Irish Water- Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment

010 Adamstown WTP - East Waterford Regional WSZ (3800PUB1110)

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TABLE OF CONTENTS

APPENDICES

Appendix A **European Sites - Conservation Objectives**

Appendix B **Nutrient Sensitive Qualifying Interests**

Appendix C **EAM Summary Report for East Waterford Regional WSZ**

LIST OF FIGURES

LIST OF TABLES

GLOSSARY OF TERMS & ABBREVIATIONS

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

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

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

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

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

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

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

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

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

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

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

1 INTRODUCTION

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

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

1.1 PURPOSE OF THIS REPORT

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

1.2 THE PLAN

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

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

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

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

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

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

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

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

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

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

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

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

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

1.3 PROJECT BACKGROUND

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

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

The EAM process identified 23 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Ardmore Head SAC, Bannow Bay SAC, Ballyteige Burrow SAC, Carnsore Point SAC, Helvick Head SAC, Hook Head SAC, Hugginstown Fen SAC, Tacumshin Lake SAC, Lady's island Lake SAC, Lower River Suir SAC, River Barrow and River Nore SAC, Saltee Island's SAC, Tramore Dunes and Backstrand SAC; and
- SPA sites: Bannow Bay SPA, Ballyteige Burrow SPA, Helvick Head to Ballyquin SPA, Dungarvan Harbour SPA, Mid-Waterford Coast SPA, Keeragh Islands SPA, Lady's Island Lake SPA, Saltee Islands SPA, Tacumshin Lake SPA Tramore Back Strand 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 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

[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

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

Adamstown WTP supplies the East Waterford Regional WSZ which includes parts of Waterford City and coastal areas of east County Waterford.. The daily production and distribution input for the WTP is 26,800 m^3/day (52% of which is accounted for, with the remainder assumed to be lost through leakage) serving a population of approximately 57,000 with a small non-domestic demand which is 15% of the distribution input. There are a number of wastewater treatment plants (WWTP) agglomerations serving the area. Waterford City, Tramore and Dunmore East are all licensed in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended and 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 smaller agglomerations with a population equivalent of less than 500 i.e. Cheekpoint, Crooke and Passage East and the estimated additional load from these plants from the orthophosphate dosing is considered at the water body level via the surface water pathways. There are an estimated 1,602 properties in the WSZ that are serviced by DWWTS (see **Appendix C**).

Adamstown WTP lies in the vicinity of the Whelansbridge and Ballymoate Streams in the Dawn and Williamstown River sub-catchments of the River Suir catchment. The EAM process identified 23 European sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Ardmore Head SAC, Bannow Bay SAC, Ballyteige Burrow SAC, Carnsore Point SAC, Helvick Head SAC, Hook Head SAC, Hugginstown Fen SAC, Tacumshin Lake SAC, Lady's island Lake SAC, Lower River Suir SAC, River Barrow and River Nore SAC, Saltee Island's SAC, Tramore Dunes and Backstrand SAC; and
- SPA sites: Bannow Bay SPA, Ballyteige Burrow SPA, Helvick Head to Ballyquin SPA, Dungarvan Harbour SPA, Mid-Waterford Coast SPA, Keeragh Islands SPA, Lady's Island Lake SPA, Saltee Islands SPA, Tacumshin Lake SPA, Tramore Back Strand SPA.

3.2 CONSTRUCTION OF CORRECTIVE WATER TREATMENT WORKS

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

There is one possible location for the orthophosphate dosing system at Adamstown WTP which will be located within the confines of the existing WTP boundary. The surrounding landscape is dominated by agricultural grassland, while the N25 road forms part of the site's northern boundary. The location of the works is shown on **Figure 3-1**.

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

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

ADAMSTOWN
Baile Adaim

CO. WATERFORD

Adamstown

Tk

Existing Raw Water Balancing Tank

Service Water Tank

Existing Prefiltration Building

Tks

Tk

Existing Settling Tanks

Existing Settling Tanks

Existing 63amp 3 Phase Supply *(former MCC / current compressor room)*

Existing Dewatering House

Existing Sludge Thickening Tank

Existing concrete Storage Apron

Approximate Route of Existing Service Water Pipework

Filter Beds

Filter Beds

Measurement Weir and Sump Outlet (Current Lime Dosing Point)

Tk

Existing Sludge Plant Building

Water Treatment Plant (Waterford Co. Co.)

Existing Service Water Pumps

Tks

Existing Sludge Balancing Tank

Proposed Connection To Existing Service Water Pipeline

Proposed Location of Lime Dosing Facility (Silo to be Retained)

Existing 800mm AC Trunk Main

Existing 5,000 Cu.m Reservoir

Proposed Location of Orthophosphate Dosing Facility

Location of Proposed Flowmeter

Existing Valve House

Proposed Caustic and Orthophosphate Dosing Points (Distribution Trunk Mains)

Proposed Location of Sodium Hydroxide Dosing Facility

Existing 5,000 Cu.m Reservoir

Proposed Service Water Booster Pump Enclosure

Existing 700mmØ DI Trunk Main

Tk

Dosing Pipework and Service Water Duct

Existing 800mm AC Trunk Main to Adamstown Booster Pumphouse at Whitfield

10m

SCALE 1:500

N

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

Client

UISCE ÉIREANN WATER

No.	Date	Drn. Chk.	Amendment / Issue	App
F01	MAY 19	BL BR	ISSUE FOR INFORMATION	GJG
A01	APR 19	BL BR	ISSUE FOR CLIENT APPROVAL	GJG
D01	SEPT 18	DB BL	DRAFT	DC

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Drawn	BL
Checked	BR
Approved	GJG
Date	13/05/2019
Scale	1:500 @ A1 1:1,000 @ A3
Job No.	MDW0766

Project
LEAD MITIGATION PLAN

Figure 3.1
ADAMSTOWN WATER TREATMENT PLANT - SITE LAYOUT

File Ref. MDW0766SK0000 Series.dwg

Drg. No. WTP0010

Rev. F01

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

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

There is an existing pH correction system at the Adamstown WTP. Discussion with the WTP site operator revealed that there are difficulties with the lime dosing system, particularly with operation and maintenance. There is no duty/standby arrangement for the lime dosing system and it is susceptible to blockages. A stable pH is critical to facilitate effective plumbosolvency control. To remedy these difficulties, it is proposed that works to the final water pH correction system are implemented, by installing a liquid caustic dosing system and dosing points on the outlet of the on-site storage reservoirs. This dosing system will be located within the confines of the existing WTP.

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

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

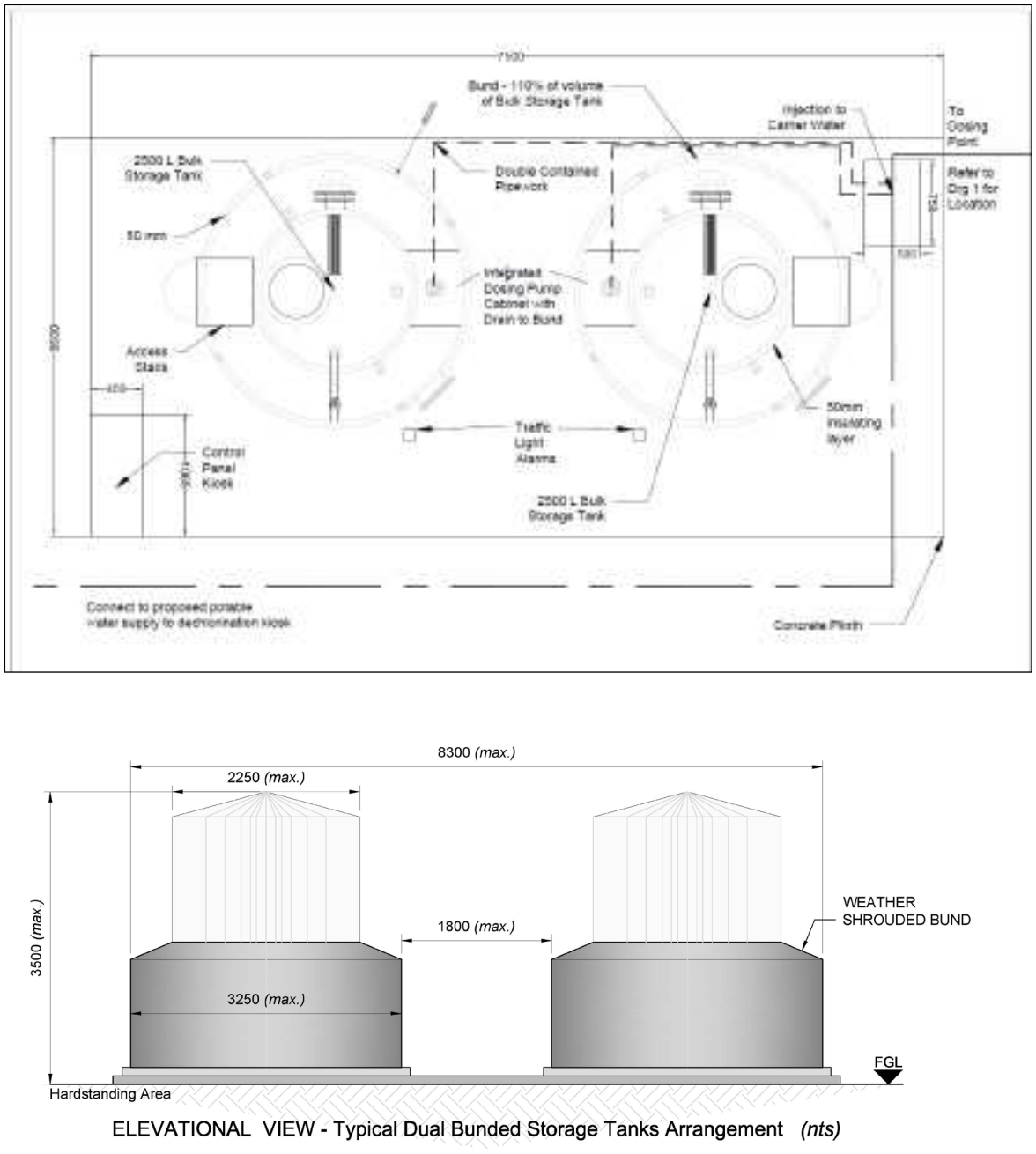


Figure 3-2: Plan and Elevation Drawings of a typical Orthophosphate Dosing Unit

3.3 CONSTRUCTION METHODOLOGY

The proposed works will be carried out by suitably qualified contractors. The proposed dosing unit will be located within the bounds of the existing Adamstown WTP.

