Irish Water-Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment

078 Midleton WTP - Zone 3 Midleton WSZ (0500PUB2406)

Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment 078 Zone 3 Midleton (0500PUB2406) - Midleton 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 significant adverse effects on the environment, as a result of implementing a plan or project.

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

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

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

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

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

1 INTRODUCTION

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

This report comprises information to support the Screening for AA in line with the requirements of Article 6(3) of the EU Habitats Directive (Directive 92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora (hereafter referred to as the Habitats Directive). The report assesses the potential for likely significant effects resulting from the additional phosphorus (P) load to environmental receptors, resulting from orthophosphate dosing being undertaken to mitigate against consumer exposure to lead in drinking water. It is therefore necessary to consider the sources, pathways and receptors in relation to added phosphorus.

1.1 PURPOSE OF THIS REPORT

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

1.2 THE PLAN

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

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

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

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

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

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

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

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

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

IW proposes to introduce corrective water treatment at up to 400 water treatment plants. This would be rolled out over an accelerated 3-year 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 Midleton WTP orthophosphate will be added at a rate of 0.6 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 25 European sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Ardmore Head SAC, Ballymacoda (Clonpriest and Pillmore) SAC, Barley Cove to Ballyrisode Point SAC, Blackwater River (Cork/Waterford) SAC, Castletownshend SAC, Clonakilty Bay SAC, Courtmacsherry Estuary SAC, Kilkeran Lake and Castlefreke Dunes SAC, Great Island Channel SAC, Lough Hyne Nature Reserve and Environs SAC, Myross Wood SAC, Roaringwater Bay and Island SAC and The Gearagh SAC.

- SPA sites: Ballycotton Bay SPA, Ballymacoda Bay SPA, Blackwater Estuary SPA, Clonakilty Bay SPA, Courtmacsherry Bay SPA, Cork Harbour SPA, Galley Head to Duneen Point SPA, Old Head of Kinsale SPA, Seven Heads SPA, Sheep's Head to Toe Head SPA, Sovereign Islands SPA and The Gearagh 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:

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

Article 6(4) states:

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

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

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

2.2 GUIDANCE FOR THE APPROPRIATE ASSESSMENT PROCESS

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

European and National Legislation:

- Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (also known as the 'Habitats Directive');

- Council Directive 2009/147/EC on the conservation of wild birds, codified version, (also known as the 'Birds Directive');
- European Communities (Birds and Natural Habitats) Regulations 2011 to 2015; and
- Planning and Development Act 2000 (as amended).

Guidance / Case Law:

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

Departmental/NPWS Circulars:

- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities.* Circular NPWS 1/10 and PSSP 2/10. (DEHLG, 2010);
- *Appropriate Assessment of Land Use Plans*. Circular Letter SEA 1/08 & NPWS 1/08;
- *Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments*. Circular L8/08;
- *Guidance on Compliance with Regulation 23 of the Habitats Directive.* Circular Letter NPWS 2/07; and
- *Compliance Conditions in respect of Developments requiring (1) Environmental Impact Assessment (EIA); or (2) having potential impacts on Natura 2000 sites*. Circular Letter PD 2/07 and NPWS 1/07.

2.3 STAGES OF THE APPROPRIATE ASSESSMENT PROCESS

According to European Commission Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive, the assessment requirements of Article 6 establish a four-staged approach as described below. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required. The four stages are as follows:

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

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

Stage 1: Screening for a likely significant effect

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

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

The aim of stage 2 of the AA process is to identify any adverse impacts that the plan or project might have on the integrity of relevant European Sites. As part of the assessment, a key consideration is 'in combination' effects with other plans or projects. Where adverse impacts are identified, mitigation measures can be proposed that would avoid, reduce or remedy any such negative impacts and the plan or project should then be amended accordingly, thereby avoiding the need to progress to Stage 3.

Stage 3: Assessment of Alternative Solutions

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

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

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

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

2.4 INFORMATION SOURCES CONSULTED

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

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

2.5 EVALUATION OF THE RECEIVING ENVIRONMENT

Ireland has obligations under EU law to protect and conserve biodiversity. This relates to habitats and species both within and outside designated sites. Nationally, Ireland has developed a National Biodiversity Plan (DCHG, 2017) to address issues and halt the loss of biodiversity, in line with international commitments. The vision for biodiversity is outlined: "*That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally*."

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

In relation to protected water-dependent habitats and species under the Birds and Habitats Directive, the river basin management planning process contributes towards achieving water related environmental supporting conditions that support Favourable Conservation Status. In preparing the RBMP (2018-2021) (DHPLG, 2018[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

[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

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, 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 an orthophosphate treatment process at the existing Midleton WTP 1.5km north of Midleton Town, Co. Cork. The Midleton WTP supplies Midleton town (0500PUB2406). The distribution input for the WTP is 3,450 m^3/day (51% of which is accounted for) serving a population of approximately 8,000, with 18% non-domestic demand of the distribution input. The area is served by Midleton WWTP (D0056) which is licenced in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 (as amended) and the potential impact of the orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There are no other WWTPs within this WSZ. There is an estimated 126 properties in the WSZ that are serviced by a domestic wastewater treatment system (DWWTS) (see **Appendix C**).

Midleton WTP lies within the Owennacurra sub catchment of the Lee, Cork Harbour and Youghal Bay (HA19) catchment. The EAM process identified 25 European sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Ardmore Head SAC, Ballymacoda (Clonpriest and Pillmore) SAC, Barley Cove to Ballyrisode Point SAC, Blackwater River (Cork/Waterford) SAC, Castletownshend SAC, Clonakilty Bay SAC, Courtmacsherry Estuary SAC, Kilkeran Lake and Castlefreke Dunes SAC, Great Island Channel SAC, Lough Hyne Nature Reserve and Environs SAC, Myross Wood SAC, Roaringwater Bay and Island SAC and The Gearagh SAC.

- SPA sites: Ballycotton Bay SPA, Ballymacoda Bay SPA, Blackwater Estuary SPA, Clonakilty Bay SPA, Courtmacsherry Bay SPA, Cork Harbour SPA, Galley Head to Duneen Point SPA, Old Head of Kinsale SPA, Seven Heads SPA, Sheep's Head to Toe Head SPA, Sovereign Islands SPA and The Gearagh SPA.

3.2 CONSTRUCTION OF CORRECTIVE WATER TREATMENT WORKS

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

There are two possible locations for the orthophosphate dosing system at Midleton WTP, both of which will be located within the confines of the existing WTP boundary, one inside the existing infrastructure of the plant and the second located outside next to the Hypochlorite Sodium and Fluoride bulk storage tanks. The surrounding landscape is dominated by agricultural grassland. The location of the works is shown on **Figure 3-1**.

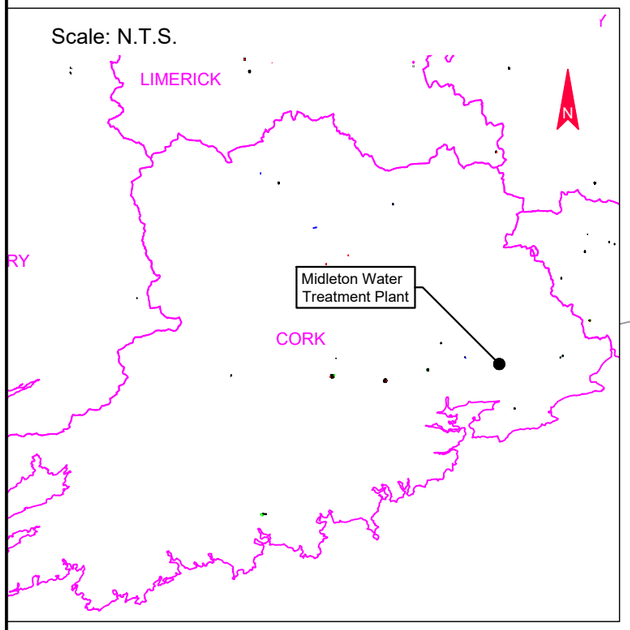
The implementation of orthophosphate dosing at the Midleton WTP will require the following elements:

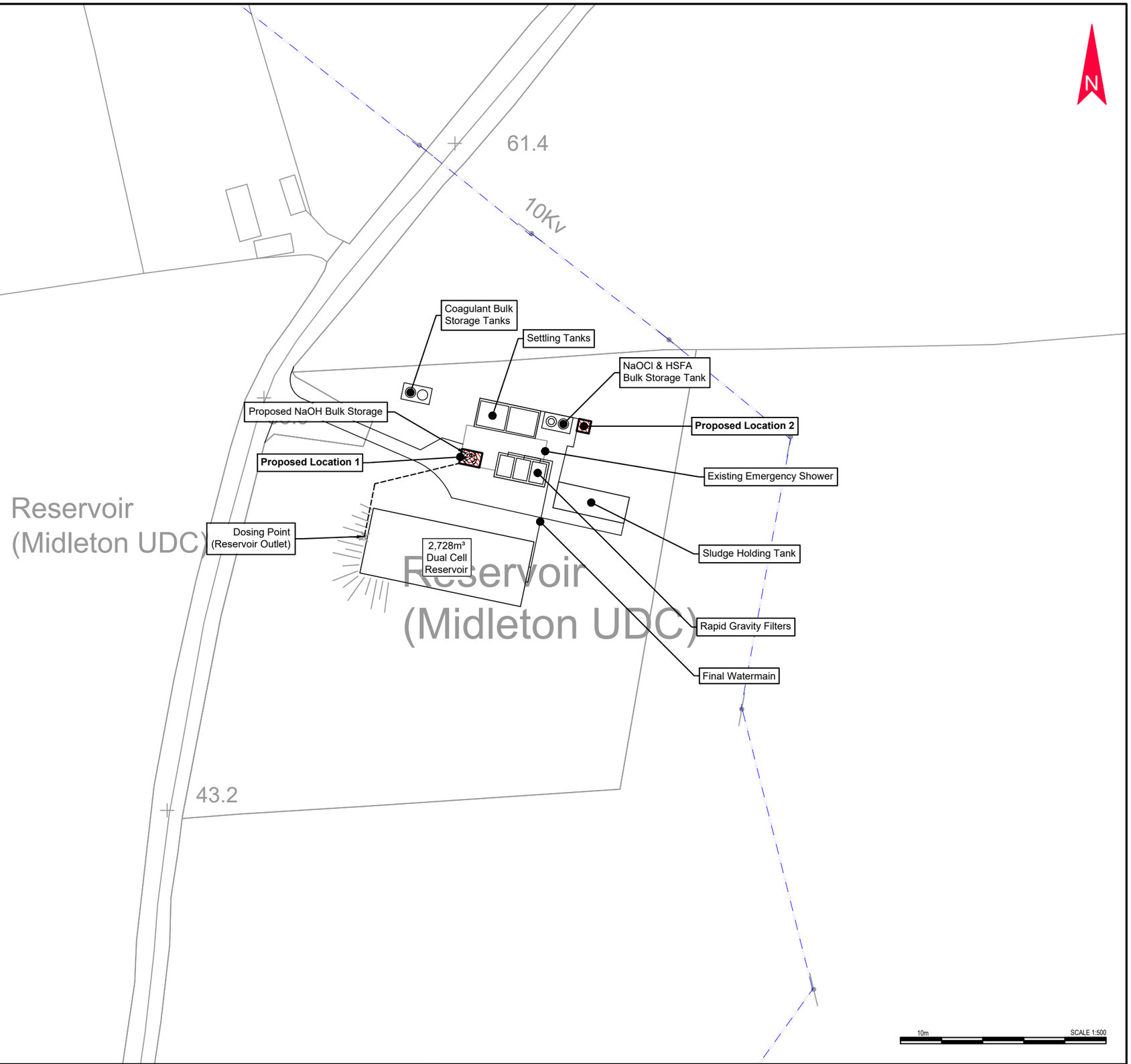
- Bulk Storage Tanks for phosphoric acid;
- Dosing pumps;
- Dosing pipework and carrier water pipework; and
- Associated electrical installations.

CO. CORK

Midleton Water Treatment Plant

Scale: N.T.S.





Client

UISCE ÉIREANN : IRISH WATER

No.	Date	Dm. Chk.	Amendment / Issue	App
A01	MAR 19	BL BR	ISSUED FOR INFORMATION	GJG
D01	NOV 18	JR BL	DRAFT	DC

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Checked	BL
Approved	GJG
Date	14/03/2019
Scale	1:500 @ A1
	1:1,000 @ A3

Project

LEAD MITIGATION PLAN

Figure 3.1 MIDLETON WATER TREATMENT PLANT - SITE LAYOUT

Job No.	File Ref.	Drg. No.	Rev.
MDW0766	MDW0766SK0000 Series.dwg	SK0078 WTP	F01

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

The bulk storage tank (2 no. tank, with a working volume of 300 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 was pH correction system at the Midleton WTP but has since been fully decommissioned. pH was corrected by the addition of lime in the final clear water tank. A stable pH is critical to facilitate effective plumbosolvency control. It's recommended to install a new pH correction to reach the optimum pH using a sodium hydroxide 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 Midleton 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.

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 Midleton 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 Midleton WTP, orthophosphate will be added to treated water at a rate of 0.6 mg/l. The onsite storage tanks have been designed to provide 60 days of storage so it is anticipated that deliveries will be approximately once every two months. All deliveries will be via existing access roads within the boundary of the WTP.

