Irish Water-Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment

004 Lee Road WTP - Cork City WSZ (0400PUB1001)

Lead in Drinking Water Mitigation Plan

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004 Cork City Water Supply Zone (0400PUB1001)- Lee Road WTP

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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 likely significant 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 project) of drinking water supplied by Lee Road Water Treatment Plant (WTP), Cork City, 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 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 Lee Road WTP orthophosphate will be added at a rate of 0.5 mg/l with seasonal variation in the proposed dose, as set out within the Preliminary Design Report for the proposed dosing.

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 24 European sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Great Island Channel SAC, The Gearagh SAC, Ballymacoda (Clonpriest and Pillmore) SAC, Blackwater River (Cork/Waterford) SAC, Ardmore Head 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; and
- SPA sites: The Gearagh SPA, Cork Harbour SPA, Ballycotton Bay SPA, Ballymacoda Bay SPA, Blackwater Estuary SPA, Sovereign Islands SPA, Old Head of Kinsale SPA, Courtmacsherry Bay SPA, Seven Heads SPA, Clonakilty Bay SPA, Galley Head to Duneen Point SPA and Sheep's Head to Toe Head 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 PROCESSS

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 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 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**).

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,

[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

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

IW is proposing to install orthophosphate treatment at the Lee Road WTP in Cork City. The Lee Road WTP supplies two WSZs: Cork City Water Supply (0400PUB1001) and Zone 2 Cork City Council Import - Lee Road WTP (0500PUB_TBC). These two WSZs have been amalgamated into one WSZ - 0400PUB1001, however the water amounts for both WSZs are included in the following calculations.. Water is imported to both WSZs from the Inniscarra WTP which is within Cork Harbour and City WSZ (0500PUB3401). The distribution input is 58,579 m3/day, including water imported from Inniscarra WTP, (50% of which is accounted for, with the remainder assumed to be lost through leakage) serving a population of approximately 125,000. The non-domestic demand is 12% of the distribution input.. The main waste water agglomeration within Cork City WSZ is Cork City. There is a small overlap between this WSZ boundary and the Ballincollig New agglomeration. There are smaller agglomerations with a population equivalent of less than 500, i.e. Kileens and Rosemount Kilcully 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 530 properties across both WSZs that are serviced by domestic waste water treatment systems (DWWTSs) (see **Appendix C**).

The Lee Road WTP lies in the vicinity of the River Lee, in the Lee Subcatchment of the Lee, Cork Harbour and Youghal Bay Catchment. There are 24 European sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Great Island Channel SAC, The Gearagh SAC, Ballymacoda (Clonpriest and Pillmore) SAC, Blackwater River (Cork/Waterford) SAC, Ardmore Head 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; and
- SPA sites: The Gearagh SPA, Cork Harbour SPA, Ballycotton Bay SPA, Ballymacoda Bay SPA, Blackwater Estuary SPA, Sovereign Islands SPA, Old Head of Kinsale SPA, Courtmacsherry Bay SPA, Seven Heads SPA, Clonakilty Bay SPA, Galley Head to Duneen Point SPA and Sheep's Head to Toe Head SPA.

3.2 CONSTRUCTION OF CORRECTIVE WATER TREATMENT WORKS

The corrective water treatment works at Lee Road 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 Lee Road WTP all of which will be located within the confines of the existing WTP boundary. The surrounding landscape is dominated by agricultural grassland and built infrastructure. The location of the works is shown in **Figure 3-1**

CO. CORK

Lee Road

LEE ROAD

Lee Vista

1 - 28

Connection Point to Future Shanakiel Rising Main and Southern A & Mid Level C Distribution Mains (Constructed as part of the New Lee Road WTP Contract)

Temporary Site Interface Between New WTP Contractor and Cork Co Co. (To be fenced off for construction stage with single access point)

PROPOSED SKID MOUNTED ORTHOPHOSPHATE PLANT

Proposed Orthophosphate and Caustic Dosing Point (Distribution Pump Sump Inlet)

Proposed Channel Flowmeter Location

Connection to the Low Level Rising Main

Proposed Lime Mixing Pumps

Roof to be Constructed Over Existing Sedimentation Tanks under new WTP Contract

Existing Lime Dosing Point

Existing Lime Saturators

Filters 1-6 Air and Backwash Pumps

Filters 7-14 Air and Backwash Pumps

Existing Power, Telemetry, Dosing & Sampling Ducts

GATE

Existing Service Water

Existing Caustic Dosing Panel

Chlorine Gas Cylinder Storage

Lime Silo

Existing Gate

Filter Beds

Tks

Corporation Water Works

Pump House

Water Works (Cork City Council)

NEW WTP SITE TRANSFER BOUNDARY LINE

Proposed Route Caustic Dosing Pipework (Alongside Temporary Rising Main)

Existing Caustic Soda Storage Tank

Scour to River

Existing Twin Raw Water Inlet Pipes (30"Ø)

Proposed new Caustic Soda Dosing Pumps to be rearranged as (D/A/A)

Weir

Fish Pass

City Co Bdy

WEATHER SHROUDED BUND

FGL

Hardstanding Area

ELEVATIONAL VIEW - Proposed Dual Bunded Storage Tanks *(Lee Road)*

Scale: 1:50 @ A1

10m

SCALE 1:500

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

Client

UISCE EIREANN : IRISH WATER

No.	Date	Drn. Chk.	Amendment / Issue	App
F01	MAR 19	BL BR	ISSUE DFOR INFORMATION	GJG
D01	NOV 18	JR 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	19/03/2019
Scale	1:500 @ A1
	1:1,000 @ A3
Job No.	MDW0766
File Ref.	MDW0766SK0000 Series.dwg
Drg. No.	SK0004 WTP
Rev.	F01

Project

LEAD MITIGATION PLAN

Figure 3.1

LEE ROAD WATER TREATMENT PLANT - SITE LAYOUT

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

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

The bulk storage tanks (2 no. tanks, each with a working volume of 3,000 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 3-2**).

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.

There is an existing pH correction system at the Lee Road WTP. pH is corrected by the addition of lime in the final clear water tank. A stable pH is critical to facilitate effective plumbosolvency control. With implementation of orthophosphate dosing it is necessary to provide a back-up system to ensure a stable pH of the final water. An existing on-site bulk storage tank shall be modified to be used as a pH back-up for the existing lime dosing system.

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 Lee Road 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.

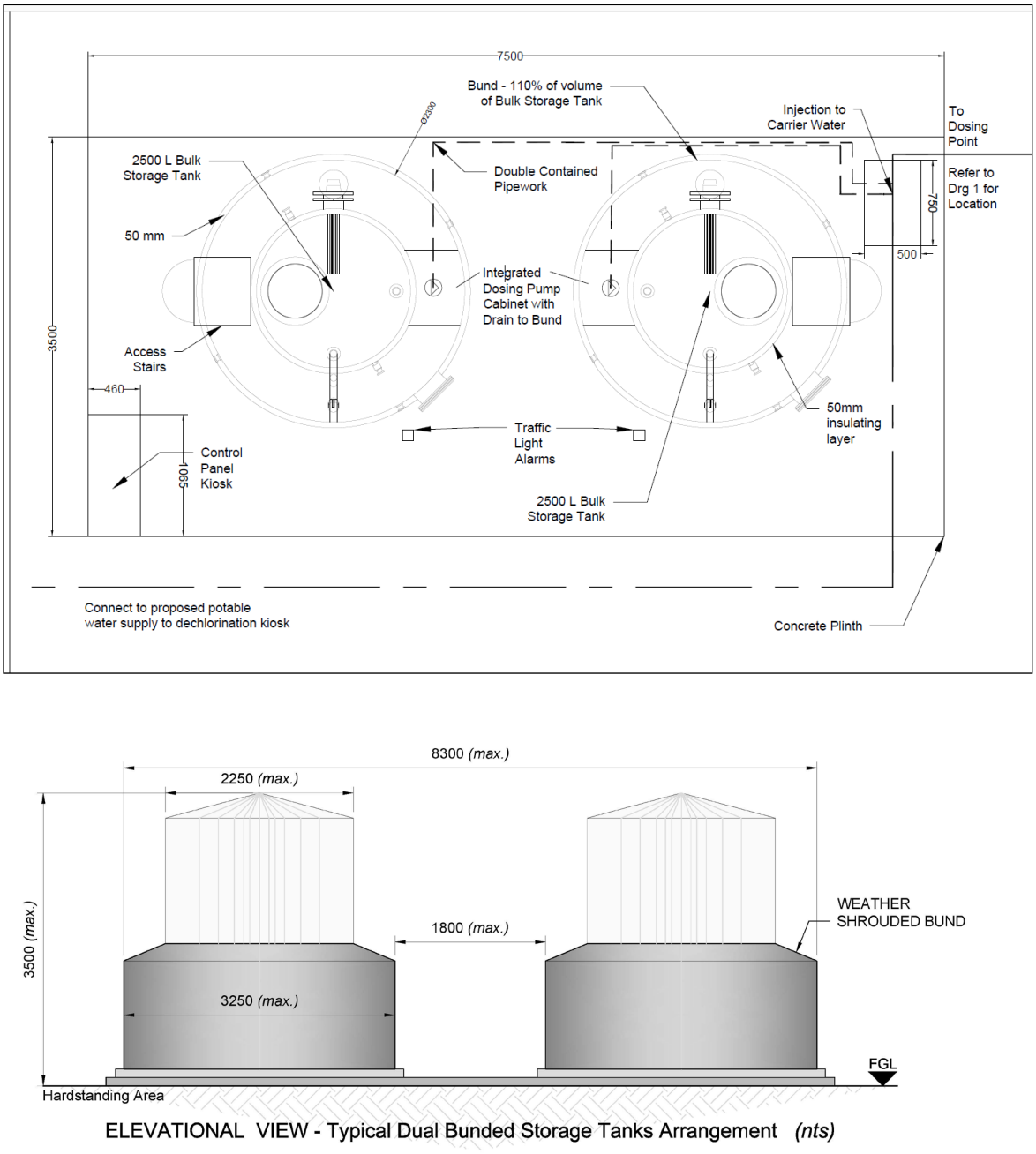


Figure 3-2: Plan and Elevation Drawings of a typical Orthophosphate Dosing Unit

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 Lee Road 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.

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 Lee Road WTP, orthophosphate will be added to treated water at a rate of 0.5 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 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 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.

Depending on the potential impacts identified, appropriate measures may be built into the project proposal, as part of an iterative process to avoid / reduce those potential impacts for the orthophosphate treatment being proposed. Project measures adopted within the overall design proposal may include selected placement of the orthophosphate treatment point within the WSZ; enhanced wastewater treatment (to potentially remove equivalent phosphorus levels related to the orthophosphate treatment at the WTP); reduced treatment rate; and water network leakage control. 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 0** below.

3.5.2 Environmental Assessment Methodology

The EAM has been developed based on a conceptual model of phosphorus 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.

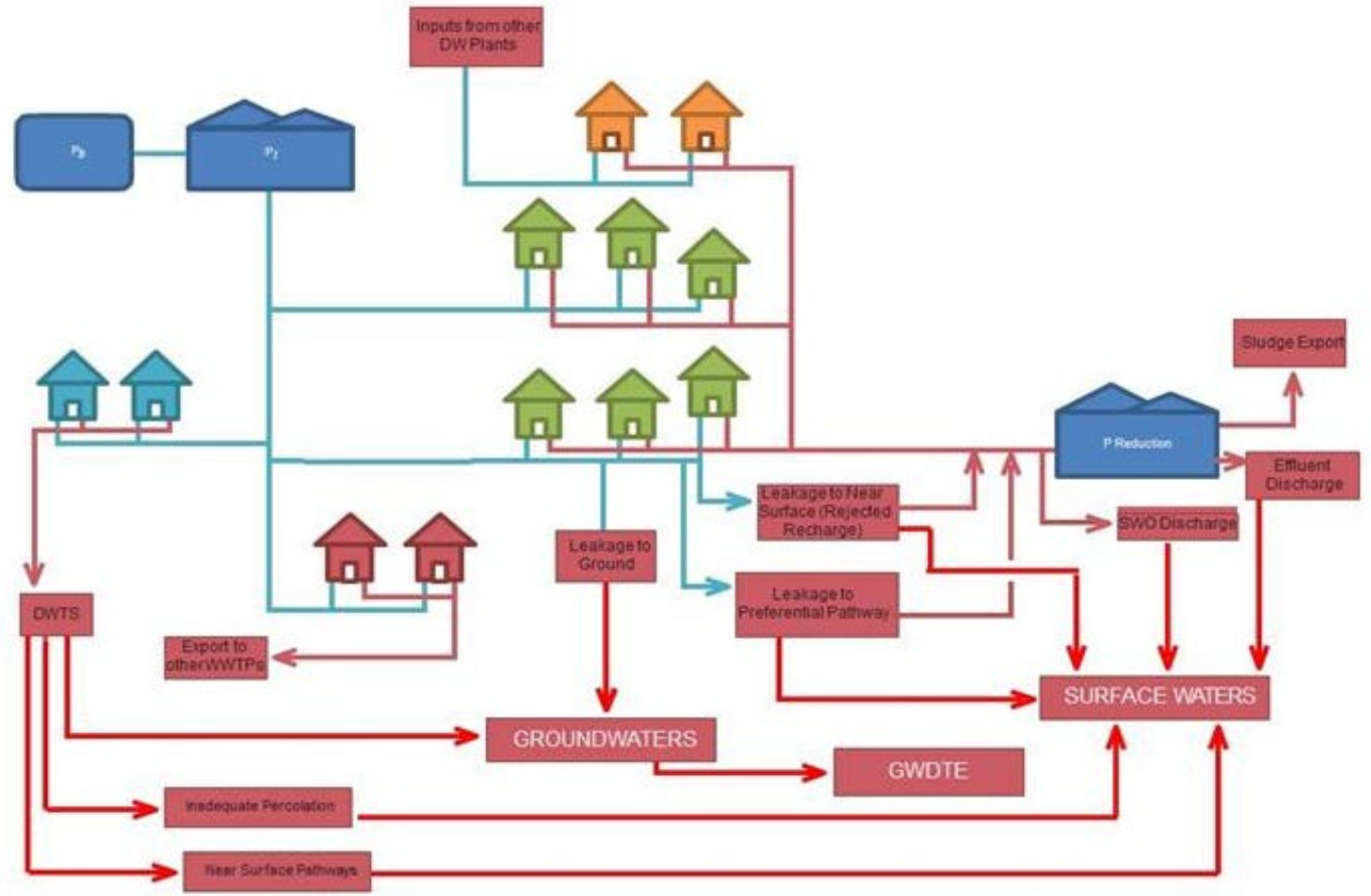


Figure 3-3: Conceptual Model of P Transfer

(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.)