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. Orthophosphate dosing will occur prior to storage in the on-site reservoirs.

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 Adamstown WTP, orthophosphate will be added to treated water at a rate of 0.5 mg/l. The onsite storage tanks have been designed to provide 60 days of storage so it is anticipated that deliveries will be approximately once every two months. All deliveries will be via existing access roads within the boundary of the WTP.

3.5 LDWMP APPROACH TO ASSESSMENT

3.5.1 Work Flow Process

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

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

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

This EAM conceptual model, which includes a GIS model that follows similar principles to the EPA Catchment Characterisation Tool (CCT), 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.

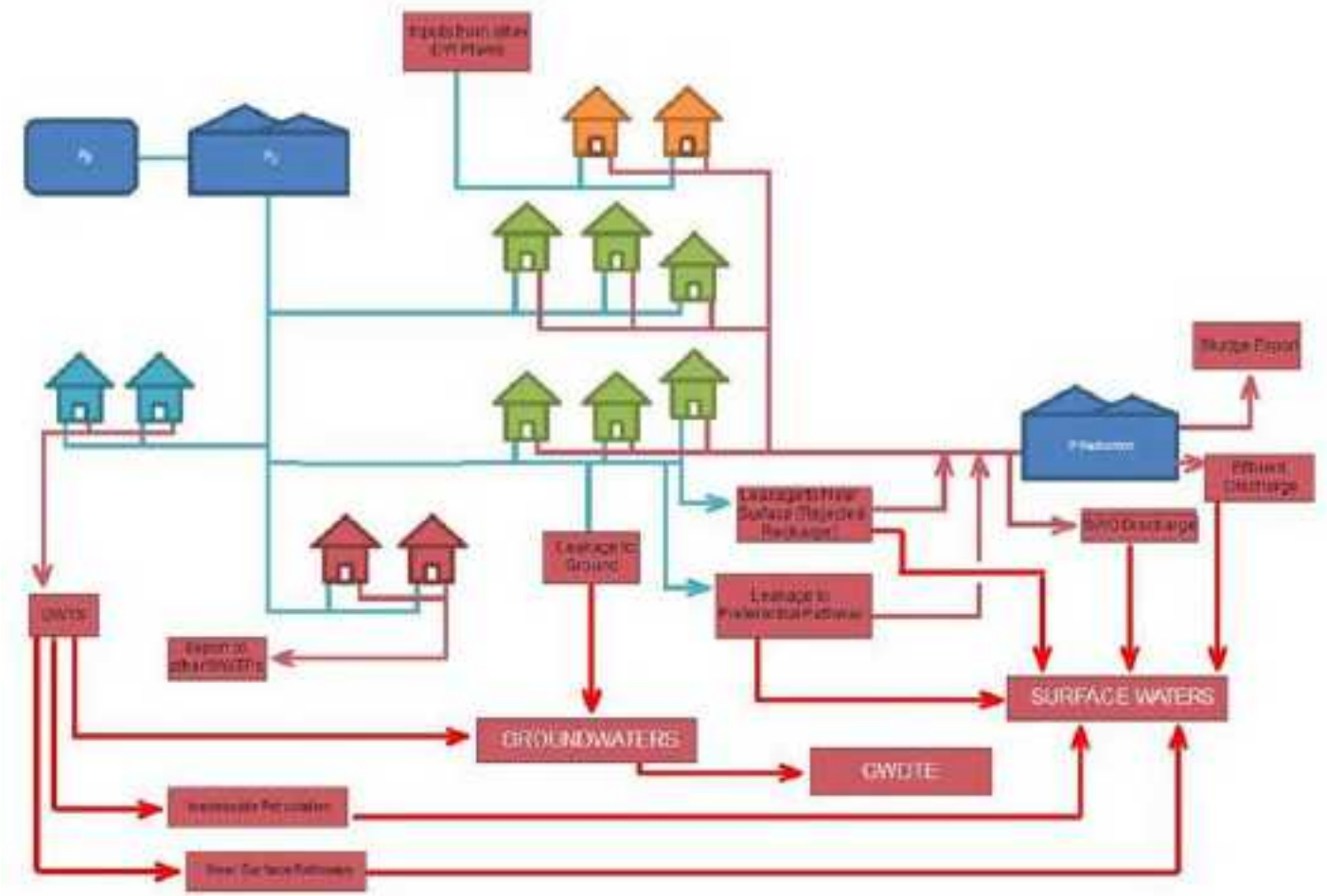


Figure 3-3: Conceptual Model of P Transfer

(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.)

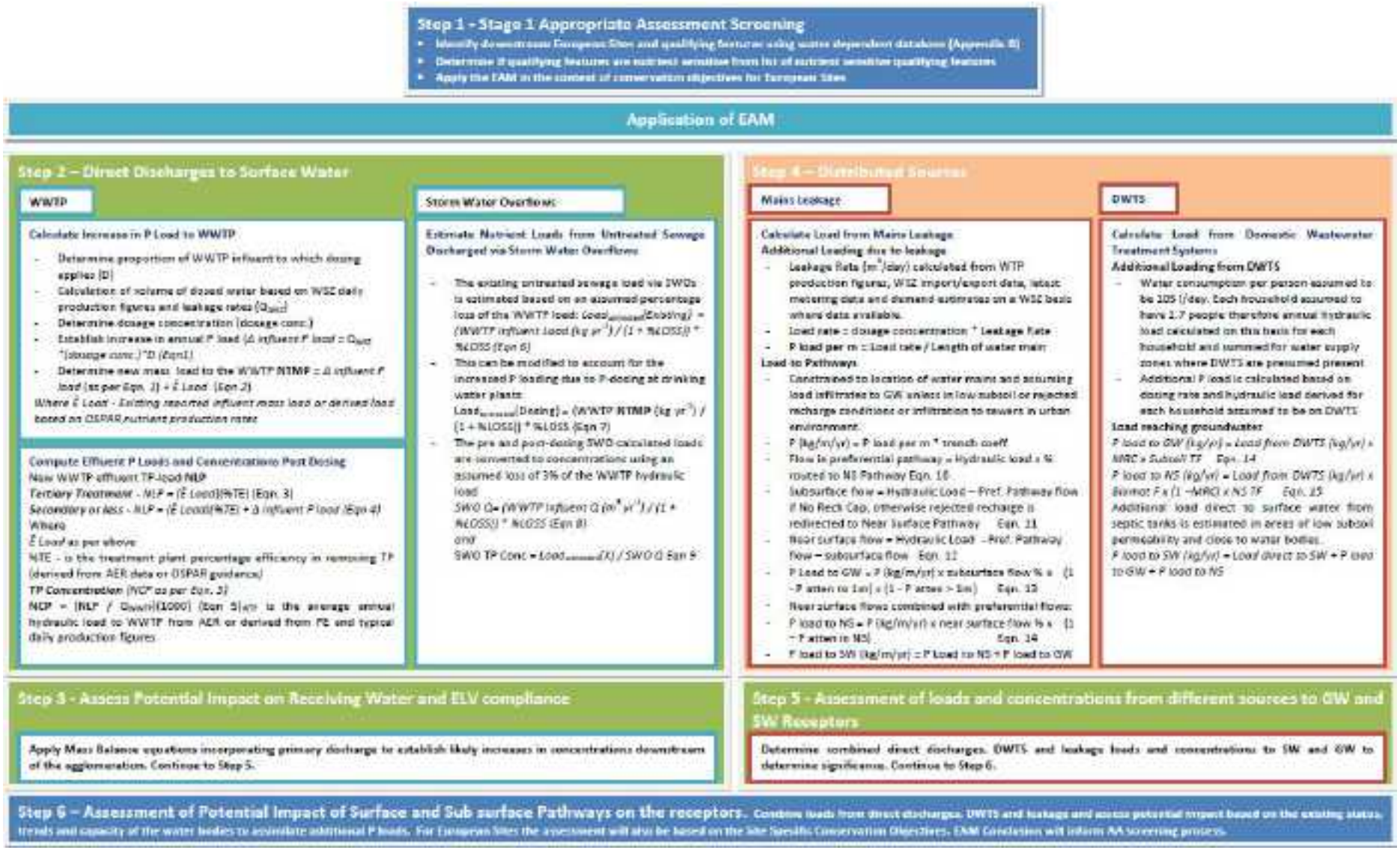


Figure 3-4: Stepwise Approach to the Environmental Assessment Methodology

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 Adamstown 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 Adamstown 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	Ground-water Connectivity	Potential Source Impact Pathway
1	Lower River Suir	SAC 002137	No	Yes	No	Yes (Waterford)	Yes
2	River Barrow & River Nore	SAC 002162	No	Yes	No	Yes (Waterford)	Yes

