before the effect of orthophosphate dosing is considered, this does not cause an automatic fail for this test. If the predicted increase in concentration due to orthophosphate is very low (i.e. below 5% of the Good/Moderate indicative quality this test will pass as the orthophosphate dosing itself can be defined as having no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

The identification of statistically and environmentally significant trends for water bodies is a specific requirement of the WFD and the Groundwater Daughter Directive. Guidance on trends in groundwater assessments (UKTAG 2009, EPA 2010) indicates that trends are environmentally significant if they indicate that the Good Ecological Status will not be achieved within two future river basin cycles, i.e. within the next 12 years.

This test applies only when the trend for orthophosphate concentration for the water body is considered statistically significant in the WFD App. For surface water bodies, the predicted concentration is given and the additional concentration due to orthophosphate dosing is added and assessed as appropriate. If the new calculated predicted concentration prevents the achievement of good indicative quality, then this test fails.

This assessment assumes a dosing rate of 0.6 mg/l.

An additional test for groundwater bodies states that downward trends should not be reversed as a result of pollution. This test applies to GWB with statistically significant trends according to the WFD

[12] The conservative thresholds in transitional and coastal waterbodies for orthophosphate indicative quality in unassigned waterbodies i.e. upper limits are: High 0.025 mg/l; Good 0.04 mg/l; Moderate 0.06 mg/l; Poor 0.09 mg/l; Bad – N/A. The higher range for transitional and coastal waterbodies with a median salinity ≤ 17mg/l are: High 0.03 mg/l; Good 0.06 mg/l; Moderate 0.1 mg/l; Poor 0.2 mg/l; Bad N/A.

App and the Sens Slope provided is used to assess direction and strength of trend. If the trend is negative and the predicted increase in orthophosphate concentration is lower than the absolute value of the Sens Slope, then the test passes.

The initial assessment is automated using existing WFD App data. If tests fail and more investigation is required, more recent data can be used, and the assessment rerun. For example, if 2019 - 2021 concentrations for a river water body are available, the 2019 – 2021 average can be used instead of the 2017 baseline provided in the WFD App.

Table 5-2: Surface and Groundwater Bodies within the WSZ with a Hydrological or Hydrogeological Connection to European Sites

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
Great Island Channel SAC (001058)	IE_SW_19K620850 Kilnaglery 19_010	RWB	*Good*	*0.030*	*0.033*	*11.7*	*0.0009*	*0.031*	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_20M010200 Minane 20_010	RWB	*Good*	*0.030*	*0.033*	18.5	0.0008	*0.031*	The modelled increase does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19B140110 Bride (Cork City)_010	RWB	Moderate Upwards Near	0.046	0.051	3.9	0.0001	0.046	The modelled increase does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19B041300 Bride (Lee)_040	RWB	*Moderate*	*0.046*	*0.051*	4.8	0.0000	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

[13] Monitoring period is annual unless specified.
[14] Surrogate Indicative Quality in italic.
[15] Distance to threshold in parentheses.
[16] Baseline year is 2020.
[17] Surrogate concentration is given in italic mg/l
[18] Values above 5% of Good / High indicative quality boundary (0.00125 mg/l) for SW or 5% of Good / Fail indicative quality boundary (0.00175 mg/l) for GW highlighted in yellow.
[19] Green cells signify that there is no risk of deterioration in Indicative Quality of the water body following dosing at the WTP.

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
	IE_SW_19B041600 Bride (Lee)_050	RWB	High Upwards Near	0.024	0.019	26.6	0.0002	0.024	Existing baseline exceeds 75% of indicative quality upper threshold. However, the modelled increase does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19C120740 Curragheen (Cork City)_010	RWB	Moderate Upwards Near	0.046	0.051	69.9	0.0015	0.047	The modelled increase exceeds 5% of the High / Good indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19D060400 Dripsey_020	RWB (multiple monitor-ing points)	Good Downwards Far	0.026	0.033	7.9	0.0001	0.026	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			High Upwards Near	0.020	0.019			0.020 *	The modelled increase does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Moderate Upwards Far	0.043	0.051			0.043	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
									deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19G040700 Glasheen (Cork City)_010	RWB	Poor	0.077	*0.087*	82.4	0.0016	0.078	The modelled increase exceeds 5% of the High / Good indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19H050470 Hilltown 19_010	RWB	*Good*	*0.030*	*0.033*	75.0	0.0024	*0.032* ^	The modelled increase exceeds 5% of the High / Good indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19L030600 Lee (Cork)_080	RWB	High Far	0.015	0.019	71.8	0.0001	0.015^	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19L030800 Lee (Cork)_090	RWB	High Downwards Far	0.014	0.019	210.4	0.0002	0.014‡	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
									of preventing the achievement of WFD objectives.
	IE_SW_19M010600 Martin_040	RWB	Moderate Upwards Near	0.056	0.051	14.9	0.0002	0.056	The existing baseline concentration exceeds 75% of the indicative quality upper threshold. However, the modelled increase in concentration does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19O010800 Owenboy (Cork)_020	RWB	Good Far	0.027	0.033	-	-	-	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19O011000 Owenboy (Cork)_030	RWB	Good Upwards Far	0.021	0.033	0.3	0.0000	0.021	The existing baseline concentration exceeds 75% of the indicative quality upper threshold. However, the modelled increase in concentration does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.026	0.033			0.026	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19O011400 Owenboy (Cork)_040	RWB	Good Upwards Near	0.026	0.033	3.7	0.0000	0.026	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
	IE_SW_19M300900 Moneygurney 19_010	RWB	*Moderate*	*0.046*	0.051	98.0	0.0046	0.050	The modelled increase exceeds 5% of the High / Good indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19S010300 Shournagh_030	RWB	Moderate Upwards Near	0.051	0.051	32.3	0.0002	0.051 ‡	The existing baseline concentration exceeds 75% of the indicative quality upper threshold. However, the modelled increase in concentration does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19S010500 Shournagh_040	RWB	Moderate Downwards Far	0.044	0.051	66.8	0.0003	0.044 ‡	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19T050890 Two Pot (Cork City)_010	RWB	Moderate	0.046	0.051	10.1	0.0009	0.046	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
	IE_SW_19G010600 Glashaboy (Lough Mahon)_030	RWB	*Good*	*0.030*	*0.033*	1.5	0.0000	*0.030*	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19T250870 Tibbotstown_010	RWB	*Good*	*0.030*	*0.033*	2.8	0.0002	*0.030*	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_060_0750 Lough Mahon	TWB Summer	High Downwards Far	0.014	0.020	3643.9	0.0001	0.021 ‡	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good Downwards Far	0.027	0.045	0.0		0.027*	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
	IE_SW_060_1200 Owenboy Estuary	TWB	*Moderate*	0.*046*	*0.051*	93.6	0.0000	*0.046* ‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_060_0900 Lee (Cork) Estuary Lower	TWB Summer	Good Downwards Near	0.033	0.037	382.8	0.0003	0.033 ‡*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good Downwards Far	0.043	0.050			0.043 *	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_060_0950 Lee (Cork) Estuary Upper	TWB Summer	High Downwards Near	0.013	0.019	376.4	0.0003	0.013 ‡	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	High Downwards Far	0.013	0.019			0.013 ‡	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_050_0000 Outer Cork Harbour	TWB Summer	High Downwards Far	0.003	0.019	3835.1	0.0000	0.003 ‡*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
		TWB Winter	Good Upwards Far	0.025	0.019			0.025 *	The existing baseline concentration exceeds 75% of the indicative quality upper threshold. However, the modelled increase in concentration does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_060_0000 Cork Harbour	TWB Summer	High Downwards Far	0.003	0.019	3816.6	0.0000	0.003 ‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good Downwards Near	0.028	0.035			0.028 *	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_004 Ballinhassig East	GWB (multiple monitor-ing points)	Good Upwards Near	0.034	0.026	79.3	0.0003	0.034	The modelled increase in concentration does not exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l). Some monitoring points are failing to achieve Good indicative quality, but the additional Ortho P load in this water body is not impacting on the ability of the dependent water bodies to achieve their WFD objectives (see surface WBs listed for this SAC).
			Good Upwards Far	0.013	0.026			0.013	
			Failing to achieve good Upwards Far	0.051	-			0.051	
			Failing to achieve good Upwards Far	0.037	-			0.038	
			Good Upwards Far	0.021	0.026			0.021	

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
			Good None Far	0.015	0.026			0.015	
			Good Upwards Far	0.006	0.026			0.006	
			Good Downwards Far	0.023	0.026			0.023	
			Failing to achieve good Upwards Far	0.268	-			0.268	
			Good Upwards Near	0.006	0.026			0.007	
			Good *Downwards Far*	0.026	0.026			0.026	
			Failing to achieve good *Upwards Far*	0.188	-			0.189	
			Good *Upwards Far*	0.012	0.026			0.057	
			Failing to achieve *Upwards Far*	0.043	-			0.043	

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
Cork Harbour SPA (004030)	IE_SW_19K620850 Kilnaglery 19_010	RWB	*Good*	*0.030*	*0.033*	*11.7*	*0.0009*	*0.031^*	The modelled increase exceeds 5% of the High / Good indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19H050470 Hilltown 19_010	RWB	*Good*	*0.030*	*0.033*	75	0.0024	*0.032*	The modelled increase exceeds 5% of the High / Good indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19M300900 Moneygurney 19_010	RWB	*Moderate*	*0.046*	0.051	98	0.0046	0.050	The modelled increase exceeds 5% of the High / Good indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_20M010200 Minane 20_010	RWB	*Good*	*0.030*	*0.033*	18.5	0.0008	*0.031*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19B140110 Bride (Cork City)_010	RWB	Moderate Upwards Near	0.046	0.051	3.9	0.0001	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19B041300 Bride (Lee)_040	RWB	*Moderate*	*0.046*	*0.051*	4.8	0.0000	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
	IE_SW_19B041600 Bride (Lee)_050	RWB	High Upwards Near	0.024	0.019	26.6	0.0002	0.024	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19C120740 Curragheen (Cork City)_010	RWB	*Moderate*	*0.046*	*0.051*	*69.9*	*0.0015*	*0.078*	The modelled increase exceeds 5% of the High / Good indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19D060400 Dripsey_020	RWB (multiple monitor-ing points)	Good Downwards Far	0.026	0.033	7.9	0.0001	0.026	The existing baseline concentration exceeds 75% of the indicative quality upper threshold. However, the modelled increase in concentration does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			High Upwards Near	0.020	0.019			0.020*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19G040700 Glasheen (Cork City)_010	RWB	Poor	0.077	*0.087*	82.4	0.0016	0.078	The modelled increase exceeds 5% of the High / Good indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19L030600 Lee (Cork)_080	RWB	High Far	0.015	0.019	71.8	0.0001	0.015^	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
									exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19L030800 Lee (Cork)_090	RWB	High Downwards Far	0.014	0.019	210.4	0.0002	0.014‡	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19M010600 Martin_040	RWB	Moderate Upwards Near	0.056	0.051	14.9	0.0002	0.056	The existing baseline concentration exceeds 75% of the indicative quality upper threshold. However, the modelled increase in concentration does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19O010800 Owenboy (Cork)_020	RWB	Good Far	0.027	0.033	-	-	-	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19O011000 Owenboy (Cork)_030	RWB	High Downwards Near	0.021	0.019	0.3	0.0000	0.021	The existing baseline concentration exceeds 75% of the indicative quality upper threshold. However, the modelled increase in concentration does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
			Good Upwards Far	0.026	0.033			0.026	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19O011400 Owenboy (Cork)_040	RWB	Good Upwards Near	0.026	0.033	3.7	0.0000	0.026	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19S010300 Shournagh_030	RWB	Moderate Upwards Near	0.051	0.051	32.3	0.0002	0.051 ‡	The existing baseline concentration exceeds 75% of the indicative quality upper threshold. However, the modelled increase in concentration does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19S010500 Shournagh_040	RWB	Moderate Downwards Far	0.044	0.051	66.8	0.0003	0.044 ‡	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19T050890 Two Pot (Cork City)_010	RWB	Moderate	0.046	0.051	10.1	0.0009	0.046	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
									of preventing the achievement of WFD objectives.
	IE_SW_19G010600 Glashaboy (Lough Mahon)_030	RWB	*Good*	*0.030*	*0.033*	1.5	0.0000	*0.030*	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19T250870 Tibbotstown_010	RWB	*Good*	*0.030*	*0.033*	2.8	0.0002	*0.030*	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_060_0750 Lough Mahon	TWB Summer	High Downwards Far	0.014	0.020	3643.9	0.0001	0.014 ‡	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good Downwards Far	0.027	0.045			0.027	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_060_1200 Owenboy Estuary	TWB	*Moderate*	0.*046*	*0.051*	93.6	0.0000	*0.046‡*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
	IE_SW_060_0900 Lee (Cork) Estuary Lower	TWB Summer	Good Downwards Near	0.033	0.037	382.8	0.0003	0.033 ‡*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good Downwards Far	0.043	0.050			0.043 *	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_060_0950 Lee (Cork) Estuary Upper	TWB Summer	High Downwards Near	0.013	0.019	382.8	0.0002	0.013 ‡	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	High Downwards Far	0.013	0.019			0.013 ‡	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_050_0000 Outer Cork Harbour	TWB Summer	High Downwards Far	0.003	0.019	3835.1	0.0000	0.003 ‡*	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
									of preventing the achievement of WFD objectives.
		TWB Winter	High Downwards Far	0.025	0.019			0.025 *	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_060_0000 Cork Harbour	TWB Summer	High Downwards Far	0.003	0.019	3816.6	0.0000	0.003 ‡	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good Downwards Near	0.028	0.035			0.028 *	The modelled increase does not exceed 5% of the High / Good indicative quality boundary and the post-dosing baseline concentration does not exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_002 Ballincollig	GWB	*Good*	*0.018*	*0.026*	67.4	0.0040	*0.022*	The modelled increase exceeds 5% of the Good / Fail indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
									of preventing the achievement of WFD objectives.
	IE_SW_G_004 Ballinhassig East	GWB (multiple monitor-ing points)	Good Upwards Near	0.034	0.026	79.3	0.0003	0.034	The modelled increase in concentration does not exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l). Some monitoring points are failing to achieve Good indicative quality, but the additional Ortho P load in this water body is not impacting on the ability of the dependent water bodies to achieve their WFD objectives (see surface WBs listed for this SAC).
			Good Upwards Far	0.013	0.026			0.013	
			Failing to achieve good Upwards Far	0.051	-			0.051	
			Failing to achieve good Upwards Far	0.037	-			0.038	
			Good Upwards Far	0.021	0.026			0.021	
			Good None Far	0.015	0.026			0.015	
			Good Upwards Far	0.006	0.026			0.006	
			Good Downwards Far	0.023	0.026			0023	
			Failing to achieve	0.268	-			0.268	

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
			good Upwards Far						
			Good Upwards Far	0.006	0.026			0.007	
			Good Upwards Far	0.026	0.026			0.026	
			Failing to achieve Good Upwards Far	0.188	-			0.189	
			Good Upwards Far	0.012	0.026			0.012	
			Failing to achieve Good Upwards Far	0.043	-			0.043	
	IE_SW_G_086 Bandon	GWB	*Good*	*0.018*	0.026	8.6	0.0001	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_072 Ringaskiddy	GWB	*Good*	*0.018*	0.026	48.1	0.0077	0.025	The modelled increase exceeds 5% of the Good / Fail indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[13]	Ortho P Indicative Quality[14] and Trends[15]	Baseline[16] Ortho P Conc.[17] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[18] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[19]	Evaluation
	IE_SW_G_009 Ballinghassig_D	GWB	*Good*	*0.018*	0.026	1.0	0.0034	0.021	The modelled increase exceeds 5% of the Good / Fail indicative quality boundary but does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

^ Effective Rainfall used to calculate concentration
‡ Load from WWTP / SWO following treatment added

The assessment of discharges from the wastewater collection system and WWTPs and the loading from leakage and DWWTSs to lakes is based on the Vollenweider equation. This is an empirical equation which aims to predict the critical total P loading to a lake where eutrophic conditions can occur. It is calculated based on area, mean depth, and hydraulic outflow of lake (Vollenweider, 1968[20]) (see **Table 5-3**).

Table 5-3: Vollenweider assessment of lakes within the WSZs

Site Name (Code)	Contributing WB Code_Name	Parameter	TP Indicative Quality & Trends[21]	Baseline[22] Ortho P Conc.[23] (mg/l)	TP Total Dosing Load (kg/yr)	Est. Existing Areal Loading Based on Vollenweider (mg/m²/yr)	Est. Post Dosing Areal Loading Based on Vollenweider (mg/m²/yr)	Lc – Critical Load (mg/m²/yr)	Increase (%)
Great Island Channel SAC (001058)	IE_SW_19_138 Inniscarra Lake	TP	Good Downwards (Near)	0.026	71.0	12,597	12,612	5,830	0.12%
Cork Harbour SPA (004030)	IE_SW_19_138 Inniscarra Lake	TP	Good Downwards Near	0.026	71.0	12,597	12,612	5,830	0.12%

[20] Vollenweider, R. A. (1968) *Scientific fundamentals of stream and lake eutrophication with particular reference to nitrogen and phosphorus*. OECD Technical Report DAF/DST/88. Organisation of Economic Cooperation and Development, Paris.
[21] Distance to Threshold. Surrogate Indicative Quality in *italic*
[22] Baseline year is 2014.
[23] Surrogate concentrations given in italic

5.3.3 Assessment of Potential Direct Impacts from WWTPs and Storm Water Overflows

The conceptual model developed for P transfer identifies a number of pathways by which orthophosphate can reach receptors. In the case of these pathways, factors contributing to potential direct impacts are:

- the quantitative increase in P loading to wastewater collecting systems;
- the efficiency of P removal at WWTPs;
- the increased P loading to surface waters via storm water overflows; and
- the sensitivity of receptors.

For the purposes of assessing the potential impact on the receiving environment a number of scenarios have been assessed at the agglomerations which receive water from the WSZ (**Table 5-4**). The existing baseline prior to orthophosphate dosing is established and compared to the potential impact on the receiving waters post-dosing. In-combination effects of the operation of the SWO and the continuous discharge from the WWTP were also assessed.

The pre-dosing scenario is based on a mass balance calculation of both the intermittent SWO discharges, in combination with the continuous discharge from the WWTP. A comparison of the pre- and post-dosing scenarios is made to identify changes in predicted concentrations downstream of the point of discharge. A summary of the results and evaluation of orthophosphate dosing downstream of each agglomeration is provided below.

Table 5-4 provides the data used for the WWTP continuous discharge, and the SWO intermittent discharge, to compare with the emission limit values (ELVs) from the waste water discharge licence (WWDL) (if it has been set) that are applicable to the agglomeration discharge to transitional waters or freshwaters. The resultant concentration in the waters downstream of the discharge point from the agglomerations is provided in **Table 5-5**, assuming mean flows**.**

The quantification of loads in a mass balance calculation was carried out using the standardised approach developed in the EAM which was devised using national data sets and applying a series of conservative and robust assumptions. The model was prepared in discussion with and utilises data supplied by the EPA, NPWS and the DHPLG to ensure that a robust model simulation is provided.