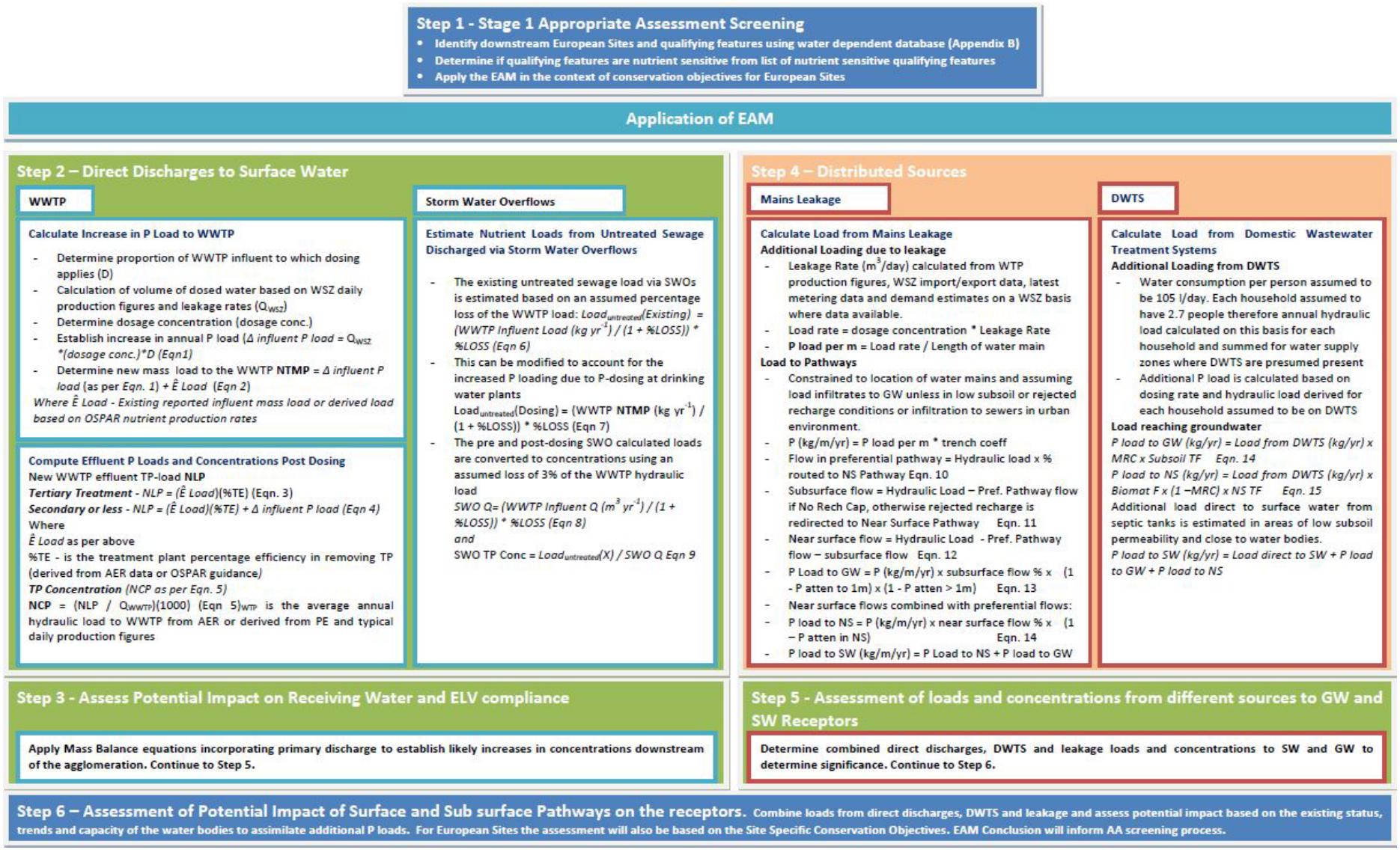


Figure 3-4: Stepwise Approach to the Environmental Assessment Methodology

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 Lee Road 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 Lee Road 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	001058	No	Yes	Yes - RWB & TWB (Lee & Lee (Cork) Estuary, Lough Mahon)	No	Yes
2	Cork Harbour SPA	004030	No	Yes	Yes - RWB & TWB (Lee & Lee (Cork) Estuary, Lough Mahon)	No	Yes
3	The Gearagh SAC	000108	No	Yes	No	Yes (Ballinhassig East; Lee Gravels)	Yes
4	The Gearagh SPA	004109	No	Yes	No	Yes (Ballinhassig East; Lee Gravels)	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 Lee Road 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.

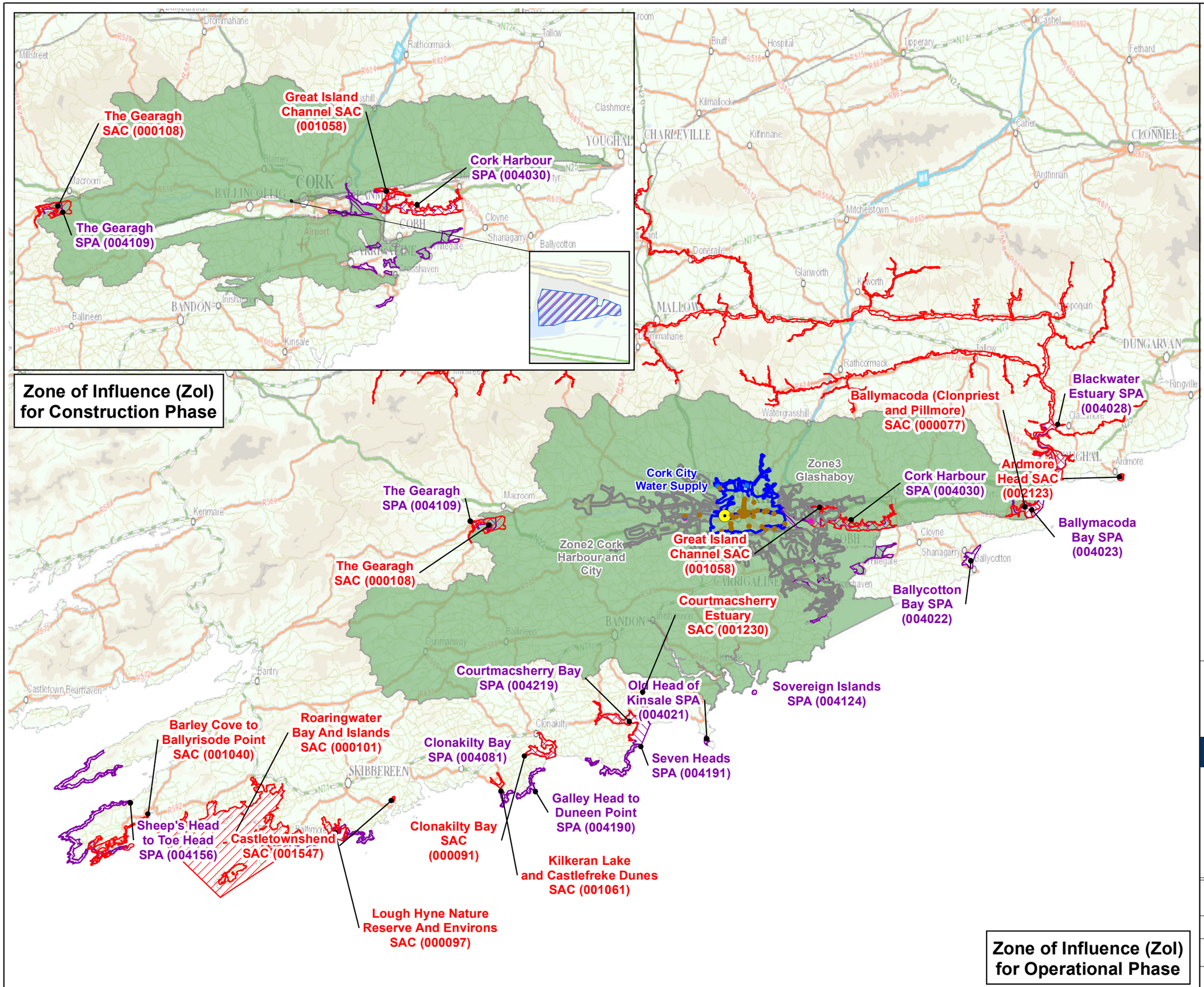
[4] All European sites overlying or supporting connectivity to this groundwater body have been assessed to determine potential source pathway receptors. The Lee Valley Gravels comprises fluvial deposits in the valley of the River Lee and intrudes into the centre of Ballinhassig East groundwater body, therefore there is likely to be a high level of interaction between the two water bodies. The groundwater flow paths in Ballinhassig East are between 30m to 300m, discharging to surface water features. As The Gearagh SAC and SPA are located > 40 km from the WTP and have only a hydrogeological connection via Ballinhassig East/Lee Valley Gravels, they are excluded from further assessment.

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

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
1	Great Island Channel SAC	SAC 001058	Yes	Yes	Yes - RWB & TWB (Lee & Lee (Cork) Estuary, Lough Mahon)	No	Yes
2	The Gearagh SAC	SAC 000108	Yes	Yes	No	Yes (Ballinhassig East)	Yes
3	Ballymacoda (Clonpriest and Pillmore) SAC	SAC 000077	Yes	Yes	Yes – CWB (Western Celtic Sea, Youghal Bay)	No	Yes
4	Blackwater River (Cork / Waterford) SAC	SAC 002170	**Yes**	**Yes**	Yes – CWB (Western Celtic Sea, Youghal Bay)	No	Yes
5	Ardmore Head SAC	SAC 002123	**Yes**	**Yes**	Yes – CWB (Western Celtic Sea)	No	Yes
6	Courtmacsherry Estuary SAC	SAC 001230	**Yes**	**Yes**	Yes – CWB (Western Celtic Sea, Courtmacsherry Bay)	No	Yes
7	Clonakilty Bay SAC	SAC 000091	**Yes**	**Yes**	Yes – CWB (Western Celtic Sea, Clonakilty Bay)	No	Yes
8	Kilkeran Lake and Castlefreke Dunes SAC	SAC 001061	**Yes**	**Yes**	Yes – CWB (Western Celtic Sea, Roscarberry Bay)	No	Yes
9	Castletownshend SAC	SAC 001547	**Yes**	**Yes**	Yes – CWB (Western Celtic Sea, Roscarberry Bay)	No	Yes
10	Lough Hyne Nature Reserve and Environs SAC	SAC 000097	**Yes**	**Yes**	Yes – CWB (Western Celtic Sea)	No	Yes
11	Roaringwater Bay and Islands SAC	SAC 000101	**Yes**	**Yes**	Yes – CWB (Western Celtic Sea)	No	Yes
12	Barley Cove to Ballyrisode Point SAC	SAC 001040	**Yes**	**Yes**	Yes – CWB (Western Celtic Sea)	No	Yes
13	The Gearagh SPA	SPA 004109	Yes	Yes	No	Yes (Ballinhassig East)	Yes
14	Cork Harbour SPA	SPA 004030	Yes	Yes	Yes - RWB & TWB (Lee & Lee (Cork) Estuary, Lough Mahon)	No	Yes
15	Ballycotton Bay SPA	SPA 004022	**Yes**	**Yes**	Yes – CWB (Western Celtic Sea, Ballycotton Bay)	No	Yes
16	Ballymacoda Bay SPA	SPA 004023	Yes	Yes	Yes – CWB (Western Celtic Sea, Youghal Bay)	No	Yes

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



Legend

LEMA Emission Type

- Primary Discharge Point
- Secondary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- Lee Road 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: UISCE ÉIREANN : IRISH WATER

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Figure 4.1

Cork City Water Supply
European Sites within the ZoI of the Proposed Project

RPS

Scale: 1:500,000 @ A3	Date: 25/07/2019
File Ref: MDW0766Arc0003aF04	Map Projection: Irish National Grid (TM65)

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 and those included, are detailed in **Table 4-3** and are displayed in **Figure 4-2.** Two European Sites have been included for further assessment for the operational and construction phase in Sections 5 and 6, with justification provided below.