4.1.2 Operational Phase

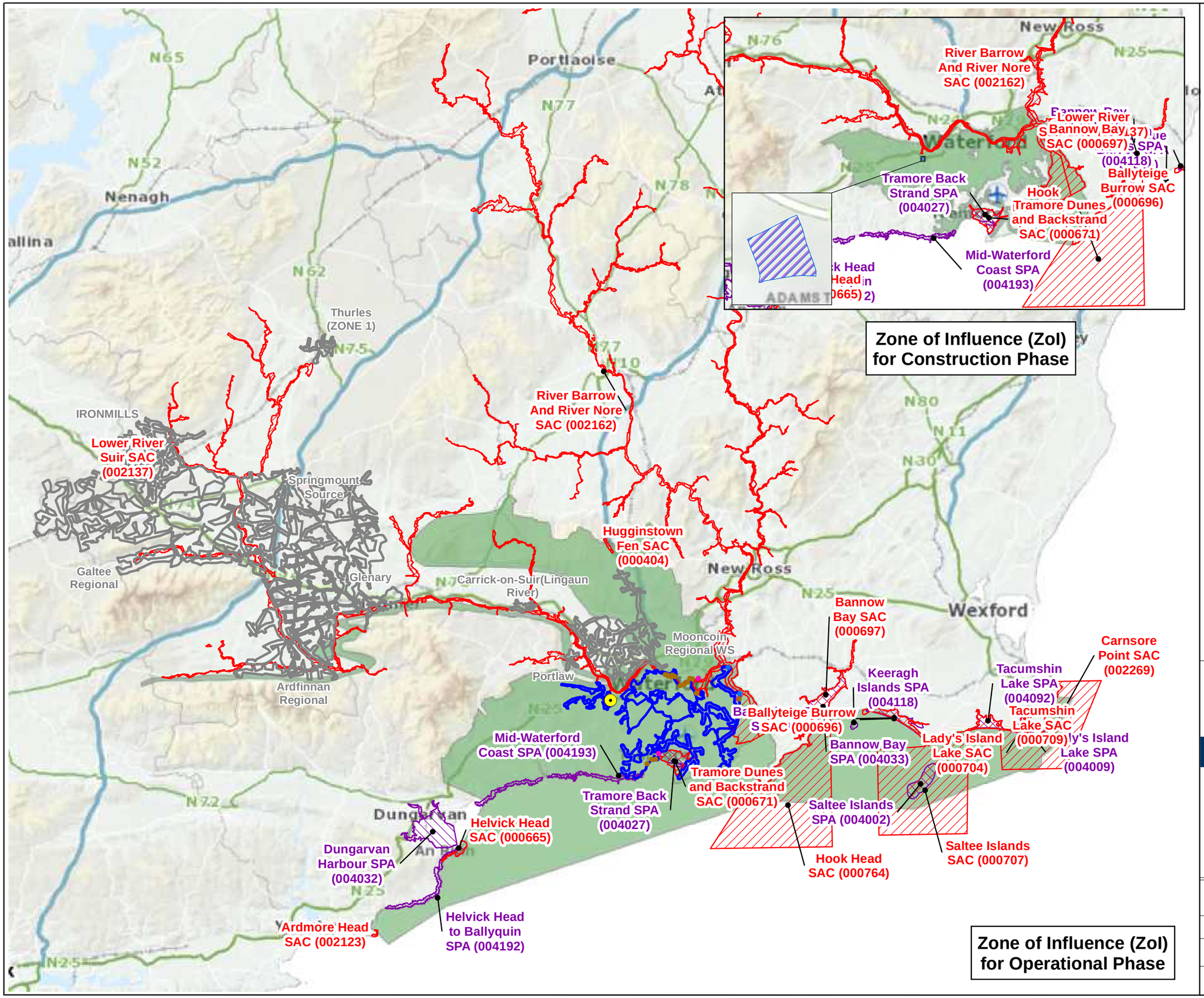
The ZoI for the operational phase of the proposed project was determined by establishing the potential for hydrological and hydrogeological connectivity between the Adamstown WTP, the associated WSZ and European Sites. The ZoI was therefore defined by the surface water sub-catchments and groundwater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

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

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

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive Species / Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Impact Pathway
1	Ardmore Head SAC	SAC 002123	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
2	Bannow Bay SAC	SAC 000697	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
3	Ballyteige Burrow SAC	SAC 000696	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
4	Carnsore Point SAC	SAC 002269	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
5	Helvick Head SAC	SAC 000665	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
6	Hook Head SAC	SAC 000764	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
7	Hugginstown Fen SAC	SAC 000404	Yes	Yes	Yes	No	No
8	Tacumshin Lake SAC	SAC 000729	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
9	Lady's island Lake SAC	SAC 000704	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
10	Lower River Suir SAC	SAC 002137	Yes	Yes	Yes –RWB	Yes	Yes
11	River Barrow and River Nore SAC	SAC 002162	Yes	Yes	Yes - RWB	Yes	Yes
12	Saltee Island's SAC	SAC 000707	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
13	Tramore Dunes and Backstrand SAC	SAC 000671	Yes	Yes	Yes - RWB	Yes	Yes
14	Bannow Bay SPA	SPA 004033	Yes	Yes	Yes – CWB Eastern	No	Yes
15	Ballyteige Burrow SPA	SPA 004020	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
16	Helvick Head to Ballyquin SPA	SPA 004192	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
17	Dungarvan Harbour SPA	SPA 004032	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive Species / Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Impact Pathway
18	Mid-Waterford Coast SPA	SPA 004193	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
19	Keeragh Islands SPA	SPA 004118	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
20	Lady's Island Lake SPA	SPA 004009	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
21	Saltee Islands SPA	SPA 004002	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
22	Tacumshin Lake SPA	SPA 004092	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
23	Tramore Back Strand SPA	SPA 004027	Yes	Yes	Yes - RWB	Yes	Yes



Legend

LEMA Emission Type

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

Data Source:
Irish Water
NPWS (June 2019)
EPA

N

0 5 10 20 Kilometres

Client

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

East Waterford Regional

European Sites within the ZoI of the Proposed Project

RPS

Scale: 1:500,000 @ A3	**Date:** 07/02/2023
File Ref: MDW0766Arc0004aF06	**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 have been included for further assessment in Sections 5 for the construction phase i.e. Lower River Suir SAC and River Barrow and River Nore SAC. Four sites have been included for further assessment for the operation phase in Section 5 and 6 i.e. Lower River Suir SAC, River Barrow and River Nore SAC, Tramore Dunes and Backstrand SAC and Tramore Back Strand SPA, with justification provided below.

The construction phase of the proposed project will take place within the confines of the existing Adamstown WTP. The WTP is located within the Waterford groundwater body (IE_SE_G_149) and there is potential hydrogeological connectivity between the proposed development site and the Lower River Suir SAC and the River Barrow and River Nore SAC.

For the operational phase, the East Waterford Regional WSZ is located adjacent to the Middle Suir Estuary (IE_SE_100_0550), the Lower Suir Estuary (Little Island – Cheekpoint) (IE_SE_100_0500), the Barrow Suir Nore Estuary (IE_SE_100_0100), Waterford Harbour (IE_SE_100_0000), Tramore Back Strand (IE_SE_120_0000) and Tramore Bay (IE_SE_110_0000). As a result, four European Sites are intersected via river pathways i.e. the Tramore Dunes and Back Strand SAC, Lower River Suir SAC, River Barrow and River Nore SAC and Tramore Back Strand SPA and are therefore included for further assessment. The sites are also connected hydrogeologically via eight groundwater bodies [Dunmore East (IE_SE_G_057), Tramore (IE_SE_G_146), Waterford (IE_SE_G_149), Carrick-on-Suir (IE_SE_G_030), Mullinavat (IE_SE_G_155), Industrial Facility (P0385-01) (IE_SE_G_179), Waste Facility (W0018-01) (IE_SE_G_175) and Industrial Facility (P0157-02) (IE_SE_G_176)] that intersect the WSZ, which will be discussed further in Section 6 (see also **Table 3, Appendix C**).

Hugginstown Fen SAC is located at the headwaters of the Blackwater (Kilamacow) River which is hydrologically connected to the Middle Suir Estuary. This European site is located upstream of the WSZ and therefore does not receive any surface water flow from the WSZ and therefore has been screened out of assessment.

A large coastal water body i.e. the Eastern Celtic Sea (IE_SE_050_0000) lies downstream of the WSZ. The WSZ discharges directly into a number of transitional and coastal water bodies – Middle Suir Estuary (IE_SE_100_0550), Lower Suir Estuary (IE_SE_100_0500), Barrow Suir Nore Estuary (IE_SE_100_0100), and then Waterford Harbour (IE_SE_100_0000), before entering the Eastern Celtic Sea coastal water body. It also discharges directly to Tramore Back Strand (IE_SE_120_0000), Tramore Bay (IE_SE_110_0000) and the Eastern Celtic Sea. The EAM results show that there is a potential increase in orthophosphate is insignificant as a result of dosing at Adamstown WTP to the Middle Suir Estuary, Lower Suir Estuary and Barrow Suir Nore Estuary transitional water bodies (0.0005mg/l, 0.0005mg/l, 0.0002mg/l respectively) before discharging to Waterford Harbour and the Eastern Celtic Sea coastal water bodies where the modelled additional concentration is also insignificant (0.0002mg/l) and undetectable (0.0000mg/l) respectively. The modelled additional concentration for Tramore Back Strand and Tramore Bay coastal water bodies are also insignificant (0.0004mg/l and 0.0001mg/l respectively) before discharging to the Eastern Celtic Sea coastal waterbody (see **Table 5.2** below).