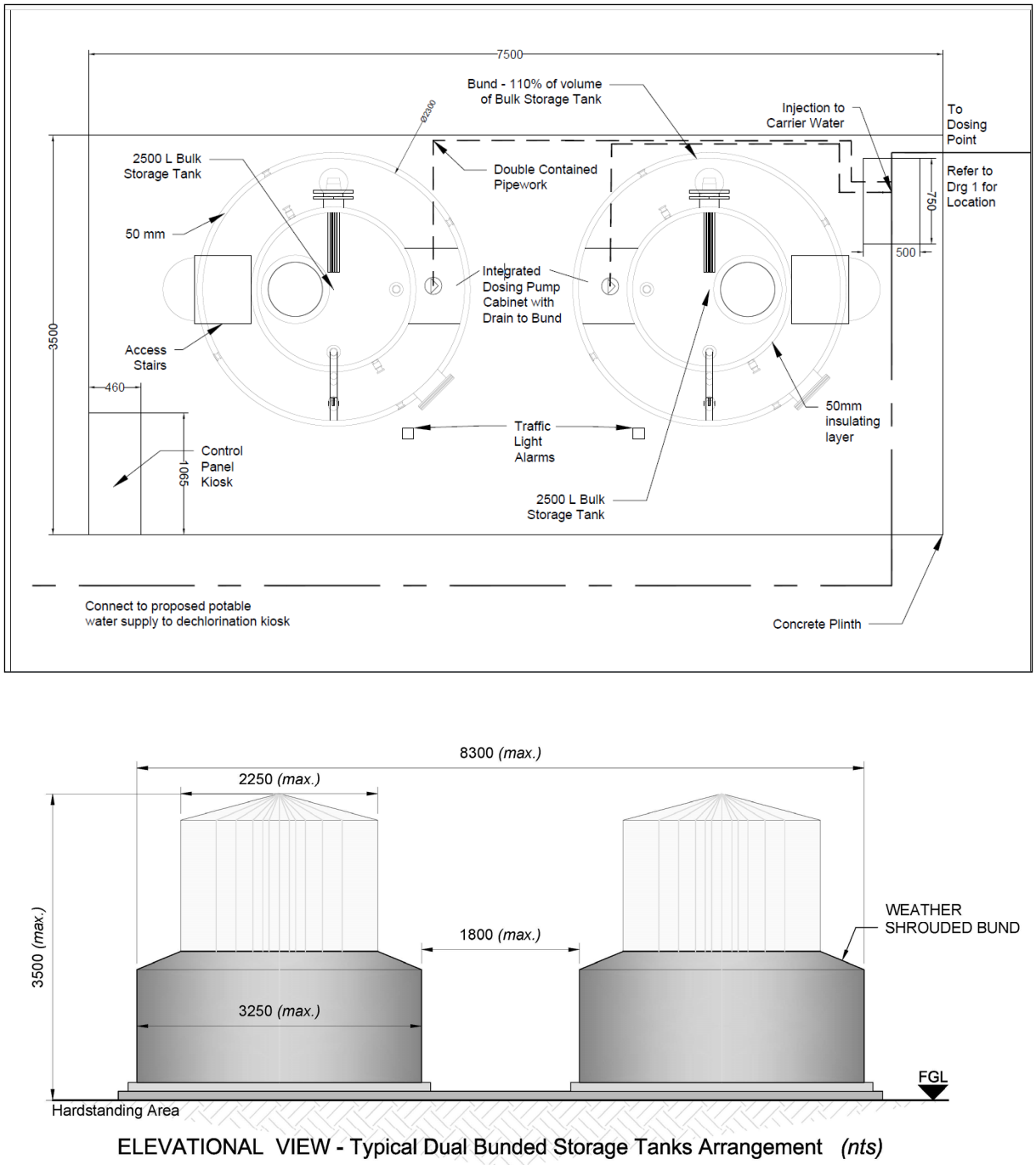


Figure 3-2: Plan and Elevation Drawings of a Typical Orthophosphate Dosing Unit

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 3.5.2** below.

3.5.2 Environmental Assessment Methodology

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

- The source of phosphorus is defined as the orthophosphate dosing at the water treatment plant which will be dependent on the water chemistry of the raw water quality, the integrity of the distribution network and the extent of lead piping.
- Pathways include discharges from the wastewater collection system (WWTP discharges and intermittent discharges – Storm Water Overflows (SWOs)), leakage from the distribution system and small point source discharges from DWWTSs.

- Receptors refer to SACs and SPAs which may receive orthophosphate dosed water via the pathway examples outlined above. Receptors and their sensitivity is of key consideration in the EAM. A water body may be more sensitive to additional phosphorus loadings where it has a low capacity for assimilating the load e.g. high status sites, such as the habitat of the freshwater pearl mussel or oligotrophic lakes. Where a SAC/SPA could receive orthophosphate dosing inputs at more than one WSZ, the cumulative effects are considered in the EAM.

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

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

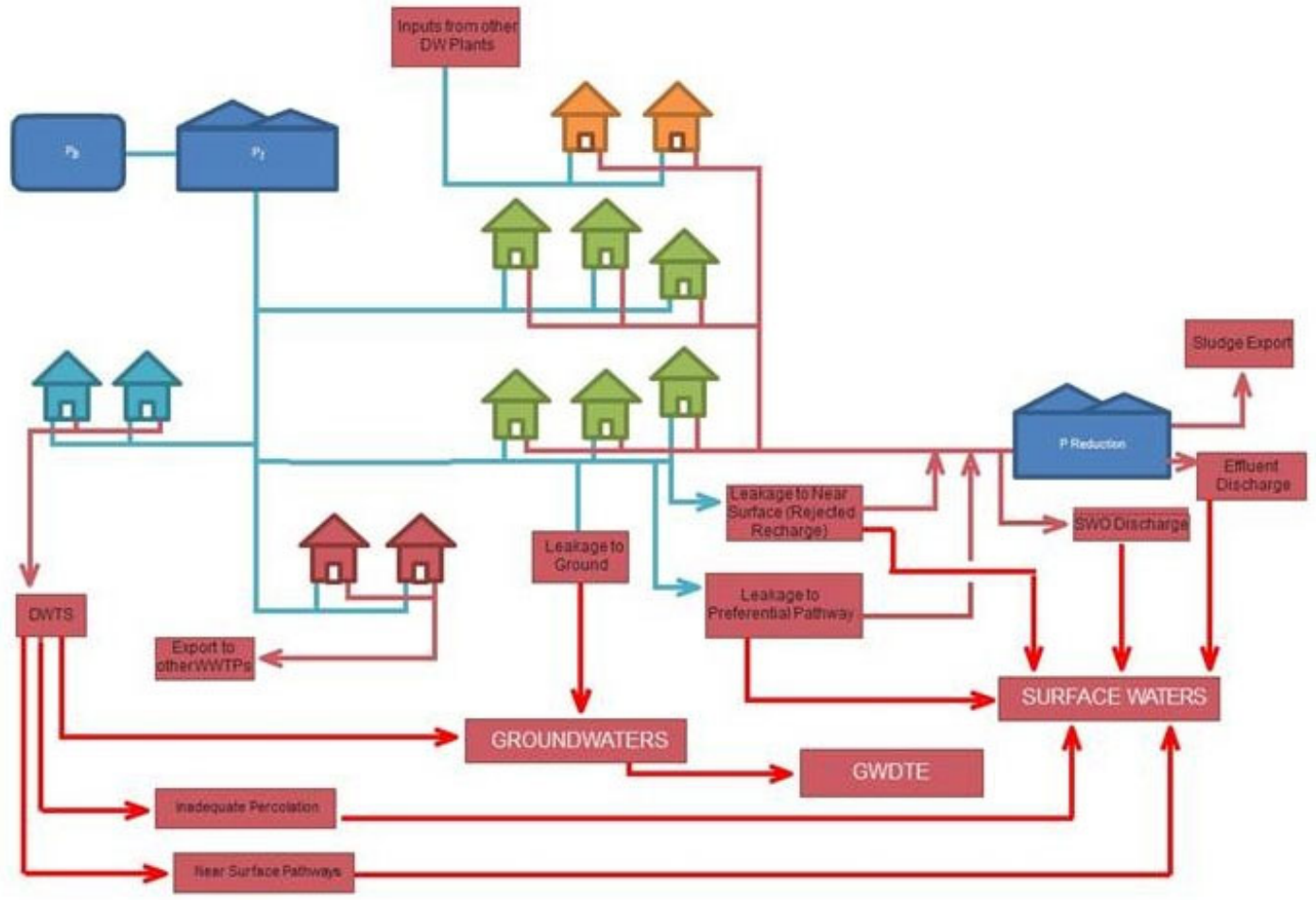


Figure 3-3: Conceptual Model of P Transfer

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

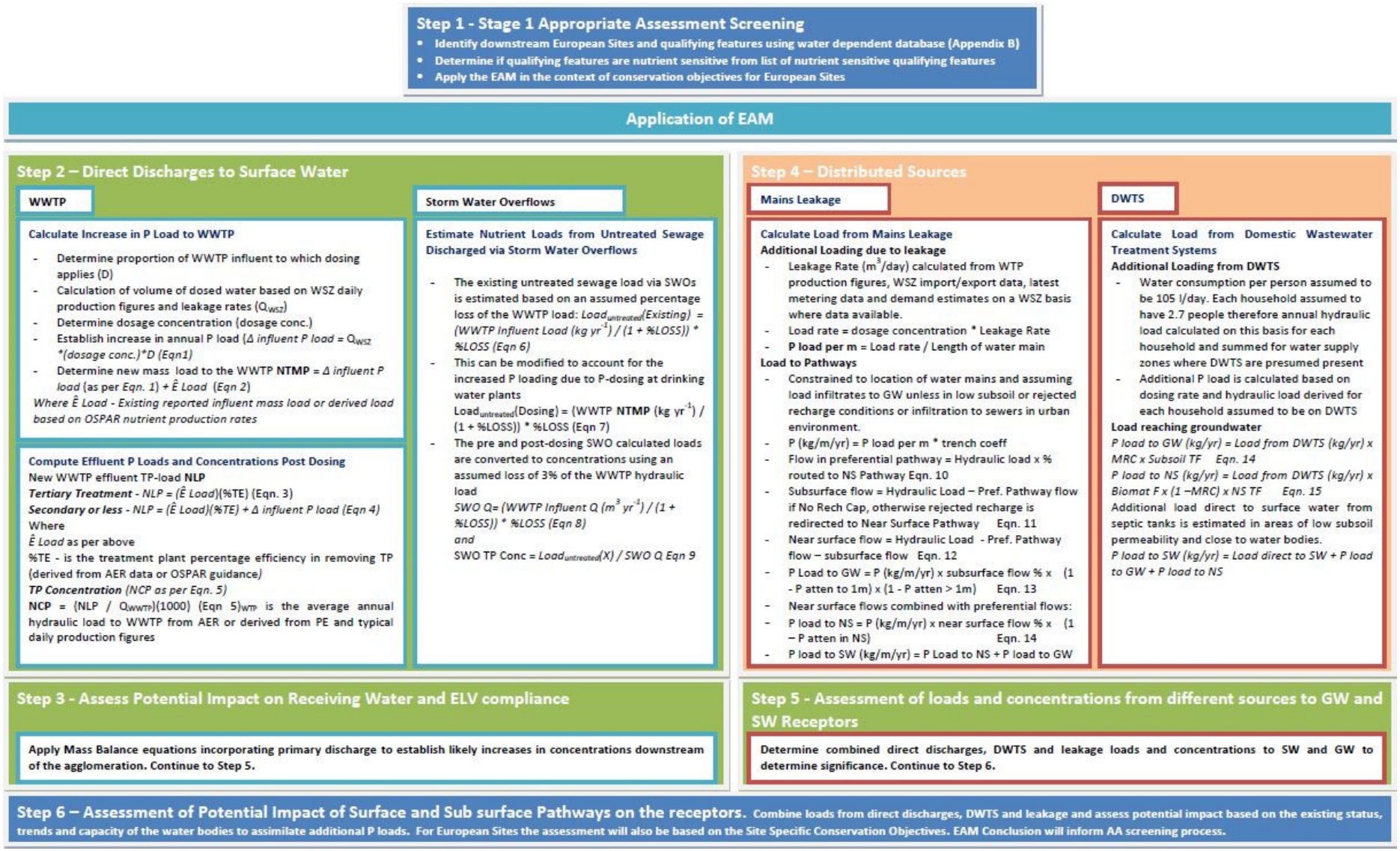


Figure 3-4: Stepwise Approach to the Environmental Assessment Methodology

4 PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

The construction phase of the proposed project will take place within the confines of the existing Midleton 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 Midleton 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[4,5]	Potential Source Pathway Receptor
1	Great Island Channel SAC	001058	No	Yes	No	Yes (Ballinhassig East)	Yes
2	The Gearagh SAC	000108	No	Yes	No	Yes (Ballinhassig East)	Yes
3	Cork Harbour SPA	004030	No	Yes	No	Yes (Ballinhassig East)	Yes
4	The Gearagh SPA	004109	No	Yes	No	Yes (Ballinhassig East)	Yes

4.1.2 Operational Phase

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

In the EAM, all water bodies linked to the WSZ have been identified. Groundwater bodies intersecting the WSZs are also included in the ZoI. Hydrogeological linkages in karst areas have also been taken into account. European Sites within the ZoI are listed in **Table 4-2** and are displayed in **Figure 4-1**.

[4] Groundwater in Ballinhassig East will discharge locally to streams and rivers crossing the aquifer and to small springs and seeps. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater – surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low. The Gearagh SAC and SPA are located between 85-90km west of the proposed construction works, therefore they have been excluded from further assessment on this basis and due to the minor nature and scale of the works within the footprint of the WTP.