The construction phase of the proposed project will take place within the confines of the existing Lee Road WTP. There is potential for surface water connectivity to the Great Island Channel SAC and Cork Harbour SPA. The WTP is located within the Ballinhassig East (IE_SW_G_004) groundwater body and the Great Island Channel SAC and Cork Harbour SPA overlie this groundwater body. Potential source impact pathways between the proposed development site and these European Sites have identified in **Table 4-1** above. Both The Gearagh SAC and The Gearagh SPA were excluded from further assessment due to the scale of the proposed works and the distance between the proposed construction works and the European Sites. Great Island Channel SAC and Cork Harbour SPA are discussed further in **Table 5-1**.

The WSZ for the operational phase for Cork City Water Supply Zone is located adjacent to the Lee River. The WSZ directly intersects the Lee (Cork) Estuary Upper (IE_SW_060_0950) and the Lee (Cork) Estuary Lower (IE_SW_060_0900) and Lough Mahon (IE_SW_060_0750) transitional water bodies. Two European Sites are connected to the WSZ via these pathways, Great Island Channel SAC and Cork Harbour SPA, and these sites are included for further assessment in Section 5 and Section 6. In addition to the surface pathways, Cork Harbour SPA is directly intersected by the WSZ and is therefore included for further assessment in Section 6. Great Island Channel SAC is hydrologically connected to the WSZ via the Lee River and Lough Mahon. As Lough Mahon is directly intersected by the WSZ the SAC is included for further assessment in Section 5 and 6.

The WSZ also intersects four groundwater bodies: Ballincollig (IE_SW_G_002); Ballinhassig_East (IE_SW_G_004); Kinsale Landfill (IE_SW_G_091); and Lee Valley Gravels GWB Group (IE_SW_G_094). The Cork Harbour SPA also intersects Ballincollig (IE_SW_G_002) and Ballinhassig East (IE_SW_G_004) while Great Island Channel SAC intersects Ballinhassig East (IE_SW_G_004).

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 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 the GSI[5], and was consulted in making the assessment.

Ballincollig (IE_SW_G_002) is a karstic groundwater body. The highly permeable aquifer supports a regional scale flow system. Groundwater flow paths can be up to several kilometres long but may be

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

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. The Cork Harbour SPA is directly intersected by the WSZ within the Ballincollig (IE_SW_G_002) groundwater body. Therefore, there is potential for the transfer of orthophosphate from the WSZ to the SAC via the groundwater body. The potential impacts associated with dosing are assessed in Section 5 and Section 6 below.

Ballinhassig East (IE_SW_G_004) is poorly productive bedrock. In these rocks groundwater flow paths are expected to be relatively short, typically from 30-300 m, with groundwater discharging to small springs, or to the streams that traverse the aquifer. Flow directions are expected to approximately follow the local surface water catchments. As Cork Harbour SPA is within 200m of the WSZ, there is potential for the transfer of orthophosphate from the WSZ to the SPA via the groundwater body Ballinhassig East (IE_SW_G_004). The potential impacts associated with dosing are assessed in Section 5 and Section 6 below. Both The Gearagh SAC and the Gearagh SPA are connected to the WSZ via this groundwater body; however they are located more than 40km west of the WSZ therefore, due to the nature of the groundwater flow paths, these site have been excluded from further assessment. The Lee Valley Gravels (IE_SW_G_094) groundwater body is located within Ballinhassig East and comprises fluvial deposits along the valley of the River Lee. There is no characterisation information available for this water body on GSI, however due to the nature of a gravel aquifer, it can be assumed that there is interaction between the two groundwater bodies. In addition, the likely flow within the Lee Valley Gravels will be along the River Lee to discharge at the coast.

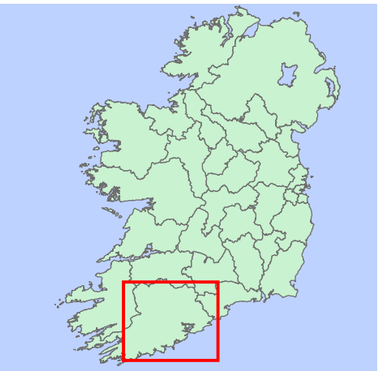
A large coastal water body, the Western Celtic Sea (HAs 18;19;20) (IE_SW_010_0000), lies downstream of the WSZ. The ZoI for the operational phase has been terminated at Cork Harbour (the EAM results demonstrate that the additional orthophosphate concentration as a result of the proposed dosing is not detectable; 0.0000 mg/l) therefore all sites located downstream of this water body in the Western Celtic Sea have been excluded from further assessment in Section 5 and Section 6 on this basis. The 20 European Sites excluded are: Ballymacoda (Clonpriest and Pillmore) SAC, Blackwater River (Cork / Waterford) SAC, Ardmore Head 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, Ballycotton Bay SPA, Ballymacoda Bay SPA, Blackwater Estuary SPA, Sovereign Islands SPA, Old Head of Kinsale SPA, Courtmacsherry Bay SPA, Seven Heads SPA, Clonakilty Bay SPA, Galley Head to Duneen Point SPA and Sheep's Head to Toe Head 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.

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 Operational 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 (*Vanellus vanellus*)	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
			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		



Legend

LEMA Emission Type

- Primary Discharge Point
- Secondary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- Lee Road 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 3.25 6.5 13 Kilometres

Client

UISCE ÉIREANN : IRISH WATER

Project Lead Mitigation Plan
Corrective Water Treatment Works

Title

Figure 4.2

Cork City Water Supply

European Sites within the ZoI which are hydro(geo)logically connected

RPS

Scale: 1:350,000 @ A3	**Date:** 25/07/2019
File Ref: MDW0766Arc0003bF04	**Map Projection:** Irish National Grid (TM65)

Zone of Influence (ZoI) for Operational Phase

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 Lee Road 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;
- 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 Lee Road 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 orthophosphate 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 Lee Road 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 Lee Road WTP into account and therefore included all possible locations. Lee Road WTP is not located within of adjacent to any European Site. The assessment of impacts associated with the construction of the corrective water treatment works at Lee Road 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 Lee Road 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
- 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[6]	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 Lee Road WTP. Lee Road WTP is not located within or adjacent to any European Site. **Surface Water** The WTP is located adjacent to the River Lee (Cork)_090 (IE_SW_19L030800). The Great Island Channel SAC is located 13km downstream of the WTP. A flood embankment is in place to protect the WTP from the river. The embankment will act as a barrier to prevent surface run-off from the works area to the river. There are no other surface pathways from the WTP to the Lee (Cork)_090 (IE_SW_19L030800). In the absence of pathways, there is no potential for surface run-off to cause a deterioration in the water quality of the Lee (Cork)_090 (IE_SW_19L030800) through sediment laden run-off, dust emissions or environmental incidents. Therefore, there is no potential for likely significant effects on the Great Island Channel SAC as a result of the construction of the corrective water treatment works at Lee Road WTP. The Cork Harbour SPA is located 8km downstream of the WTP. A flood embankment is in place to protect the WTP from the river. The embankment will act as a barrier to prevent surface run-off from the works area to the river.
	Lough Mahon (IE_SW_060_0750)	TWB	
	Lee (Cork) Estuary Lower (IE_SW_060_0900)	TWB	
	Lee (Cork) Estuary Upper (IE_SW_060_0950)	TWB	
	Ballinhassig East (IE_SW_G_004)	GWB	
Cork Harbour SPA (004030)	Lee (Cork)_090 (IE_SW_19L030800)	RWB	
	Lough Mahon (IE_SW_060_0750)	TWB	
	Lee (Cork) Estuary Lower (IE_SW_060_0900)	TWB	

[6] Monitoring period is annual unless specified.

Site Name (Code)	Contributing WB Code_Name	WB Type[6]	Evaluation of Potential Significant Effects
	Lee (Cork) Estuary Upper (IE_SW_060_0950)	TWB	There are no other surface pathways from the WTP to the Lee (Cork)_090 (IE_SW_19L030800). In the absence of pathways, there is no potential for surface run-off to cause a deterioration in the water quality of the Lee (Cork)_090 (IE_SW_19L030800) through sediment laden run-off, dust emissions or environmental incidents. Therefore, there is no potential for likely significant effects on the Cork Harbour SPA located 8km downstream, as a result of the construction of the corrective water treatment works at Lee Road WTP. **Groundwater** The WTP overlies the Lee Valley Gravels GWB (IE_SW_G_094) which is immediately adjacent to Ballinhassig East (IE_SW_G_004). Great Island Channel SAC and Cork Harbour SPA which are located 13km and 8km downstream of the WTP location respectively, intersect Ballinhassig East (IE_SW_G_004). 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 water table in the Ballinhassig GWB can vary from a few metres up to more than 10 m below ground surface, depending upon topography. Groundwater is generally unconfined. Flow path lengths are generally short, ranging from 30-300 m. Local groundwater flow directions are controlled by local topography. At the Lee Road WTP, groundwater flow direction will be to the Lee (Cork)_090 (IE_SW_19L030800). As the excavation works will not be extensive (up to c. 75m for pipework and to a depth of 700mm) interference with water table will be localised, minor and temporary. Therefore, there is no potential for likely significant effects on the Great Island Channel SAC located 13km downstream or the Cork Harbour SPA located 8 km downstream, as a result of the construction of the corrective water treatment works at Lee Road WTP.
	Cork Harbour (IE_SW_060_0000)	CWB	
	Outer Cork Harbour (IE_SW_050_0000)	CWB	
	Ballinhassig East (IE_SW_G_004)	GWB	

5.3.2 Operational Phase

In the case of the additional orthophosphate load due to dosing at Lee Road 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. Where a water body does not have monitored orthophosphate concentrations, a conservative approach is used whereby the surrogate indicative quality is calculated based on the ecological status assigned to that water body by the EPA.

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 transitional or coastal water body does not have monitored orthophosphate concentrations or salinity levels, a conservative approach is used whereby the surrogate indicative quality is calculated based on the ecological status assigned to that water body by the EPA but the more conservative freshwater orthophosphate limits for the different indicative quality bands are applied[7].

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

[7] The conservative thresholds in transitional and coastal water bodies for orthophosphate indicative quality in unassigned water bodies 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 water bodies 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.

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 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 0.5 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 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, where 2019 - 2021 concentrations for a river water body are available, the 2019-2021average 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[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
Great Island Channel SAC (001058)	IE_SW_19B020500 Blarney_010	RWB	Poor Downwards Far	0.068	0.087	1.6	0.0001	0.068	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	1.6	0.0000	0.056‡	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled conc. is undetectable, 0.0000mg/l, therefore there is no risk of deterioration in the ortho P indicative quality or of preventing the achievement of WFD objectives.
	Bride (Cork City)_010 (IE_SW_19B140110)	RWB	Moderate Downwards Near	0.046	0.051	7.8	0.0002	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.

[8] Monitoring period is annual unless specified.
[9] Surrogate indicative quality in italic.
[10] Distance to threshold in parentheses.
[11] Baseline year is 2014 for surface water bodies and 2012 for groundwater bodies.
[12] Surrogate concentration is given in italic mg/l
[13] 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.
[14] 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[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
	Bride (Cork City)_020 (IE_SW_19B140300)	RWB	*Poor*	*0.077*	*0.087*	*50.8*	*0.0014*	*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.
	Curragheen (Cork City)_010 (IE_SW_19C120740)	RWB Multiple Monitoring Points	*Moderate*	*0.046*	*0.051*	*10.5*	*0.0002*	*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.
			Moderate	*0.046*	*0.051*			*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[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
	Glashaboy (Lough Mahon)_020 (IE_SW_19G010400)	RWB Multiple Monitoring Points	Good Upwards Far	0.033	0.033	1.9	0.0000	0.033‡	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.
			Moderate Upwards Far	0.039	0.051			0.039*	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.
	Glashaboy (Lough Mahon)_030 (IE_SW_19G010600)	RWB	*Good*	*0.030*	*0.033*	*3.1*	*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.

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
	Glasheen (Cork City)_010 (IE_SW_19G040700)	RWB	Poor	0.077	*0.087*	27.7	0.0005	0.077	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.
	Glennamought Trib Bride_010 (IE_SW_19G880990)	RWB	*Moderate*	*0.046*	*0.051*	*3.8*	*0.0002*	*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.
	Moneygurney 19_010 (IE_SW_19M300900)	RWB	*Moderate*	*0.046*	*0.051*	4.1	0.0002	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[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
	Lee (Cork)_090 (IE_SW_19L030800)	RWB	High Downwards Far	0.014	0.019	18.9	0.0000	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.
	Two Pot (Cork City)_010 (IE_SW_19T050890)	RWB	Poor Upwards Far	0.046	0.051	0.4	0.0000	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.
	Lee (Cork) Estuary Upper (IE_SW_060_0950)	TWB Summer	Good Downwards Near	0.013	*0.019*	107.9	0.0001	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.