Table 5-4: Increased loading/concentration due to Orthophosphate Dosing – Dosing rate = 0.6 mg/l

Agglom. and Discharge Type	ELV from WWDL (mg/l) (Ortho P unless otherwise stated)	Scenario	TP Load Kg/Yr	Ortho P Concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	***0.4***	***0.68***
Cork City Primary Discharge	2.5 (TP) *Compliant in most recent AER (2021)*	**Existing**	88,006	0.951	0.761	1.293
		Post Dosing	94,182.3	1.017	0.814	1.384
Cork City SWOs (48 no.)	n/a	**Existing**	2,615.6	0.970	0.776	1.319
		Post Dosing	2,795.5	1.037	0.829	1.410

Agglom. and Discharge Type	ELV from WWDL (mg/l) (Ortho P unless otherwise stated)	Scenario	TP Load Kg/Yr	Ortho P Concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	***0.4***	***0.68***
Ballincollig New Primary Discharge	2.0 (TP & Ortho P) *Compliant in most recent AER (2021)*	**Existing**	364.2	0.102	0.082	0.139
		Post Dosing	364.2	0.102	0.082	0.139
Ballincollig New SWOs (3 no.)	n/a	**Existing**	265.2	2.559	2.047	3.480
		Post Dosing	281.6	2.717	2.173	3.695
Blarney Primary Discharge	1.5 (TP) 0.80 (Ortho P) *Compliant in most recent AER (2021)*	**Existing**	632.1	0.247	0.198	0.336
		Post Dosing	632.1	0.247	0.198	0.336
Blarney SWOs (1 no.)	n/a	**Existing**	108.3	1.455	1.164	1.979
		Post Dosing	112.2	1.508	1.206	2.050
Coachford Primary Discharge	n/a	**Existing**	393.2	2.418	1.935	3.289
		Post Dosing	420.7	2.587	2.070	3.518
Coachford SWOs (3 no.)	n/a	**Existing**	13.8	2.914	2.331	3.962
		Post Dosing	14.6	3.082	2.466	4.192
Ringaskiddy Primary Discharge	n/a	**Existing**	2,248.2	0.318	0.255	0.433
		Post Dosing	2,248.2	0.318	0.255	0.433
Ringaskiddy SWOs (4 no.)	n/a	**Existing**	654.8	3.184	2.548	4.331
		Post Dosing	683.3.4	3.323	2.658	4.519
Dripsey Primary Discharge	5.0 6.0 (Cond. 2)	**Existing**	43.8	0.141	0.112	0.191
		Post Dosing	43.8	0.141	0.112	0.191

Table 5-5: Mass balance assessment based on 0.6 mg/l dosing using available background concentrations and mean flow information from Hydrotool and as assumed daily tidal exchange volume.

Agglom.	RWB Name / Code for Primary Discharge	Background conc. (mg/l) (annual mean from AER u/s monitoring point)	Modelled Conc. Existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc
Cork City (D0033-01)	Lough Mahon IE_SW_060_0750	0.0315	0.0322	0.0323	0.2
Ballincollig New (D0049-01)	Lee (Cork)_090 IE_SW_19L030800	0.0242	0.0245	0.0245	0.0
Blarney (D0043-01)	Shournagh_040 IE_SW_19S010500	0.0555	0.0574	0.0574	0.0
Coachford (D0427-01)	Inniscarra - Lake IE_SW_19_138	0.0080	See Vollenwieder assessment for lake water body		
Ringaskiddy (D0057-01)	Owenboy Estuary IE_SW_060_1200	0.0060	0.0060	0.0060	0.0
Dripsey (D0426-01)	Dripsey_020 IE_SW_19D060400	0.0510	0.0512	0.0512	0.0

Cork City Agglomeration

The Cork City agglomeration has a secondary treatment facility (i.e. sequencing batch reactor) and discharges into Lough Mahon (IE_SW_060_0750) which is hydrologically connected to Great Island Channel SAC and Cork Harbour SPA. The 2021 AER shows that the WWTP is compliant with the TP ELV of 2.5 mg/l. As Cork City agglomeration only receives secondary treatment there is no treatment reduction assumed and the entire additional load from orthophosphate dosing is assumed to be discharged into Lough Mahon. When fluvial and daily tidal exchange volumes are taken into account the increase in the receiving water is negligible (0.2%) (**Table 5-5**). Therefore, there is no risk of failing to achieve WFD objectives for Lough Mahon (IE_SW_060_0750) and its hydrologically connected European Sites as a result of dosing at Inniscarra WTP.

Ballincollig New Agglomeration

Ballincollig New agglomeration discharges into Lee (Cork)_090 (IE_SW_19L030800) which is hydrologically connected to Great Island Channel SAC and Cork Harbour SPA. The modelled concentrations for both existing and post dosing scenarios are compliant with total phosphorus (TP) ELVs (2.0 mg/l) set in WWDL. Ballincollig New agglomeration receives tertiary treatment i.e. nutrient removal, at Ballincollig New agglomeration is assumed to remove any additional orthophosphate load to the WWTP during the treatment process. This is based on the assumption that there is adequate capacity in the chemical dosing system to effectively manage the removal of the additional phosphorus without affecting the performance of the treatment process at the WWTP or the quality of the effluent discharged under the current operating regime. The plant was compliant with TP and orthophosphate ELVs in 2021. When mean flows are taken into account the increase in the receiving water is not detectable (0.0%) (**Table 5-5**). Therefore, there is no risk of failing to achieve WFD objectives for Lee (Cork)_090 (IE_SW_19L030800) and its hydrologically connected European Sites as a result of dosing at Inniscarra WTP.

Blarney Agglomeration

Blarney agglomeration discharges into Shournagh_040 (IE_SW_19S010500) which is hydrologically connected to Great Island Channel SAC and Cork Harbour SPA. The modelled concentrations for both existing and post dosing scenarios are compliant with orthophosphate (0.8mg/l) and TP (1.5mg/l) ELVs set in WWDL. Blarney agglomeration receives tertiary treatment i.e. nutrient removal, at Blarney agglomeration is assumed to remove any additional orthophosphate load to the WWTP during the treatment process. This is based on the assumption that there is adequate capacity in the chemical dosing system to effectively manage the removal of the additional phosphorus without affecting the performance of the treatment process at the WWTP or the quality of the effluent discharged under the current operating regime. . The WWTP was compliant with ELV for orthophosphate in 2021.

When mean flows are taken into account the increase in the receiving water is not detectable (0.0%) (**Table 5-5**). Therefore, there is no risk of failing to achieve WFD objectives for Shournagh_040 (IE_SW_19S010500) and its hydrologically connected European Sites as a result of dosing at Inniscarra WTP.

Coachford Agglomeration

Coachford agglomeration discharges into Inniscarra Lake (IE_SW_19_138) which is hydrologically connected to Cork Harbour SPA and Great Island Channel SAC. ELVs have been set in the WWDL for Coachford. The small plant PE was over capacity however a recent upgrade in 2021 now means the plant is working within capacity. Impact from orthophosphate dosing prior to the upgrade , i.e. primary treatment by septic tank has been assessed in the Vollenweider assessment (**Table 5-3**) as a

conservative approach. As Coachford agglomeration only receives primary treatment there is no treatment reduction assumed and the entire additional load from orthophosphate dosing is assumed to be discharged into Inniscarra lake. According to the Vollenweider assessment of lakes, the post-dosing aerial load to Inniscarra Lake (IE_SW_19_138) is 0.12%. The potential effect of the orthophosphate dosing on Inniscarra Lake (IE_SW_19_138) is therefore negligible.

Ringaskiddy Agglomeration

Ringaskiddy agglomeration discharges into Owenboy Estuary (IE_SW_060_1200) which is hydrologically connected to Cork Harbour SPA and Great Island Channel SAC. No ELVs have been set for this agglomeration. No treatment reduction is assumed within the EAM. When fluvial and daily tidal exchange volumes are taken into account the increase in the receiving water is not detectable (0.0 %) (**Table 5-5**). The agglomeration is served by a WWTP with a capacity of 65,000 p.e. which was completed in December 2016. There are no othoP/TP ELVs set for this agglomeration. Therefore, there is no risk of failing to achieve WFD objectives for Owenboy Estuary (IE_SW_060_1200) and its hydrologically connected European Sites as a result of dosing at Inniscarra WTP.

Dripsey Agglomeration

Dripsey agglomeration discharges into Dripsey_020 (IE_SW_19D060400) which is hydrologically connected to Cork Harbour SPA and Great Island Channel SAC. The modelled concentrations for both existing and post dosing scenarios are compliant with total phosphorus (TP) ELVs (5.0 mg/l) set in WWDL. Dripsey agglomeration receives secondary treatment only and therefore there is no treatment reduction assumed in the EAM. When mean flows are taken into account the increase in the receiving water is undetectable (0.0%) (**Table 5-5**). Therefore, there is no risk of failing to achieve WFD objectives for Dripsey_020 (IE_SW_19D060400) and its hydrologically connected European Sites as a result of dosing at Inniscarra WTP.

5.3.4 Assessment of Potential Indirect Impact from Subsurface Flow

5.3.4.1 Sub surface flows from leakage and DWWTP

Step 4 of the EAM model assesses the distributed inputs to river water bodies from subsurface pathways (**Appendix C**). River water bodies with predicted increases in concentration above 5% of the High / Good indicative quality threshold (0.00125 mg/l) are highlighted in the table and include: Curragheen (Cork City)_010 (IE_SW_19C120740), Glasheen (Cork City)_010 (IE_SW_19G040700), Hilltown 19_010 (IE_SW_19H050470) and Moneygurney 19_010 (IE_SW_19M300900).

For Curragheen (Cork City)_010 (IE_SW_19C120740), the load from around 7% of the water main length, primarily leading to and on Haulbowline Island, is not included because it does not exist in the underlying susceptibility map; this load would be assessed in Cork Harbour and have a negligible effect on the result. Flows in this river sub-basin and others are not available, so effective rainfall has been used to estimate these increases in concentrations. The EAM further discusses this and the Project undertook further monitoring as is required under the EAM methodology to further characterise the water body and allow for a more detailed assessment of the risk.

Of the water bodies that exceed 5% of the High / Good indicative quality boundary, the highest modelled load (98.0 kg/yr) via subsurface pathways is seen in the river water body Moneygurney 19_010 (IE_SW_19M300900). Some of this load from the eastern section of this water body has been reapportioned directly to Lough Mahon. The remainder of the load however, is evaluated using the

available flows in Moneygurney 19_010 (IE_SW_19M300900) resulting in a relatively high concentration.

The catchment of Glasheen (Cork City)_010 (IE_SW_19G040700) is located in Cork City Centre on the South bank of the Lee Estuary. This water body has been assigned a poor ortho P indicative quality based on the EPA surrogate ecological status assigned to this water body. The addition of orthophosphate from dosing at Inniscarra WTP does not cause the post-dosing baseline concentrations to exceed the 75% of upper threshold.

The catchment of the river water body Curragheen (Cork City)_010 (IE_SW_19C120740) is located in Cork City Centre. This water body has been assigned a moderate ortho P indicative quality based on the EPA surrogate ecological status assigned to this water body. The addition of orthophosphate from dosing at Inniscarra WTP does not cause the post-dosing baseline concentrations to exceed the 75% of upper threshold.

The remaining water bodies have modelled increases in concentration that do not exceed 5% of the High / Good indicative quality boundary, therefore there is no risk of deterioration in the indicative quality of the remaining water bodies, or of preventing the achievement of WFD objectives.

5.3.4.2 Groundwater Assessment

The predicted loads and concentrations to a number of groundwater bodies (GWBs) are high (i.e. exceed 5% of the Good / Fail indicative quality upper threshold, 0.00175 mg/l) due to the susceptibility and hydrological conditions in general as shown in **Table 13 of Appendix C**. In most cases however, the increases in concentration are low and dosing will not increase the risk to the groundwater bodies and connected surface water bodies.

The EAM predicted loads to some groundwater bodies (GWBs) are significant for Ballincollig (IE_SW_G_002), Ballinhassig_D (waste facility) (IE_SW_G_009) and Ringaskiddy (IE_SW_G_072), (i.e. exceed 5% of the Good/ Fail boundary; 0.00175 mg/l) due to the susceptibility and hydrological conditions in general as shown in **Table 13 of Appendix C**. Tidal influences in these groundwater bodies are difficult to predict and, for the most part, will be restricted to the within 100 -200 metres of the coastline. Therefore, any additional dilution that may be available in these groundwater bodies could only be assessed within this 100 -200 metre zone, and not at water body level. The indicative quality of these groundwater bodies is unassigned and surrogate indicative quality is used. In these cases however, the groundwater body is within 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the indicative quality of the water bodies or of preventing the achievement of WFD objectives.

For Ballincollig GWB, the predicted baseline concentration following dosing does not exceed the 75% of the upper indicative quality threshold (**Table 13 of Appendix C**). Ballincollig GWB is hydrogeologically connected to Cork Harbour SPA and Great Island Channel SAC. Therefore, there is no risk of deterioration in the ortho P indicative quality or to the achievement of WFD objectives for this GWB.

The Ballinhassig_East water body (IE_SW_G_004) contains a number of monitoring points, some of which are failing to achieve Good indicative quality. The modelled concentration is insignificant (0.0003 mg/l) and well below 5% of the Good / Fail threshold (0.00175 mg/l). However, owing to the

fact there are a number of monitoring points currently failing to achieve Good indicative quality there is a risk of preventing the achievement of WFD objectives for this GWB.

For Lee Valley Gravels (IE_SW_G_094) GWB Group, the existing baseline concentration exceeds 75% of the indicative quality upper threshold but the modelled concentration is below 5% of the Good / Fail indicative quality boundary. Therefore, there is no risk of deterioration in the indicative quality of the water bodies or of preventing the achievement of WFD objectives.

5.3.4.3 Combined Assessment

Step 5 and 6 of the EAM model assesses the distributed inputs to river water bodies from subsurface and surface pathways (**Appendix C**). River water bodies with predicted increases in concentration above 5% of the High / Good indicative quality threshold (0.00125 mg/l) are highlighted in the table and include: Curragheen (Cork City)_010 (IE_SW_19C120740), Glasheen (Cork City)_010 (IE_SW_19G040700), Hilltown 19_010 (IE_SW_19H050470), Kilnaglery 19_010 (IE_SW_19K620850) and Moneygurney 19_010 (IE_SW_19M300900).

The modelled increase in concentration in Curragheen (Cork City)_010 (IE_SW_19C120740) is 0.0015 mg/l, which exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l). There are two historical monitoring monitoring points on the river but the data available is dated. The EPA have assigned the ecological status of this water body as moderate so this has been used as a surrogate for the orthophosphate indicative quality. The modelled increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body.

The modelled increase in concentration in Glasheen (Cork City)_010 (IE_SW_19G040700) exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l) at 0.0016 mg/l. There are multiple investigative monitoring points that have historical information for this water body, however the most recent EPA ecological status classification (2016-2021) of poor ecological status has been used as the baseline concentration for this waterbody as it is the most recent assessment available. The modelled increase in concentration does not cause the post-dosing baseline to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body.

The modelled post-dosing increase in concentration in Hilltown 19_010 (IE_SW_19H050470) is 0.0024 mg/l. However, this does not cause the post-dosing baseline to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body. For this river water body, the load from around 7% of the water main length, primarily leading to and on Haulbowline Island, is not included in the assessment because data is missing in the underlying susceptibility map. This load would be assessed in Cork Harbour and have a negligible effect on the result. Flows in this river sub-basin and others are not available, so effective rainfall has been used to estimate post-dosing orthophosphate concentrations.

Of the water bodies that exceed 5% of the High / Good indicative quality boundary, the highest modelled load (98.0 kg/yr) via subsurface pathways is seen in the river water body Moneygurney 19_010 (IE_SW_19M300900), which results in an increase in concentration of 0.0046 mg/l. Some of this load from the eastern section of this water body has been reapportioned directly to Lough Mahon. The remainder of the load however, is evaluated using the available flows in Moneygurney 19_010 (IE_SW_19M300900) resulting in a relatively high concentration. While the modelled increase in

concentration exceeds 5% of the High / Good indicative quality boundary, this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the water body, or of preventing the achievement of WFD objectives.

The remaining water bodies have modelled increases in concentration that do not exceed 5% of the High / Good indicative quality boundary, therefore there is no risk of deterioration in the indicative quality of the remaining water bodies, or of preventing the achievement of WFD objectives.

Table 15 of Appendix C outlines the Vollenwieder assessment of lakes within the WSZ. Inniscarra (IE_SW_19_138) is at good indicative quality for TP with a downward trend; however, the ecological status is moderate due to phytoplankton. An assessment of the loading from surface and subsurface pathways suggests that there will be an insignificant effect as a result of the orthophosphate dosing as demonstrated in Table 15 with an increase of 0.12%. An assessment of the OECD trophic status of Inniscarra suggests that the annual maximum chlorophyll levels are indicative of mesotrophic status with a low level of impact, this is consistent with the ecological status which is moderate due to phytoplankton conditions. The additional loading to the lake represents a 0.12% increase in the TP levels and this will have an insignificant effect on the trophic status of the lake.

Table 16 of Appendix C outlines the distributed inputs to transitional and coastal water bodies from sub surface pathways. The modelled increases in concentration for all transitional and coastal water bodies do not exceed 5% of the High / Good indicative quality boundary, ranging from low (0.0003 mg/l) to not detectable (0.0000 mg/l). The existing baseline for Outer Cork Harbour (IE_SW_050_0000) coastal water body exceeds 75% of the indicative quality upper threshold for the winter monitoring period, however the increase in concentration is undetectable (0.0000 mg/l). Therefore, there is no risk of deterioration in the indicative quality of the water bodies or of preventing the achievement of WFD objectives.

5.3.5 Assessment of Cumulative Impacts from other WSZs

The cumulative loads within the catchment associated with the orthophosphate dosing at Cork City Water Supply (0400PUB1001) and Zone 3 Glashaboy (0500PUB3303) have been assessed with the Cork Zone 2 City and Harbour WSZ. The common water bodies that are impacted by the WSZs supplied by these WTPs have been summarised in **Table 5-6** below.

The EAM assessment of cumulative impacts has highlighted potential risk to orthoP indicative quality and WFD objectives.

Following dosing, the additional ortho P concentration in four surface waterbodies exceed the 5% Good / High indicative quality boundary (i.e. >0.00125mg/l). These are: Bride (Cork City)_020 (IE_SW_19B140300), Curragheen (Cork City)_010 (IE_SW_19C120740), Glasheen (Cork City)_010 (IE_SW_19G0407000 and Moneygurney 19_010 (IE_SW_19M300900). For all of these water bodies the modelled post-dosing baseline does not exceed 75% of the upper indicative quality threshold and therefore there is no risk deterioration in the current moderate ortho P indicative quality or of preventing the achievement of WFD objectives.

For the remaining river water bodies, the modelled cumulative increase post-dosing does not exceed 5% of the High / Good indicative quality boundary, and the modelled increases do not cause the post-dosing baseline concentrations to exceed 75% of the indicative quality upper threshold. Therefore,

there is no risk of deterioration in the indicative quality of the water bodies, or of preventing the achievement of WFD objectives.