[5] GSI - Ballinhassig GWB: Summary of Initial Characterisation

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

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
1	Ardmore Head SAC	SAC 002123	Yes	Yes	Yes- CWB (Western Celtic Sea)	No	Yes
2	Ballymacoda (Clonpriest and Pillmore) SAC	SAC 000077	Yes	Yes	No	Yes (Midleton)	Yes
3	Barley Cove to Ballyrisode Point SAC	SAC 001040	Yes	Yes	Yes- CWB (Western Celtic Sea)	No	Yes
4	Blackwater River (Cork / Waterford) SAC	SAC 002170	Yes	Yes	Yes- CWB (Youghal Bay)	No	Yes
5	Castletownshend SAC	SAC 001547	Yes	Yes	Yes- CWB (Rosscarbery Bay)	No	Yes
6	Clonakilty Bay SAC	SAC 000091	Yes	Yes	Yes- CWB (Clonakilty Bay)	No	Yes
7	Courtmacsherry Estuary SAC	SAC 001230	Yes	Yes	Yes-CWB (Courtmacsherry Bay)	No	Yes
8	Great Island Channel SAC	SAC 001058	Yes	Yes	Yes - RWB	Yes (Ballinhassig East, Midleton)	Yes
9	Kilkeran Lake and Castlefreke Dune SAC	SAC 001061	Yes	Yes	Yes- CWB (Rosscarbery Bay)	No	Yes
10	Lough Hyne Nature Reserve and Environs SAC	SAC 000097	Yes	Yes	Yes- CWB (Western Celtic Sea)	No	Yes
11	Myross Wood	SAC 001070	Yes	Yes	Yes- TWB (Glandore Harbour)	No	Yes
12	Roaringwater Bay SAC	SAC 000101	Yes	Yes	Yes- CWB (Western Celtic Sea)	No	Yes
13	The Gearagh SAC	SAC 000108	Yes	Yes	No	Yes (Ballinhassig East)	Yes
14	Ballycotton Bay SAC	SPA 004022	Yes	Yes	Yes- CWB (Western Celtic Sea)	No	Yes
15	Ballymacoda Bay SPA	SPA 004023	Yes	Yes	No	Yes (Midleton)	Yes
16	Blackwater Estuary SPA	SPA 004028	Yes	Yes	Yes- CWB (Youghal Bay	No	Yes
17	Clonakilty Bay SPA	SAC 004081	Yes	Yes	Yes- CWB (Clonakilty Bay)	No	Yes

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
18	Courtmacsherry Bay SPA	SPA 004219	Yes	Yes	Yes-CWB (Courtmacsherry Bay)	No	Yes
19	Cork Harbour SPA	SPA 004030	Yes	Yes	Yes -RWB	Yes (Ballinhassig East, Midleton)	Yes
20	Galley Head to Duneen Point SPA	SPA 004190	Yes	Yes	Yes- CWB (Western Celtic Sea)	No	Yes
21	Old Head of Kinsale SPA	SPA 004021	Yes	Yes	Yes-CWB (Courtmacsherry Bay)	No	Yes
22	Seven Heads SPA	SPA 004191	Yes	Yes	Yes- CWB (Western Celtic Sea)	No	Yes
23	Sheep's Head to Toe Head SPA	SPA 004156	Yes	Yes	Yes- CWB (Western Celtic Sea)	No	Yes
24	Sovereign Islands SPA	SPA 004124	Yes	Yes	Yes- CWB (Western Celtic Sea)	No	Yes
25	The Gearagh SPA	SPA 004109	Yes	Yes	No	Yes (Ballinhassig East)	Yes

Zone of Influence (ZoI) for Operational Phase

Blackwater River (Cork/Waterford) SAC (002170)

The Gearagh SPA (004109)

The Gearagh SAC (000108)

Barley Cove to Ballyrisode Point SAC (001040)

Roaringwater Bay And Islands SAC (000101)

Sheep's Head to Toe Head SPA (004156)

Myross Wood SAC (001070)

Clonakilty Bay SPA (004081)

Clonakilty Bay SAC (000091)

Lough Hyne Nature Reserve And Environs SAC (000097)

Castletownshend SAC (001547)

Galley Head to Duneen Point SPA (004190)

Kilkeran Lake and Castlefreke Dunes SAC (001061)

Old Head of Kinsale SPA (004021)

Courtmacsherry Estuary SAC (001230)

Courtmacsherry Bay SPA (004219)

Seven Heads SPA (004191)

Sovereign Islands SPA (004124)

Cork Harbour SPA (004030)

Great Island Channel SAC (001058)

Ardmore Head SAC (002123)

Cork City Water Supply

Zone2 Macroom

Zone2 Ballyverane

Zone2 Cork Harbour and City

Zone2 Innishannon

Zone3 Glashaboy

Zone3 Midleton

Zone3 Whitegate Regional

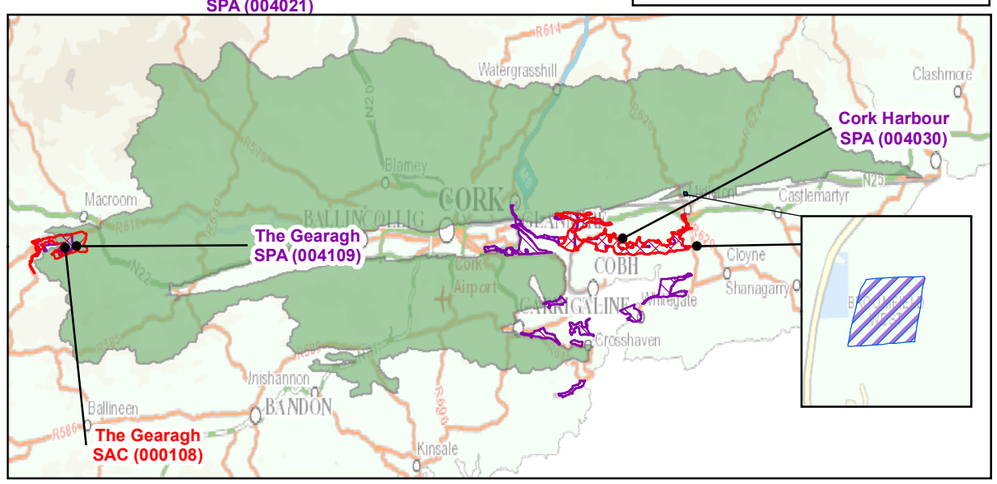
Ballycotton Bay SPA (004022)

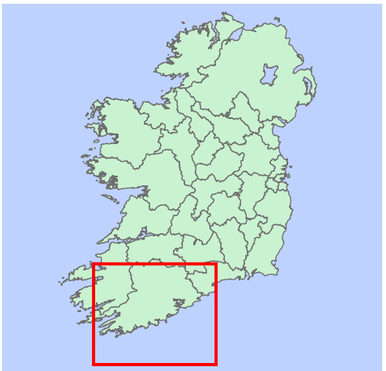
Ballymacoda (Clonpriest and Pillmore) SAC (000077)

Ballymacoda Bay SPA (004023)

Blackwater Estuary SPA (004028)

Zone of Influence (ZoI) for Construction Phase





Legend

LEMA Emission Type

- Primary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- Midleton 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 (Jan. 2019)
EPA

N

0 5 10 20 Kilometres

Client: UISCE ÉIREANN : IRISH WATER

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Zone 3 Midleton

European Sites within the ZoI of the Proposed Project

RPS

Scale: 1:500,000 @ A3	Date: 07/06/2019
File Ref: MDW0766Arc0039aF01	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 from further assessment in **Section 6**. Those included, are detailed in **Table 4-3** and are displayed in **Figure 4-2.** Two sites are included for further assessment for the construction phase and four sites for the operational phase, with justification provided below.

The construction phase of the proposed project will take place within the confines of the existing Midleton WTP. There is no potential for surface water connectivity to European Sites. The WTP is located within the Ballinahassig East (IE_SW_G_004) groundwater body. This groundwater body provides potential hydrogeological connection to four European Sites however upon further investigation two sites were excluded from further assessment (The Gearagh SAC and SPA) due to their distance from the proposed works (>85 km west of the WTP), the nature and scale of the proposed construction works, and the nature of the groundwater body which discharges locally to rivers and streams and the poor productivity of the aquifers within it[6] (see **Table 4-1** above). Two sites were included for further assessment owing to hydrogeological connectivity to the groundwater body, Great Island Channel SAC and Cork Harbour SPA.

The Midleton WSZ for the operational phase is located within the Owenacurra_SC_010 subcatchment and the Owenacurra and Dungourney rivers intersect the Midleton WSZ. Two European Sites containing water dependent and nutrient sensitive habitats/species are located within this subcatchment and have a hydrological connection with the WSZ i.e. Great Island Channel SAC and Cork Harbour SPA and are included in the Section 5 and Section 6 assessment.

The WSZ also intersects two groundwater bodies; Ballinhassig East (IE_SW_G_004) and Midleton (IE_SW_G_058) (**Table 3, Appendix C**). Great Island Channel SAC and Cork Harbour SPA are already included for assessment for surface water connectivity and also have a hydrogeological connection with both Ballinhassig East (IE_SW_G_004) and Midleton (IE_SW_G_058) groundwater bodies. For the remaining European Sites which are hydrogeologically connected (via groundwater) to the WSZ, an assessment was made on the direction of flow in the groundwater body forming the connection.

Groundwater flows through voids such as connected pore spaces in sand and gravel aquifers and through fissures, faults, joints and bedding planes in bedrock aquifers. Regional groundwater flows tend to follow the regional topography and generally discharge towards main surface water bodies including rivers, lakes and coastal water bodies. In areas of karstified limestones, high permeability zones give rise to rapid groundwater velocities with more complex flow directions, which may vary seasonally and are difficult to predict with certainty. In this case the assumption is that of groundwater flow direction is from areas of higher elevations to lower elevations unless groundwater specific information indicates otherwise. Groundwater body specific information relating to flow and discharge is available from Geological Survey Ireland (GSI)[7], and was consulted in making the assessment.

Ballymacoda (Clonpriest and Pillmore) SAC and Ballymacoda Bay SPA are not hydrologically connected to the WSZ. There is a groundwater connection via the Midleton (IE_SW_G_058) groundwater body.

[6] GSI - Ballinhassig GWB: Summary of Initial Characterisation
[7] https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx

Midleton is a karstic groundwater body dominated by diffuse flow and there is a high degree of interaction between surface water and groundwater. The area around Midleton is classed as extremely vulnerable[8]. Swallow holes and caves receive surface water, and groundwater is discharged to surface as springs or as baseflow to rivers crossing the groundwater body. Groundwater flow paths can be up to several kilometres long, but may be significantly shorter in areas where the water table is very close to the surface. Regional groundwater flow is towards the rivers draining the valley, to the sea in the east and to Lough Mahon and the surface water channels to the west and south west of the body. Ballymacoda (Clonpriest and Pillmore) SAC and Ballymacoda Bay SPA are located approximately 16km to the east of the WSZ. Owning to the karstic nature of the groundwater body and potential for long groundwater flow paths Ballymacoda (Clonpriest and Pillmore) SAC and Ballymacoda Bay SPA are included for assessment.

The Gearagh SAC and Gearagh SPA are located approximately 55km upstream of the WSZ and therefore will not interact with any surface water from the WSZ. There is a groundwater connection via the Ballinhassig East groundwater body. Ballinhassig East is a large poorly productive groundwater body with groundwater flow paths expected to be relatively short, typically from 30-300 m. Groundwater discharges to small springs, or to the streams that traverse the aquifer. Flow directions are expected to approximately follow the local surface water catchments. Groundwater is generally unconfined. Given distance from the WSZ to the European Sites, short flow path for groundwater and that groundwater follows surface water flow; the Gearagh SAC and Gearagh SPA were excluded from further assessment.

The Western Celtic Sea HAs 18;19;20 (IE_SW_010_0000) is a large coastal water body located downstream of the WSZ. The WSZ is hydrologically connected to this coastal water body via surface water bodies discharging into transitional and coastal water bodies. These water bodies include; Dungourney_020 (IE_SW_19D070700) and Owenacurra_040 (IE_SW_19O30500) rivers which discharge into the Owenacurra Estuary (IE_SW_060_0400), and then the North Channel Great Island (IE_SW_060_0400) transitional water bodies, before transiting to the Cork Harbour (IE_SW_060_0000) coastal water body.

The modelled concentration in Owenacurra Estuary (IE_SW_060_0400) is 0.0001mg/l, while for the North Channel Great Island (IE_SW_060_0400) it is undetectable (0.0000mg/l). Therefore, the ZoI for the project has been determined to terminate at North Channel Great Island (IE_SW_060_0400) transitional water body, and the following 19 European Sites which are hydrologically connected to the WSZ via the Western Celtic Sea coastal water body are excluded from further assessment; Ardmore Head SAC, Barley Cove to Ballyrisode Point SAC, Blackwater River (Cork/Waterford) SAC, Castletownshend SAC, Clonakilty Bay SAC, Courtmacsherry Estuary SAC, Kilkeran Lake and Castlefreke Dunes SAC, Lough Hyne Nature Reserve and Environs SAC, Myross Wood SAC, Roaringwater Bay and Island SAC, Ballycotton Bay SPA, Blackwater Estuary SPA, Clonakilty Bay SPA, Courtmacsherry Bay SPA, Galley Head to Duneen Point SPA, Old Head of Kinsale SPA, Seven Heads SPA, Sheep's Head to Toe Head SPA and Sovereign Islands SPA.

On this basis, two sites have been included for further assessment in order to evaluate the significance of potential effects arising during construction phase in Section 5 below i.e. Great Island Channel SAC and Cork Harbour SPA. Four sites have been included for further assessment for the operational phase in Section 5 and 6 below i.e. Ballymacoda (Clonpriest and Pillmore) SAC, Great Island Channel SAC, Ballymacoda Bay SPA and Cork Harbour SPA.