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
		TWB Winter	High Downwards Near	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.
	Lee (Cork) Estuary Lower (IE_SW_060_0900)	TWB Summer	Good Downwards Near	0.043	0.050	187.5	0.0001	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.
		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.

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
	Lough Mahon (IE_SW_060_0750)	TWB Summer	High Downwards Far	0.014	0.020	2319.9	0.0000	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‡	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.
	Glashaboy Estuary IE_SW_060_0800	TWB Summer	High Downwards Far	0.021	0.020	3.1	0.0000	0.021 ‡	The post dosing conc. exceeds the 75% upper indicative quality threshold; however, this is due to the baseline ortho P conc. The modelled conc. is undetectable (0.0000mg/l) 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[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
		TWB Winter	High Downwards Far	0.031	0.036			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.
	Ballinhassig East (IE_SW_G_004)	GWB (multiple monitoring points)	Good Upwards Near	0.034	0.026	24.0	0.0001	0.034	Some monitoring points are failing to achieve Good indicative quality. The modelled additional concentration is negligible (0.0001 mg/l) and below 5% of Good / High boundary. There is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			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	0.035			0.015	
			Good Upwards Far	0.006	0.026			0.006	

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
			Good Downwards Far	0.023	0.026			0.023	
			Failing to achieve Good Upwards Far	0.268	-			0.268	
			Good Upwards Far	0.006	0.026			0.006	
			Good Upwards Far	0.026	0.026			0.026	
			Failing to achieve Good Upwards Far	0.188	-			0.188	
			Good Upwards Far	0.0512	0.026			0.012	
			Failing to achieve Good Upwards Far	0.043	-			0.043	
Cork Harbour SPA (004030)	IE_SW_19B020500 Blarney_010	RWB	Poor Downwards Far	0.068	0.087	1.6	0.0001	0.068	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[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
	IE_SW_19M010600 Martin_040	RWB	Moderate Upwards Near	0.056	0.051	1.6	0.0000	0.056‡	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled conc. is undetectable, 0.0000mg/l, therefore there is no risk of deterioration in the ortho P indicative quality or of preventing the achievement of WFD objectives.
	Bride (Cork City)_010 (IE_SW_19B140110)	RWB	Moderate Downwards Near	0.046	0.051	7.8	0.0002	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.
	Bride (Cork City)_020 (IE_SW_19B140300)	RWB	*Poor*	*0.077*	*0.087*	*50.8*	*0.0014*	*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.

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
	Curragheen (Cork City)_010 (IE_SW_19C120740)	RWB Multiple Monitoring Points	*Moderate*	*0.046*	*0.051*	*10.5*	*0.0002*	*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.
			Moderate	*0.046*	*0.051*			*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.
	Glashaboy (Lough Mahon)_020 (IE_SW_19G010400)	RWB Multiple Monitoring Points	Good Upwards Far	0.033	0.033	1.9	0.0000	0.033‡	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[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
			Moderate Upwards Far	0.039	0.051			0.039*	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.
	Glashaboy (Lough Mahon)_030 (IE_SW_19G010600)	RWB	*Good*	*0.030*	*0.033*	*3.1*	*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.
	Glasheen (Cork City)_010 (IE_SW_19G040700)	RWB	Poor	0.077	*0.087*	27.7	0.0005	0.077	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[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
	Glennamought Trib Bride_010 (IE_SW_19G880990)	RWB	*Moderate*	*0.046*	*0.051*	*3.8*	*0.0002*	*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.
	Moneygurney 19_010 (IE_SW_19M300900)	RWB	*Moderate*	*0.046*	*0.051*	4.1	0.0002	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.
	Lee (Cork)_090 (IE_SW_19L030800)	RWB	High Downwards Far	0.014	0.019	18.9	0.0000	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.

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
	Two Pot (Cork City)_010 (IE_SW_19T050890)	RWB	Poor Upwards Far	0.046	0.051	0.4	0.0000	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.
	Lough Mahon (IE_SW_060_0750)	TWB Summer	High Downwards Far	0.014	0.020	2319.9	0.0000	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‡	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[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
	Lee (Cork) Estuary Upper (IE_SW_060_0950)	TWB Summer	Good Downwards Near	0.013	*0.019*	107.9	0.0001	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 Near	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.
	Lee (Cork) Estuary Lower (IE_SW_060_0900)	TWB Summer	Good Downwards Near	0.043	0.050	187.5	0.0001	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.

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
		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.
	Glashaboy Estuary IE_SW_060_0800	TWB Summer	High Downwards Far	0.021	0.020	3.1	0.0000	0.021 ‡	The post dosing conc. exceeds the 75% upper indicative quality threshold; however, this is due to the baseline ortho P conc. The modelled conc. is undetectable (0.0000mg/l) 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	0.031	0.036			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.

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
	IE_SW_060_0000 Cork Harbour	CWB Summer	High Downwards Far	0.003	0.019	2319.9	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.
		CWB Winter	Good Downwards Near	0.028	0.045			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_050_0000 Outer Cork Harbour	CWB Summer	High Downwards Far	0.003	*0.019*	2319.9	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.

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
		CWB Winter	High Downwards Near	0.028	*0.045*		0.0000	0.024‡	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*	53.8	0.0045	0.022	The modelled concentration is >5% High/Good indicative quality boundary. The post dosing baseline however is <75% of the upper indicative quality threshold. Therefore, there no risk of deterioration in the surrogate Ortho P indicative quality or to the achievement of WFD objectives. The additional Ortho P load in this GWB is not impacting on the ability of its overlying water bodies to achieve their WFD objectives
	Ballinhassig East (IE_SW_G_004)	GWB (multiple monitoring points)	Good Upwards Near	0.034	0.026	24.0	0.0001	0.034	Some monitoring points are failing to achieve Good indicative quality. The modelled additional concentration is negligible (0.0001 mg/l) and below 5% of Good / High boundary. There is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.013	0.026			0.013	
			Failing to achieve Good Upwards Far	0.051	-			0.051	

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
			Failing to achieve Good Upwards Far	0.037	-			0.038	
			Good Upwards Far	0.021	0.026			0.021	
			Good None Far	0.015	0.035			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 Far	0.006	0.026			0.006	
			Good Upwards Far	0.026	0.026			0.026	
			Failing to achieve Good Upwards Far	0.188	-			0.188	

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Ortho P Indicative Quality[9] and Trends[10]	Baseline[11] Ortho P Conc.[12] (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.[13] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[14]	Evaluation
			Good Upwards Far	0.0512	0.026			0.012	
			Failing to achieve Good Upwards Far	0.043	-			0.043	

*Monitoring undertaken by IW to establish Orthophosphate baseline concentration.
‡ Load from WWTP / SWO following treatment added

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 5-3**). 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 5-3 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 5-4**, 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 5-3: Increased loading/concentration due to Orthophosphate Dosing – Dosing rate = 0.5 mg/l

Agglom. and Discharge Type	ELV from WWDL (mg/l)	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 Non-compliant with ELV set in the WWDL in the 2017 AER	**Existing**	88006.0	0.951	0.761	1.293
		Post Dosing	92120.2	0.995	0.796	1.353
Cork City SWOs (48 no.)	n/a	**Existing**	2615.6	0.97	0.776	1.319
		Post Dosing	2735.4	1.015	0.812	1.380
	2.0 ortho P & TP	**Existing**	364.2	0.102	0.082	0.139

Agglom. and Discharge Type	ELV from WWDL (mg/l)	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	Compliant with ELV set in the WWDL in the 2017 AER	**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	265.2	2.559	2.047	3.480

Table 5-4: Mass balance assessment based on 0.5 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) [15]	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	0.0322	0.1
Ballincollig New (D0049-01)	Lee (Cork)_090 (IE_SW_19L030800)	0.0242	0.0245	0.0245	0.0

Cork City Agglomeration

The Cork City agglomeration (D0033-01) operates secondary treatment. The existing and post dosing effluent concentrations for TP predicted from the model are compliant with the TP ELV (Table 5-3). The agglomeration was compliant with ELVs in 2021 for Total P.

As this agglomeration currently does not receive tertiary treatment the EAM model assumes that the additional orthophosphate load is not removed in the treatment process and is added to the effluent loads from the WWTP. The effluent is discharged into the Lough Mahon (IE_SW_060_0750) which is hydrologically connected to Great Island Channel SAC and Cork Harbour SPA. Impact from orthophosphate dosing under the current scenario, i.e. secondary treatment, causes an estimated 0.1% increase in concentration levels in the receiving water when fluvial and daily tidal exchange volumes are taken into account the (**Table 5-4, Appendix C**). 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 Lee Road 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

[15] Annual mean from AER u/s monitoring point

orthophosphate ELVs in 2021. When mean flows are taken into account the increase in the receiving water is not detectable (0.0%) (Table 5-4). 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.

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**). One river water body has a modelled concentration above 5% of the Good / High boundary (0.00125 mg/l) and is highlighted in the table above: IE_SW_19B140300 Bride (Cork City)_020.

The predicted loads in the IE_SW_19B140300 Bride (Cork City)_020 water body arising from subsurface pathways is relatively large, compared to other water bodies within the WSZ, resulting in predicted concentration increases that is greater than 5% of the threshold between high and good indicative quality in the Bride (Cork City_020). However, some of the load has been re-apportioned to other water bodies based on the physical characteristics of the water bodies as described below.

The catchment of the river water body IE_SW_19B140300 Bride (Cork City)_020 is located in Cork City Centre on the North Bank of the Lee estuary. The load associated with the southern portion of the water body has been apportioned directly to the Lee Estuary based on the topography and likely flow paths directly to the estuary. The load from the remainder of the water body is apportioned to the Bride River. The additional load from sub surface pathways represents no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

The catchment of IE_SW_19G040700 Glasheen (Cork City)_010 is located in Cork City Centre on the South bank of the Lee estuary. The load associated with the western portion of the water body has been apportioned to the Glasheen River. The load associated with the northern portion has been apportioned to the Lee Estuary. The load associated with the eastern portion of the water body has been apportioned to Lough Mahon.

The predicted increase in orthophosphate concentration in transitional water bodies from sub surface pathways is virtually nil due to the dilution capacity provided by fluvial and tidal flows. The greatest change will be in Lee (Cork) Estuary Lower (IE_SW_060_0900), where orthophosphate concentrations will increase by 0.0001 mg/l post dosing. Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

5.3.4.2 Groundwater Assessment

The EAM predicted loads to some groundwater bodies (GWBs) are significant for Ballincollig (IE_SW_G_002) and Lee Valley Gravels Group (IE_SW_G_094), (i.e. exceed 5% of the Good/ Fail boundary) due to the susceptibility and hydrological conditions in general as shown in **Table 6 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.

Lee Valley Gravels group does not underly any European site, Cork Harbour SPA is located approx. 1.6km downstream within the Lee Cork Harbour Estuary Lower to which the GWB discharges. The predicted baseline concentration following dosing not exceed the 75% of the upper indicative quality threshold. Therefore, there is no risk of deterioration in the ortho P indicative quality or to the achievement of WFD objectives for this GWB.

For Ballincollig GWB, the predicted baseline concentration following dosing does not exceed the 75% of the upper indicative quality threshold (**Table 6 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_1 water 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 negligible (0.0001mg/l) and well below 5% of the Good / Fail threshold value. Therefore, there is no risk of deterioration in the ortho P indicative quality or to the achievement of WFD objectives for this GWB.

5.3.5 Combined Assessment

Table 7 of Appendix C provides details of the combined orthophosphate inputs to river waterbodies from direct discharges, DWWTSs and leakage loads. One river water body has a modelled concentration above 5% of the Good / High boundary (0.00125 mg/l) and is highlighted in the table above: IE_SW_19B140300 Bride (Cork City)_020.

The predicted loads in the IE_SW_19B140300 Bride (Cork City)_020 water body arising from subsurface pathways is relatively large, compared to other water bodies within the WSZ, resulting in predicted concentration increases that are greater than 5% of the threshold between high and good indicative quality in the Bride (Cork City_020). However, some of the load has been re-apportioned to other water bodies based on the physical characteristics of the water bodies as described below.

The catchment of the river water body IE_SW_19B140300 Bride (Cork City)_020 is located in Cork City Centre on the North Bank of the Lee estuary. The load associated with the southern portion of the water body has been apportioned directly to the Lee Estuary based on the topography and likely flow paths directly to the estuary. The load from the remainder of the water body is apportioned to the Bride River.

The predicted increased loading in the Bride (Cork City)_020 will not result in an increase in concentration that will exceed 75% of the of the upper indicative quality threshold. Therefore, there is a no risk of deterioration in the ortho P indicative quality or to the achievement of WFD objectives for this water body.