For the transitional and coastal water bodies the modelled additional concentrations are insignificant with the highest modelled additional increase in Lee (Cork) Estuary Upper (IE_SW_060_0950) and Lee (Cork) Estuary Lower (IE_SW_060_0900) of 0.0003 mg/l (i.e. <5% of the Good / High indicative quality boundary). In the case of Outer Cork Harbour (IE_SW_050_0000), the 75% upper indicative quality threshold is exceeded however this is due to the existing baseline concentrations. Therefore, there is no risk deterioration in the current ortho P indicative quality or of the achievement of WFD objectives for the transitional and coastal water bodies.

Table 5-6: Cumulative assessment of the increased loading and concentrations from Cork Zone 2 City and Harbour and other WSZs proposed for corrective water treatment in the upstream catchments

NAME / EU_CD	Period	Ortho P Indicative Quality & Trends (distance to threshold) Surrogate Indicative Quality indicated in *italic*	Baseline Year 2014 and Conc. Surrogate Conc given in *italic* mg/l	75% of Indicative quality Upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Conc. using 30%ile flows mg/l	PO_4 Potential Baseline Conc. following dosing mg/l
Bride (Cork City)_010 IE_SW_19B140110	n/a	Moderate Upwards Near	0.046	0.051	8.6	0.0002	0.046
Bride (Cork City)_020 IE_SW_19B140300	n/a	*Moderate*	*0.046*	*0.051*	*59.9*	*0.0016*	*0.047*
Curragheen (Cork City)_010 IE_SW_19C120740	n/a	Moderate Upwards Near	0.046	0.051	80.3	0.0017	0.047
		Poor Upwards Far	0.046	0.051			0.047
Glasheen (Cork City)_010 IE_SW_19G040700	n/a	*Poor*	*0.077*	*0.087*	*110.1*	*0.0021*	*0.079*
Lee (Cork)_090 IE_SW_19L030800	n/a	High Downwards Far	0.014	0.019	206.4	0.0002	0.014
Moneygurney 19_010 IE_SW_19M300900	n/a	*Moderate*	*0.046*	*0.051*	102.2	0.0048	*0.051*
Two Pot (Cork City)_010 IE_SW_19T050890	n/a	*Moderate*	*0.046*	*0.051*	*10.4*	*0.0010*	*0.046*
Lough Mahon IE_SW_060_0750	Summer	High Downwards Far	0.014	0.020	6489.1	0.0001	0.014‡
	Winter	Good Downwards Far	0.027	0.038			0.027‡
Lee (Cork) Estuary Lower IE_SW_060_0900	TWB Summer	Good Downwards Near	0.033	0.037	376.4	0.0003	0.036‡

NAME / EU_CD	Period	Ortho P Indicative Quality & Trends (distance to threshold) Surrogate Indicative Quality indicated in *italic*	Baseline Year 2014 and Conc. Surrogate Conc given in *italic* mg/l	75% of Indicative quality Upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Conc. using 30%ile flows mg/l	PO_4 Potential Baseline Conc. following dosing mg/l
	TWB Winter	Good Downwards Far	0.043	0.050			0.044‡
Lee (Cork) Estuary Upper IE_SW_060_0950	TWB Summer	High Downwards Near	0.013	0.019	376.4	0.0003	0.013‡
	TWB Winter	High Downwards Far	0.013	0.019			0.013‡
Cork Harbour IE_SW_060_0000	CWB Summer	High Downwards Far	0.003	0.019	8478.8	0.0000	0.003‡
	CWB Winter	Good Upwards Far	0.028	0.039			0.028‡
Outer Cork Harbour IE_SW_050_0000	CWB Summer	High Downwards Far	0.003	0.019	8559.6	0.0000	0.003‡
	CWB Winter	High Downwards Far	0.025	0.019			0.025‡

‡ Load from WWTP / SWO following treatment added.

5.3.6 Conclusions

In terms of the assessment of the potential direct impacts from WWTPs and Storm Water Overflows the modelled increased orthophosphate dosing concentrations do not result in a noticeable effect with orthophosphate concentrations in the receiving water bodies (**Table 12 of Appendix C**), all of which are a fraction of 1%, ranging from 0.0% in Lee (Cork)_090, Cork Harbour and Owenboy Estuary, 0.1% in Lough Mahon and Shournagh_040 to 0.6% in Dropsey_040, as shown by the mass balance assessment in **Table 12 Appendix C**.

Four river water bodies [Curragheen (Cork City)_010 (IE_SW_19C120740), Glasheen (Cork City)_010 (IE_SW_19G040700), Hilltown 19_010 (IE_SW_19H050470) and Moneygurney 19_010 (IE_SW_19M300900)] have modelled increases in concentration that exceed 5% of the High / Good indicative quality boundary for orthophosphate following dosing at Inniscarra WTP. However, in these cases the post-dosing baseline concentration is within 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the indicative quality of the water bodies, or of preventing the achievement of WFD objectives.

Several river water bodies have existing baseline concentrations that exceed 75% of the upper orthophosphate indicative quality (**Table 14 of Appendix C**). However, modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l).

Therefore, the dosing poses no risk of deterioration in the indicative quality of these river water bodies, or of preventing the achievement of WFD objectives.

For Inniscarra (IE_SW_19_138), an assessment of the loading from surface and subsurface pathways indicates that there will be an insignificant effect as a result of the orthophosphate dosing. The additional loading to the lake represents a 0.12% increase in the TP levels and this will have an insignificant effect on the trophic status of the lake.

In all transitional and coastal water bodies, the post-dosing increase in orthophosphate concentration due to subsurface pathways ranges from undetectable (0.0000 mg/l) to low (0.0003 mg/l) due to the high level of estimated flows, including tidal flows.

In transitional and coastal waters, the 5% of the Good / High indicative quality threshold was not exceeded in any water body due to the dilution capacity of fluvial and tidal flows.

One groundwater body Ballinhassig_1 (IE_SW_G_004) has some monitoring points that are currently failing to achieve good indicative quality. The modelled additional concentration due to dosing is insignificant (0.0003 mg/l) i.e. <5% of the Good / Fail indicative quality boundary. For the Ballincollig GWB (IE_SW_G_002), Ringaskiddy (IE_SW_G_072) and Ballinhassig_D (Waste Facility) (IE_SW_G_009) the modelled concentrations exceed 5% Good / Fail indicative quality boundary but do not exceed 75% of the upper indicative quality threshold. Therefore, there is no risk of deterioration in the surrogate Ortho P indicative quality of the water bodies or to the achievement of WFD objectives.

Increases in concentration for all remaining river, transitional and coastal water bodies are within the 5% Good / High indicative quality boundary threshold following dosing. Increases in all remaining groundwaters are within 5% if of the Good / Fail indicative quality boundary.

The cumulative assessment of dosing at Inniscarra WTP together with other WTPs which may be subject to dosing in the same catchments, has demonstrated that when the cumulative loads are assessed there is no risk of deterioration in the Ortho P indicative quality or of the achievement of WFD objectives. These WTPs are also subject to their own Screening for AA.

6 EVALUATION OF POTENTIAL LIKELY SIGNIFICANT EFFECTS

6.1 CONSTRUCTION PHASE

The existing Inniscarra WTP is not located within or directly adjacent to the boundary of any European Site. The WTP site is located adjacent to the Lee (Cork)_090 (IE_SW_19L030800) watercourse and there is the potential for release of construction related pollutants via overland flow. This watercourse then flows westwards through the Lee (Cork) Estuary Upper (IE_SW_060_0950) and Lee (Cork) Estuary Lower (IE_SW_060_0900) transitional water bodies before discharging into the Lough Mahon (IE_SW_060_0750) transitional water body which is hydrologically connected to the Cork Harbour SPA and Great Island Channel SAC. The WTP site is located approximately > 30 km of channel length (29.5 km '*as the crow flies'*) upstream of the Cork Harbour SPA, which lies just upstream of the Great Island Channel SAC.

The proposed construction works will be localised and contained to the immediate development area which supports amenity grassland / buildings and artificial surfaces. Works such as excavations will be contained to the defined working area and necessary works with cast in place concrete will be undertaken within sealed shuttered units. Such works practices will retain all potential construction related pollutants at source. Therefore, there is no potential for likely significant effects to these European Sites.

Therefore, it has been determined that the construction of the corrective water treatment works at Inniscarra WTP, individually or in combination with other plans or projects, will not to give rise to any likely significant effect on the qualifying interests/special conservation interests of the Great Island Channel SAC (001058) and Cork Harbour SPA (004030) as a result of the proposed construction works.

In addition, the WTP overlies the Ballinhassig East (IE_SW_G_004) groundwater body. This is a large groundwater body and intersects the four European Sites including Great Island Channel SAC, The Gearagh SAC, The Gearagh SPA and Cork Harbour SPA. Potential source receptor pathways have been ruled out for The Gearagh SAC and The Gearagh SPA, as these sites are located upstream of the proposed construction works. For the remaining European Sites; Great Island Channel SAC and Cork Harbour SPA, the interference with the groundwater will be unlikely given the nature of the construction works. As the excavation works will not be extensive (up to c. 75m for pipework and to an approximate depth of 700mm) and will be situated upon made ground, interference with water table will be unlikely to occur. Any interference would be localised, minor and temporary, not extending in scale or extent to give rise to potential likely significant effects on any designated European Site. Therefore, there is no potential for likely significant effects on the receiving ground or surface water bodies and by extension those European Sites as a result of the construction of the corrective water treatment works at Inniscarra WTP.

Therefore, it can be concluded on the basis of objective scientific information that the construction of the corrective water treatment works at Inniscarra WTP, individually or in combination with other plans or projects, will not to have likely significant effects on European Sites.

6.2 OPERATIONAL PHASE

The key pressure associated with the proposed orthophosphate dosing is the potential for increased orthophosphate levels in the receiving waters which support the qualifying interests (habitats and

species) identified in **Table 4-3** that are both water dependent and nutrient sensitive (**Appendix B**). The likelihood of significant effects on these habitats and species, in view of their Conservation Objectives, are assessed in detail below.

6.2.1 Great Island Channel SAC 001058

6.2.1.1 (1140) Mudflats and sandflats not covered by seawater at low tide

The attributes and targets that will maintain the favourable conservation condition of this habitat in the Great Island Channel SAC do not make specific reference to water quality or nutrient condition (NPWS, 2014[24]). There is however, a requirement to conserve the community of mixed sediment to sandy mud with polychaetes and oligochaetes complex in its natural conditions. The conservation objectives supporting document for Marine habitats (NPWS, 2014[25]) requires that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Great Island Channel SAC and will receive inputs from orthophosphate dosing at Inniscarra WTP:

- The river water bodies hydrologically connected to the site include: Kilnaglery_010 (IE_SW_19K620850), Moneygurney_010 (IE_SW_19M300900), Hilltown_010 (IE_SW_19H050470), Minane (Cork)_010 (IE_SW_20M010200), Bride (Cork City)_010 (IE_SW_19B140110), Bride (Lee)_040 (IE_SW_19B041300), Bride (Lee)_050 (IE_SW_19B041600), Curragheen (Cork City)_010 (IE_SW_19C120740), Dripsey_020 (IE_SW_19D060400), Glasheen (Cork City)_010 (IE_SW_19G0407000), Lee (Cork)_080 (IE_SW_19L030600), Lee (Cork)_090 (IE_SW_19L030800), Martin_040 (IE_SW_19M010600), Owenboy (Cork)_020 (IE_SW_19O010800), Owenboy (Cork)_030 (IE_SW_19O011000), Owenboy (Cork)_040 (IE_SW_19O011400), Shournagh_030 (IE_SW_19S010300), Shournagh_040 (IE_SW_19S010500), Two Pot (Cork City)_010 (IE_SW_19T050890), Tibbotstown_010 (IE_SW_19T250870) and Glashaboy (Lough Mahon)_030 (IE_SW_19G010600);
- The transitional and coastal water bodies connected to the site include: Cork Harbour (IE_SW_060_0000), Owenboy Estuary (IE_SW_060_1200), Lee (Cork) Estuary Lower (IE_SW_060_0900), Lee (Cork) Estuary Upper (IE_SW_060_0950), Outer Cork Harbour (IE_SW_050_0000), and Lough Mahon (IE_SW_060_0750);
- The groundwater bodies hydrogeologically connected to the site include: Ballincollig (IE_SW_G_002), Ballinhassig East (IE_SW_G_004), Bandon (IE_SW_G_086), Ringaskiddy (IE_SW_G_072) and Waste Facility (W0023-01) (IE_SW_G_009); and
- The lake water body hydrologically connected to the SAC is: Inniscarra Lake (IE_SW_19_138).

[24] NPWS 2014 Great Island Channel SAC 001058 Conservation Objectives
[25] NPWS 2014 Great Island Channel SAC (site code: 1058) Conservation Objectives Supporting Document - Marine Habitats. Version 1.

The habitat *mudflats and sandflats not covered by seawater at low tide* spans the full extent of the SAC. Although the habitat does not receive direct discharges from the proposed works, all affected water bodies are hydrologically connected to the SAC.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

A number of river water bodies identified in **Table 5-2** have modelled increases in concentration that exceed 5% of the High / Good indicative quality threshold (0.00125 mg/l) following dosing at Inniscarra WTP including: Curragheen (Cork City)_010 (IE_SW_19C120740), Glasheen (Cork City)_010 (IE_SW_19G040700), Hilltown 19_010 (IE_SW_19H050470) and Moneygurney 19_010 (IE_SW_19M300900).

The baseline orthophosphate concentration in two river waterbodies exceed the 75% upper indicative quality threshold: Martin_040 (IE_SW_19M010600), Dripsey_020 (IE_SW_19D060400). However, for both of these water bodies, the modelled additional orthophosphate concentrations are less than 5% of the Good / High indicative quality boundary (i.e. <0.00125 mg/l) following dosing (ranging from 0.0000 mg/l to 0.0002 mg/l). Therefore, there is no risk of deterioration in indicative quality or of preventing the achievement of WFD objectives for these river water bodies.

The modelled increase in concentration in Curragheen (Cork City)_010 (IE_SW_19C120740) is 0.0015 mg/l, which exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l). There are two historical monitoring points on the river but the data available is dated. The EPA have assigned the ecological status of this water body as moderate so this has been used as a surrogate for the orthophosphate indicative quality. The modelled increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body.

The modelled increase in concentration in Glasheen (Cork City)_010 (IE_SW_19G040700) exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l) at 0.0016 mg/l. There are multiple investigative monitoring points that have historical information for this water body, however the most recent EPA ecological status classification (2016-2021) of poor ecological status has been used as the baseline concentration for this waterbody as it is the most recent assessment available. The modelled increase in concentration does not cause the post-dosing baseline to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body.

Curragheen (Cork City)_010, Glasheen (Cork City)_010 discharge to Lee (Cork) Estuary Upper which then discharges to Lee (Cork) Estuary Lower and Lough Mahon transitional waterbodies. This QI habitat is located within Lough Mahon, Lough Mahon (Harper's Island), North Channel Great Island and Owenacurra Estuary which form the channel north of Great Island. Lough Mahon is the closest to the WSZ, 12.0 km from where Curragheen (Cork City)_010 and Glasheen (Cork City)_010 discharge to the coast. The modelled additional orthophosphate concentrations are low within the TWBs and are modelled as insignificant (0.0003 mg/l in each) for the Upper and Lower Lee (Cork) Estuaries respectively and undetectable (0.0000 mg/l) in Lough Mahon and Owenboy Estuary. This is similar for the cumulative assessment also where the modelled additional concentrations are insignificant, 0.0003 mg/l, 0.0003 mg/l and 0.0001 mg/l for the Upper and Lower Lee (Cork) Estuaries and Lough Mahon respectively.

The modelled post-dosing increase in concentration in Hilltown_010 (IE_SW_19H050470) is 0.0024 mg/l. However, this does not cause the post-dosing baseline to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body. This water body discharges into Cork Harbour coastal water body which and is approximately 6 km from the Great Island Channel SAC and the nearest location of this habitat within the SAC. The modelled additional orthophosphate concentration within the Cark Harbour Coastal water body is undetectable (0.0000 mg/l) and therefore there will be no impact on the conservation objectives of the SAC.

Of the water bodies that exceed 5% of the High / Good indicative quality boundary, the highest modelled load (98.0 kg/yr) via subsurface pathways is seen in the river water body Moneygurney 19_010 (IE_SW_19M300900), which results in an increase in concentration of 0.0046 mg/l. Some of this load from the eastern section of this water body has been reapportioned directly to Lough Mahon. The remainder of the load however, is evaluated using the available flows in Moneygurney 19_010 (IE_SW_19M300900) resulting in a relatively high concentration. While the modelled increase in concentration exceeds 5% of the High / Good indicative quality boundary, this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the water body, or of preventing the achievement of WFD objectives. The modelled additional orthophosphate concentrations are low within the TWB into which the Moneygurney 19_010 (IE_SW_19M300900) flows and is modelled as undetectable (0.0000 mg/l). This is similar for the cumulative assessment also where the modelled additional concentration is insignificant, 0.0001 mg/l, for Lough Mahon.

The remaining river water bodies have modelled increases in concentration that do not exceed 5% of the High / Good indicative quality boundary, therefore there is no risk of deterioration in the indicative quality of the remaining water bodies, or of preventing the achievement of WFD objectives.

For the Ballinhassig East (IE_SW_G_004) groundwater body there are multiple monitoring points some of which are Failing to Achieve Good. The modelled additional orthophosphate concentration is insignificant (0.0003 mg/l). Ballinhassig is a large poorly productive groundwater body and discharge is to the gaining rivers and to the coast. Flow paths are short 30-300m. A small section of the SAC boarders the groundwater body at Glounthaune within Lough Mahon (Harper's Island) TWB (IE_SW_060_0700). Groundwater discharge on the eastern side of the WSZ is likely to be towards Glashaboy (Lough Mahon)_030 , Glashaboy Estuary, the Lee (Cork) Estuary Lower and Lough Mahon. As discussed above, the modelled additional concentration within these TWBs is insignificant or undetectable.

For Inniscarra Lake (IE_SW_19_138) the additional loading as a result of dosing represents a 0.12% increase in the TP levels in the lake which will have a likely insignificant effect on the trophic status of the lake.

For all transitional and coastal water bodies hydrologically connected to the SAC, the post-dosing increases in concentration (0.0000 mg/l - 0.0003 mg/l) do not exceed 5% of the High / Good indicative quality boundary and therefore, there is no risk of deterioration in the indicative quality of the water bodies, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Inniscarra WTP, the large dilution capacity provided by the TWBs and that this QI habitat is not considered to be nutrient sensitive it has been demonstrated that the potential for likely

significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat.