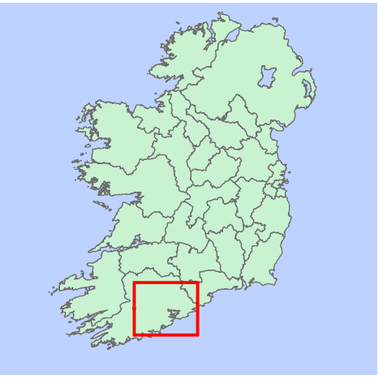
[8] Midleton Groundwater Body: Summary of Initial Characterisation

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

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

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
			A142	Lapwing (*Vanellus vanellus*)	Yes	Yes		
			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		
			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	Yes		
			A999	Wetlands	Yes	Yes		
Operation Phase Only								
Ballymacoda (Clonpriest and Pillmore) SAC	SAC 000077	19th Feb 2015 Version 2	1130	Estuaries	Yes	Yes	Yes	Yes
			1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes		
			1310	*Salicornia* and other annuals colonising mud and sand	Yes	Yes		
			1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes		
Ballymacoda Bay SPA	SPA 004023	19th Feb 2015 Version 1	A050	Wigeon (*Anas penelope*)	Yes	Yes	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
			A052	Teal (*Anas crecca*)	Yes	Yes		
			A137	Ringed Plover (*Charadrius hiaticula*)	Yes	Yes		
			A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes		
			A141	Grey Plover (*Pluvialis squatarola*)	Yes	Yes		
			A142	Lapwing (*Vanellus vanellus*)	Yes	Yes		
			A144	Sanderling (*Calidris alba*)	Yes	Yes		
			A149	Dunlin (*Calidris alpina alpine*)	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		
			A169	Turnstone (*Arenaria interpres*)	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		
			A999	Wetlands	Yes	Yes		



Legend

LEMA Emission Type

- Primary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- Midleton 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 (Jan. 2019)
EPA

N

0 2.5 5 10 Kilometres

Client

UISCE ÉIREANN : IRISH WATER

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Zone 3 Midleton

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

RPS

Scale: 1:250,000 @ A3	Date: 07/06/2019
File Ref: MDW0766Arc0039bF01	Map Projection: Irish National Grid (TM65)

5 EVALUATION OF POTENTIAL IMPACTS

5.1 CONTEXT FOR IMPACT PREDICTION

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

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

5.2 IMPACT IDENTIFICATION

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

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

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

5.2.1 Construction Phase

The source-pathway-receptor approach has identified a number of impact pathways associated with the construction of orthophosphate treatment works at Midleton 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 Midleton 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 Midleton WTP.

5.3.1 Construction Phase

There are two possible locations for the orthophosphate dosing system both 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 Midleton WTP into account and therefore included both possible locations. The assessment of impacts associated with the construction of the corrective water treatment works at Midleton 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 Midleton 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

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Evaluation
Great Island Channel SAC (001058)	Midleton (IE_SW_G_058)	GWB	The construction works will be located within the confines of the existing Midleton WTP. Midleton WTP is not located within or directly adjoining a European Site. **Surface water** There are no surface water bodies within the confines of the WTP. The Owennacurra_040 (IE_SW_19O030500) is located 1.4 km west of the WTP, with the Dungourney_020 (IE_SW_19D070700) situated 3 km south of the WTP. Both rivers flow into the Owenacurra Estuary (IE_SW060_0400) and in turn, Great Island Channel SAC and Cork Harbour SPA, both located 3 km south the of the WTP. However, there is no direct or indirect surface water connectivity between the WTP and European Sites. The proposed construction works are small scale in nature and will be undertaken within the confines of the existing built infrastructure associated with Midleton WTP. There will be no aspects of the proposed works that will result in the release of potential impacts sources identified in **Section 5.2.1.** The works will be localised and contained to the immediate development area which supports amenity grassland / buildings and artificial surfaces. Works such as excavations will be contained to the defined working area and necessary works with cast in place concrete will be undertaken within sealed shuttered units. Such works practices will retain all potential construction related pollutants at source.
	Ballinhassig East (IE_SW_G_004)	GWB	
Cork Harbour SPA (004030)	Midleton (IE_SW_G_058)	GWB	
	Ballinhassig East (IE_SW_G_004)	GWB	

[9] Monitoring period is annual unless specified.

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Evaluation
			Owing to the small scale nature of the proposed works and the distance between the WTP and the European Sites (3 km downstream) there is no potential for likely significant effects on Great Island Channel SAC or Cork Harbour SPA through sediment laden run-off, dust emissions or environmental incidents. Therefore, there is no potential for likely significant effects to these European Sites. **Groundwater** The WTP overlies the Ballinhassig East (IE_SW_G004) groundwater body, which borders the Great Island Channel SAC and Cork Harbour SPA. 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. Owing to the poor productivity of the aquifers in the Ballinhassig East (IE_SW_G_004) it is unlikely that any major groundwater surface water interactions occur. Flow directions are expected to approximately follow the local surface water catchments.[10] As the excavation works will not be extensive (up to c. 75m for pipework and to an approximate depth of 700mm) and upon made ground, interference with water table will be unlikely to occur. Any interference would be localised, minor and temporary. Therefore, there is no potential for likely significant effects to the underlying groundwater body, the receiving surface water feature and subsequently those European Sites included for further assessment, as a result of the construction of the corrective water treatment works at Midleton WTP.

5.3.2 Operational Phase

In the case of the additional orthophosphate load due to dosing at Midleton 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;

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

- 75% of the upper threshold for the indicative quality;
- Cumulative orthophosphate load to surface from leakage, DWWTS and agglomerations;
- The modelled orthophosphate concentration following dosing at the WTP; and,
- The orthophosphate potential baseline concentration (mg/l) following dosing at the WTP.

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

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

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[11].

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

It is predicted that orthophosphate dosing will not have a significant effect on water bodies (or the Conservation Objectives of a European Site) where it does not cause the P concentration to increase to a level within 25% of the remaining capacity left within the existing orthophosphate indicative quality band, i.e. cause a change in the distance to threshold from far to near. This assessment will be supported by trend analysis as outlined below to ensure the additional orthophosphate dosing and statistically significant trends for a water body will not result in deterioration in status even where the

[11] 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.

distance to threshold is currently assessed to be far. Where the water body baseline indicative quality concentration is “Near” to the threshold before the effect of orthophosphate dosing is considered, this does not cause an automatic fail for this test. If the predicted increase in concentration due to orthophosphate is very low (i.e. below 5% of the Good/Moderate indicative quality this test will pass as the orthophosphate dosing itself can be defined as having no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

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

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

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

An additional test for groundwater bodies states that downward trends should not be reversed as a result of pollution. This test applies to GWB with statistically significant trends according to the WFD App and the Sens Slope provided is used to assess direction and strength of trend. If the trend is negative and the predicted increase in orthophosphate concentration is lower than the absolute value of the Sens Slope, then the test passes.

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

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

Site Name (Code)	Contributing WB Code_Name	WB Type[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline[15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
Ballymacoda (Clonpriest & Pillmore) SAC (000077)	IE_SW_G_058 Midleton	GWB	Good Upwards Far	0.017	0.026	19.3	0.0006	0.017	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Great Island Channel SAC (001058)	IE_SW_19D070700 Dungourney_020	RWB	Good Downwards Far	0.028	0.033	9.3	0.0002	0.028	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19O030500 Owenacurra_040	RWB	Good Downwards Far	0.026	0.033	15.1	0.0001	0.026	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_060_0400 Owenacurra Estuary	TWB Summer	High Upwards Far	0.016	0.020	24.4	0.0001	0.016	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

[12] Monitoring period is annual unless specified.
[13] Surrogate indicative quality in italic.
[14] Distance to threshold.
[15] Baseline year is 2014 for surface waters and 2012 for groundwaters.
[16] Surrogate concentration is given in italic mg/l
[17] 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.
[18] Green cells signify that there is no risk of deterioration in status of the water body following dosing at the WTP.

Site Name (Code)	Contributing WB Code_Name	WB Type[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline [15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
		TWB Winter	High Upwards Near	0.022	0.022			0.022	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_060_0300 North Channel Great Island	TWB Summer	High Upwards Far	0.008	0.019	215.9	0.0000	0.008‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	High Downwards Near	0.026	0.020			0.026‡	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 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_058 Midleton	GWB	Good Upwards Far	0.017	0.026	19.3	0.0006	0.017	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[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline [15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
	IE_SW_G_004 Ballinhassig East	GWB Multiple Monitoring Points	Good Upwards Near	0.034	0.026	0.1	0.0000	0.034	Five monitoring points are failing to achieve Good indicative quality, however the modelled additional increase in concentration is not detectable (0.0000mg/l). The additional orthophosphate load in this water body is not impacting on the ability of the dependent water bodies to achieve their WFD objectives (see surface WBs listed for this SAC). Therefore, 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	
			Good Upwards Far	0.051	0.026			0.051	
			Failing to achieve good Upwards Far	0.037	-			0.037	
			Good Upwards Far	0.021	0.026			0.021	
			Good Upwards Far	0.015	0.026			0.015	
			Good Upwards Far	0.006	0.026			0.006	
			Good Upwards Far	0.023	0.026			0.23	
			Failing to achieve good Upwards Far	0.268	-			0.268	

Site Name (Code)	Contributing WB Code_Name	WB Type[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline [15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
			Good Upwards Far	0.006	0.026			0.006	
			Good Upwards Near	0.026	0.026			0.026	
			Failing to achieve good None Far	0.188	-			0.188	
			Good Upwards Far	0.012	0.026			0.012	
			Failing to achieve good Downwards Far	0.043	-			0.043	
Ballymacoda Bay SPA 004023	IE_SW_G_058 Midleton	GWB	Good Upwards Far	0.017	0.026	19.3	0.0006	0.017	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Cork Harbour SPA 004030	IE_SW_19D070700 Dungourney_020	RWB	Good Downwards Far	0.028	0.033	9.3	0.0002	0.028	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_19O030500 Owenacurra_040	RWB	Good Downwards Far	0.026	0.033	15.1	0.0001	0.026	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[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline [15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
	IE_SW_060_0400 Owenacurra Estuary	TWB Summer	High Upwards Far	0.016	0.020	24.4	0.0001	0.016	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	High Upwards Near	0.022	0.022			0.022	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_060_0300 North Channel Great Island	TWB Summer	High Upwards Far	0.008	0.019	215.9	0.0000	0.008‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	High Downwards Near	0.026	0.020			0.026‡	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 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_058 Midleton	GWB	Good Upwards Far	0.017	0.026	19.3	0.0006	0.017	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[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline [15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
	IE_SW_G_004 Ballinhassig East	GWB Multiple Monitoring Points	Good Upwards Near	0.034	0.026	0.1	0.0000	0.034	Five monitoring points are failing to achieve Good indicative quality, however the modelled additional increase in concentration is not detectable (0.0000mg/l). The additional orthophosphate load in this water body is not impacting on the ability of the dependent water bodies to achieve their WFD objectives (see surface WBs listed for this SAC). Therefore, 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	
			Good Upwards Far	0.051	0.026			0.051	
			Failing to achieve good Upwards Far	0.037	-			0.037	
			Good Upwards Far	0.021	0.026			0.021	
			Good Upwards Far	0.015	0.026			0.015	
			Good Upwards Far	0.006	0.026			0.006	
			Good Upwards Far	0.023	0.026			0.023	
			Failing to achieve good Upwards Far	0.268	-			0.268	

Site Name (Code)	Contributing WB Code_Name	WB Type[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline [15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
			Good Upwards Far	0.006	0.026			0.006	
			Good Upwards Near	0.026	0.026			0.026	
			Failing to achieve good None Far	0.188	-			0.188	
			Good Upwards Far	0.012	0.026			0.012	
			Failing to achieve good Downwards Far	0.043	-			0.043	

‡ 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 = 0.6 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*
Midleton Primary Discharge	2.0 Ortho P Non-compliant with ELV set in the WWDL within the 2017 AER	**Existing**	5544.9	0.907	0.726	1.233
		Post-dosing	5917.1	0.968	0.774	1.316
Midleton SWOs (4 no.)	n/a	**Existing**	345.8	1.942	1.554	2.641
		Post-dosing	356.7	2.003	1.602	2.724

Table 5-4 Mass balance assessment based on 0.6 mg/l dosing using available background concentrations and mean flow information.

Agglom.	RWB Name / Code for Primary Discharge	Background conc. (mg/l) (annual mean from AER u/s monitoring point)	Modelled Conc. Existing (mg/l)	Modelled Conc. Post-dosing (mg/l)	% Inc
Midleton	IE_SW_060_0300 North Channel Great Island	0.0260	0.0268	0.0268	0.0

Midleton Agglomeration

The Midleton agglomeration (D0044-01) discharges into North Channel Great Island (IE_SW_060_0300) which is hydrologically connected to Great Island Channel SAC and Cork Harbour SPA. The agglomeration receives tertiary treatment i.e. i.e. nutrient removal is assumed to remove any additional orthophosphate load to the WWTP during the treatment process. This is based on the assumption that there is adequate capacity in the chemical dosing system to effectively manage the removal of the additional phosphorus without affecting the performance of the treatment process at the WWTP or the quality of the effluent discharged under the current operating regime.