The modelled additional concentration for the remaining surface waterbodies are low and within 5% of the High/Good boundary (i.e. <0.00125mg/l) with the highest modelled additional increase of 0.0005mg/l in Glasheen (Cork City)_010. Therefore, there is no risk of deterioration in the indicative quality of these waterbodies or of preventing the achievement of WFD objectives**.**

Table 8 of Appendix C outlines the increased loading and concentrations to transitional waterbodies receiving flows from river waterbodies connected to the WSZ.

For the winter orthophosphate indicative quality in Outer Cork Harbour (IE_SW_050_0000) the 75% upper indicative quality threshold is exceeded, however this is due to the existing baseline concentrations. The modelled additional increase in orthophosphate concentrations in all transitional and coastal water bodies due to the proposed level of dosing is undetectable (0.0000mg/l) or negligible (0.0001mg/l) (i.e. <5% of the Good/High boundary). Therefore, there is no risk of deterioration in the indicative quality of these transitional or coastal waterbodies or of preventing the achievement of WFD objectives**.**

5.3.6 Assessment of Cumulative Impacts from other WSZs

The cumulative loads to the Lee river and estuary associated with the orthophosphate dosing have been assessed with the Lee Road Public Supply WSZ. The common water bodies that are impacted by the WSZs supplied by these WTPs have been summarised in **Table 5-5** below.

- 006 Inniscarra WTP Cork Zone 2 City and Harbour Water Supply (0500PUB3401) and
- 026 Glashaboy WTP Zone 3 Glashaboy (0500PUB3303)

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 river waterbodies exceed the 5% Good/High indicative quality threshold (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).

In all cases the potential baseline following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk deterioration in the ortho P indicative quality and of 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 Glashaboy Estuary (IE_SW_060_0800) of 0.0005mg/l (i.e. <5% of the Good/High indicative quality boundary). In Outer Cork Harbour (IE_SW_050_0000), during the winter monitoring period, the 75% upper indicative quality threshold is exceeded however this is due to the baseline concentrations. Therefore, there is no risk deterioration in the current moderate ortho P indicative quality and of the achievement of WFD objectives for the transitional coastal waterbodies.

Table 5-5: Cumulative assessment of the increased loading and concentrations to receiving waterbodies from Lee Road Public Supply and other WSZs proposed for corrective water treatment in the upstream catchments

NAME / EU_CD	WB Type/Period	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 Ortho P Indicative Quality Upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Modelled increase in Conc. Using Flows (30%ile tidal or gauged) mg/l	PO4 Potential Baseline Conc. following dosing mg/l
Bride (Cork City)_010 IE_SW_19B140110	RWB	Moderate Upwards Near	0.046	0.051	8.6	0.0002	0.046
Bride (Cork City)_020 IE_SW_19B140300	*RWB*[16]	*Poor*	*0.077*	*0.087*	*59.9*	*0.0016*	*0.078‡ **
Curragheen (Cork City)_010 IE_SW_19C120740	RWB Multiple Monitoring Points	Moderate Upwards Far	0.046	0.051	80.3	0.0017	0.047
		Moderate Upwards Near	0.046	0.051			0.047
Glasheen (Cork City)_010 IE_SW_19G040700	RWB	Poor	0.077	0.087	110.1	0.0021	0.078
Lee (Cork)_090 IE_SW_19L030800	RWB	High Downwards Far	0.014	0.019	206.4	0.0002	0.014
Moneygurney 19_010 IE_SW_19M300900	RWB	*Moderate*	0.046	0.051	102.2	0.0048	0.050
Two Pot (Cork City)_010 IE_SW_19T050890	RWB	Poor Upwards Far	0.046	0.051	10.4	0.0010	0.046
Martin_040 (IE_SW_19M010600)	RWB	Moderate Upwards Near	0.056	0.051	16.6	0.0002	0.056
Glashaboy (Lough Mahon)_030 (IE_SW_19G010600)	RWB	*Poor*	*0.030*	0.033	65.2	0.0005	0.031‡
Glashaboy Estuary IE_SW_060_0800	TWB Summer	High Downwards Near	0.021	0.020	65.2	0.0005	0.022‡
	TWB Winter	Good Downwards Far	0.031	0.036			0.032
Lough Mahon IE_SW_060_0750	TWB Summer	High Downwards Far	0.014	0.020	6489.1	0.0001	0.014‡

[16] Bride (Cork City)_020 (IE_SW_19B140300) – a monitoring program started in 2014 with five monitoring points. Data indicates that one of these is at Moderate Ortho P Indicative Quality and with a concentration above 75% of the upper threshold while the other is of Poor indicative quality but is far from the upper threshold. The most downstream monitoring point is MP15 Leitrim Street which is at Bad Indicative Quality (0.0256 mg/l), being most representative of the sub-basin.

NAME / EU_CD	WB Type/Period	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 Ortho P Indicative Quality Upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Modelled increase in Conc. Using Flows (30%ile tidal or gauged) mg/l	PO4 Potential Baseline Conc. following dosing mg/l
	TWB Winter	Good Downwards Far	0.027	0.045			0.027*
Lee (Cork) Estuary Upper IE_SW_060_0950	TWB Summer	High Downwards Far	0.013	0.019	376.4	0.0003	0.013‡
	TWB Winter	High Downwards Near	0.013	0.019			0.013
Lee (Cork) Estuary Lower IE_SW_060_0900	TWB Summer	Good Downwards Near	0.043	0.050	376.4	0.0002	0.044‡ *
	TWB Winter	Good Downwards Near	0.043	0.050			0.044*
Cork Harbour IE_SW_060_0000	CWB Summer	High Downwards Far	0.003	0.019	8478.8	0.0000	0.003‡
	CWB Winter	Good Downwards Near	0.028	0.045			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	0.023	0.019			0.024*

5.3.7 Conclusions

The modelled increased orthophosphate dosing concentrations from direct pathways from the agglomerations within the WSZ do not result in a noticeable effect with orthophosphate concentrations in the receiving Lough Mahon estuary (a fraction of 1%) and in Lee (Cork)_090 river water body (0%), as shown by the mass balance assessment in **Table 5 Appendix C**.

The modelled concentrations due to subsurface pathways are insignificant in all river water bodies with the exception of _SW_19B140300 Bride (Cork City)_020]. This water body has a modelled concentration above 5% of the Good / High boundary (0.00125 mg/l) following dosing at Lee Road WTP however the post-dosing baseline concentration is <75% of upper indicative quality threshold.

In transitional and coastal waters, the 5% of the Good/High 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 (0.0001mg/l) i.e. <5% of the Good / Fail boundary.

For the Ballincollig GWB (IE_SW_G_002) the modelled concentration is >5% High/Good indicative quality boundary but is <75% of the upper indicative quality threshold. Therefore, there is a risk of deterioration in the surrogate Ortho P indicative quality or to the achievement of WFD objectives.

The cumulative assessment of dosing at Lee Road WTP together with other WTPs which may be subject to dosing in the same catchments, has demonstrated that 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 FOR LIKELY SIGNIFICANT EFFECTS

6.1 CONSTRUCTION PHASE

Lee Road WTP is not located within or directly adjacent to the boundary of any European Site. The closest sites with connectivity to the proposal are Cork Harbour SPA and the Great Island Channel SAC, located at a distance of 8km and 13km, respectively. Therefore, there is no potential for direct impacts to the European Sites as a result of the construction of the corrective water treatment works at Lee Road WTP.

The Lee Road WTP lies within 15m of the River Lee (Cork)_090 (IE_SW_19L030800). This river water body is hydrologically connected to the Great Island Channel SAC and Cork Harbour SPA via the transitional waterbodies Lee (Cork) Estuary Upper (IE_SW_060_0950); Lee (Cork) Estuary Lower (IE_SW_060_0900); and, Lough Mahon (IE_SW_060_0750). The WTP is located approximately 8km and 13km upstream of Cork Harbour SPA and Great Island Channel SAC, respectively. From the minor scale of the proposed construction works, the embankment which will act as a barrier to prevent surface run-off from the works area to the river and impact assessment presented in **Section 5.3.1** above; there are no impact pathways identified which give rise to connectivity between the proposed construction works and any other European Sites. Therefore, it has been determined that the construction of the corrective water treatment works at Lee Road WTP, individually or in combination with other plans or projects, will not to give rise to any significant adverse effect on the qualifying interests/special conservation interests of the Great Island Channel SAC and Cork Harbour SPA as a result of.

6.2 OPERATIONAL PHASE

The key pressure associated with the proposed orthophosphate dosing is the potential for increased orthophosphate levels in the receiving waters and the potential to impact upon the qualifying interests (habitats and species) identified in **Table 4-3** that are both water dependent and nutrient sensitive (**Appendix B**). The potential for such impacts to give rise to significant adverse 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 conditions (NPWS, 2014[17]), however there is 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[18]) 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

[17] NPWS 2014 Great Island Channel SAC 001058 Conservation Objectives

[18] NPWS 2014 Great Island Channel SAC 001058 Conservation Objectives Supporting Document - Marine Habitats

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 the proposed orthophosphate dosing at Lee Road WTP:

- The river waterbodies hydrologically connected to the site include: Blarney_010 (IE_SW_19B020500), Martin_040 (IE_SW_19M010600), Bride (Cork City)_010 (IE_SW_19B140110), Bride (Cork City)_020 (IE_SW_19B140300), Curragheen (Cork City)_010 (IE_SW_19C120740), Glashaboy (Lough Mahon)_020 (IE_SW_19G010400), Glashaboy (Lough Mahon)_030 (IE_SW_19G010600), Glasheen (Cork City)_010 (IE_SW_19G040700), Glennamought Trib Bride_010 (IE_SW_19G880990), Moneygurney_010 (IE_SW_19M300900), Lee (Cork)_090 (IE_SW_19L030800) and Two Pot (Cork City)_010 (IE_SW_19T050890);
- The transitional waterbodies hydrologically connected to the site include: Lough Mahon (IE_SW_060_0750), Lee (Cork) Estuary Lower (IE_SW_060_0900), Lee (Cork) Estuary Upper (IE_SW_060_0950); and
- The groundwater body hydrogeologically connected to the site is: Ballinhassig East (IE_SW_G_004).

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**.

The habitat *Mudflats and sandflats not covered by seawater at low tide* span the full extent of the SAC and are therefore susceptible to inputs from all waterbodies identified as hydrologically connected to the SAC.

The baseline orthophosphate concentration in one river waterbodies exceed the 75% upper indicative quality threshold; Martin_040 (IE_SW_19M010600),. However, the modelled additional orthophosphate concentrations is within 5% of the Good/ High boundary (i.e. <0.00125 mg/l) following dosing (0.0000mg/l) therefore there is no risk of deterioration in indicative quality or of preventing the achievement of WFD objectives for these river waterbodies.

One river water body has a modelled concentration above 5% of the Good / High boundary (0.00125 mg/l) and is highlighted in the Table 5-2 above: Bride (Cork City)_020 (IE_SW_19B14030.

The predicted loads in the Bride (Cork City)_020 (IE_SW_19B140300) water body arising from subsurface pathways is relatively large, compared to other water bodies within the WSZ, resulting in predicted concentration increases that are greater than 5% of the threshold between high and good indicative quality in the Bride (Cork City_020). However, some of the load has been re-apportioned to other water bodies based on the physical characteristics of the water bodies as described below. The catchment of the river water body IE_SW_19B140300 Bride (Cork City)_020 is located in Cork City Centre on the North Bank of the Lee estuary. The load associated with the southern portion of the water body has been apportioned directly to the Lee Estuary based on the topography and likely flow paths directly to the estuary. The load from the remainder of the water body is apportioned to the Bride River.

The predicted increased loading in the Bride (Cork City)_020 will not result in an increase in concentration that will exceed 75% of the of the upper indicative quality threshold. Therefore, there is a no risk of deterioration in the ortho P indicative quality or to the achievement of WFD objectives for this water body.

The Bride (Cork City)_020 discharges 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, approximately 9.7km from where the Bride (Cork City)_020 discharges to the coast. The modelled additional orthophosphate concentrations are low within the TWBs and are modelled as insignificant (0.0001 mg/l) for the Upper and Lower Lee (Cork) estuaries respectively and undetectable (0.0000mg/l) in Lough Mahon. This is similar for the cumulative assessment also where the modelled additional concentrations are insignificant, 0.0003mg/l, 0.0002mg and 0.0001mg/l for the Upper and Lower Lee (Cork) Estuaries and Lough Mahon respectively.

The modelled additional concentration for the remaining surface waterbodies are low and within 5% of the High/Good boundary (i.e. <0.00125mg/l) with the highest modelled additional increase of 0.0005mg/l in Glasheen (Cork City)_010. Therefore, there is no risk of deterioration in the indicative quality of these waterbodies 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 negligible (0.0001 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). This section is located 4km east of the WSZ. 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.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Lee Road 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 site found no nutrient specific targets for this habitat (NPWS, 2014[17]). Several attributes were highlighted as important such as flooding regime. The target is to maintain the natural tidal regime. The conservation objectives supporting document on coastal habitats (NPWS, 2014[19]) 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.

[19] NPWS 2014 Great Island Channel SAC 001058 Conservation Objectives Supporting Document - Coastal Habitats

Table 5-2 identifies the surface and ground water bodies that have the potential to be impacted by the orthophosphate dosing at Lee Road WTP and which are hydrologically or hydrogeologically connected to Great Island Channel SAC.