6.2.1.2 (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

A review of the SSCOs for the SAC found no nutrient specific targets for this habitat however there is a target to maintain the natural tidal regime. The CO supporting document on coastal habitats (NPWS, 2014)[26] for the SAC was reviewed, and discusses the flooding regime attribute and associated target in further detail. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Great Island Channel SAC and will receive inputs from orthophosphate dosing at Inniscarra WTP:

- The river water bodies hydrologically connected to the site include: Kilnaglery_010 (IE_SW_19K620850), Moneygurney_010 (IE_SW_19M300900), Hilltown_010 (IE_SW_19H050470), Minane (Cork)_010 (IE_SW_20M010200), Bride (Cork City)_010 (IE_SW_19B140110), Bride (Lee)_040 (IE_SW_19B041300), Bride (Lee)_050 (IE_SW_19B041600), Curragheen (Cork City)_010 (IE_SW_19C120740), Dripsey_020 (IE_SW_19D060400), Glasheen (Cork City)_010 (IE_SW_19G0407000), Lee (Cork)_080 (IE_SW_19L030600), Lee (Cork)_090 (IE_SW_19L030800), Martin_040 (IE_SW_19M010600), Owenboy (Cork)_020 (IE_SW_19O010800), Owenboy (Cork)_030 (IE_SW_19O011000), Owenboy (Cork)_040 (IE_SW_19O011400), Shournagh_030 (IE_SW_19S010300), Shournagh_040 (IE_SW_19S010500), Two Pot (Cork City)_010 (IE_SW_19T050890), Tibbotstown_010 (IE_SW_19T250870) and Glashaboy (Lough Mahon)_030 (IE_SW_19G010600);
- The transitional and coastal water bodies connected to the site include: Cork Harbour (IE_SW_060_0000), Owenboy Estuary (IE_SW_060_1200), Lee (Cork) Estuary Lower (IE_SW_060_0900), Lee (Cork) Estuary Upper (IE_SW_060_0950), Outer Cork Harbour (IE_SW_050_0000), and Lough Mahon (IE_SW_060_0750);
- The groundwater bodies hydrogeologically connected to the site include: Ballincollig (IE_SW_G_002), Ballinhassig East (IE_SW_G_004), Bandon (IE_SW_G_086), Ringaskiddy (IE_SW_G_072) and Waste Facility (W0023-01) (IE_SW_G_009); and
- The lake water body hydrologically connected to the SAC is: Inniscarra Lake (IE_SW_19_138).

The habitat Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) is scattered throughout the site and are all of the estuarine type on mud substrate. Although the habitat does not receive direct discharges from the proposed works, all affected water bodies are hydrologically connected to the habitat.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

[26] NPWS 2014 Great Island Channel SAC (site code: 1058) Conservation Objectives Supporting Document - Coastal Habitats. Version 1.

A number of river water bodies identified in Table 5 2 have modelled increases in concentration that exceed 5% of the High / Good indicative quality threshold (0.00125 mg/l) following dosing at Inniscarra WTP including: Curragheen (Cork City)_010 (IE_SW_19C120740), Glasheen (Cork City)_010 (IE_SW_19G040700), Hilltown 19_010 (IE_SW_19H050470), Kilnaglery 19_010 (IE_SW_19K620850) and Moneygurney 19_010 (IE_SW_19M300900).

The baseline orthophosphate concentration in two river waterbodies exceed the 75% upper indicative quality threshold: Martin_040 (IE_SW_19M010600), Dripsey_020 (IE_SW_19D060400). However, for both of these water bodies, the modelled additional orthophosphate concentrations are less than 5% of the Good / High indicative quality boundary (i.e. <0.00125 mg/l) following dosing (ranging from 0.0000 mg/l to 0.0002 mg/l). Therefore, there is no risk of deterioration in indicative quality or of preventing the achievement of WFD objectives for these river water bodies.

The modelled increase in concentration in Curragheen (Cork City)_010 (IE_SW_19C120740) is 0.0015 mg/l, which exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l). There are two historical monitoring points on the river but the data available is dated. The EPA have assigned the ecological status of this water body as moderate so this has been used as a surrogate for the orthophosphate indicative quality. The modelled increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body.

The modelled increase in concentration in Glasheen (Cork City)_010 (IE_SW_19G040700) exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l) at 0.0016 mg/l. There are multiple investigative monitoring points that have historical information for this water body, however the most recent EPA ecological status classification (2016-2021) of poor ecological status has been used as the baseline concentration for this waterbody as it is the most recent assessment available. The modelled increase in concentration does not cause the post-dosing baseline to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body.

Curragheen (Cork City)_010, Glasheen (Cork City)_010 discharge to Lee (Cork) Estuary Upper which then discharges to Lee (Cork) Estuary Lower and Lough Mahon transitional waterbodies. This QI habitat is located within Lough Mahon, Lough Mahon (Harper's Island), North Channel Great Island and Owenacurra Estuary which form the channel north of Great Island. Lough Mahon is the closest to the WSZ, 12.0 km from where Curragheen (Cork City)_010 and Glasheen (Cork City)_010 discharge to the coast. The modelled additional orthophosphate concentrations are low within the TWBs and are modelled as insignificant (0.0003 mg/l in each) for the Upper and Lower Lee (Cork) Estuaries respectively and undetectable (0.0000 mg/l) in Lough Mahon and Owenboy Estuary. This is similar for the cumulative assessment also where the modelled additional concentrations are insignificant, 0.0003 mg/l, 0.0003 mg/l and 0.0001 mg/l for the Upper and Lower Lee (Cork) Estuaries and Lough Mahon respectively.

The modelled post-dosing increase in concentration in Hilltown_010 (IE_SW_19H050470) is 0.0024 mg/l. However, this does not cause the post-dosing baseline to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body. This water body discharges into Cork Harbour coastal water body which and is approximately 6 km from the Great Island Channel SAC. The modelled additional orthophosphate concentration within the Cark Harbour Coastal water body is undetectable (0.0000 mg/l) and therefore there will be no impact on the conservation objectives of the SAC.

Of the water bodies that exceed 5% of the High / Good indicative quality boundary, the highest modelled load (98.0 kg/yr) via subsurface pathways is seen in the river water body Moneygurney 19_010 (IE_SW_19M300900), which results in an increase in concentration of 0.0046 mg/l. Some of this load from the eastern section of this water body has been reapportioned directly to Lough Mahon. The remainder of the load however, is evaluated using the available flows in Moneygurney 19_010 (IE_SW_19M300900) resulting in a relatively high concentration. While the modelled increase in concentration exceeds 5% of the High / Good indicative quality boundary, this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the water body, or of preventing the achievement of WFD objectives. The modelled additional orthophosphate concentrations are low within the TWB into which the Moneygurney 19_010 (IE_SW_19M300900) flows and is modelled as undetectable (0.0000 mg/l). This is similar for the cumulative assessment also where the modelled additional concentration is insignificant, 0.0001 mg/l, for Lough Mahon.

The remaining river water bodies have modelled increases in concentration that do not exceed 5% of the High / Good indicative quality boundary, therefore there is no risk of deterioration in the indicative quality of the remaining water bodies, or of preventing the achievement of WFD objectives.

For the Ballinhassig East (IE_SW_G_004) groundwater body there are multiple monitoring points some of which are Failing to Achieve Good. The modelled additional orthophosphate concentration is insignificant (0.0003 mg/l). Ballinhassig is a large poorly productive groundwater body and discharge is to the gaining rivers and to the coast. Flow paths are short 30-300m. A small section of the SAC boarders the groundwater body at Glounthaune within Lough Mahon (Harper's Island) TWB (IE_SW_060_0700). Groundwater discharge on the eastern side of the WSZ is likely to be towards Glashaboy (Lough Mahon)_030 , Glashaboy Estuary, the Lee (Cork) Estuary Lower and Lough Mahon. As discussed above, the modelled additional concentration within these TWBs is insignificant or undetectable.

For Inniscarra Lake (IE_SW_19_138) the additional loading as a result of dosing represents a 0.12% increase in the TP levels in the lake which will have a likely insignificant effect on the trophic status of the lake.

For all transitional and coastal water bodies hydrologically connected to the SAC, the post-dosing increases in concentration (0.0000 mg/l - 0.0003 mg/l) do not exceed 5% of the High / Good indicative quality boundary and therefore, there is no risk of deterioration in the indicative quality of the water bodies, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Inniscarra WTP, the large dilution capacity provided by the TWBs and that this QI habitat is not considered to be nutrient sensitive it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat.

6.2.2 Cork Harbour SPA 004030

Cork Harbour is a large, sheltered bay system, with several river estuaries – principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra (NPWS, 2015)[27]. The SPA site comprises most of the

[27] NPWS 2015 Cork Harbour SPA Site Synopsis

main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas River Estuary, inner Lough Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay, Ringabella Creek and the Rostellan and Poulnabibe inlets.

This is an SPA under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Mallard, Pintail, Shoveler, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds (NPWS, 2015)[27].

In relation to protected water-dependent habitats and species under the Birds and Habitats Directive, the river basin management planning process contributes towards achieving water conditions that support Favourable Conservation Status. In preparing the RBMP (2018-2021) (DHPLG, 2018[28]) the risk assessment carried out by the EPA for these water dependent European Site protected areas has focussed on looking at the risks to the water standards/objectives established for the purpose of supporting Good Ecological Status (GES). GES, which is the default objective of the WFD, is considered adequate for supporting many water dependent European Site protected areas where site specific environmental supporting conditions have not been defined within SSCOs by the NPWS. This is the case for SPA birds and wetlands.

Cork Harbour has 25 SCIs all of which are considered nutrient sensitive (see **Appendix B**). The SSCOs for Cork Harbour SPA (NPWS, 2014[29]) list targets for each species, specifically:

- Population trend: long term population trends should be stable or increasing; and
- Distribution: there should be no likely significant decrease in the range, timing or intensity of use of areas by the listed species, other than that occurring from natural patterns of variation.

There is also a target for the wetland habitat that supports the SPA in which the permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 2,587 hectares, other than that occurring from natural patterns of variation.

Cork Harbour has a history of problems associated with water pollution and eutrophication. Up to the 1960's most of the urban and industrial developments took place in Cork City and its immediate environs, and sewage and other waste were discharged directly into the River Lee. In the late 1980's, sewers were installed to convey waste water to two outfalls on the quays. While this improved the water quality status upstream, the Lee Estuary and Lough Mahon regularly suffered from problems of increased concentrations of organic matter (BOD), nutrient enrichment, faecal coliform bacteria and a decrease in dissolved oxygen levels. In addition to the Lee Estuary and Lough Mahon, the Owennacurra estuary below Midleton has also suffered with serious pollution in the past; again linked to sewage outfalls.

Water quality in the Upper Harbour was improved by the engineering works conducted under the Cork Main Drainage Scheme, which included the building of Carrigrennan WWTP (i.e. Cork City agglomeration) at Little Island, Co. Cork. The plant treats wastewater from Cork City and surrounding areas in the County including the City Environs, Glanmire and the proposed new town at Monard. The

[28] DHPLG 2018 River Basin Management Plan for Ireland 2018-2021

[29] NPWS 2014 Cork Harbou SPA 004030 Conservation Objectives

plant was commissioned in 2004 with a design organic load capacity of 413,000 population equivalent and provides primary and secondary treatment. Treated wastewater from the plant is discharged through a 500m long outfall pipe to Cork Harbour at Lough Mahon. However, the design of the existing plant did not include for nutrient removal or disinfection and since the plant was commissioned, the upper harbour has been designated as a sensitive area under the Urban Wastewater Treatment (Amendment) Regulations 2004 (S.I. No. 440 of 2004). Current discharges from the plant do not comply with these regulations and the plant therefore needs to be upgraded.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Cork Harbour SPA and will receive inputs from orthophosphate dosing at Inniscarra WTP:

- The river water bodies hydrologically connected to the site include: Kilnaglery_010 (IE_SW_19K620850), Moneygurney_010 (IE_SW_19M300900), Hilltown_010 (IE_SW_19H050470), Minane (Cork)_010 (IE_SW_20M010200), Bride (Cork City)_010 (IE_SW_19B140110), Bride (Lee)_040 (IE_SW_19B041300), Bride (Lee)_050 (IE_SW_19B041600), Curragheen (Cork City)_010 (IE_SW_19C120740), Dripsey_020 (IE_SW_19D060400), Glasheen (Cork City)_010 (IE_SW_19G0407000), Lee (Cork)_080 (IE_SW_19L030600), Lee (Cork)_090 (IE_SW_19L030800), Martin_040 (IE_SW_19M010600), Owenboy (Cork)_020 (IE_SW_19O010800), Owenboy (Cork)_030 (IE_SW_19O011000), Owenboy (Cork)_040 (IE_SW_19O011400), Shournagh_030 (IE_SW_19S010300), Shournagh_040 (IE_SW_19S010500), Two Pot (Cork City)_010 (IE_SW_19T050890), Tibbotstown_010 (IE_SW_19T250870) and Glashaboy (Lough Mahon)_030 (IE_SW_19G010600);
- The transitional and coastal water bodies connected to the site include: Cork Harbour (IE_SW_060_0000), Owenboy Estuary (IE_SW_060_1200), Lee (Cork) Estuary Lower (IE_SW_060_0900), Lee (Cork) Estuary Upper (IE_SW_060_0950), Outer Cork Harbour (IE_SW_050_0000), and Lough Mahon (IE_SW_060_0750);
- The groundwater bodies hydrogeologically connected to the site include: Ballincollig (IE_SW_G_002), Ballinhassig East (IE_SW_G_004), Bandon (IE_SW_G_086), Ringaskiddy (IE_SW_G_072) and Waste Facility (W0023-01) (IE_SW_G_009); and
- The lake water body hydrologically connected to the SAC is: Inniscarra Lake (IE_SW_19_138).

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

A number of river water bodies identified in Table 5 2 have modelled increases in concentration that exceed 5% of the High / Good indicative quality threshold (0.00125 mg/l) following dosing at Inniscarra WTP including: Curragheen (Cork City)_010 (IE_SW_19C120740), Glasheen (Cork City)_010 (IE_SW_19G040700), Hilltown 19_010 (IE_SW_19H050470), Kilnaglery 19_010 (IE_SW_19K620850) and Moneygurney 19_010 (IE_SW_19M300900).

The baseline orthophosphate concentration in two river waterbodies exceed the 75% upper indicative quality threshold: Martin_040 (IE_SW_19M010600), Dripsey_020 (IE_SW_19D060400). However, for both of these water bodies, the modelled additional orthophosphate concentrations are less than 5% of the Good / High indicative quality boundary (i.e. <0.00125 mg/l) following dosing (ranging from 0.0000 mg/l to 0.0002 mg/l). Therefore, there is no risk of deterioration in indicative quality or of preventing the achievement of WFD objectives for these river water bodies.

The modelled increase in concentration in Curragheen (Cork City)_010 (IE_SW_19C120740) is 0.0015 mg/l, which exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l). There are two historical monitoring points on the river but the data available is dated. The EPA have assigned the ecological status of this water body as moderate so this has been used as a surrogate for the orthophosphate indicative quality. The modelled increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body.

The modelled increase in concentration in Glasheen (Cork City)_010 (IE_SW_19G040700) exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l) at 0.0016 mg/l. There are multiple investigative monitoring points that have historical information for this water body, however the most recent EPA ecological status classification (2016-2021) of poor ecological status has been used as the baseline concentration for this waterbody as it is the most recent assessment available. The modelled increase in concentration does not cause the post-dosing baseline to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body.

Curragheen (Cork City)_010, Glasheen (Cork City)_010 discharge to Lee (Cork) Estuary Upper which then discharges to Lee (Cork) Estuary Lower and Lough Mahon transitional waterbodies. This QI habitat is located within Lough Mahon, Lough Mahon (Harper's Island), North Channel Great Island and Owenacurra Estuary which form the channel north of Great Island. Lough Mahon is the closest to the WSZ, 12.0 km from where Curragheen (Cork City)_010 and Glasheen (Cork City)_010 discharge to the coast. The modelled additional orthophosphate concentrations are low within the TWBs and are modelled as insignificant (0.0003 mg/l in each) for the Upper and Lower Lee (Cork) Estuaries respectively and undetectable (0.0000 mg/l) in Lough Mahon and Owenboy Estuary. This is similar for the cumulative assessment also where the modelled additional concentrations are insignificant, 0.0003 mg/l, 0.0003 mg/l and 0.0001 mg/l for the Upper and Lower Lee (Cork) Estuaries and Lough Mahon respectively.

The modelled post-dosing increase in concentration in Hilltown_010 (IE_SW_19H050470) is 0.0024 mg/l. However, this does not cause the post-dosing baseline to exceed 75% of the indicative quality upper threshold and therefore the dosing will not increase the risk of deterioration in the ecological status of the water body. This water body discharges into Cork Harbour coastal water body which is within the Cork Harbour SPA. The modelled additional orthophosphate concentration within the Cork Harbour coastal water body is undetectable (0.0000 mg/l) and therefore there will be no impact on the upon the main supporting habitats for SCI bird species within the SPA.

Of the water bodies that exceed 5% of the High / Good indicative quality boundary, the highest modelled load (98.0 kg/yr) via subsurface pathways is seen in the river water body Moneygurney 19_010 (IE_SW_19M300900), which results in an increase in concentration of 0.0046 mg/l. Some of this load from the eastern section of this water body has been reapportioned directly to Lough Mahon. The remainder of the load however, is evaluated using the available flows in Moneygurney 19_010 (IE_SW_19M300900) resulting in a relatively high concentration. While the modelled increase in concentration exceeds 5% of the High / Good indicative quality boundary, this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the water body, or of preventing the achievement of WFD objectives. The modelled additional orthophosphate concentrations are low within the TWB into which the Moneygurney 19_010 (IE_SW_19M300900) flows, i.e. Lough Mahon, and is modelled as undetectable (0.0000 mg/l). This is similar for the cumulative assessment also where the modelled additional concentration is insignificant, 0.0001 mg/l, for Lough Mahon.

The remaining river water bodies have modelled increases in concentration that do not exceed 5% of the High / Good indicative quality boundary, therefore there is no risk of deterioration in the indicative quality of the remaining water bodies, or of preventing the achievement of WFD objectives.

For the Ballinhassig East (IE_SW_G_004) groundwater body there are multiple monitoring points some of which are Failing to Achieve Good. The modelled additional orthophosphate concentration is insignificant (0.0003 mg/l). Ballinhassig is a large poorly productive groundwater body and discharge is to the gaining rivers and to the coast. Flow paths are short 30-300m. A small section of the SPA boarders the groundwater body at Glounthaune within Lough Mahon (Harper's Island) TWB (IE_SW_060_0700). Groundwater discharge on the eastern side of the WSZ is likely to be towards Glashaboy (Lough Mahon)_030 , Glashaboy Estuary, the Lee (Cork) Estuary Lower and Lough Mahon. As discussed above, the modelled additional concentration within these TWBs is insignificant or undetectable.

For Inniscarra Lake (IE_SW_19_138) the additional loading as a result of dosing represents a 0.12% increase in the TP levels in the lake which will have a likely insignificant effect on the trophic status of the lake.

For all transitional and coastal water bodies hydrologically connected to the SPA, the post-dosing increases in concentration (0.0000 mg/l - 0.0003 mg/l) do not exceed 5% of the High / Good indicative quality boundary and therefore, there is no risk of deterioration in the indicative quality of the water bodies, or of preventing the achievement of WFD objectives.

Cork Harbour SPA provides both feeding and roosting sites for the SCI bird species. The potential for significant effects to SCI bird species of Cork Harbour SPA is discussed below.

The main feeding habitat for birds in Cork Harbour SPA are areas of intertidal mudflat (estimated at 1,461ha within the SPA). When exposed or partially exposed by the tide, intertidal habitats provide important foraging areas for many species of waterbirds, especially wading birds, as well as providing roosting/loafing areas. When the intertidal area is inundated by the tide it becomes available for benthic and surface feeding ducks and piscivorous/other waterbirds. During this tidal state this area can be used by various waterbirds as a loafing/roosting resource. Supratidal habitat is estimated to be 243ha within Cork Harbour SPA and is used by a range of waterbird species as a roosting resource as well as providing feeding opportunities for some species. Lagoon habitat is estimated to be 57ha. In addition, scattered salt marshes provide high tide roosts and marginal wet grassland areas used by feeding and roosting birds (NPWS 2014[30]). All of these habitats are located within the transitional or coastal waterbodies of the SPA.