The WWTP was compliant with the ELV's set in the WWDL for ortho P in the 2021 AER. When fluvial and daily tidal exchange volumes are taken into account the increase in the receiving water is undetectable (0.0%) (**Table 5-4**). Therefore, there is no risk of failing to achieve WFD objectives for the North Channel Great Island transitional water body (IE_SW_060_0300) and its hydrologically connected European Sites as a result of dosing at Midleton 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 surface water bodies from subsurface pathways (**Appendix C**). The modelled concentrations due to subsurface pathways are insignificant in river water bodies, i.e. < 0.00125 mg/l (5% of the Good / High indicative quality boundary for surface water bodies). The highest potential increase in concentration (0.0002 mg/l) was predicted for Dungourney_020 (IE_SW_19D070700).

Transitional water bodies directly affected by the WSZ include: Owenacurra Estuary (IE_SW_060_0400) and North Channel Great Island (IE_SW_060_0300). Modelled increases in concentrations in transitional water bodies are insignificant for the Owenacurra Estuary (0.0001 mg/l) and undetectable for North Channel Great Island (0.0000 mg/l), therefore are within 5% of the High / Good indicative quality boundary.

Therefore, there is no risk of deterioration in the indicative quality of surface water bodies as a result of dosing at Midleton WTP, or of preventing the achievement of WFD objectives.

There are no coastal water bodies directly affected by the WSZ.

5.3.4.2 Groundwater assessment

The predicted loads and concentrations to groundwater bodies (GWBs) are undetectable or insignificant (i.e. <0.00175 mg/l = 5% of the Good / Fail indicative quality boundary) as shown in **Table 3 of Appendix C**.

The ZoI contains two groundwater bodies, Midleton (IE_SW_G_058) and Ballinhassig East (IE_SW_G_004). **Table 3 of Appendix C** outlines the increased loadings and concentrations in these GWBs.

The modelled additional increase in concentration for Midleton (IE_SW_G_058) is 0.0006 mg/l and therefore does not exceed 5% of the Good / Fail indicative quality boundary (<0.00175 mg/l). Ballinhassig East (IE_SW_G_004) has a number of monitoring points, five of which are Failing to Achieve Good indicative quality. The modelled additional increase in concentration for this groundwater body is undetectable at 0.0000 mg/l.

Therefore, there is no risk of deterioration in the indicative quality of groundwater bodies as a result of dosing at Midleton WTP, or of preventing the achievement of WFD objectives.

5.3.5 Combined Assessment

Table 4A of Appendix C provides details of the combined orthophosphate inputs to river water bodies from direct discharges, DWWTSs and leakage loads. The increased concentrations due to orthophosphate dosing are not predicted to be significant in any river water body i.e. below 5% of the Good / High indicative quality boundary (0.00125 mg/l). These rivers are Dungourney_020 (IE_SW_19D070700) and Owennacurra_040 (IE_SW_19O030500). Modelled increases in concentrations are 0.0002 mg/l and 0.0001 mg/l respectively. The dosing therefore will not result in deterioration of the indicative quality of the river water bodies identified in **Table 5-2**, or prevent the achievement of WFD objectives.

Table 4B of Appendix C provides details of the increased loading and concentrations to transitional and coastal water bodies receiving flows from river water bodies connected to the WSZ. The current winter baseline monitoring in the North Channel Great Island (IE_SW_060_0300) exceeds 75% of the indicative quality upper threshold for orthophosphate. However, the modelled additional increase in concentration is undetectable in the case of North Channel Great Island (0.0000 mg/l) and therefore do not exceed 5% of the High / Good indicative quality boundary. The modelled additional increase in concentration is negligible (0.0001 mg/l) for Owenacurra Estuary (IE_SW_060_0400). The dosing therefore will not result in deterioration of the indicative quality of the transitional water bodies identified in **Table 5-2**, or prevent the achievement of WFD objectives.

5.3.6 Assessment of Cumulative Impacts from other WSZs

The cumulative loads to the Lee, Cork Harbour & Youghal (HA 19) and 20 Bandon-Ilen (HA 20) associated with the orthophosphate dosing have been assessed with the Zone 4 Midleton 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 – Zone 2 Cork City and Harbour

- 026 Glashaboy WTP – Zone 3 Glashaboy
- 030 Innishannon WTP – Zone 2 Innishannon
- 036 Clonakilty RWSS WTP (Jones Bridge WTP) - Zone 1 Clonakilty
- 054 Mallow WTP (Ballyellis WTP) – Zone 4 Mallow
- 059 Glendine WTP - Zone3 Youghal Regional
- 060 Ballyhilty WTP - Zone 1 Skibbereen Ballyhilty
- 072 Kilva Reservoir Site – Zone 3 Whitegate Regional
- 083 Tibbetstown WTP - Tibbotstown
- 118 Macroom WTP – Zone 2 Macroom
- 157 Carriglusky Reservoir Site, Cloyne - Zone3 Cloyne
- 161 Freemount WTP – Zone 4 Allow Regional
- 165 Knockraha WTP -Zone3 Glanmire
- 180 Mitchelstown South WTP – Zone 4 Mitchelstown South
- 192 Michelstown Galtee WTP - Cappamore Foileen Water Supply
- 236 Mountnorth Reservoir – Zone 4 Mount North
- 324 Killdorrery WTP – Zone 4 Kildorrery
- 333 Shrone WTP - Shrone PWSS 078A
- 359 Ballymacoda Road Borehole – Zone 3 Killeagh
- 363 Hammond Place Pump Station - Zone 4 Dromahane
- 370 LCB Cappoquin Pump Station - LCB Cappoquin
- 371 LCB Lismore WTP – LCB Lismore
- 376 Tallow WTP – Tallow
- 386 Drimoleague WTP, Deelish - Zone1 Drimoleague
- 400 Bweeng WTP – Zone4 Bweeng

The current winter baseline monitoring in the North Channel Great Island (IE_SW_060_0300) and Youghal Bay (IE_SW_020_0000) exceeds 75% of the indicative quality upper threshold for orthophosphate. However, the modelled additional increase in concentration is insignificant in the case of North Channel Great Island (0.0002 mg/l) and undetectable for Youghal Bay (0.0000mg/l) therefore do not exceed 5% of the High / Good indicative quality boundary .

The cumulative assessment has demonstrated that there will be no deterioration in the indicative quality if the water bodies affected. As outlined in **Table 5-5** below as all modelled increases in concentrations in these water bodies are <5% of the Good / High indicative quality boundary for surface waters and will not prevent the achievement of WFD objectives.

Table 5-5: Cumulative assessment of the increased loading and concentrations to water bodies impacted by 078 Midleton WTP – Zone3 Midleton and other WSZs proposed for corrective water treatment in the upstream catchments.

EU Code_Name	WB Type/Period	Ortho P Indicative Quality[19] and Trends[20]	Baseline Year 2014 and Conc.[21] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Conc. using 30%ile Flows (mg/l)	PO4 Potential Baseline Conc. Following Dosing (mg/l)
IE_SW_19D070700 Dungourney_020	RWB	Good Downwards Far	0.028	0.033	30.3	0.0007	0.029
IE_SW_19O030500 Owennacurra_040	RWB	Good Downwards Far	0.026	0.033	26.9	0.0002	0.026
IE_SW_060_0400 Owenacurra Estuary	TWB Summer	High Upwards Far	0.016	0.020	201.2	0.0006	0.017‡
	TWB Winter	High Upwards Near	0.020	0.019			0.023‡
IE_SW_060_0300 North Channel Great Island	TWB Summer	High Upwards Far	0.008	0.019	799.8	0.0002	0.008‡
	TWB Winter	High Downwards Near	0.026	0.020			0.026‡
IE_SW_060_0000 Cork Harbour	TWB Summer	High Downwards Far	0.006	0.019	8478.8	0.0004	0.006‡
	TWB Winter	High Downwards Near	0.024	0.019			0.024‡
IE_SW_050_0000 Outer Cork Harbour	TWB Summer	High Downwards Far	0.003	0.019	8559.6	0.0003	0.003‡
	TWB Winter	High Downwards Far	0.016	0.018			0.016‡
IE_SW_030_0100 Womanagh Estuary	TWB	*High*	*0.013*	*0.019*	9.6	0.0001	0.013‡
IE_SW_020_0000 Youghal Bay	CWB Summer	High Upwards Far	0.009	0.019	517.9	0.0000	0.009‡
	CWB Winter	High Downwards Far	0.014	0.019			0.014‡
IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20)	CWB	*High*	*0.013*	*0.019*	9601.2	0.0001	0.013‡

[19] Surrogate indicative quality in *italic*
[20] Distance to threshold in parentheses
[21] Surrogate concentration indicated in *italic*

5.3.7 Conclusions

The modelled increased orthophosphate dosing concentrations do not result in a noticeable effect with orthophosphate concentrations in the receiving North Channel Great Island being undetectable 0.0%, as shown by the mass balance assessment in **Table 2 Appendix C.**

The modelled additional concentrations for both river water bodies assessed [Dungourney_020 (IE_SW_19D070700) and Owennacurra_040 (IE_SW_19O030500)] are below the 5% of the Good / High indicative quality boundary (0.00125 mg/l).

The modelled concentration in Owenacurra Estuary (IE_SW_060_0400) is 0.0001 mg/l, while for the North Channel Great Island (IE_SW_060_0400) it is undetectable (0.0000 mg/l).

All remaining river and transitional water bodies are within the 5% Good / High indicative quality boundary threshold following dosing.

One groundwater body Ballinhassig East (IE_SW_G_004) has a number of monitoring points, five of which are Failing to Achieve Good indicative quality. The modelled additional increase in concentration for the water body is undetectable at 0.0000 mg/l. The modelled additional increase in concentration for Midleton (IE_SW_G_058) does not exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) at 0.0006 mg/l.

The cumulative assessment of dosing at Midleton WTP together with other WTPs which may be subject to dosing in the same catchments, has demonstrated that there will not be a significant effect on receiving water bodies. These WTPs are also subject to their own Screening for AA.

Therefore, there is no risk of deterioration in the orthophosphate indicative quality of the receiving water bodies as a result of the proposed project, and the dosing will not prevent the achievement of the WFD objectives for these water bodies.

6 EVALUATION OF LIKELY SIGNIFICANT EFFECTS

6.1 CONSTRUCTION PHASE

Midleton WTP is not located within or directly adjacent to the boundary of any European Site. There are no surface water bodies within the confines of the WTP. The Owennacurra_040 (IE_SW_19O030500) is located 1.4 km west of the WTP, and the Dungourney_020 (IE_SW_19D070700) situated 3km south of the WTP. Both rivers flow into the Owenacurra Estuary (IE_SW060_0400) and in turn Great Island Channel SAC and Cork Harbour SPA, both located 3 km south the of the WTP. However, there is no direct or indirect surface water connectivity between the WTP and European Sites

The proposed construction works will be localised and contained to the immediate development area which supports amenity grassland / buildings and artificial surfaces. Works such as excavations will be contained to the defined working area and necessary works with cast in place concrete will be undertaken within sealed shuttered units. Such works practices will retain all potential construction related pollutants at source.

The WTP overlies the Ballinhassig East (IE_SW_G004) which borders the Midleton (IE_SW_G_058) GWB to the south. The Midleton GWB borders the Owenacurra Estuary (IE_SW_060_0400), Great Island Channel SAC and Cork Harbour SPA. Potential source receptor pathways have been ruled out for Great Island Channel SAC and Cork Harbour SPA. The interference with the underlying water table will be unlikely to occur owing to the nature of the construction works. Any interference would be localised, minor and temporary.

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

6.2 OPERATIONAL PHASE

The key pressure associated with the proposed orthophosphate dosing is the potential for increased orthophosphate levels in the receiving waters which support the qualifying interests (habitats and species) identified in **Table 4-3** that are both water dependent and nutrient sensitive (**Appendix B**). The likelihood of significant effects on these habitats and species, in view of their Conservation Objectives are assessed in detail below.

6.2.1 Ballymacoda (Clonpriest and Pillmore) SAC 000077

6.2.1.1 (1130) Estuaries

A review of the SSCOs found no nutrient specific targets for this SAC, however there is a requirement to maintain sediment communities in a natural condition (NPWS, 2015[22]). The COs supporting document for marine habitats (NPWS, 2015[23]) require that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Table 5-2 identifies the groundwater bodies which are hydrogeologically connected to Ballymacoda (Clonpriest and Pillmore) SAC (there was no hydrological connectivity) and will receive inputs form the proposed orthophosphate dosing at Midleton WTP:

- The groundwater body hydrogeologically connected is Midleton (IE_SW_G_058).

Ballymacoda Estuary flows into Youghal Bay and is formed by the Womanagh River, a substantial river that drains a large agricultural catchment. Estuarine habitat covers an estimated 160ha. Part of the tidal section of the river is included in the site and on the seaward side the boundary extends to the low tide mark. The inner part of the estuary is well sheltered by a stabilised sandy peninsula (Ring peninsula). Intertidal mudflats and sandflats, which form part of the overall estuarine habitat, are well represented. Much of the land adjacent to the estuary has been reclaimed and is subject to intensive agriculture, with cattle grazing and silage being the most common land uses. The most serious threat to the site is water pollution, primarily from slurry spreading. Although the habitat does not receive surface water discharges from the proposed works, there is a hydrogeological connection between the WSZ and the SAC.