As the modelled additional concentrations in these transitional and coastal waterbodies are predicted to be low due to high flow volumes and flushing resulting in dilution, the ZoI for the project has been determined to terminate at Tramore Bay and Waterford Harbour coastal water bodies. The following sites are excluded from further assessment which are located within the Eastern Celtic Sea CWB which has an undetectable modelled additional concentration i.e. Ardmore Head SAC, Helvick Head SAC, Hook Head SAC, Bannow Bay SAC, Ballyteigue Burrow SAC, Saltee Islands SAC, Tacumshin Lake SAC, Lady's Island Lake SAC, Carnsore Point SAC, Helvick Head to Ballyquin SPA, Dungarvan Harbour SPA, Mid-Waterford Coast SPA, Bannow Bay SPA, Keeragh Islands SPA, Ballyteigue Burrow SPA, Saltee Islands SPA, Tacumshin Lake SPA and Lady's Island Lake SPA.

On this basis, two sites have been included for further assessment as result of potential effects arising during the construction phase in Sections 5 below i.e. Lower River Suir SAC and the River Barrow and River Nore SAC. Four sites have been included for further assessment for the operational phase in sections 5 and 6 below i.e. Lower River Suir SAC, River Barrow and River Nore SAC, Tramore Dunes and Backstrand SAC and Tramore Back Strand SPA.

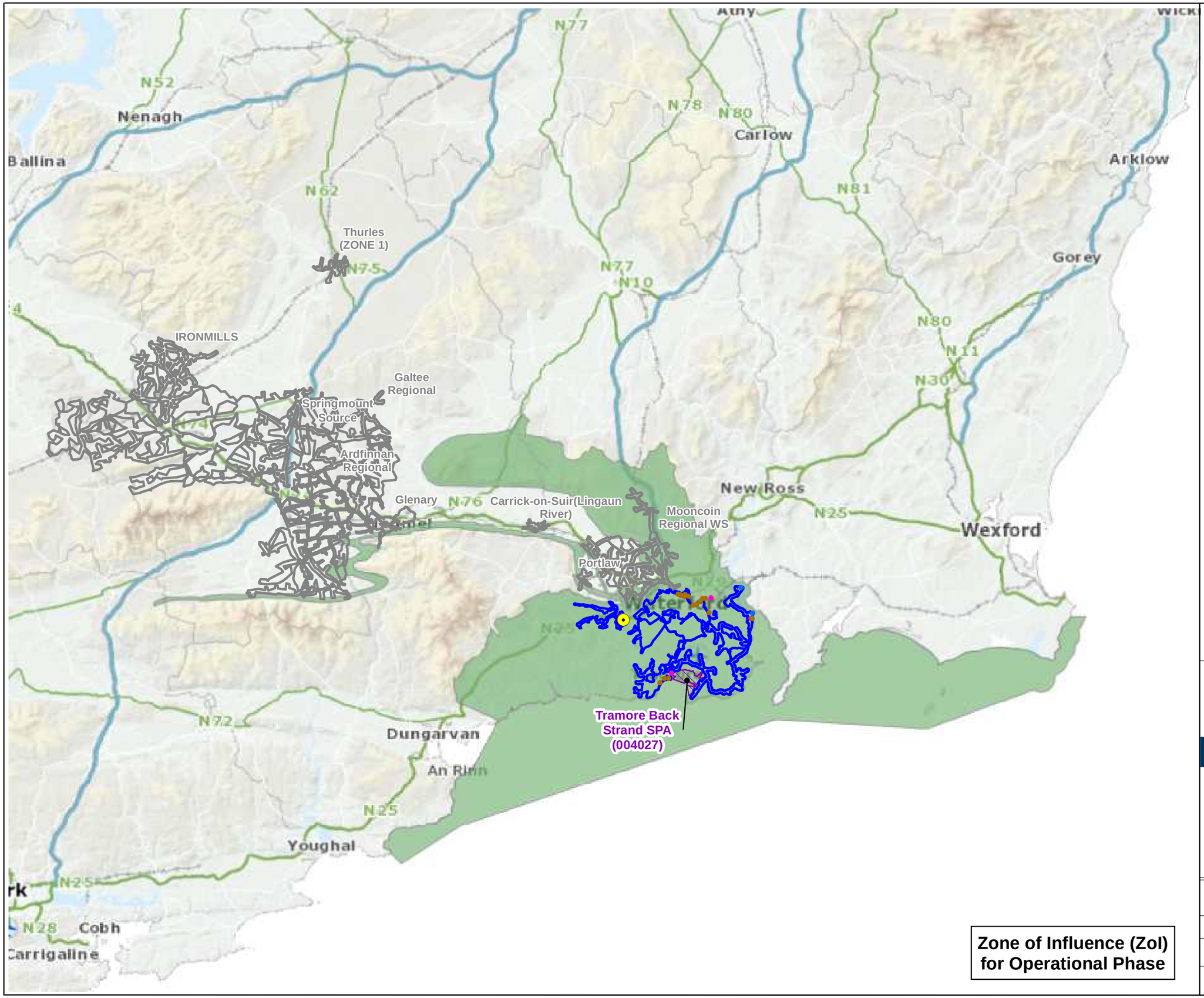
Table 4-3: European Sites Hydrologically or Hydrogeologically Connected to or Downstream of the WTP and WSZ

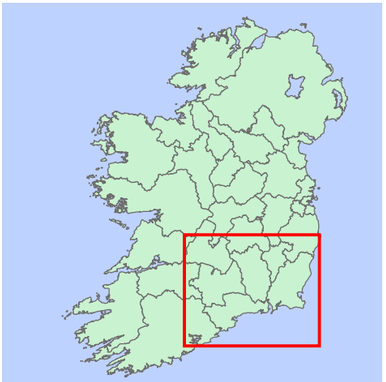
Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive Species / Habitats	Potential Hydrological / Hydrogeological Connectivity	Potential Source Impact Pathway
Operation Phase Only								
Tramore Back Strand SPA	SPA 004027	03rd Oct 2013 Version 1	A046	Light-bellied Brent Goose (*Branta bernicla hrota*)	Yes	Yes	Yes	Yes
			A140	Golden Plover (*Pluvialis apricaria*)		Yes		
			A141	Grey Plover (*Pluvialis squatarola*)		Yes		
			A142	Lapwing (*Vanellus vanellus*)		Yes		
			A149	Dunlin (*Calidris alpina*)		No		
			A156	Black-tailed Godwit (*Limosa limosa*)		Yes		
			A157	Bar-tailed Godwit (*Limosa lapponica*)		Yes		
			A160	Curlew (*Numenius arquata*)		Yes		
			A999	Wetlands and Waterbirds		Yes		
Tramore Dunes and Backstrand SAC	SAC 000671	05th Sep 2013 Version 1	1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	Yes	Yes
			1210	Annual vegetation of drift lines	Yes	Yes		
			1220	Perennial vegetation of stony banks	Yes	No		
			1310	*Salicornia* and other annuals colonising mud and sand	Yes	Yes		
			1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes		
			1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes		
			2110	Embryonic shifting dunes	No	Yes		

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive Species / Habitats	Potential Hydrological / Hydrogeological Connectivity	Potential Source Impact Pathway
			2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	No	Yes		
			2130	*Fixed coastal dunes with herbaceous vegetation (grey dunes)	No	Yes		
Construction and Operation Phase								
Lower River Suir SAC	SAC 002137	28th Mar 2017 Version 1	1029	Freshwater pearl mussel (*Margaritifera margaritifera*)	Yes	Yes	Yes	Yes
			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*) (only in fresh water)	Yes	Yes		
			1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes		
			1355	Otter (*Lutra lutra*)	Yes	Yes		
			1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes		
			3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Yes	Yes		
			6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	Yes	Yes		
			91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	No	Yes		
			91E0	* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Yes	Yes		
			91J0	* *Taxus baccata* woods of the British Isles	No	No		

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive Species / Habitats	Potential Hydrological / Hydrogeological Connectivity	Potential Source Impact Pathway
River Barrow and River Nore SAC	SAC 002162	19th July 2011 Version 1	1016	Desmoulin's whorl snail (*Vertigo moulinsiana*)	Yes	Yes	Yes	Yes
			1029	Freshwater pearl mussel (*Margaritifera margaritifera*)	Yes	Yes		
			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*) (only in fresh water)	Yes	Yes		
			1130	Estuaries	Yes	Yes		
			1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes		
			1170	Reefs	Yes	Yes		
			1310	*Salicornia* and other annuals colonising mud and sand	Yes	Yes		
			1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes		
			1355	Otter (*Lutra lutra*)	Yes	Yes		
			1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes		
			1421	Killarney fern (*Trichomanes speciosum*)	Yes	Yes		
			1990	Nore Freshwater pearl mussel (*Margaritifera durrovensis*)	Yes	Yes		

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive Species / Habitats	Potential Hydrological / Hydrogeological Connectivity	Potential Source Impact Pathway
			3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Yes	Yes		
			4030	European dry heaths	No	No		
			6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	Yes	Yes		
			7220	* Petrifying springs with tufa formation (*Cratoneurion*)	Yes	Yes		
			91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	No	Yes		
			91E0	* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)	Yes	Yes		





Legend

LEMA Emission Type

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

Data Source:
Irish Water
NPWS (June 2019)
EPA

N

0 4.75 9.5 19 Kilometres

Client UISCE EIREANN WATER

Project Lead Mitigation Plan
Corrective Water Treatment Works

Title

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

RPS

Scale: 1:500,000 @ A3	**Date:** 07/02/2023
File Ref: MDW0766Arc0004bF06	**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 Adamstown 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 Adamstown 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 Adamstown WTP.