The EAM highlighted river water bodies where the modelled increase in concentration from the orthophosphate dosing may be detectable in the receiving waters but will not result in a risk in the deterioration in the status of these water bodies. These river water bodies all flow through Cork City before discharging to Lee (Cork) Estuary Upper. As they near the estuary they have been artificially confined and heavily urbanised. In the case of the Bride (Cork City)_020 the lower 1km section has been diverted underground before discharging to the estuary. The SPA is approximately 5km from where the Bride (Cork City)_020 discharges to the coast, 7km from the Glasheen (Cork City)_010 and 7.2km from the Curragheen (Cork City)_010.

30 https://www.npws.ie/sites/default/files/publications/pdf/Cork%20Harbour%20SPA%20(004030)%20Conservation%20objectives%20supporting%20document%20-%20[Version%201].pdf

These rivers are considered to have limited supporting habitats outside of the SPA. Upstream there are grasslands, agricultural fields, playing pitches which may act as secondary supporting habitats outside of the SPA. However, occurrences of SCI avifauna feeding in these areas are opportunistic and intermittent and associated with localised flood events / sustained rainfall events where invertebrate prey may be more readily available. A review of historical flooding information[31] indicates that there are areas of localised spot flooding in the Bride (Cork City)_020, Glasheen (Cork City)_010 and Curragheen (Cork City)_010. Flood waters from these rivers have the potential to transport nutrients onto feeding grassland areas. This may be a potential positive indirect impact by increasing prey resources or negative through change in resource type availability. However, flood events on these rivers are localised and there are numerous other fields/grassland areas of similar quality in the surrounding area. Therefore, this is considered not to have an indirect impact on ex situ supporting habitats for the listed SCI bird species.

While these river water bodies are not located directly in the SPA, they discharge to the Lee (Cork) Estuary Upper which is >5km from the SPA. This TWB then discharges to Lee (Cork) Estuary Lower, Lough Mahon TWBs and ultimately Cork Harbour and Outer Cork Harbour CWBs. The EAM has modelled the additional ortho P concentration within the transitional/coastal waterbodies connected to the SPA as either insignificant (0.0003 mg/l) for Lee (Cork) Estuary Upper and Lower or undetectable (0.0000 mg/l) for Lough Mahon, Owenboy Estuary Cork Harbour and Outer Cork Harbour. The cumulative assessment has also modelled the additional concentration as insignificant (i.e. <5% Good / High indicative quality boundary, <0.00125 mg/l) within these transitional and coastal water bodies i.e. 0.0003 mg/l, 0.0003 mg /l and 0.0001 mg/l for the Upper and Lower Lee (Cork) Estuaries and Lough Mahon respectively or undetectable for Cork Harbour and Outer Cork Harbour (0.0000 mg/l).

Therefore, it has been determined that proposed dosing for the river water bodies will not have a significant effect upon the main supporting habitats for SCI bird species within the SPA.

For Ballincollig GWB (IE_SW_G_002), the modelled baseline concentration following dosing exceed the 5% Good / Fail indicative quality boundary (0.00175 mg/l) but does not exceed the 75% of the upper indicative quality threshold for Ballincollig GWB (**Table 13 of Appendix C**).

Ballincollig is a karstic GWB and the Glasheen (Cork City)_010 and Curragheen (Cork City)_010 partially overlie it. Groundwater flow paths can be up to several kilometres long but may be significantly shorter where the water table is very close to the surface. Regional groundwater flow is away from the ridges to the north and south, towards the rivers draining the valley and to Lough Mahon in the east. In this GWB, in addition to the general surface water interactions with the karstic aquifer, Cork Lough (001081) and the Douglas River Estuary (001046) are NHAs within this GWB which may be influenced by groundwater[32]. This groundwater connection to Cork Lough has not been confirmed.

Suburban housing estates surround the boundary of Cork Lough or "The Lough". The Cork City Biodiversity Plan 2009-2014 indicates that the islands in The Lough function as a refuge, roosting and breeding area for numerous bird species. It supports Mute swans, feral flock of Canada geese, Mallard, Teal, Tufted duck and Coot as well as Black backed gulls (NPWS, 2009[33]). The Cork City Biodiversity Plan also indicates that Shoveler also occur in numbers which occasionally reach the threshold for a Nationally Important population. Large numbers of gulls also use The Lough, attracted by the large amount of bread fed to the ornamental wildfowl and ducks by visiting people. There is little aquatic

[31] www.floodmaps.ie accessed 16/04/2019
[32] https://secure.dccae.gov.ie/GSI_DOWNLOAD/Groundwater/Reports/GWB/BallincolligGWB.pdf
[33] https://www.npws.ie/sites/default/files/general/pNHA_Site_Synopsis_Portfolio.pdf .

vegetation in the Lough due mainly to the introduced population of Carp and it often experiences episodes of very poor water quality. From the available information regarding The Lough it is used mainly as sheltering/roosting area and birds are attracted due to artificial feeding which is causing severe eutrophication (NPWS, 2009). The EAM modelling has determined that there is no risk in deterioration in the indicative ortho P water quality or risk to WFD objectives, therefore it is considered that the GWB will not impact upon the supporting habitats for birds.

No Site Synopsis is available for Douglas River Estuary. The estuary forms part of Cork Harbour SPA and the Lough Mahon transitional water body. The EAM modelling has determined that there is no risk in deterioration in the indicative ortho P water quality or risk to WFD objectives within Lough Mahon, therefore it is considered that the GWB will not impact upon the supporting habitats for birds within the estuary.

The Ballinhassig groundwater body (IE_SW_G_004) contains a number of monitoring points, some of which are failing to achieve Good indicative quality. The predicted concentration is insignificant (0.0003 mg/l) and well below 5% of the Good / Fail threshold value. However, owing to the fact there are a number of monitoring points currently failing to achieve Good indicative quality there is a risk of preventing the achievement of WFD objectives for this GWB.

Ballinhassig is a poorly productive groundwater body with short flow paths 30-300m. Groundwater discharges to small springs, or to the streams that traverse the aquifer and to the coast. Flow directions are expected to approximately follow the local surface water catchments. The Douglas River Estuary (001046) is NHAs within this GWB which may be influenced by groundwater. No Site Synopsis is available for Douglas River Estuary. The estuary forms part of Cork Harbour SPA and the Lough Mahon transitional water body. The EAM modelling has determined that there is no risk in deterioration in the indicative ortho P water quality or risk to WFD objectives within Lough Mahon, therefore it is considered that the GWB will not impact upon the supporting habitats for birds within the estuary. There are no other groundwater influenced waterbodies overlying this groundwater body and intersecting the WZS which may provide supporting habitats for birds within the SPA.

In light of the EAM assessment which has determined that there is no risk of deterioration in the water quality indicative quality of the waterbodies that support the structure and function of the SPA; the additional loading from the orthophosphate dosing will not have a likely significant effect on the favourable conservation status of its SCIs, either in terms of individual bird species or wetland habitats.

6.3 ASSESSMENT OF IN-COMBINATION EFFECTS WITH OTHER PLANS OR PROJECTS

In order to ensure all potential impacts upon European sites within the project's ZoI were considered, including those direct and indirect impacts that are a result of cumulative or in-combination impacts, the following steps were completed:

1. Identify projects/ plans which might act in combination: identify all possible sources of effects from the project or plan under consideration, together with all other sources in the existing environment and any other effects likely to arise from other proposed projects or plans;
2. Impacts identification: identify the types of impacts that are likely to affect aspects of the structure and functions of the site vulnerable to change;

3. Define the boundaries for assessment: define boundaries for examination of cumulative effects; these will be different for different types of impact and may include remote locations;
4. Pathway identification: identify potential cumulative pathways (e.g., via water, air, etc.; accumulations of effects in time or space);
5. Prediction: prediction of magnitude/ extent of identified likely cumulative effects, and
6. Assessment: comment on whether or not the potential cumulative impacts are likely to be significant.

A search of Cork County Council's planning enquiry system was conducted for developments that may have in-combination effects on European Sites with the ZoI. Plans and projects relevant to the area were searched in order to identify any elements of the plans or projects that may act cumulatively or in-combination with the proposed development.

Based on this search and the Project Teams knowledge of the study area a list of those Plans and Projects which may potentially contribute to cumulative or in-combination impacts with the proposed project was generated as outlined in **Table 6-1** below.

Table 6-1: In-Combination Impacts with Other Plans, Programmes and Policies

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Cork County Development Plan 2022-2028[34] The plan outlines under WM 11-8: Water Supply, the following objectives: a) Support the prioritisation of the supply of adequate sustainable drinking water for the resident population and invest and expand the water supply in line with future population targets. b) Ensure that all drinking water in the County complies with the European Union Drinking Water Directive 98/83/EC and that all surface water and groundwater supplies comply with the requirements of Surface Water Directive 75/440/EC and Groundwater Directive 80/68/EEC. c) Conserve sources of drinking water and minimise threats to either the quality or quantity of drinking water reserves that might result from different forms of development or development activity and other sources of pollution. Conserve sources of drinking water and minimise threats to either the quality or quantity of drinking water reserves that might result from difference forms of development or development activity and other sources of pollution. The plan outlines under WM 11-1: EU Water Framework Directive and the River Basin Management Plan the following objectives: a) Protect and improve the County's water resources and ensure that development permitted meets the requirements of the River Basin Management Plan and does not contravene the objectives of the EU Water Framework Directive. b) Promote compliance with the River Basin Management Plan and associated environmental standards and objectives set out in the European Communities (Environmental Objectives) Surface Water Regulations, 2009 and the European Communities (Environmental Objectives) Groundwater Regulations, 2010, to prevent deterioration; restore good status; reduce chemical pollution, and	▪ N/A	The County Development Plan emphasis the objectives for water services in the county which include the enhancement and improved quality of the service to its consumers. The plan also outlines the importance of compliance with the South Western River Basin Management Plan (now replaced by the Draft RBMP 2018-2021), and emphasises compliance with environmental objectives. There is no potential for cumulative impacts with these plans.

[34] https://www.corkcoco.ie/en/resident/planning-and-development/cork-county-development-plan-2022-2028

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
achieve water related protected areas objectives in rivers, lakes, groundwater, estuaries and coastal waters (as applicable). The plan outlines under WM 11-2: Surface Water Protection a) Protect and improve the status and quality of all surface waters throughout the County, includingtransitional and coastal waters.		
River Basin Management Plan For Ireland 2022 – 2027 The Third Cycle Draft River Basin Management Plan 2022-2027 Consultation Report has been published. This report presents a summary of the issues raised in the submissions reviewed from the public consultation on the draft River Basin Management Plan for Ireland 2022-2027. The 3rd cycle of River Basin Management Plan (RBMP) for the period of 2022-2027 is currently being prepared by Department of Housing, Local Government and Heritage (DHLGH) in line with the EU Water Framework Directive (WFD) (2000/60/EC). The document (Chapter 3) sets out the condition of Irish waters and a summary of status for all monitored waters in the 2013 – 2018 period, including a description of the changes since 2007 – 2009 and 2010-2015. A large number of river waterbodies are still declining and unless this is addressed, sustained and progressive improvements in water quality will be difficult to achieve. Overall, 53% of surface waters are in good or high ecological status while the remaining 47% are in unsatisfactory ecological status. For groundwater bodies, 92% are in good chemical and quantitative status. Chapter 3 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each water body that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2027. This work was presented in the RBMP for 4,842 water bodies nationally. 1,603 water bodies were classed *At Risk* or 33%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 1,000 water bodies that are *At*	▪ N/A	The objectives of the RBMP are to • Prevent deterioration; • Restore good status; • Reduce chemical pollution; and • Achieve water related protected areas objectives The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each water body. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of this plan will have a positive impact on biodiversity and the Project will not affect the achievement of the RBMP objectives given the detailed assessment of the effects of dosing on water body environmental objectives under the EAM.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Risk. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.		
Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive The Office of Public Works (OPW) is responsible for the implementation of the Floods Directive 2007/60/EC which is being carried out through a Catchment based Flood Risk Assessment and Management (CFRAM) Programme. As part of the directive Ireland is required to undertake a Preliminary Flood Risk Assessment, to identify areas of existing or potentially significant future flood risk and to prepare flood hazard and risk maps for these areas. Following this, flood risk management plans are developed for these areas setting objectives for managing the flood risk and setting out a prioritised set of measures to achieve the objectives. The CFRAM programme is currently being rolled out and Draft Flood Risk Management Plans have been prepared. These plans have been subject AA.	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Alterations to water quality and/or water movement; ▪ Disturbance; ▪ In-combination impacts within the same scheme.	CFRAM Studies and their product Flood Risk Management Plans will each undergo appropriate assessment. Any future flood plans will have to take into account the design and implementation of water management infrastructure as it has the potential to impact on hydromorphology and potentially on the ecological status and favourable conservation status of water bodies. The establishment of how flooding may be contributing to deterioration in water quality in areas where other relevant pressures are absent is a significant consideration in terms of achieving the objectives of the WFD. The AA of the plans will need to consider the potential for impacts from hard engineering solutions and how they might affect hydrological connectivity and hydromorphological supporting conditions for protected habitats and species. There is no potential for cumulative impacts with the CFRAMS programme as no infrastructure is proposed as part of this project.
Foodwise 2025 Foodwise 2025 strategy identifies significant growth opportunities across all subsectors of the Irish agri-food industry. Growth Projection includes increasing the value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	Foodwise 2025 was subject to its own AA[35]. Growth is to be achieved through sustainable intensification to maximise production efficiency whilst minimising the effects on the environment however there is increased risk of nutrient discharge to receiving waters and in turn a potential risk to biodiversity and Europe Sites if not controlled. With the required mitigation in the Food Wise Plan, no significant in-combination impacts are predicted. Mitigation measures included cross compliance with 13 Statutory Management Requirements, EIA Agricultural Regulations 2011, GLAS, and AA Screening of licencing and permitting in the forestry and seafood sectors.

[35] http://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/environmentalanalysis/AgriFoodStrategy2025NISDRAFT300615.pdf

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Rural Development Programme 2014 – 2020 The agricultural sector is actively enhancing competitiveness whilst trying to achieve more sustainable management of natural resources. The common set of objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2020 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while improvements are sought in relation to water management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and Targeted Agriculture Modernisation Scheme (TAMS). They provide the role of a supportive measure to improve water quality and thus provide direct benefits in achieving the measures within the RBMP. The achievement of the objectives outlined within GLAS, to improve water quality, mitigate against climate change and promote biodiversity will be of direct positive benefit in achieving the measures within the RBMP and the goals of the Natura Directives. The scheme has an expected participation for 2014-2020 of 50,000 farmers which have to engage in specific training and tasks in order to receive full payment. Farmers within the scheme must have a nutrient management plan which is a strategy for maximising the return from on and off-farm chemical and organic fertilizer resources. This has a direct positive contribution towards protecting water bodies from pollution through limiting the amount of fertiliser that is placed on the land. The scheme prioritises farms in vulnerable catchments with 'high status' water bodies and also focuses on educating farmers on best practices to try and improve efficiency along with environmental outcomes. The TAMS scheme is open to all farmers and is focused on supporting productive investment for modernisation. This financial grant for farmers is focused on the pig and poultry sectors, dairy equipment and the storage of slurry and other	▪ Overgrazing; ▪ Land use change or ▪ intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	The RDP for 2014 – 2020 has been subject to SEA[36], and AA[37]. The AA assessed the potential for impacts from the RDP measures e.g. for the GLAS scheme to result in inappropriate management prescriptions; minimum stocking rates under the Areas of Natural Constraints measure leading to overgrazing in sensitive habitats with dependent species, and TAMS supporting intensification. Mitigation included project specific AA for individual building, tourism or agricultural reclamation projects, consultations with key stakeholders during detailed measure development, and site-based monitoring of the effects of RDP measures. With such measures in place, it was concluded that there would be no significant in-combination impacts on Natura 2000 sites.

[36] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf
[37] https://www.agriculture.gov.ie/media/migration/agarchive/ruralenvironment/preparatoryworkfortherdp2014-2020/RDP20142020DraftAppropriateAssessmentReport160514.pdf

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
farmyard manures. Within the TAMS scheme are two further schemes; the Animal Welfare, Safety and Nutrient Storage Scheme and the Low Emission Slurry Spreading Scheme. Both schemes are focused on productivity for farmers but have the ability to contribute towards a reduction in point and diffuse source pollution through improved nutrient management.		
National Nitrates Action Programme Article 28 of the Good Agricultural Practice Regulations, in line with the Nitrates Directive (91/676/EEC), requires the Minister for Housing, Local Government and Heritage, in consultation with the Minister for Agriculture, Food and the Marine, to review the Nitrates Action Programme every four years. Ireland has published the Fifth Nitrates Action Programme on the 11th March 2022. The Programme sets out new measures that have been introduced since the Fourth Programme. This iteration of the NAP is developed in the context of significantly greater environmental ambition in the Programme for Government and at EU level. The key issues considered in the fifth iteration of the NAP include: ▪ Better Policy Alignment; ▪ Compliance and Enforcement; ▪ Climate Action Measures. ▪ Biodiversity Measures; and Nitrates Derogation.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	In accordance with the Directive 2001/42/EC on the assessment of effects of certain plans and programmes, as transposed into Irish law, a Strategic Environmental Assessment (SEA) is being undertaken and an Environmental Report has been prepared. Appropriate Assessment under EU Directive 92/43/EEC, as transposed into Irish law, is also being undertaken and a Natura Impact Statement (NIS) has been prepared It concluded that the NAP was an environmental programme which imposes environmental constraints on all agricultural systems in the state. Consultation and submission on the 5th NAP have been considered in the SEA Statement and the Natura Impact Statement of the adopted fifth Nitrates Action Programme. These documents provide information on the decision-making process and documents how environmental considerations, the views of consultees/stakeholders and the recommendations of the SEA Environmental Report and the assessment carried out under Article 6 of the Habitats Directive have influenced the final adopted Plan. Adherence to the recommendations in these documents and incorporation into he Plan will ensure that there is no potential for cumulative impacts with the proposed project.
Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) / Forestry Programme 2014 - 2020	▪ Habitat loss or destruction;	Ireland's Forestry Programme 2014 – 2020 has undergone AA[38]. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts

[38] https://www.agriculture.gov.ie/media/migration/forestry/publicconsultation/newforestryprogramme2014-2020/nis/ForestryProgrammeNaturalImpactStatement290914.pdf