- The river waterbodies hydrologically connected to the site include: Blarney_010 (IE_SW_19B020500), Martin_040 (IE_SW_19M010600), Bride (Cork City)_010 (IE_SW_19B140110), Bride (Cork City)_020 (IE_SW_19B140300), Curragheen (Cork City)_010 (IE_SW_19C120740), Glashaboy (Lough Mahon)_020 (IE_SW_19G010400), Glashaboy (Lough Mahon)_030 (IE_SW_19G010600), Glasheen (Cork City)_010 (IE_SW_19G040700), Glennamought Trib Bride_010 (IE_SW_19G880990), Moneygurney_010 (IE_SW_19M300900), Lee (Cork)_090 (IE_SW_19L030800) and Two Pot (Cork City)_010 (IE_SW_19T050890);
- The transitional waterbodies hydrologically connected to the site include: Lough Mahon (IE_SW_060_0750), Lee (Cork) Estuary Lower (IE_SW_060_0900), Lee (Cork) Estuary Upper (IE_SW_060_0950); and
- The groundwater body hydrogeologically connected to the site is: Ballinhassig East (IE_SW_G_004).

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**

The habitat *Atlantic salt meadows (Glauco-Puccinellietalia maritimae)* is distributed across the full extent of the SAC and are therefore susceptible to inputs from all waterbodies identified as hydrologically connected to the SAC.

The baseline orthophosphate concentration in one river waterbodies exceed the 75% upper indicative quality threshold; Martin_040 (IE_SW_19M010600),. However, the modelled additional orthophosphate concentrations is within 5% of the Good/ High boundary (i.e. <0.00125 mg/l) following dosing (0.0000mg/l) therefore there is no risk of deterioration in indicative quality or of preventing the achievement of WFD objectives for these river waterbodies.

One river water body has a modelled concentration above 5% of the Good / High boundary (0.00125 mg/l) and is highlighted in the Table 5 2 above: Bride (Cork City)_020 (IE_SW_19B14030.

The predicted loads in the Bride (Cork City)_020 (IE_SW_19B140300) water body arising from subsurface pathways is relatively large, compared to other water bodies within the WSZ, resulting in predicted concentration increases that are greater than 5% of the threshold between high and good indicative quality in the Bride (Cork City_020). However, some of the load has been re-apportioned to other water bodies based on the physical characteristics of the water bodies as described below. The catchment of the river water body IE_SW_19B140300 Bride (Cork City)_020 is located in Cork City Centre on the North Bank of the Lee estuary. The load associated with the southern portion of the water body has been apportioned directly to the Lee Estuary based on the topography and likely flow paths directly to the estuary. The load from the remainder of the water body is apportioned to the Bride River.

The predicted increased loading in the Bride (Cork City)_020 will not result in an increase in concentration that will exceed 75% of the of the upper indicative quality threshold. Therefore, there

is a no risk of deterioration in the ortho P indicative quality or to the achievement of WFD objectives for this water body.

The Bride (Cork City)_020 discharges 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, approximately 9.7km from where the Bride (Cork City)_020 discharges to the coast. The modelled additional orthophosphate concentrations are low within the TWBs and are modelled as insignificant (0.0001 mg/l) for the Upper and Lower Lee (Cork) estuaries respectively and undetectable (0.0000mg/l) in Lough Mahon. This is similar for the cumulative assessment also where the modelled additional concentrations are insignificant, 0.0003mg/l, 0.0002mg and 0.0001mg/l for the Upper and Lower Lee (Cork) Estuaries and Lough Mahon respectively.

The modelled additional concentration for the remaining surface waterbodies are low and within 5% of the High/Good boundary (i.e. <0.00125mg/l) with the highest modelled additional increase of 0.0005mg/l in Glasheen (Cork City)_010. Therefore, there is no risk of deterioration in the indicative quality of these waterbodies 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 negligible (0.0001 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). This section is located 4km east of the WSZ. 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.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Lee Road 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[20]. The SPA site comprises most of the 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.

The site 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,

[20] NPWS 2015 Cork Harbour SPA 004030 Site Synopsis

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. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetlands & Waterbirds.

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[21]) 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 (**Appendix B**). The SSCOs for Cork Harbour SPA (NPWS, 2013[22]) lists targets for each species, specifically:

- Population trend: long term population trends should be stable or increasing; and
- Distribution: there should be no 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 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. According to the 2017

[21] DHPLG 2018 River Basin Management Plan for Ireland 2018-2021
[22] NPWS 2013 Cork Harbour SPA 004030 Conservation Objectives

Annual Environmental Report Cork City agglomeration an upgrade to the Carrigrenan WWTP is planned under Irish Water's Capital Works Projects to add phosphorus removal prior to discharge. As this plant currently does not have tertiary treatment the EAM model assumes that all the additional load as a result of orthophosphate dosing will pass through the plant.

The Cork Lower Harbour Main Drainage Project is now complete and wastewater from the agglomerations of Ringaskiddy-Crosshaven-Carrigaline, Ringaskiddy Village, Passage-Monkstown and Cobh town no longer discharges untreated to Cork harbour. Instead it is collected and fully treated before its safe discharge to sea.

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

- The river waterbodies hydrologically connected to the site include: Blarney_010 (IE_SW_19B020500), Martin_040 (IE_SW_19M010600), Bride (Cork City)_010 (IE_SW_19B140110), Bride (Cork City)_020 (IE_SW_19B140300), Curragheen (Cork City)_010 (IE_SW_19C120740), Glashaboy (Lough Mahon)_020 (IE_SW_19G010400), Glashaboy (Lough Mahon)_030 (IE_SW_19G010600), Glasheen (Cork City)_010 (IE_SW_19G040700), Glennamought Trib Bride_010 (IE_SW_19G880990), Moneygurney_010 (IE_SW_19M300900), Lee (Cork)_090 (IE_SW_19L030800) and Two Pot (Cork City)_010 (IE_SW_19T050890);
- The transitional waterbodies hydrologically connected to the site include: Lough Mahon (IE_SW_060_0750), Lee (Cork) Estuary Lower (IE_SW_060_0900), Lee (Cork) Estuary Upper (IE_SW_060_0950); and
- The groundwater bodies hydrogeologically connected to the site are: Ballinhassig East (IE_SW_G_004) and Ballincollig (IE_SW_G_002).

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

The baseline orthophosphate concentration in one river waterbodies exceed the 75% upper indicative quality threshold; Martin_040 (IE_SW_19M010600),. However, the modelled additional orthophosphate concentrations is within 5% of the Good/ High boundary (i.e. <0.00125 mg/l) following dosing (0.0000mg/l) therefore there is no risk of deterioration in indicative quality or of preventing the achievement of WFD objectives for these river waterbodies.

One river water body has a modelled concentration above 5% of the Good / High boundary (0.00125 mg/l) and is highlighted in the Table 5 2 above: Bride (Cork City)_020 (IE_SW_19B14030.

The predicted loads in the Bride (Cork City)_020 (IE_SW_19B140300) water body arising from subsurface pathways is relatively large, compared to other water bodies within the WSZ, resulting in predicted concentration increases that are greater than 5% of the threshold between high and good indicative quality in the Bride (Cork City_020). However, some of the load has been re-apportioned to other water bodies based on the physical characteristics of the water bodies as described below. The catchment of the river water body IE_SW_19B140300 Bride (Cork City)_020 is located in Cork City Centre on the North Bank of the Lee estuary. The load associated with the southern portion of the water body has been apportioned directly to the Lee Estuary based on the topography and likely flow

paths directly to the estuary. The load from the remainder of the water body is apportioned to the Bride River.

The predicted increased loading in the Bride (Cork City)_020 will not result in an increase in concentration that will exceed 75% of the of the upper indicative quality threshold. Therefore, there is a no risk of deterioration in the ortho P indicative quality or to the achievement of WFD objectives for this water body.

The Bride (Cork City)_020 discharges 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, approximately 9.7km from where the Bride (Cork City)_020 discharges to the coast. The modelled additional orthophosphate concentrations are low within the TWBs and are modelled as insignificant (0.0001 mg/l) for the Upper and Lower Lee (Cork) estuaries respectively and undetectable (0.0000mg/l) in Lough Mahon. This is similar for the cumulative assessment also where the modelled additional concentrations are insignificant, 0.0003mg/l, 0.0002mg and 0.0001mg/l for the Upper and Lower Lee (Cork) Estuaries and Lough Mahon respectively.

The modelled additional concentration for the remaining surface waterbodies are low and within 5% of the High/Good boundary (i.e. <0.00125mg/l) with the highest modelled additional increase of 0.0005mg/l in Glasheen (Cork City)_010. Therefore, there is no risk of deterioration in the indicative quality of these waterbodies 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 negligible (0.0001 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). This section is located 4km east of the WSZ. 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.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Lee Road 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.

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[25]). 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.

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[26] indicates that there are areas of localised spot flooding in the Bride (Cork City)_020, Glenamought trib Bride_010, 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 the 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 negligible (0.0001 mg/l) for Lee (Cork) Estuary Upper and Lower respectively or undetectable (0.0000mg/l) for Lough Mahon, 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, <0.00125mg/l) within these transitional and coastal water bodies i.e. 0.0003mg/l, 0.0002mg /l and 0.0001mg/l for the Upper and Lower Lee (Cork) Estuaries, Lough Mahon or undetectable for Cork Harbour and Outer Cork Harbour (0.0000mg/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, the predicted 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 9 of Appendix C**).

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

[26] www.floodmaps.ie accessed 16/04/2019

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[27]. 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[28]). 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 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 negligible (0.0001mg/l) and well below 5% of the Good / Fail threshold value.

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 a NHA 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.

[27] https://secure.dccae.gov.ie/GSI_DOWNLOAD/Groundwater/Reports/GWB/BallincolligGWB.pdf
[28] https://www.npws.ie/sites/default/files/general/pNHA_Site_Synopsis_Portfolio.pdf .

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, Projects, Programmes and Policies

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Cork County Development Plan 2022-2028[29] 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 achieve water related protected areas objectives in rivers, lakes, groundwater, estuaries and coastal waters (as applicable).	1 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.

[29] 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
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, including transitional 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 Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.	2 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.
Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive	3 Habitat loss or destruction;	CFRAM Studies and their product Flood Risk Management Plans will each undergo appropriate assessment. Any future

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
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.	4 Habitat fragmentation or degradation; 5 Alterations to water quality and/or water movement; 6 Disturbance; 7 In-combination impacts within the same scheme.	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.	8 Land use change or intensification; 9 Water pollution; 10 Nitrogen deposition; 11 Disturbance to habitats / species.	Foodwise 2025 was subject to its own AA[30]. 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.

[30] 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[31], and AA[32]. 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.

[31] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf
[32] 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 the 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[33]. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts

[33] 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 at the Lee Road WTP, within the Cork City 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 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 Lee Road 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 including: Great Island Channel SAC and Cork Harbour SPA have been assessed. The EAM identified that as a result of dosing alone and in combination with other WSZs that there are water bodies at risk of deterioration in the orthophosphate indicative quality or of preventing the achievement of WFD objectives following dosing at Lee Road 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 Lee Road 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

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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) Summary Report

004 Lee Road WTP – Cork City Water Supply (0400PUB1001)

National Lead in Water Mitigation Strategy

Environmental Assessment Methodology Report – 004 Cork City Water Supply & Zone 2 Cork City Council Import– Lee Road WTP

Document Control Sheet

Client:	Irish Water
Project Title:	National Lead in Water Mitigation Strategy
Document Title:	Environmental Assessment Methodology Report: 006 Cork City Water Supply & Zone 2 Cork City Council Import
Document No:	MDW0766RP_5.1_EAM_004 Lee Road_F06

Text Pages:	14	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F02	Final Submission	17/04/2019	IP		MM		MM	
F03	Final Submission	17/07/2019	IP		MM		GJG	
F04	Final Submission	07/08/2019	IP		MM		GJG	
F05	Final Submission	24/03/2023	YE		MM		IP	
F06	Final Submission	12/06/2023	YE		MM		IP	

004 Cork City Water Supply (0400PUB1001) & Zone 2 Cork City Council Import (0500PUB_TBC) – Lee Road WTP

Supporting spreadsheet: 004 Lee Road WTP - Cork City Water Supply_rev16

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 Lee Road WTP historically supplied two WSZs:

- Cork City Water Supply (0400PUB1001); and
- Zone 2 Cork City Council Import - Lee Road WTP (0500PUB_TBC).

These two WSZs have been amalgamated into one WSZ - 0400PUB1001, however the water amounts for both WSZs are included in the following calculations. The distribution input is 58,579 m^3/day, including water imported from Inniscarra WTP, (50% of which is accounted for, with the remainder assumed to be lost through leakage) serving a population of approximately 125,000. The non-domestic demand is 12% of the distribution input.

The area is served by the Cork City and Ballincollig New WWTPs which are all licenced in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended. The 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 three agglomerations with less than 500 PE, namely Kileens, Coole East and Rosemount/Kilcully 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 530 properties across both WSZs that are serviced by DWWTSs.