5.3.1 Construction Phase

There is one possible location for the orthophosphate dosing system at Adamstown WTP which will be located within the confines of the existing WTP boundary upon an area of made ground. In addition, a proposed pH dosing system will be located within the confines of the existing WTP, which supports made ground / artificial surfaces that do not support connectivity to the surrounding environment. The assessment of impacts associated with construction of the corrective water treatment works was conducted taking the whole Adamstown WTP into account and therefore included both possible locations. The assessment of impacts associated with the construction of the corrective water treatment works at Adamstown 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 Adamstown WTP;
- A review of hydrological connectivity between the proposed works and European Sites using the EPA Mapping Resources: http://gis.epa.ie/; www.Catchments.ie;
- Ordnance Survey Ireland Map viewer: http://maps.osi.ie/publicviewer/#V1,591271,743300,0,10; and
- Site synopses, conservation objectives and qualifying interest data for European Sites.

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

Site Name (Code)	Contributing WB Code_Name	WB Type[4]	Evaluation
Lower River Suir SAC (002137)	Waterford (IE_SE_G_149)	GWB	The construction works will be located within the confines of the existing Adamstown WTP. Adamstown WTP is not located within or directly adjoins a European Site. **Surface water** There are no surface water bodies within the confines of Adamstown WTP. The WTP footprint and proposed construction works are located 600m east of the Whelan's Bridge Stream_010 (IE_SE_16W010400) which is designated as part of the Lower River Suir SAC, 700m north of the WTP site. Whelan's Bridge Stream_010 is a tributary of the River Suir main channel. There are no surface water linkages providing connectivity between Adamstown WTP, Whelan's Bridge Stream and those downstream sections of the Lower River Suir SAC. In addition, the proposed construction works are small scale in nature and will be undertaken within the confines of the existing built infrastructure associated with Adamstown WTP. There will be no aspects of the proposed works that will result in the
River Barrow and River Nore SAC (002162)	Waterford (IE_SE_G_149)	GWB	

[4] Monitoring period is annual unless specified.

Site Name (Code)	Contributing WB Code_Name	WB Type[4]	Evaluation
			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 buildings, artificial surfaces associated within the in-situ built infrastructure of Adamstown WTP and the built infrastructure is surrounded by amenity grassland. 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. **Groundwater** The WTP overlies the Waterford (IE_SE_G_149) groundwater body. 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. Adamstown WTP overlies the Waterford (IE_SE_G_149) groundwater body. The Geological Survey of Ireland (GSI) summary[5] of this water body's classification suggests that regional discharge is in the direction of the River Suir and in areas of poorly productive aquifers groundwater is forced into associated surface water bodies such as Whelan's Bridge Stream. Therefore, preferential groundwater flow paths for the Adamstown WTP and surrounds are likely to be to those nearby areas of Whelan's Bridge Stream. Whelan's Bridge Stream_010 (IE_SE_16W010400) is designated as part of the Lower River Suir SAC ca. 250m downstream of its intersection with the N25. This stream is also a tributary of the River Suir main channel which is designated as part of the Lower River Suir SAC. This River Suir main channel provides connectivity to those transitional and coastal water bodies located downstream including the Middle Suir Estuary (IE_SE_100_0550), Lower Suir Estuary (IE_SE_100_0500), Barrow Suir Nore Estuary (IE_SE_100_0100) and the Waterford Harbour coastal water body (IE_SE_100_0000). The Barrow Suir Nore Estuary transitional water body supports the River Barrow and River Nore SAC. 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

[5] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/WaterfordGWB.pdf

Site Name (Code)	Contributing WB Code_Name	WB Type[4]	Evaluation
			water table will be unlikely to occur. Any interference would be localised within the WTP site, minor and temporary. Therefore, there is no potential for likely significant effects to the underlying groundwater body, the receiving surface water features and subsequently those hydrologically connected European Sites included for further assessment, as a result of the construction of the corrective water treatment works at Adamstown WTP.

5.3.2 Operational Phase

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

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

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

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

For significance threshold band (i.e. 75% of the upper threshold for the indicative quality band) in transitional and coastal water bodies, a sliding linear scale is used depending on median salinity. The EAM determines if the dosing will result in a baseline concentration that exceeds the relevant 75% threshold for the indicative quality bands (based on salinities) in order to evaluate whether there could be an increased risk of deterioration in indicative quality.

Where a water body is unassigned and therefore does not have monitored orthophosphate concentrations or salinity levels, a conservative approach is used whereby the surrogate indicative quality for orthophosphate is calculated based on the surrogate ecological status as defined by the EPA for the purposes of classifying the status of the waterbody but the more conservative freshwater orthophosphate limits for the different indicative quality bands are applied[6].

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

The identification of statistically and environmentally significant trends for water bodies is a specific requirement of the WFD and the Groundwater Daughter Directive. Guidance on trends in groundwater assessments (UKTAG 2009, EPA 2010) indicates that trends are environmentally significant if they indicate that the Good Ecological Status will not be achieved within one future river basin cycles, i.e. within the next 6 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 baseline and the additional concentration due to orthophosphate dosing is added and assessed as appropriate. If the new calculated predicted concentration prevents the achievement of good indicative quality then this test fails.

This assessment assumes a dosing rate of 0.5 mg/l.

[6] 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.

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 the most up to date baseline data from the WFD monitoring programme. If tests fail and more investigation is required, more recent data can be used and the assessment rerun. For example, if project monitoring provides more recent baseline concentrations than that available from the WFD monitoring programme these can be used instead of the WFD baseline information, particularly if the most recent WFD monitoring is not available.

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[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
Tramore Back Strand SPA (004027)	IE_SE_17B290990 Ballygunnermore_010	RWB	*Moderate*	*0.046*	*0.051*	23.7	0.0013	0.047	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_17M060970 Monloum_010	RWB	*Moderate*	*0.046*	*0.051*	20.9	0.0023	0.048 †	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P

[7] Monitoring period is annual unless specified.
[8] Surrogate Indicative Quality in italic.
[9] Distance to threshold.
[10] Baseline year is 2020 for surface water bodies and 2018 for groundwater bodies.
[11] Surrogate concentration is given in italic mg/l
[12] 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.
[13] Green cells signify that there is no risk of deterioration in indicative quality of the water body following dosing at the WTP.