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

[22] NPWS 2015 Ballymacoda (Clonpriest and Pillmore) SAC 000077 Conservation Objectives
[23] NPWS 2015 Ballymacoda (Clonpriest and Pillmore) SAC 000077 Conservation Objectives Supporting Document - Marine Habitat

The modelled post-dosing concentration in Midleton GWB is 0.0006 mg/l which is <0.00175mg/l (5% of the Good / Fail indicative quality boundary). Therefore there is no risk of deterioration in the indicative quality of the groundwater body, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Midleton WTP, 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 (1140) Mudflats and sandflats not covered in seawater at low tide

A review of the SSCOs found no nutrient specific targets for this SAC, however there is a requirement to maintain sediment communities in a natural condition (NPWS, 2015[24]). The COs supporting document for marine habitats (NPWS, 2015[25]) requires that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Table 5-2 identifies the groundwater bodies which are hydrogeologically connected to Ballymacoda (Clonpriest and Pillmore) SAC (there was no hydrological connectivity) and will receive inputs form the proposed orthophosphate dosing at Midleton WTP:

- The groundwater body hydrogeologically connected is Midleton (IE_SW_G_058).

Intertidal mudflats and sandflats, which form part of the overall estuarine habitat, are well represented and estimated to cover 302ha. The sediment types vary from muds to muddy sands in the inner part, to fine rippled sands in the outer exposed part. The macro-invertebrate fauna of the intertidal flats is well-developed. In the more sheltered areas the intertidal flats are colonised by mats of green algae (mostly *Enteromorpha* spp.), with brown seaweeds occurring on the rocky shores of the shingle spits.

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 modelled post-dosing concentration in Midleton GWB is 0.0006 mg/l which is <0.00175mg/l (5% of the Good / Fail indicative quality boundary). Therefore there is no risk of deterioration in the indicative quality of the groundwater body, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Midleton WTP, it has been demonstrated that the potential for likely significant effects on

[24] NPWS 2015 Ballymacoda (Clonpriest and Pillmore) SAC 000077 Conservation Objectives
[25] NPWS 2015 Ballymacoda (Clonpriest and Pillmore) SAC 000077 Conservation Objectives Supporting Document - Marine Habitat

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

6.2.1.3 (1310) *Salicornia* and other annuals colonising mud and sand, (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

Saltmarshes are stands of vegetation that occur along sheltered coasts, mainly on mud or sand, and are flooded periodically by the sea. They are restricted to the area between mid-neap tide level and high water spring tide level. A review of the SSCOs (NPWS, 2015[26]) for the SAC found there are no nutrient specific targets for the two habitats. The location, character and dynamic behaviour of saltmarshes are governed by sediment supply, tidal regime, wind-wave climate and sea level change. A target has been set (under structure and function) to maintain the physical structure: flooding/tidal regime of the habitats. 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 indeed survival of saltmarshes.

Table 5-2 identifies the groundwater bodies which are hydrogeologically connected to Ballymacoda (Clonpriest and Pillmore) SAC (there was no hydrological connectivity) and will receive inputs form the proposed orthophosphate dosing at Midleton WTP:

- The groundwater body hydrogeologically connected is Midleton (IE_SW_G_058).

The Saltmarsh Monitoring Project[27] found saltmarsh has developed at several locations around Ballymacoda Estuary including Pilmore, Ringpoint, The Duck, Clonpriest East, and Near Crompaun Bridge. The results are detailed in the Conservation Objectives Supporting Document on Coastal Habitats (NPWS 2014[28]). Further unsurveyed sites may also be present with this SAC. A further Annex I habitat, Mediterranean salt meadows, was mapped but is not designated as part of this SAC.

Salicornia habitat is found at several locations around the estuary. There are no large patches of this habitat, but when added together they represent a considerable extent of this habitat (in a national context) with a total estimated area of 1.57ha. The largest areas are found at Pillmore and along the western shoreline at Clonpriest East and The Duck.

Atlantic salt meadow is the dominant saltmarsh habitat and located in all survey locations. This habitats extent is notable in a regional context with an estimated area of 28.36ha. Due to its relatively large extent and the fact that saltmarsh has developed on different substrates and in different situations this habitat is quite diverse and a range different communities are present.

Mediterranean salt meadow is found on the island at Clonpriest East. This saltmarsh is well-established and has well developed saltmarsh topography.

[26] NPWS 2015 Ballymacoda (Clonpriest and Pillmore) SAC 000077 Conservation Objectives
[27] McCorry & Ryle 2009 Saltmarsh Monitoring Project 2007-2008. A report to National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[28] NPWS 2014 Ballymacoda (Clonpriest and Pillmore) SAC 000077 Conservation Objectives Supporting Document-Coastal Habitats

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 modelled post-dosing concentration in Midleton GWB is 0.0006 mg/l which is <0.00175mg/l (5% of the Good / Fail indicative quality boundary). Therefore there is no risk of deterioration in the indicative quality of the groundwater body, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Midleton WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of *Salicornia* habitat or the maintenance of the favourable conservation condition of Atlantic salt meadow habitat.

6.2.2 Great Island Channel SAC 001058

6.2.2.1 (1140) Mudflats and sandflats not covered in seawater at low tide

A review of the SSCOs found no nutrient specific targets for this SAC; there is a requirement to conserve the community of mixed sediment to sandy mud with polychaetes and oligochaetes complex in its natural conditions (NPWS, 2014[29]). The COs supporting document for marine habitats (NPWS, 2014[30]) require that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site. The greatest threats to its conservation significance come from road works, infilling, sewage outflows and possible marina developments.

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

- The river water bodies hydrologically connected to the site include: Dungourney_020 (IE_SW_19D070700) and Owenacurra_040 (IE_SW_19O030500);
- The transitional water bodies hydrologically connected to the site include: Owenacurra Estuary (IE_SW_060_0400) and North Channel Great Island (IE_SW_060_0300); and
- The groundwater bodies hydrogeologically connected include: Ballinhassig East (IE_SW_G_004) and Midleton (IE_SW_G_058).

The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. Within the site is the estuary of the Owennacurra and Dungourney Rivers. Owing to the sheltered conditions, the intertidal flats are composed mainly of soft muds and cover an estimated 723ha. These muds support a range of macro-invertebrates. Green algal species occur on

[29] NPWS 2014 Great Island Channel SAC 001058 Conservation Objectives
[30] NPWS 2014 Great Island Channel SAC 001058 Conservation Objectives Supporting Document - Marine Habitat

the flats, especially *Ulva lactua* and *Enteromorpha* spp. Cordgrass (*Spartina* spp.) has colonised the intertidal flats in places, especially at Rossleague and Belvelly.

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 modelled post-dosing concentration in the river water bodies connected to the SAC are within 5% of the High / Good indicative quality boundary with a concentration of <0.00125 mg/l; therefore there is no risk of deterioration in the indicative quality of these river water bodies. Modelled increases in concentrations are as follows: 0.0002 mg/l for Dungourney_020 (IE_SW_19D070700) and 0.0001 mg/l for Owenacurra_040 (IE_SW_19O030500).

The transitional water body Owenacurra Estuary (IE_SW_060_0400) has a negligible modelled post dosing increase in concentration (0.0001 mg/l) which is below 5% of the High / Good indicative quality boundary. The winter monitoring for North Channel Great Island (IE_SW_060_0300) exceeds the water body's 75% indicative quality threshold for orthophosphate (0.020 mg/l). However, the modelled post dosing increase in concentration is undetectable (0.0000 mg/l). The dosing therefore poses no risk of deterioration in the indicative quality of the transitional water bodies, which is High, and will not prevent the achievement of WFD objectives.

The groundwater body Ballinhassig East (IE_SW_G_004) has a number of monitoring points, five of which are Failing to Achieve Good indicative quality. The post-dosing modelled increase in concentration for the water body is undetectable at 0.0000 mg/l. The modelled post-dosing increase in concentration in Midleton (IE_SW_G_058) is 0.0006 mg/l which is <0.00175mg/l (5% of the Good/Fail boundary). Therefore there is no risk of deterioration in the indicative quality of these groundwater bodies or of preventing the achievement of WFD objectives.

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

6.2.2.2 (1330) Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

Saltmarshes are stands of vegetation that occur along sheltered coasts, mainly on mud or sand, and are flooded periodically by the sea. They are restricted to the area between mid-neap tide level and high water spring tide level. A review of the SSCOs (NPWS, 2014[31]) for the SAC found there are no nutrient specific targets for Atlantic salt meadow habitat. The location, character and dynamic behaviour of saltmarshes are governed by sediment supply, tidal regime, wind -wave climate and sea level change. A target has been set (under structure and function) to maintain the physical structure: tidal regime of the habitat. 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 indeed survival of saltmarshes.

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

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

- The river water bodies hydrologically connected to the site include: Dungourney_020 (IE_SW_19D070700) and Owenacurra_040 (IE_SW_19O030500);
- The transitional water bodies hydrologically connected to the site include: Owenacurra Estuary (IE_SW_060_0400) and North Channel Great Island (IE_SW_060_0300); and
- The groundwater bodies hydrogeologically connected include: Ballinhassig East (IE_SW_G_004) and Midleton (IE_SW_G_058).

The Saltmarsh Monitoring Project[32] found saltmarsh has developed at two sub-sites, Bawnard and Cariggatohil. The results are detailed in the Conservation Objectives Supporting Document on Coastal Habitats (NPWS 2014[33]). Habitat supporting Atlantic salt meadow at the two sub-sites is estimated to cover 1.30ha and additional areas of potential saltmarsh (17.60ha) were identified from an examination of aerial photographs, giving a total estimated area of 18.90ha. Further un-surveyed sites may also be present with this SAC.

At Bawnard, most of the Atlantic salt meadow habitat is found at the head of the bay. There are two small shingle spits extending from the northern and southern sides of the bay that shelter much of this bay. The entire bay empties at low tide to expose intertidal mudflats. At Carrigtohil, Atlantic salt meadow habitat is mainly found fringing the southern Slatty Water shoreline (the northern shoreline of Foaty Island).

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 modelled post-dosing concentration in the river water bodies connected to the SAC are within 5% of the High / Good indicative quality boundary with a concentration of <0.00125 mg/l; therefore there is no risk of deterioration in the indicative quality of these river water bodies. Modelled increases in concentrations are as follows: 0.0002 mg/l for Dungourney_020 (IE_SW_19D070700) and 0.0001 mg/l for Owenacurra_040 (IE_SW_19O030500).

The transitional water body Owenacurra Estuary (IE_SW_060_0400) has a negligible modelled post dosing increase in concentration (0.0001 mg/l) which is below 5% of the High / Good indicative quality boundary. The winter monitoring for North Channel Great Island (IE_SW_060_0300) exceeds the water body's 75% indicative quality threshold for orthophosphate (0.020 mg/l). However, the modelled post dosing increase in concentration is undetectable (0.0000 mg/l). The dosing therefore poses no risk of deterioration in the indicative quality of the transitional water bodies, which is High, and will not prevent the achievement of WFD objectives.

The groundwater body Ballinhassig East (IE_SW_G_004) has a number of monitoring points, five of which are Failing to Achieve Good indicative quality. The post-dosing modelled increase in

[32] McCorry & Ryle 2009 Saltmarsh Monitoring Project 2007-2008. A report to National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[33] NPWS 2014 Great Island Channel SAC 001058 Conservation Objectives Supporting Document-Coastal Habitats

concentration for the water body is undetectable at 0.0000 mg/l. The modelled post-dosing increase in concentration in Midleton (IE_SW_G_058) is 0.0006 mg/l which is <0.00175mg/l (5% of the Good/Fail boundary). Therefore there is no risk of deterioration in the indicative quality of these groundwater bodies or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Midleton WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the habitat.

6.2.3 Ballymacoda Bay SPA 004023

Ballymacoda Bay stretches north-east from Ballymacoda to within several kilometres of Youghal, Co. Cork. It comprises the estuary of the Womanagh River, a substantial river which drains a large agricultural catchment. Part of the tidal section of the river is included in the site and on the seaward side the boundary extends to, and includes Bog Rock, Barrel Rocks and Black Rock. The main channel is flanked by salt marshes and wet fields, much of the latter being improved for agriculture. There are 16 bird species of SCI: Wigeon, Teal, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Sanderling, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Turnstone, Black-headed Gull, Common Gull and Lesser Black-backed Gull. It is also of SCI for wetland habitat. All SCIs are considered nutrient sensitive (**Appendix B**) and water dependent.

There are no nutrient specific targets within the SSCOs; however targets for each species are listed (NPWS 2015[34]), 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.

In addition, for the wetland habitat that supports the SPA there is an objective to maintain the favourable conservation condition of the wetland habitat at Ballymacoda Bay SPA as a resource for the regularly occurring migratory waterbirds that utilise it. This is defined by the target that the permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 602ha, other than that occurring from natural patterns of variation wetlands.

Ballymacoda Bay SPA is one of the most important sites in the country for wintering waterfowl. The site provides both feeding and roosting areas for the birds. It qualifies for international importance on the basis of regularly exceeding 20,000 wintering birds but also for its Golden Plover and Black-tailed Godwit populations which occur in internationally important numbers. In addition, it supports nationally important populations of a further fourteen species. Two of the species which occur, Golden Plover and Bar-tailed Godwit, are listed on Annex I of the E.U. Birds Directive. Ballymacoda Bay is also a Ramsar Convention site.

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 River Basin Management Plan for Ireland

[34] NPWS 2015 Ballymacoda Bay SPA 004023 Conservation Objectives

2018-2021 (DHPLG, 2018[35]), 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.

Table 5-2 identifies the groundwater bodies which are hydrogeologically connected to the Ballymacoda Bay SPA (there is no surface water connectivity) and will receive inputs form the proposed orthophosphate dosing at Midleton WTP:

- The groundwater body hydrogeologically connected is Midleton (IE_SW_G_058).

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 modelled post-dosing concentration in Midleton GWB is 0.0006 mg/l which is <0.00175mg/l (5% of the Good / Fail indicative quality boundary). Therefore there is no risk of deterioration in the indicative quality of the groundwater body, or of preventing the achievement of WFD objectives.