This assessment has been undertaken for the WSZ in isolation. However, if corrective water treatment is proposed for WTPs in the same catchment area, the cumulative impacts from the combined loads to downstream water bodies are assessed (see Recommendations and Tables 9 and 10).

Water Supply Zone(s)	**Cork City Water Supply (0400PUB1001)** **Zone2 Cork City Council Import - Lee Road WTP (0500PUB_TBC) – data only** **See Figure 4.1 / 4.2 of the AA Screening for a map of the WSZ and ZoI**	
Step 1 Appropriate Assessment Screening	**Downstream European Sites**	**Nutrient Sensitivity**
	Cork Harbour SPA Great Island Channel SAC	Nutrient Sensitive Qualifying Interests present – **Yes**
	Appropriate Assessment Required – see AA screening report for details	

<table>
<tr><td rowspan="2">Step 2 – Direct Inputs to Surface Water</td><td>Agglomerations within WSZ</td><td>Increased loading/concentration due to Orthophosphate Dosing – Optimum Dosing rate based on raw chemistry data assessment = 0.5 mg/l</td></tr>
<tr><td>Cork City</td><td>
<u>Table 1: Cork City Primary Discharge</u>
<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>92120.2</td><td>0.995</td><td>0.796</td><td>1.353</td></tr>
</table>
Note – existing and post dosing modelled concentrations are compliant with the TP ELV (2.5mg/l) set in the WWDL.

<u>Table 2: Cork City SWOs (48 no.)</u>
<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>2615.6</td><td>0.970</td><td>0.776</td><td>1.319</td></tr>
<tr><td>Post Dosing</td><td>2735.4</td><td>1.015</td><td>0.812</td><td>1.380</td></tr>
</table>
</td></tr>
<tr><td>Ballincollig New</td><td>
<u>Table 3: Ballincollig New Primary Discharge</u>
<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>364.2</td><td>0.102</td><td>0.082</td><td>0.139</td></tr>
<tr><td>Post Dosing</td><td>364.2</td><td>0.102</td><td>0.082</td><td>0.139</td></tr>
</table>
Note – existing and post dosing modelled concentrations are compliant with the TP ELV (2mg/l) set in the WWDL. 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

<u>Table 4: Ballincollig New SWOs (3 no.)</u>
<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>265.2</td><td>2.559</td><td>2.047</td><td>3.480</td></tr>
<tr><td>Post Dosing</td><td>265.2</td><td>2.559</td><td>2.047</td><td>3.480</td></tr>
</table>
</td></tr>
</table>

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

Table 5: Mass balance assessment based on 0.5 mg/l dosing rate using available background concentrations from AER, 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	0.0322	0.1
Ballincollig New	LEE (CORK)_090 IE_SW_19L030800	0.0242	0.0245	0.0245	0.0
Killeens	BLARNEY_010 IE_SW_19B020500	0.0722	0.0738	0.0738	0.0
Coole East	Glashaboy (Lough Mahon)_020 IE_SW_19G010400	N/A	N/A	N/A	-
Rosemount Kilcully	GLENNAMOUGHT TRIB BRIDE_010 IE_SW_19G880990	N/A	N/A	N/A	-

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 (Table 1). The latest AER published in 2021 shows the effluent to be compliant with the TP ELV of 2.5 mg/l. Table 5 demonstrates an insignificant increase in the modelled concentration post dosing at the WWTP and Table 8 demonstrates that an insignificant impact on the 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 predicted from the model are compliant with ELVs and the latest monitored results in the 2020 AER also demonstrate compliance. There is no additional impact on the receiving water as a result of the proposed orthophosphate dosing.

Step 4 Distributed Inputs to Surface Water Bodies

The predicted increases in concentration in subsurface pathways are insignificant for the river water bodies (less than 0.00125 mg/l, which is 5% of Good/High boundary for surface waterbodies), except in the Bride (Cork City)_020 (IE_SW_19B140300) where the predicted increase is 0.0014 mg/l.

Some waterbodies are reported with monitoring points at Bad Ortho P indicative quality, namely Bride (Cork City)_020 (IE_SW_19B140300), Glasheen (Cork City)_010 (IE_SW_19G040700) and GLENNAMOUGHT TRIB BRIDE_010 (IE_SW_19G880990). The monitoring data for these water bodies is only available up to 2017 and the more recent assignment of status by the EPA based on the grouping approach, i.e. based on monitoring information for water bodies of similar type and with similar pressures means these water bodies are considered to be a moderate ecological status. If we assume moderate indicate quality for orthophosphate this means that the insignificant increases in concentration due to sub surface loads will have no impact on these water bodies.

Re-Apportionment of Load

Loads in the Bride (Cork City)_020 (IE_SW_19B140300) and Glasheen (Cork City)_010 (IE_SW_19G040700) water bodies were apportioned as follows:

Bride (Cork City)_020 water body (IE_SW_19B140300) - the load associated with the southern portion of the water body has been apportioned directly to the Lee Estuary based on the topography and likely flow paths directly to the estuary. The load from the remainder of the water body is apportioned to the Bride River (Figure 1).

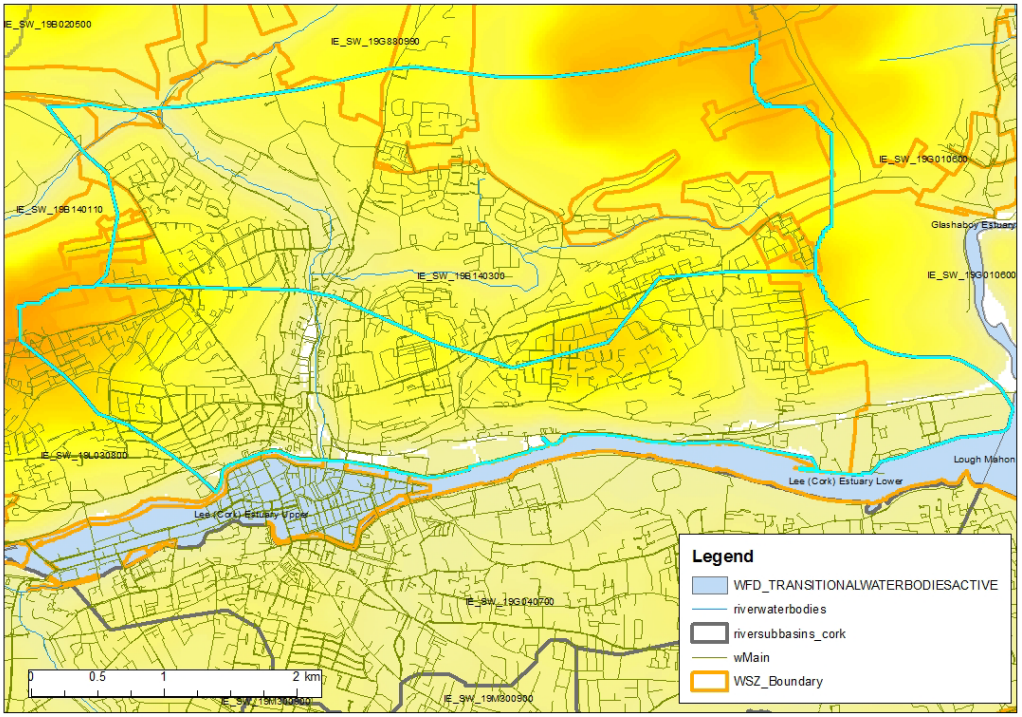


Figure 1: Load re-apportionment from the Bride (Cork City)_020 water body (IE_SW_19B140300)

GLASHEEN (Cork City)_010 water body (IE_SW_19G040700) - the load associated with the western portion of the water body has been apportioned to the Glasheen River. The load associated with the northern portion (labelled IE_SW_19G040700_1 below) has been apportioned to the Lee Estuary. The load associated with the eastern portion of the water body (labelled IE_SW_19G040700_2) has been apportioned to Lough Mahon.

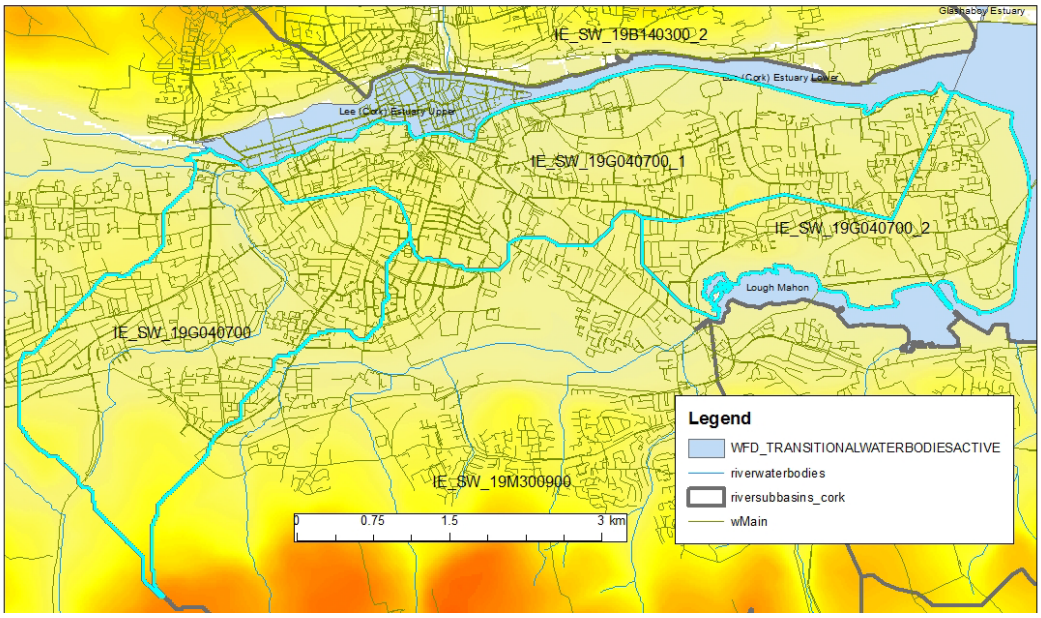


Figure 2: Load re-apportionment from the GLASHEEN (Cork City)_010 water body (IE_SW_19G040700)

The predicted increases in P concentration in downstream transitional water bodies and coastal waterbodies due to orthophosphate dosing are negligible (0.0001 mg/l) in the case of the Lee Estuary water bodies and undetectable (0.0000 mg/) for all other transitional and coastal water bodies due to the dilution provided by the fluvial and tidal flows. Therefore, it is considered that there would be no impact on these water bodies resulting from the proposed level of orthophosphate dosing.

Step 5 and 6: Combined Inputs to Groundwater Bodies

Table 6: Increased loadings and concentrations in groundwater bodies connected to the WSZs (*note: where existing monitoring data not available, a surrogate indicative quality is derived from qualitative status of the GWB or the qualitative status 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 *italic* mg/l	75% of Indicative Quality Upper threshold mg/l	PO4 Total GW Dosing Load kg/yr	PO4 Potential Conc. due to Dosing mg/l	PO4 Potential Baseline Conc. following dosing mg/l	Notes
IE_SW_G_002 Ballincollig	*Good*	*0.018*	*0.026*	*53.8*	*0.0045*	*0.022*	
IE_SW_G_004 Ballinhassig East	Good Upwards Near	0.034	0.026	24.0	0.0001	0.034	MP1
	Good Upwards Far	0.013	0.026			0.013	MP2
	Failing to achieve good Upwards	0.051	-			0.051	MP3

	Far						
	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	0.035			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			0.006	MP10
	Good Upwards Far	0.026	0.026			0.026	MP11
	Failing to achieve good Upwards Far	0.188	-			0.188	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_091 Kinsale Landfill	*Good*	*0.018*	*0.026*	*0.2*	*0.0007*	*0.018*	
IE_SW_G_094 Lee Valley Gravels GWB Group	Good Downwards Far	0.010	0.026	14.0	0.0021	0.012	

MP: multiple Monitoring Points given for waterbody
See text below for explanation of cells highlighted in red

The existing (measured) concentrations in some of the groundwater bodies (GWBs) are within 25% of the upper threshold value as a result of the general susceptibility and hydrological conditions (Table 6). Increases due to P dosing in these cases are less than 5% of the Good/Failing boundary and will not be significant.

The Lee Valley Gravels GWB Group (IE_SW_G_094) has a predicted increase greater than 5% of the Good / Fail threshold value, 0.0021 mg/l, however the post dosing concentration remains well below the 0.026 mg/l threshold above which the water body would be considered to be at risk.

The Ballinhassig East water body (IE_SW_G_004) contains a number of monitoring points, some of which are failing to achieve Good Status. The predicted increase in P concentration is well below 5% of the Good / Fail threshold value and will therefore not cause any

measurable deterioration in the water body.

Kinsale Landfill water body is currently at Poor Chemical status, however the "Impact of Groundwater on Surface Water Ecological/Chemical Status Test" and the "Groundwater Dependent Ecosystems (GWDTE) - Chemical Assessment Test" are both passing. These tests consider the impact of the groundwater contribution of orthophosphate to surface waters and the potential impact on the ecological status. Given that the qualitative status assessment has these tests at good status it is reasonable to assume that the orthophosphate indicative quality is also good. On this basis the Surrogate OP IQ is considered to be "Good" for this groundwater body and the additional load from the orthophosphate dosing will not have a significant impact on this water body.