Site Name (Code)	Contributing WB Code_Name	WB Type[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
									indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_17L010300 Leperstown Stream_010	RWB	Poor	0.077	0.087	0.7	0.0002	0.077 ^	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_110_0000 Tramore Bay	CWB	*Good*	*0.033*	*0.036*	*234.1*	0.0001	0.033 ‡	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_120_0000 Tramore Back Strand	CWB	*High*	*0.013*	*0.019*	*234.1*	0.0004	0.013 ‡‡	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_G_057 Dunmore East	GWB	*Good*	*0.018*	*0.026*	16.3	0.0016	0.019	The increase in modelled concentration is <5% good/less than good indicative quality boundary for gwb. 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[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
Tramore Dunes & Backstrand SAC (000671)	IE_SE_17B290990 Ballygunnermore_010	RWB	*Moderate*	*0.046*	*0.051*	23.7	0.0013	0.047	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_17M060970 Monloum_010	RWB	*Moderate*	*0.046*	*0.051*	20.9	0.0023	0.048 †	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_17L010300 Leperstown Stream_010	RWB	Poor	0.077	0.087	0.7	0.0002	0.077 ^	The increase in modelled concentration is <5% High/Good indicative quality boundary. 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[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
	IE_SE_110_0000 Tramore Bay	CWB	*Good*	*0.033*	*0.036*	*234.1*	0.0001	0.033 ǂ	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_120_0000 Tramore Back Strand	CWB	*High*	*0.013*	*0.019*	*234.1*	0.0004	0.013 ǂǂ	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_G_057 Dunmore East	GWB	*Good*	*0.018*	*0.026*	16.3	0.0016	0.019	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Lower River Suir SAC (002137)	IE_SE_16F150440 Faithlegg_010	RWB	*Moderate*	*0.046*	*0.051*	6.0	0.0011	0.047	The increase in modelled concentration is <5% High/Good indicative quality boundary. 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[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
	IE_SE_16G770380 Glengrant_010	RWB	*Good*	*0.030*	*0.033*	21.9	0.0025	0.033 ^	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16H020300 Halfway House Stream_010	RWB	Moderate	0.037	0.051	9.7	0.0009	0.038 ^†	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16L680750 Luffany_010	RWB	*Good*	*0.030*	*0.033*	5.8	0.0005	0.031	The increase in modelled concentration is <5% High/Good indicative quality boundary. 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[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
	IE_SE_16S030400 St John's_010	RWB	*Poor*	*0.077*	*0.087*	*8.4*	*0.0023*	*0.079*	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16S030600 St John's_020	RWB	*Poor*	*0.077*	*0.087*	*70.5*	*0.0018*	*0.078 †**	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16D040300 DAWN_010	RWB	High	0.015	0.019	3.4	0.0001	0.016	The increase in modelled concentration is <5% High/Good indicative quality boundary. 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[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
	IE_SE_16D040500 DAWN_020	RWB	High	0.024	0.019	6.0	0.0002	0.024	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16D290570 DARRIGAL_010	RWB	*Good*	*0.030*	*0.033*	*0.8*	*0.0001*	*0.030*	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16W010400 WHELAN'S BRIDGE STREAM_010	RWB	Good	0.029	0.033	8.3	0.0005	0.029	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_100_0600 Upper Suir Estuary	TWB Summer	High (S) None Far	0.006	0.019	48.1	0.0000	0.006	The increase in modelled concentration is <5% High/Good indicative quality boundary and the predicted concentration is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
		TWB Winter	High (W) None Near	0.023	0.019			0.023	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 insignificant (0.0005mg/l) therefore there is no risk of deterioration in the ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_100_0550 Middle Suir Estuary	TWB Summer	High Upwards Near	0.029	0.023	1029.0	0.0004	0.029 ‡†	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 insignificant (0.0005mg/l) therefore there is no risk of deterioration in the ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good Downwards Far	0.037	0.053			0.037 †	The increase in modelled concentration is <5% High/Good indicative quality boundary and the predicted concentration is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
	IE_SE_100_0500 Lower Suir Estuary (Little Island - Cheekpoint)	TWB Summer	High Upwards Near	0.026	0.023	1055.4	0.0004	0.027 ‡	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good Downwards Near	0.053	0.053			0.053	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_G_030 Carrick-on-Suir	GWB	Good Upwards Far	0.035	0.0426	1.5	0.0000	0.035	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_G_179 Galco Ltd Industrial Facility (P0385-01)	GWB	*Good*	*0.018*	*0.026*	6.3	0.0670	0.085†	The modelled additional concentration is >5% Good/Fail indicative quality boundary and post dosing baseline is >75% of the upper indicative quality threshold This GWB was delineated due to industrial point source pressures. The additional Ortho P load does not impact the ability of the dependent water bodies to achieve their WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
									Please see the EAM report for further detailed assessment of the risk to this waterbody.
	IE_SE_G_155 Mullinavat	GWB	Good Upwards Far	0.019	0.026	0.1	0.0000	0.019	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_G_149 Waterford	GWB	Good Upwards Far	0.008	0.026	130.3	0.0026	0.010	The increase in modelled concentration is <5% High/Good indicative quality boundary which is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
River Barrow and River Nore SAC (002162)	IE_SE_17K210690 Cooltegin_010	RWB	*Good*	*0.030*	*0.033*	*13.8*	*0.0013*	*0.031*	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
	IE_SE_17K410990 Knockacurrin_010	RWB	*Poor*	*0.077*	*0.087*	*6.7*	*0.0012*	*0.078*	The increase in modelled concentration is <5% High/Good indicative quality boundary and the predicted which is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16F150440 Faithlegg_010	RWB	*Moderate*	*0.046*	*0.051*	*6.0*	*0.0011*	*0.047*	The increase in modelled concentration is <5% High/Good indicative quality boundary which is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16G770380 Glengrant_010	RWB	*Good*	*0.030*	*0.033*	21.9	0.0025	0.033^	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
	IE_SE_16H020300 Halfway House Stream_010	RWB	*Moderate*	*0.037*	*0.051*	9.7	0.0009	0.038 ^†	The increase in modelled concentration is <5% High/Good indicative quality boundary which is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16L680750 Luffany_010	RWB	*Good*	*0.030*	*0.033*	*5.8*	*0.0005*	0.031	The increase in modelled concentration is <5% High/Good indicative quality boundary which is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16S030400 St John's_010	RWB	*Poor*	*0.077*	*0.087*	*11.3*	*0.0023*	*0.079*	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
	IE_SE_16S030600 St John's_020	RWB	*Poor*	*0.077*	*0.087*	70.5	0.0018	0.078 †*	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16D040300 DAWN_010	RWB	High Far	0.015	0.019	3.4	0.0001	0.016	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16D040500 DAWN_020	RWB	High Near	0.024	0.019	6.0	0.0002	0.024	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16D290570 DARRIGAL_010	RWB	*Good*	*0.030*	*0.033*	*0.8*	*0.0001*	*0.030*	The increase in modelled concentration is <5% High/Good indicative quality boundary. 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[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
	IE_SE_16W010400 WHELAN'S BRIDGE STREAM_010	RWB	Good Far	0.029	0.033	8.3	0.0005	0.029	The increase in modelled concentration is <5% High/Good indicative quality boundary. No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_100_0600 Upper Suir Estuary	TWB Summer	High (S) None Far	0.006	0.019	48.1	0.0000	0.006	The increase in modelled concentration is <5% High/Good indicative quality boundary and the predicted concentration is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	High (W) None Near	0.023	0.019			0.023	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 insignificant (0.0005mg/l) therefore there is no risk of deterioration in the ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_100_0550 Middle Suir Estuary	TWB Summer	High Upwards Near	0.029	0.023	1029.0	0.0004	0.029 ‡†	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 insignificant

Site Name (Code)	Contributing WB Code_Name	WB Type[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
									(0.0005mg/l) therefore there is no risk of deterioration in the ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good Downwards Far	0.037	0.053			0.037 †	The increase in modelled concentration is <5% High/Good indicative quality boundary which is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_100_0500 Lower Suir Estuary (Little Island - Cheekpoint)	TWB Summer	High Upwards Near	0.026	0.023	1055.4	0.0004	0.027 ‡	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 insignificant (0.0005mg/l) therefore there is no risk of deterioration in the ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good Downwards Near	0.053	0.053			0.053	The increase in modelled concentration is <5% High/Good indicative quality boundary which is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing

Site Name (Code)	Contributing WB Code_Name	WB Type[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
									the achievement of WFD objectives.
	IE_SE_100_0100 Barrow Suir Nore Estuary	TWB Summer	High Upwards Far	0.019	0.020	1092.9	0.0002	0.019 ‡	The increase in modelled concentration is <5% High/Good indicative quality boundary which is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good Near	0.045	0.042			0.046	The increase in modelled concentration is <5% High/Good indicative quality boundary therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_G_057 Dunmore East	GWB	*Good*	*0.018*	*0.026*	16.3	0.0016	0.019	The increase in modelled concentration is <5% High/Good indicative quality boundary which is less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[7]	Ortho P Indicative Quality[8] and Trends[9]	Baseline[10] Ortho P Conc.[11] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[12] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[13]	Evaluation
	IE_SE_G_149 Waterford	GWB	Good Upwards Far	0.008	0.026	130.3	0.0026	0.019	The increase in modelled concentration is >5% High/Good indicative quality boundary but the post dosing Ortho P concentration is modelled to be less than 75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

^ Effective Rainfall used to calculate concentration
† Reapportionment of loads to estuaries undertaken
‡ Load from WWTP / SWO following treatment added
** Surrogate indicative quality and baseline assigned from Characterisation tab in WFD App for GW Group

5.3.3 Assessment of 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.

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 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**.**

Waterford City Agglomeration

The Waterford City agglomeration (D0022-01) operates secondary treatment. There is no treatment reduction assumed and the entire additional load from orthophosphate dosing is assumed to be discharged into the Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) which is hydrologically connected to Hook Head SAC, Lower River Suir SAC and the River Barrow and River Nore SAC. No ELV for orthophosphate have been set for this agglomeration. Orthophosphate dosing causes an estimated <0.5% increase in concentration levels in the receiving water when mean flows are taken into account (**Table 5-4; Table 7 of Appendix C**). Therefore, there is no risk of failing to achieve WFD objectives for the Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500), and its hydrologically connected European Sites as a result of dosing at Adamstown WTP.

Table 5-3: Increased loading/concentration due to Orthophosphate Dosing – Dosing rate = 0.5 mg/l

Agglom. and Discharge Type	ELV from WWDL (mg/l)	Scenario	TP Load Kg/yr	Ortho P Concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	***0.4***	***0.68***
Waterford City Primary Discharge	n/a	**Existing**	18,008	0.67	0.53	0.91
		Post Dosing	19,816	0.73	0.62	1.05
Waterford City SWOs (1 no.)	n/a	**Existing**	1,873.3	2.83	1.91	3.24
		Post Dosing	1,925.9	2.45	1.99	3.38
Tramore Primary Discharge	n/a	**Existing**	1,385	0.33	0.26	0.45
		Post Dosing	1,753	0.42	0.37	0.64
Tramore SWOs (1 no.)	n/a	**Existing**	237.2	1.94	1.55	2.63
		Post Dosing	248.0	2.02	1.66	2.82
Dunmore East Primary Discharge	n/a	**Existing**	1,754	5.50	3.74	6.35
		Post Dosing	1,845	5.79	4.03	6.85
Dunmore East SWOs (3 no.)	n/a	**Existing**	92.9	10.0	8.0	13.60
		Post Dosing	95.5	10.29	8.36	14.22

Table 5-4: Mass balance assessment based on 0.5 mg/l dosing using available background concentrations and and mean flow information from Hydrotool and as assumed daily tidal exchange volume.

Agglom.	RWB Name / Code for Primary Discharge	Background conc. (mg/l) (annual mean from AER u/s monitoring point)	Modelled Conc. Existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc
Waterford City (D0022-01)	Lower Suir Estuary (Little Island - Cheekpoint) IE_SE_100_0500	0.053	0.055	0.055	0.5
Tramore (D0015-01)	Tramore Bay IE_SE_110_0000	0.021	0.022	0.022	0.5
Dunmore East (D0170-01)	Waterford Harbour IE_SE_100_0000	0.020	0.020	0.020	0

Tramore Bay Agglomeration

The Tramore Bay agglomeration (D0015-01) operates secondary treatment. There is no treatment reduction assumed and the entire additional load from orthophosphate dosing is assumed to be discharged into Tramore Bay (IE_SE_110_0000) which is hydrologically connected to Tramore Back Strand SPA and Tramore Dunes and Backstrand SAC. No orthophospahte ELVs have been set for this agglomeration. Orthophosphate dosing causes an estimated <0.5% increase in concentration levels in the receiving water when large tidal volumes are taken into account due to the ability of the tidal flows to assimilate the discharge from the agglomeration (**Table 5-4; Table 7 of Appendix C**). Therefore, there is no risk of failing to achieve WFD objectives for the Tramore Bay (IE_SE_110_0000), and its hydrologically connected European Sites as a result of dosing at Adamstown WTP.