In light of the EAM assessment, which evaluates the additional orthophosphate loading from dosing at Midleton WTP, it has been demonstrated that there is no risk of deterioration in the water quality status of the water bodies that support the structure and function of the SPA. The additional loading from the orthophosphate dosing will therefore have no likely significant effect on the maintenance of favourable conservation status of its SCIs, either in terms of individual bird species or wetland habitats.

6.2.4 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. 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. There are 23 bird species of SCI within Cork Harbour SPA;

Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern. It is also of SCI for wetland habitat. All SCIs are considered nutrient sensitive (**Appendix B**) and water dependent.

There are no nutrient specific targets within the SSCOs; however targets for each species are listed (NPWS 2014[36]), specifically:

[35] DHPLG (2018) The River Basin Management Plan for Ireland (2018-2021). Available at: http://www.housing.gov.ie/sites/default/files/publications/files/rbmp_full_reportweb.pdf
[36] NPWS 2014 Cork Harbour SPA 004030 Conservation Objectives

- 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.

In addition, for the wetland habitat that supports the SPA there is an objective to maintain the favourable conservation condition of the wetland habitat at Cork Harbour SPA as a resource for the regularly occurring migratory waterbirds that utilise it. This is defined by the target that the permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 2,587ha, other than that occurring from natural patterns of variation wetlands.

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[37]) 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.

Cork Harbour is of major ornithological significance, being of international importance both for the total numbers of wintering birds (i.e. > 20,000) and also for its populations of Black-tailed Godwit and Redshank. In addition, it supports nationally important wintering populations of 22 species, as well as a nationally important breeding colony of Common Tern. The site provides both feeding and roosting sites for the various bird species that use it. Cork Harbour is also a Ramsar Convention site and part of Cork Harbour SPA is a Wildfowl Sanctuary.

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

[37] DHPLG (2018) The River Basin Management Plan for Ireland (2018-2021). Available at: http://www.housing.gov.ie/sites/default/files/publications/files/rbmp_full_reportweb.pdf

(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.

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 the Cork Harbour SPA and will receive inputs from the proposed orthophosphate dosing at Midleton WTP:

- The river water bodies hydrologically connected to the site include: Dungourney_020 (IE_SW_19D070700) and Owenacurra_040 (IE_SW_19O030500);
- The transitional water bodies hydrologically connected to the site include: Owenacurra Estuary (IE_SW_060_0400) and North Channel Great Island (IE_SW_060_0300); and
- The groundwater bodies hydrogeologically connected include: Ballinhassig East (IE_SW_G_004) and Midleton (IE_SW_G_058).

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 modelled post-dosing concentration in the river water bodies connected to the SAC are within 5% of the High / Good indicative quality boundary with a concentration of <0.00125 mg/l; therefore there is no risk of deterioration in the indicative quality of these river water bodies. Modelled increases in concentrations are as follows: 0.0002 mg/l for Dungourney_020 (IE_SW_19D070700) and 0.0001 mg/l for Owenacurra_040 (IE_SW_19O030500).

The transitional water body Owenacurra Estuary (IE_SW_060_0400) has a negligible modelled post dosing increase in concentration (0.0001 mg/l) which is below 5% of the High / Good indicative quality boundary. The winter monitoring for North Channel Great Island (IE_SW_060_0300) exceeds the water body's 75% indicative quality threshold for orthophosphate (0.020 mg/l). However, the modelled post dosing increase in concentration is undetectable (0.0000 mg/l). The dosing therefore poses no risk of deterioration in the indicative quality of the transitional water bodies, which is High, and will not prevent the achievement of WFD objectives.

The groundwater body Ballinhassig East (IE_SW_G_004) has a number of monitoring points, five of which are Failing to Achieve Good indicative quality. The post-dosing modelled increase in concentration for the water body is undetectable at 0.0000 mg/l. The modelled post-dosing increase in concentration in Midleton (IE_SW_G_058) is 0.0006 mg/l which is <0.00175mg/l (5% of the Good/Fail boundary). Therefore there is no risk of deterioration in the indicative quality of these groundwater bodies or of preventing the achievement of WFD objectives.

In light of the EAM assessment, which evaluates the additional orthophosphate loading from dosing at Midleton WTP, it has been demonstrated that there is no risk of deterioration in the water quality status of the water bodies that support the structure and function of the SPA. The additional loading from the orthophosphate dosing will have no likely significant effect on the maintenance of favourable conservation status of its SCIs; either in terms of individual bird species or wetland habitats.

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

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

1. Identify projects/ plans which might act in combination: identify all possible sources of effects from the project or plan under consideration, together with all other sources in the existing environment and any other effects likely to arise from other proposed projects or plans;
2. Impacts identification: identify the types of impacts that are likely to affect aspects of the structure and functions of the site vulnerable to change;
3. Define the boundaries for assessment: define boundaries for examination of cumulative effects; these will be different for different types of impact and may include remote locations;
4. Pathway identification: identify potential cumulative pathways (e.g., via water, air, etc.; accumulations of effects in time or space);
5. Prediction: prediction of magnitude/ extent of identified likely cumulative effects, and
6. Assessment: comment on whether or not the potential cumulative impacts are likely to be significant.

A search of Cork County Council's planning enquiry system was conducted for developments that may have in-combination effects on European Sites with the ZoI. Plans and projects relevant to the area were searched in order to identify any elements of the plans and 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 projects and plans which may potentially contribute to cumulative or in-combination impacts with the proposed project was generated as listed in **Table 6-1** below.

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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Cork County Development Plan 2022-2028[38] 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).	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.

[38] 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.	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	• 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.	▪ Habitat fragmentation or degradation; ▪ Alterations to water quality and/or water movement; ▪ Disturbance; ▪ 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.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	Foodwise 2025 was subject to its own AA[39]. 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.

[39] 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[40], and AA[41]. 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.

[40] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf
[41] 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[42]. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts

[42] 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 Midleton WTP, within the Midleton WSZ, in combination with other plans or projects, is likely to have a significant effect on European Sites.

The appraisal undertaken in this Screening assessment has been informed by an EAM (see **Appendix C**) with reference to the ecological communities and habitats 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 Midleton 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; Ballymacoda (Clonpriest and Pillmore) SAC, Blackwater Ballymacoda Bay SPA, Cork Harbour SPA and Great Island Channel SAC have been assessed. Due to the low orthophosphate inputs following dosing at Midleton WTP and no risk of deterioration in the orthophosphate indicative quality of the receiving water bodies or of preventing the achievement of WFD objectives, 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. 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 Midleton 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
Ballymacoda (Clonpriest and Pillmore) SAC (000077)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000077.pdf
Great Island Channel SAC (001058)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO001058.pdf
Ballymacoda Bay SPA (004023)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004023.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

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
3180	Turloughs	Yes	Yes	Yes
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

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
8240	Limestone pavements	No		Yes
8310	Caves not open to the public	Yes	Yes	Yes
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

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

078 Midleton WTP – Zone3 Midleton (0500PUB2406)

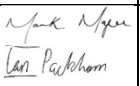
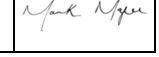
National Lead in Water Mitigation Strategy

Environmental Assessment Methodology Report – 078 Midleton WTP (Zone3 Midleton)

Document Control Sheet

Client:	Irish Water
Project Title:	National Lead in Water Mitigation Strategy
Document Title:	Environmental Assessment Methodology Report: 078 Midleton WTP – Zone3 Midleton (0500PUB2406)
Document No:	MDW0766RP_5.1_EAM_078_Midleton_F05

Text Pages:	9	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F03	Final	21st May 2019	YE		IP,MM		DC	
F04	Final	16th Aug 2019	IP		MM		GJG	
F05	Final	24th Apr 2023	YE		IP		MM	

078 Midleton WTP – Zone3 Midleton (0500PUB2406)

Supporting spreadsheet: 078_Midleton WTP_Zone3 Midleton_V07

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

Midleton WTP, located 23 km East of Cork City and 1.5 km north of Midleton town, supplies Midleton Town. The distribution input for Zone3 Midleton is 3,450 m^3/day (51% of which is accounted for, with the remainder assumed to be lost through leakage) serving a population of approximately 8,000. The non-domestic demand is 18% of the distribution input.

The area is served by Midleton WWTP (D0056) which is licenced in accordance with the requirements of the Wastewater 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 no other WWTPs within this WSZ. There are an estimated 126 properties across the WSZ that are serviced by a DWWTS.

This assessment has been undertaken for the WSZ in isolation. However, if corrective water treatment is proposed for WTPs in the same catchment area, the cumulative impact from the combined loads to downstream water bodies are assessed (see Summary, Mitigation, and Table 5).

<table>
<tr><td>Water Treatment Plant</td><td colspan="2">Midleton WTP</td></tr>
<tr><td>Water Supply Zone</td><td colspan="2">Zone3 Midleton (0500PUB2406)
See Figure 4.1 / 4.2 of the AA Screening for a map of the WSZ and ZoI</td></tr>
<tr><td rowspan="6">Step 1 Appropriate Assessment Screening</td><td colspan="2">European Sites within Zone of Influence</td></tr>
<tr><td colspan="2">SACs</td></tr>
<tr><td>- Ballymacoda (Clonpriest and Pillmore) SAC
- Lough Hyne Nature Reserve and Environs SAC
- Roaringwater Bay and Islands SAC
- The Gearagh SAC</td><td>- Barley Cove To Ballyrisode Point SAC
- Great Island Channel SAC
- Ardmore Head SAC-</td></tr>
<tr><td colspan="2">SPAs</td></tr>
<tr><td>- Ballycotton Bay SPA
- Ballymacoda Bay SPA
- Cork Harbour SPA
- Galley Head to Duneen Point SPA</td><td>- Seven Heads SPA
- Sheep's Head to Toe Head SPA
- Sovereign Islands SPA
- The Gearagh SPA</td></tr>
<tr><td colspan="2">Nutrient Sensitive Qualifying Interests present – Yes
Appropriate Assessment Screening Required – Yes</td></tr>
</table>

Step 2 – Direct Inputs to Surface Water

Table 1: Increased loading/concentration to agglomerations due to Orthophosphate Dosing – Dosing rate = 0.6 mg/l

Agglomeration and discharge type	ELV (Ortho P unless otherwise stated) 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*
Midleton Primary Discharge	2.0	Existing	5544.9	0.907	0.726	1.233
		Post Dosing	5917.1	0.968	0.774	1.316
Midleton SWOs (4 no.)	N/A	Existing	345.8	1.942	1.554	2.641
		Post Dosing	356.7	2.003	1.602	2.724

Note: The effluent concentrations are compliant with ELVs.

As Midleton WWTP (D0056) receives tertiary treatment, i.e. chemical dosing for nutrient removal, and is compliant with the WWDL ELVs, the additional P loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality.

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

Table 2: Mass balance assessment based on 0.6 mg/l dosing using available background concentrations and mean flow information

Agglom.	WB Name / Code for Primary Discharge	Background Conc. (mg/l) (Annual mean from AER u/s monitoring point)	Modelled Conc. existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc.
Midleton	North Channel Great Island IE_SW_060_0300	0.0260	0.0268	0.0268	0.0

Surface Assessment

North Channel Great Island (*IE_SW_060_0300)* – The effluent concentrations from Midleton WWTP are compliant with ELVs. Tertiary treatment is assumed to remove any additional orthophosphate from the effluent due to dosing and impact due to SWOs is negligible as shown by the assessment in Tables 1 and 2.

The dosing will therefore have an insignificant impact on the direct discharges to surface water from agglomerations within the WSZ.

Step 4 Distributed Inputs to surface water bodies from sub surface pathways

Subsurface Assessment

The modelled increases in concentration in the subsurface pathways are insignificant for all river water bodies (less than 0.00125 mg/l, which is 5% of the Good/High Ortho P indicative quality boundary for surface water bodies), with highest increase equal to 0.0002 mg/l, taking place in Dungourney_020 (IE_SW_19D070700).

Transitional water bodies directly affected by this WSZ are Owenacurra Estuary (IE_SW_060_0400) and North Channel Great Island (IE_SW_060_0300), with a modelled concentration of 0.0001 mg/l and 0.0000 mg/l respectively, so the impact due to orthophosphate dosing is negligible.

Step 5 and 6: Combined Inputs to Groundwater Bodies

Groundwater Bodies as receptors connected to WSZ

Table 3 gives the loads and modelled concentrations for the assessment of groundwater bodies.

The predicted concentrations to groundwater bodies are at insignificant levels, below 5% of the Good / Failing to achieve good Ortho P indicative quality boundary (0.00175mg/l). For all groundwater bodies the potential increase does not raise the baseline to levels above 75% of the Good Ortho P indicative quality upper threshold.

Of the 14 monitoring points in Ballinhassig East (IE_SW_G_004), four are "Failing to Achieve Good". These are remote from the WSZ and are not considered characteristic of the groundwater within the WSZ. In addition, any increase in Ortho P concentration due to dosing will be undetectable (0.0000 mg/l) and thus there will be no risk to WFD objectives.

The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, and none of the overlying surface waterbodies are at Bad ecological status, there is no risk of failing WFD objectives for groundwater receptors due to orthophosphate dosing.