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Ireland's forestry sector is striving to increase forestry cover and one of the recommended policy actions in the Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) is to increase the level of afforestation annually over time and support afforestation and mobilisation measures under the Forestry Programme 2014-2020. Two key objectives within the Forestry Programme 2014-2020 that will influence the RBMP are to increase Ireland's forest cover to 18% and to establish 10,000 ha of new forests and woodlands per annum. As part of this programme there are a number of schemes that promote sustainable forest management and they include the Afforestation Scheme, the Woodland Improvement Scheme, the Forest Road Scheme and the Native Woodland Conservation Scheme. Under the Native Woodland Conservation Scheme funding is provided to restore existing native woodland which promotes Ireland's native woodland resource and associated biodiversity. Native woodlands provide wider ecosystem functions and services which once restored can contribute to the protection and enhancement of water quality and aquatic habitats. New guidance and plans are also being developed to address forestry adjacent to water bodies, Freshwater Pearl Mussel Plans for 8 priority catchments and a Hen Harrier Threat Response Plan (NPWS). The mitigation measures within these plans will be particularly important in terms of protecting sensitive habitats and species from such forestry increases.	▪ Habitat fragmentation or degradation; ▪ Water quality changes; ▪ Disturbance to species.	and the proximity of Natura 2000 habitats and species should be taken into account when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there is no potential for cumulative impacts with the proposed project.
Water Services Strategic Plan (WSSP, 2015) Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and WFD requirements. The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short, medium and long term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to be used for key water service areas such as water resource management, wastewater compliance and sludge management. The WSSP also sets out the strategic objectives against which the Irish Water Capital	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	The overarching strategy was subject to Appropriate Assessment and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Irish Water owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.		
National Wastewater Sludge Management Plan (2016) The National Wastewater Sludge Management Plan was prepared in 2015, outlining the measures needed to improve the management of wastewater sludge.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	The plan was subject to both AA and SEA and includes a number of mitigation measures which were identified in relation to transport of materials, land spreading of sludge and additional education and research requirements. This plan does not specifically address domestic wastewater loads, only those relating to Irish Water facilities. In relation to the plan as it stands, no in-combination effects are expected with the implementation of proposed mitigation measures.
National Water Resources Plan – Framework Plan This Framework will deliver a sustainable water supply on a catchment and water resource zone basis, meeting growth and demand requirements through drought and critical periods. The resources plan takes account of WFD objectives and the programme of measures proposed in the relevant catchments and water resource zones. Specific measures in the plan with relevance to Irish Water include those for urban wastewater and urban runoff and also as part of other measures in relation to the lead in drinking water.	▪ Increased abstractions leading to changes / pressure on existing hydrology / hydrogeological regimes.	The plan will seek to develop sustainable water supplies but must consider particularly critical drought periods when assimilation capacity for diffuse runoff may be reduced. The SEA Environmental Report for the Framework Plan has made mitigation recommendations for the implementation of the Framework Plan which are included in the Environmental Action Plan (EAP), and the EAP will provide a basis for tracking recommendations from the SEA and NIS during the Framework Plan implementation and Regional Plan development. A Monitoring Plan has also been developed which covers the integration of environmental and sustainability considerations throughout implementation of the Framework Plan and the options development methodology and provides a framework for future long-term monitoring. Therefore, no likely significant in-combination effects are envisaged.
Planning Applications There are a number of planning applications pending or recently approved in Cork City and Harbour. The applications are predominantly for the construction of new infrastructure or renovations to existing infrastructure. In the case of	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance;	Adherence to the overarching policies and objectives of the Cork County Development Plan 2014 will ensure that local planning applications and subsequent grant of planning will comply with the requirements of relevant environmental legislation including the WFD and Habitats Directive. Effluent

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
new infrastructure, the applications seek to connect to the city's foul and storm drainage systems.	▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	from proposed and new infrastructure connected to the city's foul and storm drainage systems will be treated prior to discharge, negating the potential for in-combination/ cumulative impacts in the receiving environment.
Integrated Pollution Control (IPC) Licensing Cork City and Harbour is home to many international pharmaceutical companies. Under the Industrial Emissions Directive 2010/75/EU and Environmental Protection Agency Act, 1992 (as amended) industrial activities (e.g. pharmaceutical) are licenced by the EPA to prevent or reduce emissions to air, water and land, reduce water and use energy/resources efficiently. An IPC licence is a single integrated licence which covers all emissions from the facility and its environmental management. All related operations that the licence holder carries in connection with the activity are controlled by this licence.	▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	The EPA is responsible for monitoring emissions and dealing with any infringements on IPC licences. All emissions must be within set limits which must not be contravened. Limits are set for phosphorus where relevant. Compliance with the limits set for phosphorus will ensure that there will be no significant cumulative impacts on the receiving environment.

7 SCREENING CONCLUSION STATEMENT

This Screening to inform the AA process has considered whether the proposed construction works and operational orthophosphate dosing at the Inniscarra WTP, within the Cork Zone 2 City and Harbour WSZ, in combination with other plans or projects, is likely to have a significant effect on European Sites.

The appraisal undertaken in this Screening assessment has been informed by an EAM (see **Appendix C**) with reference to the qualifying interests/special conservation interests of the European Sites potentially affected by the proposed project, in order to provide a scientific basis for the evaluations.

During the construction phase of the corrective water treatment works at Inniscarra WTP the potential for direct, indirect and cumulative impacts affecting European Sites within the ZoI (i.e. Great Island Channel SAC and Cork Harbour SPA) has been assessed. There will be no significant direct, indirect or cumulative impacts that will result in likely significant effects to the qualifying interests/special conservation interests of the European Sites within the ZoI.

During the operational phase, the potential for direct, indirect and cumulative impacts affecting European Sites within the ZoI (i.e. Great Island Channel SAC and Cork Harbour SPA) has been assessed. The EAM identified that as a result of dosing alone and in combination with other WSZs that there are a number of water bodies at risk of deterioration in the orthophosphate indicative quality or of preventing the achievement of WFD objectives following dosing at Inniscarra WTP. It has been determined this will not result in potential significant direct, indirect or cumulative impacts that will result in likely significant effects to the qualifying interests/special conservation interests of the European Sites within the ZoI. This is concluded with regard to the range, population densities and overall conservation status of the habitats and species for which these sites are designated (i.e. Conservation Objectives).

The screening has been carried out on the basis of the information presented in the Project Description. It has been concluded that the project it is not connected or necessary to the management of any European Site. It can be concluded on the basis of objective scientific information and in view of best scientific knowledge, the proposed orthophosphate dosing and associated construction works at the Inniscarra WTP; individually or in combination with other plans or projects, will not have a significant effect on any European Sites. Therefore, AA is not required.

8 REFERENCES

Council Directive 79/409 EEC on the Conservation of Wild Birds.

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora.

DEHLG (2010). Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning *Authorities.* Produced by the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Environment Agency (2006). Use and design of oil separators in surface water drainage systems: PPG 3.https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290142/pmho0406biyl-e-e.pdf.

EPA (2010) Methodology for establishing groundwater threshold values and the assessment of chemical and quantitative status of groundwater, including an assessment of pollution trends and trend reversal. 57 pp.
http://www.epa.ie/pubs/reports/water/ground/Methodology%20for%20Groundwater%20Chemical%20&%20Quantitative%20Status%20Methology,%20TVs%20and%20Trends.pdf

European Commission (2000a) Communication from the Commission on the Precautionary Principle, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2000b). *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 (2002). *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. Office for Official Publications of the European Communities, Luxembourg.

European Commission (2011). *Guidelines on the Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones, with particular attention to port development and dredging*. European Communities (Natural Habitats) Regulations (S.I. No. 477 of 2011)

King, J.L.; Marnell, F.; Kingston, N.; Rosell, R.; Boylan, P.; Caffrey, J.M.; Fitzpatrick, Ú.; Gargan, P.G.; Kelly, F.L.; O'Grady, M.F.; Poole, R.; Roche, W.K.; Cassidy, D. (2011). *Red Lists Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

NPWS (2009). *Threat response plan: otter (2009 - 2011).* National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

NPWS (2013a) Article 17 Overview Report (Vol. 1) The Status of EU Protected Habitats and Species in Ireland.

NPWS (2013b) Article 17 Habitat Conservation Assessments (Vol. 2) Version 1.1. The Status of EU Protected Habitats and Species in Ireland.

NPWS (2013c) Article 17 Species Conservation Assessments (Vol. 3) Version 1.1. The Status of EU Protected Habitats and Species in Ireland.

UKTAG (2009) Reporting confidence in groundwater status assessments. 4pp. http://www.wfduk.org/resources%20/reporting-confidence-groundwater-status-ssessments

Vollenweider, R. A. (1968) Scientific fundamentals of stream and lake eutrophication with particular reference to nitrogen and phosphorus. OECD Technical Report DAF/DST/88. Organisation of Economic Cooperation and Development, Paris.

APPENDIX A

European Sites

A full listing of the COs and QIs/ SCIs for each European Site, as well as the attributes and targets to maintain or restore the QIs/ SCIs to a favourable conservation condition, are available from the NPWS website www.npws.ie. Links to the COs for the European Sites relevant to this Screening for AA are provided below.

Site Name (Code)	Conservation Objectives Source
Great Island Channel SAC (001058)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO001058.pdf
Cork Harbour SPA (004030)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004030.pdf

APPENDIX B

Nutrient Sensitive Qualifying Interests

Water dependant and nutrient sensitive SAC species

Code	Qualifying Interest	Water dependant	Nutrient sensitive
1013	Whorl snail (*Vertigo geyeri*)	Yes	Yes
1014	Whorl snail (*Vertigo angustior*)	Yes	Yes
1016	Whorl snail (*Vertigo moulinsiana*)	Yes	Yes
1024	Kerry Slug (*Geomalacus maculosus*)	No	Yes
1029	Freshwater Pearl mussel (*Margaritifera margaritifera*)	Yes	Yes
1065	Marsh Fritillary (*Euphydryas aurinia*)	Yes	No
1092	White-clawed crayfish (*Austropotamobius pallipes*)	Yes	Yes
1095	Sea lamprey (*Petromyzon marinus*)	Yes	Yes
1096	Brook lamprey (*Lampetra planeri*)	Yes	Yes
1099	River lamprey (*Lampetra fluviatilis*)	Yes	Yes
1103	Twaite shad (*Alosa fallax*)	Yes	Yes
1106	Atlantic salmon (*Salmo salar* (freshwater only))	Yes	Yes
1303	Lesser Horseshoe bat (*Rhinolophus hipposideros*)	No	Yes
1349	Bottlenose dolphin (*Tursiops truncatus*)	Yes	Yes
1351	Harbour porpoise (*Phocoena phocoena*)	Yes	Yes
1355	Otter (*Lutra lutra*)	Yes	Yes
1364	Grey seal (*Halichoerus grypus*)	Yes	Yes
1365	Common seal (*Phoca vitulina*)	Yes	Yes
1393	Shining sickle moss (*Drepanocladus vernicosus*)	Yes	No
1395	Petalwort (*Petalophyllum ralfsii*)	Yes	Yes
1421	Killarney fern (*Trichomanes speciosum*)	Yes	Yes
1528	Marsh saxifraga (*Saxifraga hirculus*)	Yes	Yes
1833	Slender naiad (*Najas flexilis*)	Yes	Yes
1990	Nore freshwater pearl mussel (*Margaritifera durrovensis*)	Yes	Yes
5046	Killarney shad (*Alosa fallax killarnensis*)	Yes	Yes

Water dependant and nutrient sensitive SAC habitats

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
1110	Sandbanks which are slightly covered by sea water all the time	Yes		Yes
1130	Estuaries	Yes		Yes
1140	Mudflats and sandflats not covered by seawater at low tide	Yes		Yes
1150	Coastal lagoons	Yes		Yes
1160	Large shallow inlets and bays	Yes		Yes
1170	Reefs	Yes		Yes
1180	Submarine structures made by leaking gases	No		No
1210	Annual vegetation of drift lines	Yes		Yes
1220	Perennial vegetation of stony banks	Yes		No
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	Yes		Yes
1310	Salicornia and other annuals colonising mud and sand	Yes		Yes
1320	Spartina swards (*Spartinion maritimae*)	No		No
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes	Yes
1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes	Yes
1420	Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)	Yes		Yes
2110	Embryonic shifting dunes	Yes		Yes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	Yes		Yes
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)	Yes		Yes
2140	Decalcified fixed dunes with Empetrum nigrum	Yes		Yes
2150	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)	Yes		Yes
2170	Dunes with Salix repens ssp. argentea (*Salicion arenariae*)	Yes	Yes	Yes
2190	Humid dune slacks	Yes	Yes	Yes
21A0	Machairs (* in Ireland)	Yes	Yes	Yes
3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	Yes		Yes
3130	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or Isoeto-Nanojuncetea	Yes		Yes
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	Yes		Yes
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	Yes		Yes
3160	Natural dystrophic lakes and ponds	Yes		Yes
3180	Turloughs	Yes	Yes	Yes

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Yes		Yes
3270	Rivers with muddy banks with *Chenopodion rubri* p.p. and Bidention p.p. vegetation	Yes	Yes	Yes
4010	Northern Atlantic wet heaths with Erica tetralix (Flushes only)	Yes	Yes	Yes
4030	European dry heaths	No		Yes
4060	Alpine and Boreal heaths	No		No
5130	Juniperus communis formations on heaths or calcareous grasslands	No		No
6130	Calaminarian grasslands of the *Violetalia calaminariae*	No (flood risk)*		Yes
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	No (flood risk)*		Yes
6230	Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)	No		No
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	Yes	Yes	Yes
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	Yes	Yes	Yes
6510	Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)	No (flood risk)*		Yes
7110	Active raised bogs	Yes	Yes	Yes
7120	Degraded raised bogs still capable of natural regeneration	Yes	Yes	Yes
7130	Blanket bogs (* if active bog)	Yes	Yes	Yes
7140	Transition mires and quaking bogs	Yes	Yes	Yes
7150	Depressions on peat substrates of the Rhynchosporion	Yes	Yes	Yes
7210	Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	Yes	Yes	Yes
7220	Petrifying springs with tufa formation (*Cratoneurion*)	Yes	Yes	Yes
7230	Alkaline fens	Yes	Yes	Yes
8110	Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)	No		No
8120	Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)	No		No
8210	Calcareous rocky slopes with chasmophytic vegetation	No		No
8220	Siliceous rocky slopes with chasmophytic vegetation	No		No
8240	Limestone pavements	No		Yes
8310	Caves not open to the public	Yes	Yes	Yes

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
8330	Submerged or partially submerged sea caves	Yes		Yes
91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	No		Yes
91D0	Bog woodland	Yes	Yes	Yes
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Yes	Yes	Yes
91J0	Taxus baccata woods of the British Isles	No		No

*While this habitat is determined to be non-water dependent, it is incuded in the assessment in terms of flood risk only

Water dependant and nutrient sensitive SPA birds

Code	Species of special conservation interest	Water dependant	Nutrient sensitive
A001	Red-throated Diver (*Gavia stellata*)	Yes	Yes
A003	Great Northern Diver (*Gavia immer*)	Yes	Yes
A004	Little Grebe (*Tachybaptus ruficollis*)	Yes	Yes
A005	Great Crested Grebe (*Podiceps cristatus*)	Yes	Yes
A009	Fulmar (*Fulmarus glacialis*)	Yes	Yes
A013	Manx Shearwater (*Puffinus puffinus*)	Yes	Yes
A014	Storm Petrel (*Hydrobates pelagicus*)	Yes	Yes
A015	Leach's Storm-petrel (*Oceanodroma leucorhoa*)	Yes	Yes
A016	Gannet (*Morus bassanus*)	Yes	Yes
A017	Cormorant (*Phalacrocorax carbo*)	Yes	Yes
A018	Shag (*Phalacrocorax aristotelis*)	Yes	Yes
A028	Grey Heron (*Ardea cinerea*)	Yes	Yes
A037	Bewick's Swan (*Cygnus columbianus bewickii*)	Yes	Yes
A038	Whooper Swan (*Cygnus cygnus*)	Yes	Yes
A043	Greylag Goose (*Anser anser*)	Yes	Yes
A045	Barnacle Goose (*Branta leucopsis*)	Yes	Yes
A046	Light-bellied Brent Goose (*Branta bernicla hrota*)	Yes	Yes
A048	Shelduck (*Tadorna tadorna*)	Yes	Yes
A050	Wigeon (*Anas penelope*)	Yes	Yes
A051	Gadwall (*Anas strepera*)	Yes	Yes
A052	Teal (*Anas crecca*)	Yes	Yes
A053	Mallard (*Anas platyrhynchos*)	Yes	Yes
A054	Pintail (*Anas acuta*)	Yes	Yes
A056	Shoveler (*Anas clypeata*)	Yes	Yes
A059	Pochard (*Aythya ferina*)	Yes	Yes
A061	Tufted Duck (*Aythya fuligula*)	Yes	Yes
A062	Scaup (*Aythya marila*)	Yes	Yes
A063	Eider (*Somateria mollissima*)	Yes	Yes
A065	Common Scoter (*Melanitta n*igra)	Yes	Yes
A067	Goldeneye (*Bucephala clangula*)	Yes	Yes
A069	Red-breasted Merganser (*Mergus serrator*)	Yes	Yes
A082	Hen Harrier (*Circus cyaneus*)	Yes	Yes
A098	Merlin (*Falco columbarius*)	Yes	Yes
A103	Peregrine (*Falco peregrinus*)	Yes	Yes
A122	Corncrake (*Crex crex*)	Yes	Yes
A125	Coot (*Fulica atra*)	Yes	Yes
A130	Oystercatcher (*Haematopus ostralegus*)	Yes	Yes
A137	Ringed Plover (*Charadrius hiaticula*)	Yes	Yes

Code	Species of special conservation interest	Water dependant	Nutrient sensitive
A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes
A141	Grey Plover (*Pluvialis squatarola*)	Yes	Yes
A142	Lapwing (*Vanellus vanellus*)	Yes	Yes
A143	Knot (*Calidris canutus*)	Yes	Yes
A144	Sanderling (*Calidris alba*)	Yes	Yes
A148	Purple Sandpiper (*Calidris maritima*)	Yes	Yes
A149	Dunlin (*Calidris alpina*) (non-breeding)	Yes	Yes
A156	Black-tailed Godwit (*Limosa limosa*)	Yes	Yes
A157	Bar-tailed Godwit (*Limosa lapponica*)	Yes	Yes
A160	Curlew (*Numenius arquata*)	Yes	Yes
A162	Redshank (*Tringa totanus*)	Yes	Yes
A164	Greenshank (*Tringa nebularia*)	Yes	Yes
A169	Turnstone (*Arenaria interpres*)	Yes	Yes
A179	Black-headed Gull (*Larus ridibundus*)	Yes	Yes
A182	Common Gull (*Larus canus*)	Yes	Yes
A183	Lesser Black-backed Gull (*Larus fuscus*)	Yes	Yes
A184	Herring Gull (*Larus argentatus*)	Yes	Yes
A188	Kittiwake (*Rissa tridactyla*)	Yes	Yes
A191	Sandwich Tern (*Sterna sandvicensis*)	Yes	Yes
A192	Roseate Tern (*Sterna dougallii*)	Yes	Yes
A193	Common Tern (*Sterna hirundo*)	Yes	Yes
A194	Arctic Tern (*Sterna paradisaea*)	Yes	Yes
A195	Little Tern (*Sterna albifrons*)	Yes	Yes
A199	Guillemot (*Uria aalge*)	Yes	Yes
A200	Razorbill (*Alca torda*)	Yes	Yes
A204	Puffin (*Fratercula arctica*)	Yes	Yes
A229	Kingfisher (*Alcedo atthis*)	Yes	Yes
A346	Chough (*Pyrrhocorax pyrrhocorax*)	Yes	Yes
A395	Greenland White-fronted Goose (*Anser albifrons flavirostris*)	Yes	Yes
A466	Dunlin (*Calidris alpina schinzii*) (breeding)	Yes	Yes

APPENDIX C

EAM Summary Report

Irish Water - Lead in Drinking Water Mitigation Plan

Environmental Assessment Methodology (EAM) SummaryReport

006 Inniscarra WTP – Cork Zone 2 City and Harbour (0500PUB3401)

National Lead in Water Mitigation Strategy

Environmental Assessment Methodology Report – 006 Cork Zone 2 City and Harbour – Inniscarra WTP

Document Control Sheet

Client:	Irish Water
Project Title:	National Lead in Water Mitigation Strategy
Document Title:	EAM Report: 006 Cork Zone 2 City and Harbour – Inniscarra WTP
Document No:	MDW0766RP_5.1_EAM_006_Inniscarra_F05

Text Pages:	17	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
A05	Review	15th Aug 2018	YE		IP		MM	
F01	Final	31st Aug 2018	YE		IP		MM	
F02	Final	19th Apr 2019	MH		IP		MM	
F03	Final	24th Jun 2019	MH		IP		MM	
F04	Final	8th August 2019	IP		MM		GJG	
F05	Final	24 Mar 2023	YE		MM		IP	

006 Cork Zone 2 City and Harbour (0500PUB3401) – Inniscarra WTP

Supporting spreadsheet: 006 Inniscarra WTP - Zone 2 Cork city and harbour_rev19

This EAM report should be read in conjunction with the Irish Water Lead in Drinking Water Mitigation Plan – Environmental Assessment Methodology report (MDE1218Rp0005 F02).