Dunmore East Agglomeration

The Dunmore East Agglomeration (D0170-01) operates secondary treatment. There is no treatment reduction assumed and the entire additional load from orthophosphate dosing is assumed to be

discharged into Waterford Harbour (IE_SE_100_0000) which is hydrologically connected to Hook Head SAC. No orthophosphate ELVs have been set for this agglomeration. Orthophosphate dosing causes an estimated <0.1% increase in concentrations levels in the receiving water when mean flows are taken into account (**Table 5-4; Table 7 of Appendix C**). Therefore, there is no risk of failing to achieve WFD objectives for Waterford Harbour (IE_SE_100_0000), and its hydrologically connected European Sites as a result of dosing at Adamstown WTP.

5.3.4 Assessment of Indirect Impact from Subsurface Flow

5.3.4.1 Sub surface flows from leakage and DWWTP

Step 4 of the EAM model assesses the distributed inputs to river water bodies from subsurface pathways (**Appendix C**). River water bodies with predicted concentrations above 5% of the Good / High boundary (0.00125 mg/l) are highlighted in the table and include: Glengrant_010 (IE_SE_16G770380); St John's_010 (IE_SE_16S030400); St John's_020 (IE_SE_16S030600); Cooltegin_010 (IE_SE_17K210690); Monloum_010 (IE_SE_17M060970) and Ballygunnermore_010 (IE_SE_17B290990).

The catchment of the river water body Monloum_010 (IE_SE_17M060970) contains a high density of watermain in Tramore and although much of the load has been reapportioned to Tramore Bay the modelled additional concentration is 0.0023 mg/l.

St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) are located in the Waterford City Centre, with high density of watermain. St John's _010 (IE_SE_16S030400) is a particularly small catchment. The modelled additional orthophosphate concentration in each of these water bodies is 0.0023 mg/l and 0.0018 mg/l, respectively. Glengrant_010 (IE_SE_16G770380) and Cooltegin_010 (IE_SE_17K210690) have a modelled additional concentration of 0.0026 mg/l and 0.0013 mg/l, respectively.

In the case of each of these river water bodies the addition of orthophosphate from dosing at Adamstown WTP results in a predicted concentration that is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the orthophosphate indicative quality of the water body.

There are three lakes in the WSZ however there is no loading assigned to these water bodies from leakage or DWWTS as they are in the headwaters remote from water mains, DWWTS and do not receive any inputting water bodies.

Table 10 of Appendix C outlines the distributed inputs to transitional and coastal water bodies from sub-surface pathways. The modelled increase in orthophosphate concentration in transitional water bodies is less than 5% of the High / Good indicative quality boundary due to the dilution capacity provided by fluvial and tidal flows. The greatest change will be in within the Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island Cheekpoint) (IE_SE_100_0500) where the additional orthophosphate concentrations is 0.0005 mg/l. Therefore, there is no risk of deterioration in the orthophosphate indicative quality or of preventing the achievement of WFD objectives.

5.3.4.2 Groundwater Assessment

The predicted loads to some groundwater bodies (GWBs) exceed 5% of the Good / Fail indicative quality boundary due to the susceptibility and hydrological conditions in general as shown in **Table 8 of Appendix C**.

Three GWBs correspond to industrial facilities and two of these (IE_SE_G_175 and IE_SE_G_176) are listed as poor overall groundwater status due to the chemical status being poor. These are not monitored water bodies but rather the parent group of groundwater bodies, which determine their status, are considered to be at poor chemical status. These groundwater bodies were delineated to capture industrial pressures when the characterisation and groundwater risk assessments were undertaken and to ensure that the entire groundwater body beyond the contaminant plume was not classified as poor. Orthophosphate is unlikely to be an issue in these focused groundwater bodies where the chemical status assessment focuses on parameters and standards relating to the human use of water, i.e. drinking water standards, of which orthophosphate is not one. Indeed the characterisation of these water bodies has established that they are likely to be indicative of good orthophosphate Indicative Quality. For IE_SE_G_176 the issue is chemical pollution (priority substances) and IE_SE_G_175 has a nutrient pressure however the pressure is most likely to be ammonium given that the key driver for the risk classification is Kilbarry Landfill.

Waterford GWB also encloses three GWBs nominated as industrial or waste facilities delineated to focus on these industrial pressures and to ensure that the entire groundwater body beyond the contaminant plume was not classified as Poor. IE_SE_G_175 (Kilbarry Landfill Waste Facility), IE_SE_G_176 (Ibrook Industrial Facility) are classified at Poor Overall Groundwater Status due to Poor chemical status, but Orthophosphate is not listed as a Status Failure Reason. IE_SE_G_179 (Galco Ltd Industrial Facility) is at good overall groundwater status and this is the only groundwater body from thee three which is directly hydrogeologically connected to a European Site.. Information reported by the EPA under the further characterisation process suggests that these GWBs were at Good Ortho P indicative status in the WFD Cycle 2. A surrogate status of Good has therefore been assigned to their Ortho P indicative quality. Their small volume and the relatively small loading from leakage of dosed water into these GWB's results in large increases in OP concentration, highlighted in Table 8 of the Appendix C. However, due to their low groundwater flows and limited contributing loads to surface waters they will not have a significant effect on the wider environment.

Therefore, the modelled additional concentrations will not result in an alteration of the ecological status for the surface water bodies with which these ground waterbodies interact (St John's_10, St Johns_020 and Glengrant_010), and will not deteriorate in indicative quality as a result of the groundwater pathways from orthophosphate dosing. Nor will the WFD objective of achieving good status by 2021 be compromised as there is a downward trend in orthophosphate levels and the dosing does not reverse this where it is statistically significant. This has been demonstrated in the EAM modelling and is illustrated in the combined orthophosphate inputs in **Table 9 of Appendix C**.

5.3.5 Combined Assessment

Table 9 of Appendix C gives the loads and modelled concentrations for the combined assessment to rivers. In most circumstances the EAM model assumes that the entire leakage load (following attenuation) enters the main river within a sub-catchment. In the case of estuarine or coastal catchments this is not always appropriate, as part of the basin may be drained by a large number of

small, unmonitored, channels leading directly to marine (estuarine or coastal) waters. Where this is the case part of the load is "reapportioned" direct to the receiving transitional or coastal waterbody.

As was the case with the subsurface pathways to river water bodies the combined assessment of loading to river water bodies has established that the addition of orthophosphate from dosing at Adamstown WTP results in a predicted concentration that is within 75% of the upper indicative quality threshold of the current orthophosphate indicative quality in all rivers with the exception of one. The Dawn_020 (IE_SE_16D040500) river water body has a current indicative quality of 0.024 mg/l which is above the 75% thresholds. However the predicted increase in concentration in orthophosphate is insignificant and therefore there is no risk of deterioration in the orthophosphate indicative quality of the water body.

Table 10 of Appendix C outlines the increased loading and concentrations to transitional water bodies receiving flows from river water bodies connected to the WSZ.

Three transitional waterbodies have a pre-dosing baseline concentrations that is greater than the 75% upper indicative quality thresholds i.e. Upper Suir Estuary (IE_SE_100_0600) and Middle Suir Estuary (IE_SE_100_0550) (summer) and Lower Suir Estuary (Little Island - Cheekpoint) (summer and winter). However, the modelled additional increase in orthophosphate concentrations in these water bodies due to the proposed level of dosing is undetectable (0.0000 mg/l) or insignificant (0.0005 mg/l) (i.e. <5% of the Good / High indicative quality boundary). Therefore, there is no risk of deterioration in the indicative quality of these transitional or coastal water bodies or of preventing the achievement of WFD objectives**.**

5.3.6 Assessment of Cumulative Impacts from other WSZs

The cumulative loads to the Ballyteigue-Barrow (HA13) Barrow (HA 14), and Nore (HA15) catchments associated with the orthophosphate dosing have been assessed with the East Waterford Regional WSZ. The common water bodies that are impacted by the WSZs supplied by these WTPs have been summarised in **Table 5-5** below.

- 021 Rossadrehid WTP - Galtee Regional (2900PUB0130)
- 041 Glenary WTP – Glenary (2000PUB1009)
- 047 Goatenbridge WTP - Ardfinnan Regional (2900PUB0102)
- 098 Mooncoin WTP - Mooncoin Regional WS 1012 (1500PUB1012)
- 115 Springmount Pump Station - Springmount Source (2900PUB_TEMP_002)
- 138 Thurles WTP [Thurles (ZONE 1)] (2800PUB1012)
- 177 Linguan WTP - Carrick-on-Suir [Linguan River] (2900PUB0108)
- 190 Ironmills Pump Station – Ironmills (2900PUB0146)
- 399 Portlaw WTP – Portlaw (3100PUB1081)

The cumulative assessment has modelled the additional increase in orthophosphate as a result of dosing are all <5% of the Good / High indicative quality boundary i.e. 0.00125mg/l and therefore will not cause a deterioration in the orthophosphate indicative quality or prevent the achievement of the WFD objectives of the water bodies.