Table 3: Increased loading and concentrations to groundwater bodies connected to the WSZs ***(note: where existing monitoring data is not available, a surrogate indicative quality is derived from the initial characterisation or chemical status of the WB, and 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 indicated in italic]*	Baseline Ortho P Conc. mg/l *[Surrogate Conc. given in italic]*	75% of Ortho P Indicative Quality upper threshold mg/l	Total Ortho P load to GW due to dosing kg/yr	Potential Increase in Ortho P Conc. due to Dosing mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SW_G_004 Ballinhassig East	Good Upwards Near	0.034	0.026	0.1	0.0000	0.034	MP1
	Good Upwards Far	0.013	0.026			0.013	MP2
	Good Upwards Far	0.051	0.026			0.051	MP3
	Failing to achieve good Upwards Far	0.037	-			0.037	MP4

		Good Upwards Far	0.021	0.026			0.021	MP5
		Good Upwards Far	0.015	0.026			0.015	MP6
		Good Upwards Far	0.006	0.026			0.006	MP7
		Good Upwards 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 Near	0.026	0.026			0.026	MP11
		Failing to achieve good None Far	0.188	-			0.188	MP12
		Good Upwards Far	0.012	0.026			0.012	MP13
		Failing to achieve good Downwards Far	0.043	-			0.043	MP14
	IE_SW_G_058 Midleton	Good Upwards Far	0.017	0.026	19.3	0.0006	0.017	

MP: multiple Monitoring Points given for waterbody

Step 5 and 6: Combined Inputs to Surface Water Bodies

Combined Assessment

Table 4.A and Table 4.B give the loads and modelled concentrations for the combined assessment to rivers and receiving waterbodies respectively. The increases in concentration due to orthophosphate dosing are predicted to be insignificant, i.e. are below 5% of the Good / High boundary for Ortho P Indicative Quality (0.00125mg/l).

The winter monitoring in IE_SW_060_0300 (North Channel Great Island) is within 75% of the upper boundary for Ortho P Indicative Quality, however, as the modelled concentration is insignificant, the waterbody is not at risk of deterioration in indicative quality.

Table 4.A: Increased loading and concentrations to river water bodies connected to the WSZs ***(note: where existing monitoring data is 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 indicated in italic]*	Baseline Conc. mg/l *[Surrogate Conc. given in italic]*	75% of Ortho P Indicative Quality upper threshold mg/l	Total Ortho P Load in receiving waters kg/yr	Potential Increase in Ortho P Conc. due to Dosing (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SW_19D070700 DUNGOURNEY_020	Good Downwards Far	0.028	0.033	9.3	0.0002	0.028	
IE_SW_19O030500 OWENNACURRA_040	Good Downwards Far	0.026	0.033	15.1	0.0001	0.026	

Table 4.B: Increased loading and concentrations to Transitional and Coastal water bodies connected to the WSZs ***(note: where existing monitoring data is 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 indicated in italic]*	Baseline Conc. mg/l *[Surrogate Conc. given in italic]*	75% of Ortho P Indicative Quality upper threshold mg/l	Total Ortho P Load in receiving waters due to dosing kg/yr	Potential Increase in Ortho P Conc. due to Dosing (30%ile, gauged or tidal) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SW_060_0400 Owenacurra Estuary	High (S) Upwards Far	0.016	0.020	24.4	0.0001	0.016	
	High (W) Upwards Near	0.022	0.022			0.022	
IE_SW_060_0300 North Channel Great Island	High (S) Upwards Far	0.008	0.019	215.9	0.0000	0.008	‡
	High (W) Downwards Near	0.026	0.020			0.026	

‡ Load from WWTP / SWO following treatment added

S = Summer monitoring period, W = Winter monitoring period

Summary and Mitigation Proposed	Considering Midleton WTP in isolation, orthophosphate dosing is predicted to have an insignificant impact on all waterbodies. The modelled load and concentrations to both groundwater and surface water receptors do not cause a risk to WFD objectives. The fate of P loads from Midleton WTP is depicted in Figure 1 and the breakdown from source to pathway is shown in Figure 2. The cumulative impacts on Lee, Cork Harbour & Youghal (HA 19) and 20 Bandon-Ilen (HA 20) associated with orthophosphate dosing from following additional WTPs are summarised in Table 5 below: • 4 Lee Road WTP - Cork City Water Supply • 6 Inniscarra WTP – Zone 2 Cork City and Harbour • 26 Glashaboy WTP – Zone 3 Glashaboy • 30 Innishannon WTP – Zone 2 Innishannon • 36 Clonakilty RWSS WTP (Jones Bridge WTP) - Zone 1 Clonakilty • 54 Mallow WTP (Ballyellis WTP) – Zone 4 Mallow • 59 Glendine WTP - Zone3 Youghal Regional • 60 Ballyhilty WTP - Zone 1 Skibbereen Ballyhilty • 72 Kilva Reservoir Site – Zone 3 Whitegate Regional • 83 Tibbetstown WTP - Tibbotstown • 118 Macroom WTP – Zone 2 Macroom • 157 Carriglusky Reservoir Site, Cloyne - Zone3 Cloyne • 161 Freemount WTP – Zone 4 Allow Regional • 165 Knockraha WTP -Zone3 Glanmire • 180 Mitchelstown South WTP – Zone 4 Mitchelstown South • 192 Michelstown Galtee WTP - Cappamore Foileen Water Supply • 236 Mountnorth Reservoir – Zone 4 Mount North • 324 Killdorrery WTP – Zone 4 Kildorrery • 333 Shrone WTP - Shrone PWSS 078A • 359 Ballymacoda Road Borehole – Zone 3 Killeagh • 363 Hammond Place Pump Station - Zone 4 Dromahane • 370 LCB Cappoquin Pump Station - LCB Cappoquin • 371 LCB Lismore WTP – LCB Lismore • 376 Tallow WTP - Tallow • 386 Drimoleague WTP, Deelish - Zone1 Drimoleague • 400 Bweeng WTP – Zone4 Bweeng

Table 5: Cumulative assessment of the increased loading and concentrations to water bodies impacted by 078 Midleton WTP – Zone3 Midleton and other WSZs proposed for corrective water treatment in the upstream catchments.

EU_CD / NAME	Ortho P Indicative Quality and Trends (distance to threshold) *Surrogate Indicative Quality indicated in italic*	Baseline 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	Potential Increase in Ortho P Conc. due to Dosing (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l mg/l	Notes
IE_SW_19D070700 DUNGOURNEY_020	Good Downwards Far	0.028	0.033	30.3	0.0007	0.029	
IE_SW_19O030500 OWENNACURRA_040	Good Downwards Far	0.026	0.033	26.9	0.0002	0.026	*
IE_SW_060_0400 Owenacurra Estuary	High (S) Upwards Far	0.016	0.020	210.2	0.0006	0.017	
	High (W) Upwards Near	0.022	0.022			0.023	
IE_SW_060_0300 North Channel Great Island	High (S) Upwards Far	0.008	0.019	799.8	0.0002	0.008	‡
	High (W) Downwards Near	0.026	0.020			0.026	
IE_SW_060_0000 Cork Harbour	High Downwards Far	0.006	0.019	8478.8	0.0000	0.006	‡
	High Downwards Near	0.024	0.019			0.024	
IE_SW_050_0000 Outer Cork Harbour	High Downwards Far	0.003	0.019	8559.6	0.0003	0.003	‡
	High Downwards Far	0.016	0.018			0.016	
IE_SW_030_0100 Womanagh Estuary	*High*	*0.013*	*0.019*	*9.6*	*0.0001*	*0.013*	‡
IE_SW_020_0000 Youghal Bay	High Upwards Far	0.009	0.019	517.9	0.0000	0.009	‡
	High Downwards Far	0.014	0.019			0.014	
IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20)	*High*	*0.013*	*0.019*	*9601.2*	*0.0001*	*0.013*	‡

* Trend is Statistically Significant

‡ Load from WWTP / SWO following treatment added

S = Summer monitoring point, W = Winter monitoring point

	The cumulative assessment has demonstrated that there will not be a significant impact on the water bodies affected. **MITIGATION OPTION** – None required **RAG STATUS** – GREEN

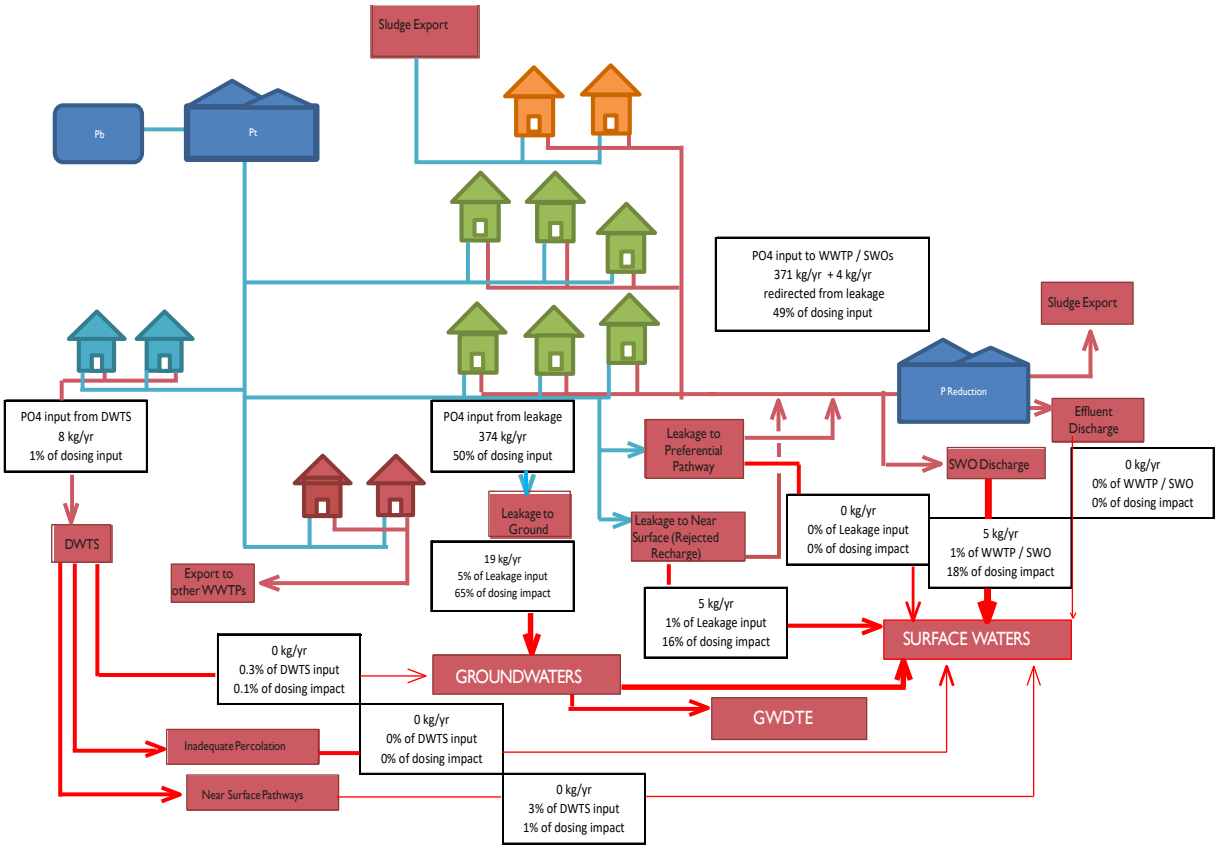
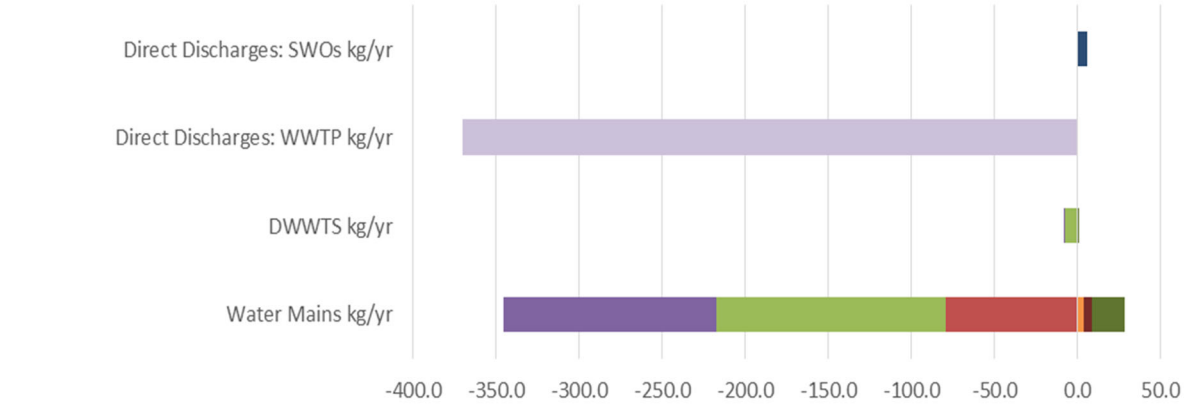


Figure 1 – Source Pathway Receptor model for Midleton WTP Regional WSZ illustrating key sources and pathways to the associated WSZs.



	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	-79.8	-0.5		
Load attenuated in 1m below trench	-137.9	-7.2		
Load attenuated in Subsurface Pathway	-128.0	-0.2		
Load intercepted by gravity main in Preference Pathway	0.0			
Load intercepted by gravity main in Near Surface Pathway	3.9			
Load reaching SW direct or via Preference (inadequate percolation) Pathway	0.0	0.0	0.0	5.4
Load reaching SW via Near Surface Pathway	4.9	0.2		
Load reaching SW via Subsurface Pathway	19.3	0.0		
Load treated in WWTP			-370.5	

Figure 2 – Fate of orthophosphate loads modelled for Midleton WTP impacting on Owenacurra Estuary (IE_SW_060_0400), North Channel Great Island (IE_SW_060_0300), Cork Harbour (IE_SW_060_0000), and Outer Cork Harbour (IE_SW_050_0000) due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.