Step 5 and 6: Combined Inputs to River Water Bodies

Table 7: Increased loading and concentrations to 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, the mid-range of that indicative quality is used as Baseline Concentration)***

EU_CD / NAME	Ortho P Indicative Quality and Trends (distance to threshold) Surrogate Indicative Quality given 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 gauged or 30%ile flows mg/l	PO4 Potential Baseline Conc. following dosing mg/l	Notes
IE_SW_19B020500 BLARNEY_010	Poor Downwards Far	0.068	0.087	1.6	0.0001	0.068	
IE_SW_19B140110 BRIDE (Cork City)_010	Moderate Upwards Near	0.046	0.051	7.8	0.0002	0.046	
IE_SW_19B140300 BRIDE (Cork City)_020	*Poor*	*0.077*	*0.087*	*50.8*	*0.0014*	*0.078*	‡
IE_SW_19C120740 CURRAGHEEN (Cork City)_010	*Moderate*	*0.046*	*0.051*	*10.5*	*0.0002*	*0.046*	MP1
	Moderate	*0.046*	*0.051*			*0.046*	MP2
IE_SW_19G010400 GLASHABOY (LOUGH MAHON)_020	Good Upwards Far	0.033	0.033	1.9	0.0000	0.033	‡
	Moderate Upwards Far	0.039	0.051			0.039	*
IE_SW_19G010600 GLASHABOY (LOUGH MAHON)_030	*Good*	*0.030*	*0.033*	*3.1*	*0.0000*	*0.030*	‡
IE_SW_19G040700 GLASHEEN (Cork City)_010	*Poor*	*0.077*	*0.087*	*27.7*	*0.0005*	*0.077*	

	IE_SW_19G880990 GLENNAMOUGHT TRIB BRIDE_010	*Moderate*	*0.046*	*0.051*	*3.8*	*0.0002*	*0.046*	
	IE_SW_19L030800 LEE (CORK)_090	High Downwards Far	0.014	0.019	18.9	0.0000	0.014	
	IE_SW_19M010600 MARTIN_040	Moderate Upwards Near	0.056	0.051	1.6	0.0000	0.056	‡
	IE_SW_19M300900 MONEYGURNEY 19_010	*Moderate*	*0.046*	*0.051*	*4.1*	*0.0002*	*0.046*	
	IE_SW_19T050890 TWO POT (Cork City)_010	*Moderate*	*0.046*	*0.051*	*0.4*	*0.0000*	*0.046*	

‡ Load from WWTP / SWO following treatment added
MP = Multiple Monitoring Points

Step 5 and 6: Combined Inputs to Transitional Water Bodies

Table 8 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 / ecological status of neighbouring WBs, the mid-range of that indicative quality is used as Baseline Concentration)*

EU_CD / NAME	Ortho P Indicative Quality and Trends (distance to threshold) Surrogate Indicative quality given in *italic*	Baseline 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 kg/yr	Conc. using gauged, 30%ile or tidal flows mg/l	PO4 Potential Baseline Conc. following dosing mg/l	Notes
IE_SW_060_0800 Glashaboy Estuary	High (S) Downwards Far	0.021	0.020	3.1	0.0000	0.021	‡
	Good (W) Downwards Far	0.031	0.036			0.031	
IE_SW_060_0950 Lee (Cork) Estuary Upper	High (S) Downwards Far	0.013	0.019	107.9	0.0001	0.013	‡
	High (W) Downwards Near	0.013	0.019			0.013	
IE_SW_060_0900 Lee (Cork) Estuary Lower	Good (S) Downwards Near	0.043	0.050	187.5	0.0001	0.043	‡
	Good (W) Downwards Far	0.043	0.050			0.043	

IE_SW_060_0750 Lough Mahon	High (S) Downwards Far	0.014	0.020	2319.9	0.0000	0.014	‡
	Good (W) Downwards Far	0.027	0.045			0.027	
IE_SW_060_0000 Cork Harbour	High (S) Downwards Far	0.003	0.019	2319.9	0.0000	0.003	‡
	Good (W) Downwards Near	0.028	0.045			0.028	
IE_SW_050_0000 Outer Cork Harbour	High (S) Downwards Far	0.003	0.019	2319.9	0.0000	0.003	‡
	High (W) Downwards Near	0.024	0.019			0.024	

‡ Load from WWTP / SWO following treatment added
S – Summer monitoring, W – Winter monitoring

Combined Assessment

Table 7 gives the loads and modelled concentrations for the combined assessment to rivers waterbodies. The increased concentrations due to orthophosphate dosing are predicted to be insignificant, i.e. below 5% of the Good / High boundary for Ortho P Indicative Quality (0.00125mg/l), except in the BRIDE (Cork City)_020) (IE_SW_19B140300). 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 loading resulting from the corrective water treatment will not increase the risk of this water body failing its objectives.

Some of the pre-dosing baseline concentrations are within 25% of indicative quality upper thresholds for rivers: GLASHABOY (LOUGH MAHON)_020 (IE_SW_19G010400) and MARTIN_040 (IE_SW_19M010600). However, the predicted increase in orthophosphate concentrations in these water bodies due to the proposed level of dosing is insignificant so there is no risk of deterioration.

In Table 8, Outer Cork Harbour (IE_SW_050_0000) has a baseline above 75% of indicative quality upper threshold in winter, but since predicted increase in orthophosphate concentrations in this coastal water body due to the proposed level of dosing is undetectable, there is no risk of deterioration.

Table 8 gives the modelled loads and concentrations for the receiving transitional and coastal waterbodies. In all cases the predicted increase in concentration is insignificant (<0.00125 mg/l), negligible (0.0001 mg/l) or undetectable (0.0000 mg/l).

Summary and Mitigation Proposed

The modelled increases in concentration for river water bodies and receiving water bodies due to this water supply zone in isolation suggest that there will not be a significant impact when the additional investigative monitoring and assessment is considered.

Figure 3 depicts the fate of modelled orthophosphate loads for the Cork City WSZ due to dosing, indicating levels of attenuation in pathways and relative impact on the surface

water receptor.

The cumulative impacts on Lee, Cork Harbour, and Youghal Bay Catchment (HA 19) associated with phosphate dosing are summarised in Tables 9 and 10 and include the following WSZs in addition to 004 Lee Road WTP WSZs.

- 006 Inniscarra WTP - Cork Zone2 City and Harbour
- 026 Glashaboy WTP – Zone3 Glashaboy

The modelled increase in concentration in receiving river water bodies is not significant as outlined in Table 9, except in BRIDE (Cork City)_020 (IE_SW_19B140300. The cumulative load is higher than the contributing load from Lee Road WTP in isolation, however it will not result in an increase in the concentration post dosing that would result in a risk of deterioration in the indicative quality.

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

Table 9: Cumulative assessment of the increased loading and concentrations to river water bodies common to the Cork WSZs

EU_CD / NAME	Ortho P Indicative Quality and Trends (distance to threshold) Surrogate indicative quality given 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 gauged or 30%ile flows mg/l	PO4 Potential Baseline Conc. following dosing mg/l	Notes
IE_SW_19B140110 BRIDE (Cork City)_010	Moderate Upwards Near	0.046	0.051	8.6	0.0002	0.046	
IE_SW_19B140300 BRIDE (Cork City)_020	*Poor*	*0.077*	*0.087*	*59.9*	*0.0016*	*0.078*	‡*
IE_SW_19C120740 CURRAGHEEN (Cork City)_010	Moderate Upwards Far	0.046	0.051	80.3	0.0017	0.047	
	Moderate Upwards Near	0.046	0.051			0.047	
IE_SW_19G040700 GLASHEEN (Cork City)_010	*Poor*	*0.077*	*0.087*	*110.1*	*0.0021*	*0.078*	
IE_SW_19G010600 GLASHABOY (LOUGH MAHON)_030	*Good*	*0.030*	*0.033*	*65.2*	*0.0005*	*0.031*	‡
IE_SW_19M010600 MARTIN_040	Moderate Upwards Near	0.056	0.051	16.6	0.0002	0.056	

IE_SW_19M300900 MONEYGURNEY 19_010	*Moderate*	*0.046*	*0.051*	*102.2*	*0.0048*	*0.050*	
IE_SW_19T050890 TWO POT (Cork City)_010	Moderate Upwards Far	0.046	0.051	10.4	0.0010	0.046	
IE_SW_19L030800 LEE (CORK)_090	High Downwards Far	0.014	0.019	206.4	0.0002	0.014	

‡ Load from WWTP / SWO following treatment added
MP – Multiple Monitoring Points

The modelled increase in concentration in receiving river water bodies is not significant as outlined in Table 9, 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 "Poor" 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 (0.046) 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 (0.0017 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 in 2022, 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 assigned 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 0.0021 mg/l which will not result in the predicted concentration post dosing to exceed the 75% upper threshold for a water body at poor

orthophosphate indicative quality. 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 10. Therefore, the cumulative assessment has demonstrated that there will not be a significant impact on the receiving waterbodies.

Table 10: Cumulative assessment of the increased loading and concentrations to transitional and coastal water bodies common to the Cork WSZs

EU_CD / NAME	Ortho P Indicative Quality and Trends (distance to threshold) Surrogate indicative quality given 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 gauged, 30%ile or tidal flows mg/l	PO4 Potential Baseline Conc. following dosing mg/l	Notes
IE_SW_060_0800 Glashaboy Estuary	High (S) Downwards Near	0.021	0.020	65.2	0.0005	0.022	‡
	Good (W) Downwards Far	0.031	0.036			0.032	
IE_SW_060_0950 Lee (Cork) Estuary Upper	High (S) Downwards Far	0.013	0.019	376.4	0.0003	0.013	‡
	High (W) Downwards Near	0.013	0.019			0.013	
IE_SW_060_0900 Lee (Cork) Estuary Lower	Good (S) Downwards Near	0.043	0.050	376.4	0.0002	0.044	‡*
	Good (W) Downwards Far	0.043	0.050			0.044	*
IE_SW_060_0750 Lough Mahon	High (S) Downwards Far	0.014	0.020	6489.1	0.0001	0.014	‡

	Good (W) Downwards Far	0.027	0.045			0.027	*
IE_SW_060_0000 Cork Harbour	High (S) Downwards Far	0.003	0.019	8478.8	0.0000	0.003	‡
	Good (W) Downwards Near	0.028	0.045			0.028	*
IE_SW_050_0000 Outer Cork Harbour	High (S) Downwards Far	0.003	0.019	8559.6	0.0000	0.003	‡*
	High (W) Downwards Near	0.024	0.019			0.024	*

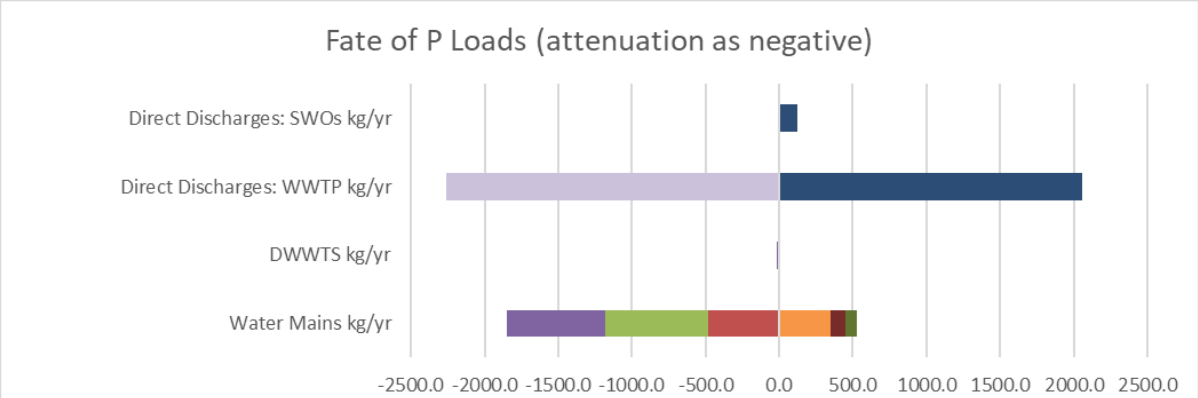
‡ Load from WWTP / SWO following treatment added
S – Summer monitoring, W – Winter monitoring

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	0.0	0.0		
Load attenuated in Near Surface Pathway	-480.2	-1.2		
Load attenuated in 1m below trench	-698.2	-8.7		
Load attenuated in Subsurface Pathway	-668.3	-0.9		
Load intercepted by gravity main in Preference Pathway	0.0			
Load intercepted by gravity main in Near Surface Pathway	345.9			
Load reaching SW direct or via Preference (inadequate percolation) Pathway	0.0	0.0	2058.9	120.1
Load reaching SW via Near Surface Pathway	106.5	0.3		
Load reaching SW via Subsurface Pathway	75.8	0.3		
Load treated in WWTP			-2263.9	

Figure 3 – Fate of orthophosphate loads modelled for Cork City WSZ (impacting on the Cork Harbour water body) due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.