The Inniscarra WTP supplies Zone 2 Cork City and Harbour, Zone 2 Knockburden and Zone 3 Ballyshoneen WSZs. The distribution input to these water supply zones is 63,000 m^3/day (58% of which is accounted for) serving a population of approximately 88,200. There are a number of WWTP agglomerations serving Cork City and surrounding areas including Cork City, Dripsey, Ballincollig New, Blarney, Coachford and Ringaskiddy (Shanbally) and which are all licenced in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended. The impact of the orthophosphate (Ortho P) dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There are also two agglomerations with less than 500 PE served by this WTP, namely Inniscarra Water Works and Killumney and the estimated additional load from these plants from the orthophosphate dosing is considered at the water body level via the surface water pathways. There are an estimated 4,250 properties across the WSZ that are serviced by a DWWTS.

This assessment has been undertaken for the WSZ in isolation. However, if corrective water treatment is proposed for the WTPs in the same catchment area, the cumulative impacts from the combined loads to downstream water bodies are assessed (see Recommendations and Tables 17 and 18).

<table>
<tr><td>Water Supply Zone</td><td colspan="2">Cork Zone 2 City and Harbour (0500PUB3401)
See Figure 4.1 / 4.2 of the AA Screening for a map of the WSZ and ZoI</td></tr>
<tr><td rowspan="3">Step 1 Appropriate Assessment Screening</td><td>Downstream European Sites</td><td>Nutrient Sensitivity</td></tr>
<tr><td>List of SAC/SPAs
Great Island Channel SAC
Cork Harbour SPA</td><td>Nutrient Sensitive Qualifying Interests present – Yes</td></tr>
<tr><td colspan="2">Appropriate Assessment Required – see AA screening report for details</td></tr>
<tr><td rowspan="2">Step 2 – Direct Inputs to Surface Water</td><td>Agglomerations within WSZ</td><td>Increased loading/concentration due to Ortho P Dosing – Optimum Dosing rate based on raw chemistry data assessment = 0.6 mg/l</td></tr>
<tr><td>Cork City</td><td><u>Effluent Quality</u>
Table 1: Cork City Primary Discharge
<table>
<tr><th rowspan="2"></th><th rowspan="2">TP Load Kg/yr</th><th colspan="3">Ortho P concentration mg/l
TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)</th></tr>
<tr><th>0.5</th><th>0.4</th><th>0.68</th></tr>
<tr><td>Existing</td><td>88006.0</td><td>0.951</td><td>0.761</td><td>1.293</td></tr>
<tr><td>Post Dosing</td><td>94182.3</td><td>1.017</td><td>0.814</td><td>1.384</td></tr>
</table>
Note – Modelled concentrations compliant with Total Phosphorus (TP) ELVs (2.5 mg/l) set in WWDL for both existing and post dosing concentrations.</td></tr>
</table>

Table 2: Cork City SWOs (48 no.)

	TP Load Kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	2615.6	0.970	0.776	1.319
Post Dosing	2795.5	1.037	0.829	1.410

Ballincollig New

Effluent Quality

Table 3: Ballincollig New Primary Discharge

	TP Load Kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	364.2	0.102	0.082	0.139
Post Dosing	364.2	0.102	0.082	0.139

Note – Compliant with TP ELVs (2 mg/l) set in WWDL for both existing and post dosing concentrations. As Ballincollig New receives tertiary treatment, i.e. chemical dosing for orthophosphate removal, the EAM assumes that the additional P loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality.

Table 4: Ballincollig New SWOs (3 no.)

	TP Load Kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	265.2	2.559	2.047	3.480
Post Dosing	281.6	2.717	2.173	3.695

Blarney

Effluent Quality

Table 5: Blarney Primary Discharge

	TP Load Kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	632.1	0.247	0.198	0.336
Post Dosing	632.1	0.247	0.198	0.336

Note – Modelled to be compliant with orthophosphate (0.8 mg/l) and TP (1.5 mg/l) ELVs set in WWDL for both existing and post dosing concentrations. As Blarney receives tertiary treatment, i.e. chemical dosing for orthophosphate removal, the EAM assumes that the additional P loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality.

Table 6: Blarney SWOs (1 no.)

	TP Load Kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	108.3	1.455	1.164	1.979
Post Dosing	112.2	1.508	1.206	2.050

Coachford

Effluent Quality

Table 7: Coachford Primary Discharge

	TP Load Kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	393.2	2.418	1.935	3.289
Post Dosing	420.7	2.587	2.070	3.518

Note – Modelled to be non compliant with TP (1.5 mg/l) ELV set in WWDL for both existing and post dosing concentrations..

Table 8: Coachford SWOs (3 no.)

	TP Load Kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	13.8	2.914	2.331	3.962
Post Dosing	14.6	3.082	2.466	4.192

Ringaskiddy

Effluent Quality

Table9: Ringaskiddy Primary Discharge

	TP Load Kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	2248.2	0.318	0.255	0.433
Post Dosing	2248.2	0.318	0.255	0.433

Table 10: Ringaskiddy SWOs (4 no.)

	TP Load Kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	654.8	3.184	2.548	4.331
Post Dosing	683.3	3.323	2.658	4.519

Step 2 – Direct Inputs to Surface Water	**Dripsey**	**Effluent Quality** **Table11: Dripsey Primary Discharge**

	TP Load Kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	43.8	0.141	0.112	0.191
Post Dosing	43.8	0.141	0.112	0.191

As Dripsey receives chemical dosing for orthophosphate removal, the EAM assumes that the additional P loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality.

Step 3 – Potential impact of Direct Inputs on Receiving Water Bodies

Table 12: Mass balance assessment based on 0.6 mg/l dosing using available background concentrations and mean flow information from inputting fluvial waterbodies (hydrotool and gauges) and tidal flows based on RPS hydrodynamic model for Cork Harbour

Agglom.	RWB Name / Code	Background Conc. (mg/l) (annual mean from AER u/s monitoring point)	Modelled conc. existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc.
Cork City	Lough Mahon IE_SW_060_0750	0.0315	0.0322	0.0323	0.2
Ballincollig New	LEE (CORK)_090 IE_SW_19L030800	0.0242	0.0245	0.0245	0.03
Blarney	SHOURNAGH_040 IE_SW_19S010500	0.0555	0.0574	0.0574	0.0
Coachford	Iniscarra - Lake IE_SW_19_138	0.0080	No significant impact - see Vollenweider assessment for Lake water body (Table 18)		
Ringaskiddy	Owenboy Estuary IE_SW_060_1200	0.0060	0.0060	0.0060	0.0
Dripsey	DRIPSEY_020 IE_SW_19D060400	0.0510	0.0512	0.0512	0.0

Surface Assessment

	Cork City **(**IE_SW_060_0750**)** – The existing and post dosing effluent concentrations for TP predicted from the model are compliant with ELVs. The latest AER published in 2021 demonstrates compliance with the TP ELV of 2.5 mg/l. Table 12 demonstrates an insignificant increase in the modelled concentration post dosing at the WWTP and Table 16 demonstrates an insignificant impact on the downstream waterbody, Lough Mahon (see Step 5 and 6: Combined Inputs to Surface Water Bodies). The orthophosphate dosing will therefore not impact on the performance of the WWTP or the indicative quality in the receiving water body. ***Ballincollig New*** **(IE_SW_19L030800)** – The effluent concentrations are compliant with ELVs and there is no additional impact on the receiving water as a result of the proposed orthophosphate dosing. ***Blarney*** **(IE_SW_19S010500)** – The effluent concentrations are modelled as compliant with ELVs for orthophosphate prior to dosing. The operational monitoring reported in the 2021 AER indicates that the effluent was compliant with the ELVs for TP (1.5 mg/l) and OP (0.8mg/l). A small increase in load due to dosing is predicted due to input via SWOs. There is no additional impact on the receiving water as a result of the proposed orthophosphate dosing. Tertiary treatment, i.e. nutrient removal, at Blarney WWTP is assumed to remove any additional orthophosphate load to the WWTP during the treatment process. This is based on the assumption that there is adequate capacity in the chemical dosing system to effectively manage the removal of the additional phosphorus without affecting the performance of the treatment process at the WWTP or the quality of the effluent discharged under the current operating regime. ***Coachford*** **(IE_SW_19_138)** – The WWTP has been upgraded to provide adequate capacity and treatment. Given that the works have now been upgraded it is assumed that the new WWTP is compliant with the ELVs specified in the Licence. The WWTP discharges to Inniscarra Lake and has been assessed in the Vollenweider which indicated insignificant impact on the waterbody (Table 15). ***Ringaskiddy Village*** **(IE_SW_060_0000)** – No ELVs are set for this primary treatment plant. There is no additional impact on the receiving water as a result of the proposed orthophosphate dosing. ***Ringaskiddy*** **(IE_SW_060_1200)** – No ELVs are set for this primary treatment plant. There is no additional impact on the receiving water as a result of the proposed orthophosphate dosing. **Dripsey (IE_SW_19D060400) -** Dripsey WWTP has been upgraded in 2021 and commissioned in Q1 2022. There are currently no monitoring results or compliance information available however the upgrade included chemical dosing for phosphorus removal. Therefore the corrective water treatment will not result in a significant impact to the WWTP or the receiving environment as the load can be managed within the treatment process.
Step 4 Distributed Inputs to River Water Bodies	Impacts due to subsurface and near surface pathways due to orthophosphate dosing on river water bodies are low in the majority of cases. However, the following have a predicted modelled increase in concentration above 5% of the Good / High Boundary (0.00125 mg/l): • Curragheen (Cork City)_010 (IE_SW_19C120740), • Glasheen (Cork City)_010 (IE_SW_19G040700), • Hilltown 19_010 (IE_SW_19H050470), • Kilnaglery 19_010 (IE_SW_19K620850), • Moneygurney_010 (IE_SW_19M300900)

For HILLTOWN 19_010 (IE_SW_19H050470), the load from around 7% of the water main length, primarily leading to and on Haulbowline Island, discharges directly to Cork Harbour and this load is assessed as part of the Cork Harbour total loading. Flows in this river sub-basin and others are not available, so effective rainfall has been used to estimate these increases in concentrations.

The highest modelled load via subsurface pathways is seen in MONEYGURNEY 19_010 (IE_SW_19M300900). Some of the load from the eastern section of this water body (labelled IE_SW_19M300900_1 in Figure 1 below) has been reapportioned directly to Lough Mahon. The rest of the load, however, is evaluated using the available flows in IE_SW_19M300900, resulting in a relatively high increase in concentration.

Much of the watermain in Kilnaglery 19_010 (IE_SW_19K620850) is also adjacent to the Owenboy Estuary, so approximately 85% of the load is reapportioned to this waterbody. The remaining load in the waterbody is evaluated using flows derived from rainfall runoff in IE_SW_19K620850, resulting in a concentration below significant levels.

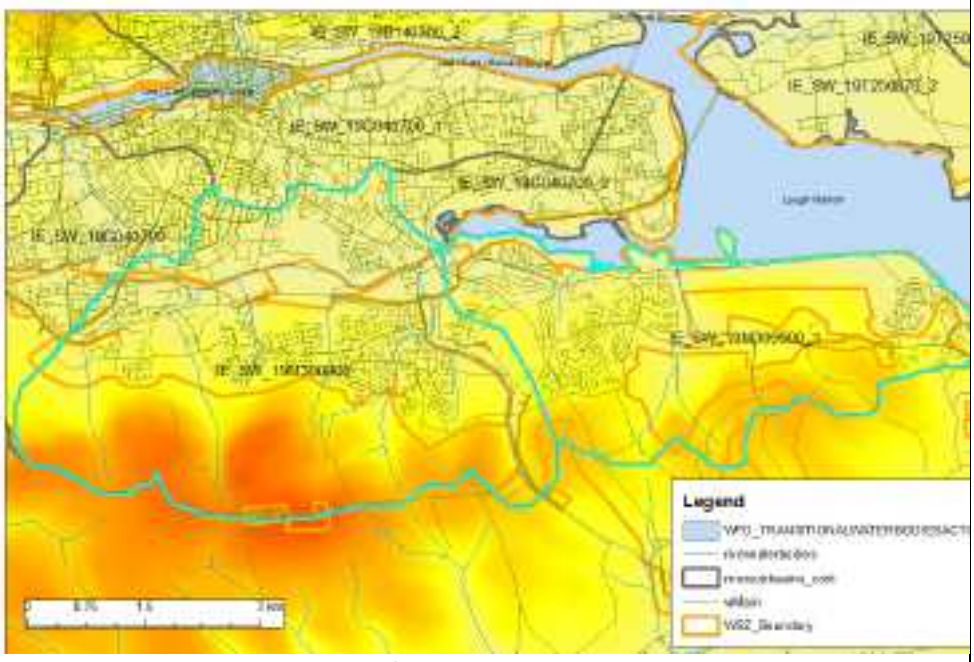


Figure 1: Load re-apportionment from the MONEYGURNEY 19_010 water body (IE_SW_19M300900)

Step 5 and 6: Combined Impact on GW Receptor Assessment

Groundwater Bodies as receptors connected to WSZ

Table 13: Increased loadings and concentrations in Groundwater bodies
(note where existing monitoring data not available, a surrogate indicative quality is derived from chemical status of the GWB or Ortho P indicative quality of the Group GWBS, the mid-range of that indicative quality is used as Baseline Concentration)

EU_CD	Ortho P Indicative Quality and Trends (Distance to Threshold. Surrogate indicative quality in *italic*)	Baseline 2019 Conc. Surrogate Conc. given in	75% of Upper threshold mg/l	Ortho P Total GW Dosing Load kg/yr	Ortho Potential Conc. due to Dosing mg/l	Ortho P Potential Baseline Conc. following dosing mg/l	Notes
IE_SW_G_002 Ballincollig	*Good*	*0.018*	*0.026*	*67.4*	*0.0040*	*0.022*	
IE_SW_G_004 Ballinhassig East	Good Upwards Near	0.034	0.026	79.3	0.0003	0.034	MP1
	Good Upwards Far	0.013	0.026			0.013	MP2
	Failing to achieve good Upwards Far	0.051	-			0.051	MP3
	Failing to achieve good Upwards Far	0.037	-			0.038	MP4
	Good Upwards Far	0.021	0.026			0.021	MP5
	Good None Far	0.015	0.026			0.015	MP6
	Good Upwards Far	0.006	0.026			0.006	MP7
	Good Downwards Far	0.023	0.026			0.023	MP8
	Failing to achieve good Upwards Far	0.268	-			0.268	MP9
	Good Upwards Far	0.006	0.026			0.007	MP10
	Good Upwards Far	0.026	0.026			0.026	MP11
	Failing to achieve good Upwards Far	0.188	-			0.189	MP12

	Good Upwards Far	0.012	0.026			0.012	MP13
	Failing to achieve good Upwards Far	0.043	-			0.043	MP14
IE_SW_G_009 Ballinhassig_D	*Good*	*0.018*	*0.026*	*1.0*	*0.0034*	*0.021*	
IE_SW_G_037 Glenville	Good Upwards Far	0.006	0.026	0.0	-	-	MP1
	Good None Far	0.009	0.026			-	MP2
IE_SW_G_050 Lismore	Good Upwards Far	0.006	0.026	0.0	-	-	MP1
	Good Upwards Far	0.005	0.026			-	MP2
IE_SW_G_072 Ringaskiddy	*Good*	*0.018*	*0.026*	*48.1*	*0.0077*	*0.025*	
IE_SW_G_083 Haulbowline Island	*Good*	*0.018*	*0.026*	*0.0*	-	-	
IE_SW_G_086 Bandon	*Good*	*0.018*	*0.026*	*8.6*	*0.0001*	*0.018*	
IE_SW_G_094 Lee Valley Gravels GWB Group	Good Downwards Far	0.010	0.026	10.0	0.0007	0.010	
IE_SW_G_089 Industrial Facility (P0016-02)	*Good*	*0.018*	*0.026*	*2.7*	*0.0032*	*0.021*	

MP: multiple Monitoring Points given for waterbody

Groundwater Assessment

Where the predicted loads result in potentially significant increases in groundwater P concentration results are highlighted in yellow in Table 13. However, none of these predicted increases will result in an increased risk of either groundwater or connected surface water bodies failing to achieve WFD objectives.

One GWB is currently either Failing to Achieve Good Status or at risk of Failing to Achieve Good Status:
Ballinhassig East (IE_SW_G_004) has a number of monitoring points, some of which are Failing to Achieve Good Status, but these are all remote from the WSZ and the monitoring points will not be affected. In addition the modelled increase in P concentration due to dosing is below 5% of the Good / Fail boundary (0.00175 mg/l), so would not be significant.

Haulbowline Island (IE_SW_G_083) Load from a small length of water main within this GWB is assumed to discharge direct to Cork Harbour, with correspondingly high dilution, so negligible impact is expected.

Step 5 and 6: Combined input to river water bodies

Table 14: Increased loading and concentrations to water bodies connected to the WSZs ***(note: where existing monitoring data not available, a surrogate indicative quality is derived from ecological status of the WB or Ortho P indicative quality / Ecological status of neighbouring WBS, the mid-range of that indicative quality is used as Baseline Concentration)***

EU_CD	Ortho P Indicative Quality and Trends (Distance to Threshold. Surrogate indicative quality in *italic*	Baseline 2020 Conc. Surrogate Conc. given in *italic* mg/l	75% of Upper threshold mg/l	Ortho P Total GW Dosing Load kg/yr	Ortho P Potential Conc. due to Dosing mg/l	Ortho P Potential Baseline Conc. following dosing mg/l	Notes
IE_SW_18B022500 BLACKWATER (MUNSTER)_210	Good Upwards Near	0.033	0.033	0.0	0.0000	0.033	
IE_SW_18B050700 BRIDE (BLACKWATER)_060	Good Downwards Near	0.027	0.033	0.0	0.0000	0.027	
IE_SW_19B041300 BRIDE (LEE)_040	*Moderate*	*0.046*	*0.051*	*4.8*	*0.0000*	*0.046*	
IE_SW_19B041600 BRIDE (LEE)_050	High Upwards Near	0.024	0.019	26.6	0.0002	0.024	
IE_SW_19B140110 BRIDE (Cork City)_010	*Moderate*	*0.046*	*0.051*	*3.9*	*0.0001*	*0.046*	
IE_SW_19C120740 CURRAGHEEN (Cork City)_010	*Moderate*	*0.046*	*0.051*	*69.9*	*0.0015*	*0.047*	
IE_SW_19D060400 DRIPSEY_020	Good Downwards Far	0.026	0.033	7.9	0.0001	0.026	
	High Upwards Near	0.020	0.019			0.020	
IE_SW_19G040700 GLASHEEN (Cork City)_010	*Poor*	*0.077*	*0.087*	*82.4*	*0.0016*	*0.078*	
IE_SW_19H050470 HILLTOWN 19_010	*Good*	*0.030*	*0.033*	*75.0*	*0.0024*	*0.032*	^
IE_SW_19K620850 KILNAGLERY 19_010	*Good*	*0.030*	*0.033*	*11.7*	*0.0009*	*0.031*	^
IE_SW_19L030500 LEE (CORK)_070	*Good*	*0.030*	*0.033*	*15.2*	*0.0004*	*0.030*	^
IE_SW_19L030600 LEE (CORK)_080	High Far	0.015	0.019	71.8	0.0001	0.015	^
IE_SW_19L030800 LEE (CORK)_090	High Downwards Far	0.014	0.019	210.4	0.0002	0.014	‡

IE_SW_19M010600 MARTIN_040	Moderate Upwards Near	0.056	0.051	14.9	0.0002	0.056	
IE_SW_19M300900 MONEYGURNEY 19_010	*Moderate*	*0.046*	*0.051*	*98.0*	*0.0046*	*0.050*	
IE_SW_19O010800 OWENBOY (CORK)_020	Good Far	0.027	0.033	-	-	-	
IE_SW_19O011400 OWENBOY (CORK)_040	Good Upwards Near	0.026	0.033	3.7	0.0000	0.026	
IE_SW_19S010300 SHOURNAGH_030	Moderate Upwards Near	0.051	0.051	32.3	0.0002	0.051	‡
IE_SW_19S010500 SHOURNAGH_040	Moderate Downwards Far	0.044	0.051	66.8	0.0003	0.044	‡
IE_SW_19T050890 TWO POT (Cork City)_010	Moderate	0.046	0.051	10.1	0.0009	0.046	
IE_SW_20M010200 Minane 20_010	*Good*	*0.030*	*0.033*	*18.5*	*0.0008*	*0.031*	
IE_SW_19G010600 GLASHABOY (LOUGH MAHON)_030	*Good*	*0.030*	*0.033*	*1.5*	*0.0000*	*0.030*	
IE_SW_19O011000 OWENBOY (CORK)_030	High Downwards Near	0.021	0.019	0.9	0.0000	0.021	
	Good Upwards Far	0.026	0.033			0.026	
IE_SW_19T250870 Tibbotstown_010	*Good*	*0.030*	*0.033*	*2.8*	*0.0002*	*0.030*	

^ Effective Rainfall used to calculate concentration
‡ Load from WWTP / SWO following treatment added
MP: multiple Monitoring Points given for waterbody

Step 5 and 6: Combined input Receiving Water Bodies

Lake Water bodies

Table 15: Vollenweider assessment of Lakes within the WSZs

NAME / EU_CD	Parameter	TP Indicative Quality and Trends (Distance to Threshold. Surrogate indicative quality in *italic*	Baseline Conc. Surrogate Conc. given in *italic* mg/l	TP Total Dosing Load kg/yr	Estimated Existing Areal loading based on Vollenveider (mg/m2/yr)	Estimated Post dosing Areal loading based on Vollenveider (mg/m2/yr)	Lc (mg/m2/yr)	Post Dosing Areal Load
IE_SW_19_138 Inniscarra	TP	Good Downwards (Near)	0.026	71.0	12,597	12,612	5,830	0.12%

Transitional and Coastal Water Bodies

Table 16: Increased loading and concentrations to transitional water bodies receiving flows from river water bodies connected to the WSZs ***(note: where existing monitoring data not available, a surrogate indicative quality is derived from ecological status of the WB or Ortho P indicative quality / Ecological status of neighbouring WBS, the mid-range of that indicative quality is used as Baseline Concentration)***

NAME / EU_CD	Ortho P indicative quality and Trends (distance to threshold) Surrogate indicative quality indicated in *italic*	Baseline Year 2020 and Conc. Surrogate Conc. given in *italic* mg/l	75% of status threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS, & WWTPs kg/yr	Conc. using 30%ile flows mg/l	Ortho P Potential Baseline Conc. following dosing mg/l	Notes
Lough Mahon IE_SW_060_0750	High (S) Downwards Far	0.014	0.020	3643.9	0.0001	0.014	‡
	Good (W) Downwards Far	0.027	0.045	0.0		0.027	
Owenboy Estuary IE_SW_060_1200	*Moderate*	*0.046*	*0.051*	*96.8*	*0.0000*	*0.046*	‡
Lee (Cork) Estuary Upper IE_SW_060_0950	High (S) Downwards Near	0.013	0.019	382.8	0.0003	0.013	‡
	High (W) Downwards Far	0.013	0.019	0.0		0.013	
Lee (Cork) Estuary Lower IE_SW_060_0900	Good (S) Downwards Near	0.033	0.037	382.8	0.0003	0.033	‡
	Good (W) Downwards Far	0.043	0.050			0.043	
Cork Harbour IE_SW_060_0000	High (S) Downwards Far	0.003	0.019	3819.6	0.0000	0.003	‡
	Good (W) Downwards Near	0.028	0.035			0.028	
Outer Cork Harbour IE_SW_050_0000	High (S) Downwards Far	0.003	0.019	3838.1	0.0000	0.003	‡
	High (W) Downwards Far	0.025	0.019			0.025	

‡ Load from WWTP / SWO following treatment added

Combined Assessment

Where predicted increase in concentration in receiving waters are greater than 5% of the upper threshold value for the current indicative quality the value has been highlighted in yellow in Tables 14, 15 and 16.

Rivers

While there are some cases where the modelled increase in P concentration is potentially significant none of the water bodies are at risk of failing to achieve WFD objectives as a result of dosing.

CURRAGHEEN (Cork City)_010 (IE_SW_19C120740): The project monitoring suggests that a surrogate Ortho P indicative quality of Moderate is suitable for this waterbody (baseline = 0.046 mg/l) which is consistent with the ecological status of moderate assigned by the EPA to this water body. Using this revised baseline and considering the biological elements, the modelled increase in concentration due to the cumulative assessment (0.0015 mg/l) does not put the waterbody at risk of deterioration in Ortho P indicative quality.

It is therefore concluded that the appropriate RAG status for the CURRAGHEEN (Cork City)_010 (IE_SW_19C120740) is GREEN.

GLASHEEN (Cork City)_010 (IE_SW_19G040700): Project monitoring in October 2018 confirmed the Ortho P baseline at Bad (0.156 mg/l), but the biological assessment gave a Q-value of 2-3 that indicates Poor biological status. The most recent ecological status for this water body, assigned by the EPA based on the grouping approach is Poor. For a water body at poor ecological status, by definition the supporting conditions are considered as being consistent with the achievement of the class for the biological elements. Because the biology is poor in the case of the Glasheen (Cork City)_010 then the nutrient conditions are considered to be consistent with the achievement of the value specified for the biological quality elements, i.e. Poor. The EAM model is considered conservative and the modelled increase in concentration due to the cumulative assessment is unmeasurable (0.0024 mg/l). It is therefore reasoned that the dosing will not result in any further impact on the structure and functioning of aquatic ecosystems in these water bodies and will not result in any further deterioration in the contributing elements to ecological status.

It is therefore concluded that the appropriate RAG status for the GLASHEEN (Cork City)_010 (IE_SW_19G040700) is GREEN.

MONEYGURNEY 19_010 (IE_SW_19M300900): This water body has an unassigned Ortho P indicative quality, so project specific monitoring was undertaken. The measured value (0.0125 mg/l), indicates that the water body has an orthophosphate concentration that is consistent with the achievement of high ecological status. This would not be at risk as a result of the predicted increase due to dosing. The most recent ecological status for this water body, assigned by the EPA based on the grouping approach is good, but this has been assigned with Low confidence However, given the urban diffuse pressures a surrogate indicative quality of moderate was assigned. The modelled increase in concentration will not cause the 75% threshold of the indicative quality boundary to be exceeded in this case.

Lakes

Inniscarra (IE_SW_19_138): This lake is at good indicative TP indicative quality with a downwards trend however the ecological status is moderate due to phytoplankton. An assessment of the loading from surface and subsurface pathways suggests that there will

be an insignificant impact as a result of the orthophosphate dosing as demonstrated in Table 15 with an increase of 0.12%. An assessment of the OECD trophic status of Inniscarra suggests that the annual maximum chlorophyll levels are indicative of mesotrophic status with a low level of impact, this is consistent with the ecological status which is moderate due to phytoplankton conditions. The additional loading to the lake represents a 0.12% increase in the TP levels and this will have an insignificant impact on the trophic status of the lake.

Transitional

The model indicates that increases in phosphate input due to dosing will not result in significant increases in OP concentration in transitional waters as increases are below method detection limits (Table 16). Lough Mahon, Lee (Cork) Estuary Upper and Cork Harbour have baseline concentrations above 75% of their Ortho P indicative quality threshold due to existing conditions.

Summary and Mitigation Proposed

The modelled increase in concentrations for water bodies and receiving water bodies due to this water supply zone in isolation suggests that the impact is not significant. The fate of P loads from Inniscarra WTP to Cork Harbour is depicted in Figure 2.

The cumulative impacts on Lee, Cork Harbour, and Youghal Bay Catchment (HA 19) associated with phosphate dosing from following additional WTPs are summarised in Tables 17 and 18 below:

- 004 Lee Road WTP – Cork City Water Supply
- 026 Glashaboy WTP – Zone3 Glashaboy

Table 17: Cumulative assessment of the increased loading and concentrations to river water bodies common to the Cork WSZs.

NAME / EU_CD	Ortho P indicative quality and Trends (distance to threshold) Surrogate indicative quality indicated in *italic*	Baseline Year 2020 and Conc. Surrogate Conc. given in *italic* mg/l	75% of indicative quality upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Conc. using 30%ile flows mg/l	Ortho P Potential Baseline Conc. following dosing mg/l	Notes
BRIDE (Cork City)_010 IE_SW_19B140110	Moderate Upwards Near	0.046	0.051	8.6	0.0002	0.046	
IE_SW_19B140300 BRIDE (Cork City)_020	*Moderate*	*0.046*	*0.051*	*59.9*	*0.0016*	*0.047*	
CURRAGHEEN (Cork City)_010 IE_SW_19C120740	Moderate Upwards Near	0.046	0.051	80.3	0.0017	0.047	
	Poor Upwards Far	0.046	0.051			0.047	

GLASHEEN (Cork City)_010 IE_SW_19G040700	*Poor*	*0.077*	*0.087*	*110.1*	*0.0021*	*0.079*	
LEE (CORK)_090 IE_SW_19L030800	High Downwards Far	0.014	0.019	206.4	0.0002	0.014	‡
MONEYGURNEY 19_010 IE_SW_19M300900	*Moderate*	*0.046*	*0.051*	102.2	0.0048	*0.051*	
TWO POT (Cork City)_010 IE_SW_19T050890	*Moderate*	*0.046*	*0.051*	*10.4*	*0.0010*	*0.046*	

‡ Load from WWTP / SWO following treatment added
MP: multiple Monitoring Points given for waterbody

The impact to the receiving river water bodies is not significant as outlined in Table 17, except in:

BRIDE (Cork City)_020 (IE_SW_19B140300) - BRIDE (Cork City)_020: There is no recent monitoring information for the monitoring stations in this water body however the EPA have assigned an ecological status of "moderate" to the water body based on the grouping approach, i.e. using information from other water bodies of a similar type with similar pressures to assign the status. On this basis an indicative quality of moderate for orthophosphate has been assumed. The additional cumulative loading resulting from the corrective water treatment will not increase the risk of this water body failing its objectives.

It is therefore concluded that the appropriate RAG status for the BRIDE (Cork City)_020) (IE_SW_19B140300) is GREEN.

CURRAGHEEN (Cork City)_010 (IE_SW_19C120740): Project monitoring in October 2018 confirmed the Ortho P baseline at Moderate (0.041) mg/l, but the biological assessment gave a Q-value of 4 that indicates Good biological status. The project monitoring suggests that a surrogate Ortho P indicative quality of Moderate is suitable for this waterbody (baseline = 0.046 mg/l) which is consistent with the ecological status of moderate assigned by the EPA to this water body. Using this revised baseline and considering the biological elements, the modelled increase in concentration due to the cumulative assessment (0.0018 mg/l) does not put the waterbody at risk of deterioration in Ortho P indicative quality.

It is therefore concluded that the appropriate RAG status for the CURRAGHEEN (Cork City)_010 (IE_SW_19C120740) is GREEN.

GLASHEEN (Cork City)_010 (IE_SW_19G040700): Project monitoring in October 2018 confirmed the Ortho P baseline at Bad (0.156 mg/l), but the biological assessment gave a Q-value of 2-3 that indicates Poor biological status. The most recent ecological status for this water body, assigned by the EPA based on the grouping approach, is Poor. For a water body at poor ecological status, by definition the supporting conditions are considered as being consistent with the achievement of the class for the biological elements. Because the biology is poor in the case of the Glasheen (Cork City)_010 then the nutrient conditions are considered to be consistent with the achievement of the value specified for the biological quality elements, i.e. Poor. The EAM model is considered conservative and the

modelled increase in concentration due to the cumulative assessment is unmeasurable (0.0024 mg/l). It is therefore reasoned that the dosing will not result in any further impact on the structure and functioning of aquatic ecosystems in these water bodies and will not result in any further deterioration in the contributing elements to ecological status.

It is therefore concluded that the appropriate RAG status for the GLASHEEN (Cork City)_010 (IE_SW_19G040700) is GREEN.

MONEYGURNEY 19_010 (IE_SW_19M300900): The most recent ecological status for this water body, assigned by the EPA based on the grouping approach is good, but this has been assigned with Low confidence However, given the urban diffuse pressures a surrogate indicative quality of moderate was assigned. The modelled increase in concentration will not cause the 75% threshold of the indicative quality boundary to be exceeded in this case.

It is therefore concluded that the appropriate RAG status for the MONEYGURNEY 19_010 (IE_SW_19M300900) is GREEN.

The modelled increase in concentration in receiving transitional and coastal water bodies is not significant as outlined in Table 18. Therefore, the water supply zones can receive corrective water treatment without impacting on the status of the water bodies and WFD objectives.

Table 18: Cumulative assessment of the increased loading and concentrations to transitional and coastal water bodies common to the Cork WSZs

NAME / EU_CD	Ortho P indicative quality and Trends (distance to threshold) Surrogate indicative quality indicated in *italic*	Baseline Year 2014 and Conc. Surrogate Conc. given in *italic* mg/l	75% of indicative quality upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Conc. using 30%ile flows mg/l	Ortho P Potential Baseline Conc. following dosing mg/l	Notes
Lee (Cork) Estuary Upper IE_SW_060_0950	High (S) Downwards Near	0.013	0.019	376.4	0.0003	0.013	‡
	High (W) Downwards Far	0.013	0.019			0.013	‡
Lee (Cork) Estuary Lower IE_SW_060_0900	Good (S) Downwards Near	0.033	0.037	376.4	0.0003	0.036	‡
	Good (W) Downwards Far	0.043	0.050			0.044	‡
Lough Mahon IE_SW_060_0750	High (S) Downwards Far	0.014	0.020	6489.1	0.0001	0.014	‡
	Good (W) Downwards Far	0.027	0.038			0.027	‡

Cork Harbour IE_SW_060_0000	High (S) Downwards Far	0.003	0.019	8478.8	0.0000	0.003	‡
	Good (W) Upwards Far	0.028	0.039			0.028	‡
Outer Cork Harbour IE_SW_050_0000	High (S) Downwards Far	0.003	0.019	8559.6	0.0000	0.003	‡
	High (W) Downwards Far	0.025	0.019			0.025	‡

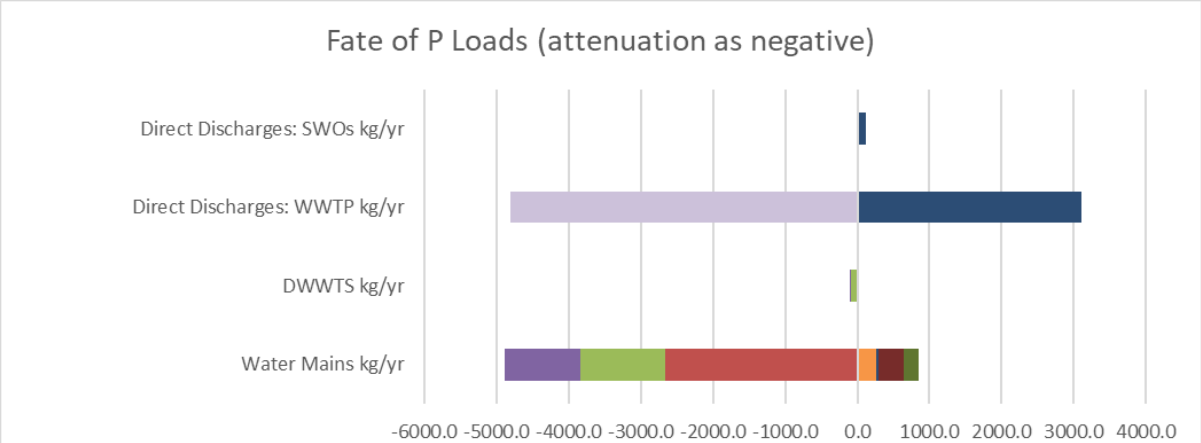
‡ Load from WWTP / SWO following treatment added.

RECOMMENDATION:

Continued monitoring of the following waterbodies to confirm Ortho P levels are improving and confirm biological assessment undertaken by the project and to link any improvement to RBD and EPA programme of measures:

IE_SW_19B140300 - BRIDE (Cork City)_020
IE_SW_19G040700 - GLASHEEN (Cork City)_010

RAG STATUS – Green



	Water Mains kg/yr	DWWTS kg/yr	Direct Discharges: WWTP kg/yr	Direct Discharges: SWOs kg/yr
Load attenuated in Preference (inadequate percolation) pathway	-10.4	0.0		
Load attenuated in Near Surface Pathway	-2646.8	-9.3		
Load attenuated in 1m below trench	-1177.0	-76.4		
Load attenuated in Subsurface Pathway	-1046.4	-4.4		
Load intercepted by gravity main in Preference Pathway	5.1			
Load intercepted by gravity main in Near Surface Pathway	257.5			
Load reaching SW direct or via Preference (inadequate percolation) Pathway	30.2	0.2	3105.0	115.3
Load reaching SW via Near Surface Pathway	346.4	3.4		
Load reaching SW via Subsurface Pathway	208.3	1.1		
Load treated in WWTP			-4810.8	

Figure 2 – Fate of orthophosphate loads modelled for Cork Zone 2 City and Harbour WSZ (impacting on the Cork Harbour) due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.