In the transitional and coastal water bodies some of the baseline concentrations following dosing are predicted to be in excess of the relevant orthophosphate indicative quality upper threshold (adjusted for salinity as required) but in these cases the original baseline concentration is already above 75% of

the relevant threshold and the predicted increase in concentration is insignificant (0.0005 mg/l) (i.e. <5% of the Good / High indicative quality boundary). Therefore, there is no risk of deterioration in the indicative quality of these transitional or coastal water bodies or of preventing the achievement of WFD objectives**.**

Table 5-5: Cumulative assessment of the increased loading and concentrations from East Waterford Regional and other WSZs proposed for corrective water treatment in the upstream catchments

NAME / EU_CD	WB Type/Period	Ortho P Indicative Quality and Trends (distance to threshold) Surrogate Indicative Quality indicated in *italic*	Baseline Year 2014 and Conc. Surrogate Conc given in *italic* mg/l	75% of Ortho P Indicative Quality Upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Modelled increase in Conc. Using Flows (30%ile tidal or gauged) mg/l	PO4 Potential Baseline Conc. following dosing mg/l
IE_SE_16B020500 BLACKWATER (KILMACOW)_050	RWB	Good Downwards Far	0.031	0.033	19.7	0.0002	0.031‡
IE_SE_16L680750 Luffany_010	RWB	*Moderate*	*0.046*	*0.051*	*8.5*	*0.0008*	*0.046*
IE_SE_100_0600 Upper Suir Estuary	TWB Summer	High None Far	0.006	0.019	535.9	0.0002	0.006
	TWB Winter	High None Near	0.023	0.019			0.023
IE_SE_100_0550 Middle Suir Estuary	TWB Summer	High Upwards Near	0.029	0.023	2618.7	0.0010	0.030
	TWB Winter	Good Downwards Far	0.037	0.053			0.038
IE_SE_100_0500 Lower Suir Estuary (Little Island - Cheekpoint)	TWB Summer	High Upwards Near	0.026	0.023	2648.9	0.0010	0.027
	TWB Winter	Good Downwards Near	0.053	0.053			0.054
IE_SE_100_0100 Barrow Suir Nore Estuary	TWB Summer	High Upwards Far	0.019	0.020	3752.2	0.0004	0.020
	TWB Winter	Good None Far	0.045	0.042	2827.2	0.0003	0.046
IE_SE_100_0000 Waterford Harbour	CWB Summer	High Downwards Far	0.005	0.019	3851.9	0.0003	0.006
	CWB Winter	High Downwards Far	0.020	0.019			0.020
IE_SE_050_0000 Eastern Celtic Sea (HAs 13;17)	CWB	*Good*	*0.033*	*0.036*	4716.3	0.0000	0.033‡

*Trends are statistically significant

‡ Load from WWTP / SWO following treatment added

5.3.7 Conclusions

The modelled increased orthophosphate dosing concentrations do not result in a noticeable effect with orthophosphate concentrations in the receiving estuaries calculated as a fraction of 1%, as shown by the mass balance assessment in **Table 7 Appendix C**.

Six river water bodies [Glengrant_010 (IE_SE_16G770380);; St John's_010 (IE_SE_16S030400); St John's_020 (IE_SE_16S030600); Ballygunnermore_010 (IE_SE_17B290990); Cooltegin_010 (IE_SE_17K210690); Monloum_010 (IE_SE_17M060970)] have a modelled concentration above 5% of the Good / High boundary (0.00125 mg/l) following dosing at Adamstown WTP. However, in each case the indicative quality of water body post-dosing is within 75% of upper threshold.

For the transitional water bodies the modelled additional orthophosphate concentration is insignificant, <0.00125mg/l (i.e. <5% of the Good / High indicative quality boundary).

For the sole coastal water body the modelled additional orthophosphate concentration is undetectable (0.0000mg/l) (i.e. <5% of the Good / High indicative quality boundary).

Three groundwater bodies [Kilbarry Landfill Waste Facility (W0018-01) (IE_SE_G_175); Ibrook Industrial Facility (P0157-02) (IE_SE_G_176); Galco Ltd Industrial Facility (P0385-01) (IE_SE_G_179)] associated with industrial facilities have been assigned a surrogate Good indicative quality and baseline for which the groundwater group has been assigned as part of the characterisation process in the WFD App. These groundwater bodies were delineated to capture the point source industrial pressures when the characterisation and groundwater risk assessments were undertaken, and orthophosphate is unlikely to be an issue in these focused groundwater bodies.

The cumulative assessment of dosing at Adamstown 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 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

Adamstown WTP is not located within or directly adjacent to the boundary of any European Site. The Adamstown WTP footprint and proposed construction works are located 600 m east of the Whelan's Bridge Stream_010 (IE_SE_16W010400) which is designated as part of the Lower River Suir SAC, 700 m north of the WTP site. Whelan's Bridge Stream_010 is a tributary of the River Suir main channel. There are no surface water linkages providing connectivity between Adamstown WTP, Whelan's Bridge Stream and those downstream sections of the Lower River Suir SAC. The proposed construction works (to facilitate both the orthophosphate and pH dosing units) will be localised and contained within the WTP site development boundary which comprises 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.

In addition, the WTP overlies the Waterford (IE_SE_G_149) groundwater body which encapsulates Waterford City, part of the River Suir Estuary and lands located to the west of Waterford City. This groundwater body intersects the Lower River Suir SAC and adjoins the River Barrow and River Nore SAC. The GSI summary of this water body's classification suggests that regional discharge is in the direction of the River Suir and in areas of poorly productive aquifers groundwater is forced into associated surface water bodies such as Whelan's Bridge Stream. Therefore, preferential groundwater flow paths for the Adamstown WTP and surrounds are likely to be to those nearby areas of Whelan's Bridge Stream. The proposed excavation works will not be extensive (up to c. 75 m for pipework and to an approximate depth of 700 mm) and will be situated upon made ground within the WTP development site. Interference with the underlying water table will be unlikely to occur and any potential 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 features and subsequently those hydrologically connected European Sites included for further assessment, as a result of the construction of the corrective water treatment works at Adamstown WTP.

It can be concluded on the basis of objective scientific information that the construction of the corrective water treatment works at Adamstown WTP, individually or in combination with other plans or projects, will not have a likely significant effect on any European Site.

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 Tramore Dunes and Backstrand SAC 000671

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

There are no nutrient specific targets in the SSCO (NPWS, 2013[14]). A review of SSCOs for other SACs with this habitat, equally do not make specific reference to water quality and nutrient conditions however, there is a requirement to conserve community types in their natural conditions. The Conservation Objective supporting document for Marine habitats (NPWS, 2013[15]) does 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 surface and groundwater bodies which are hydrologically or hydrogeologically connected to Tramore Dunes and Backstrand SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies hydrologically connected to the site include: Ballygunnermore_010 (IE_SE_17B290990), Monloum_010 (IE_SE_17M060970) and Leperstown Stream_010 (IE_SE_17L010300);
- The coastal water bodies connected to the site include: Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000); and
- The groundwater body hydrogeologically connected to the site is: Dunmore East (IE_SE_G_057).

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

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flow data. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5.** In the case of Tramore Back Strand (IE_SE_120_0000) tidal flows have been evaluated, to allow for dilution contributions greater than the contributing fluvial flow of less than $1m^3/s$.

The river water body, Leperstown Stream_010 (IE_SE_17L010300) (0.0002 mg/l) has a modelled increase in orthophosphate concentrations less than 5% of the Good / High boundary (0.00125 mg/l) following dosing and is not significantly impacted.

The river water bodies Ballygunnermore_010 (IE_SE_17B290990) (0.0013 mg/l) and Monloum_010 (IE_SE_17M060970) (0.0023 mg/l) however, have predicted concentrations which are above 5% of the Good / High boundary. The Monloum_010 river water body contains a high density of watermain in Tramore and much of the load has been reapportioned to Tramore Bay which is located outside the

[14] NPWS 2013 Tramore Dunes and Backstrand SAC 000671 Conservation Objectives

[15] NPWS 2013 Tramore Dunes and Backstrand SAC (site code: 0671) Conservation Objectives Supporting Document - Marine Habitats

SAC. For both rivers the modelled baseline following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current moderate ortho P indicative quality or of the achievement of WFD objectives for these river water bodies.

For the coastal water bodies Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000) the modelled additional concentration is insignificant (0.0001 mg/l and 0.004 mg/l respectively) i.e. within 5% of the Good / High boundary and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for the coastal water bodies assessed.

The groundwater body Dunmore East (IE_SE_G_057) has a modelled post-dosing concentration of 0.0016 mg/l which does not exceed 75% of the Good / Fail boundary, therefore there is no risk in deterioration of the Good (surrogate) indicative quality of the water body.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Adamstown 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 (1210) Annual vegetation of drift lines

There are no nutrient specific targets in the SSCO (NPWS, 2013[14]). A review of the SSCOs of other SACs where the habitat is a qualifying feature identified the following target; percentage of negative indicator species below 5%. The percentage of negative indicators is indicative of a change in the nutrient condition of the habitat.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Tramore Dunes and Backstrand SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies hydrologically connected to the site include: Ballygunnermore_010 (IE_SE_17B290990), Monloum_010 (IE_SE_17M060970) and Leperstown Stream_010 (IE_SE_17L010300);
- The coastal water bodies connected to the site include: Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000); and
- The groundwater body hydrogeologically connected to the site is: Dunmore East (IE_SE_G_057).

The habitat Annual vegetation of drift lines is limited to the outer boundary of the SAC between the coastal water bodies of Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000). The river water body Ballygunnermore_010 (IE_SE_17B290990) discharges close to the habitat. Given its location, the habitat is likely to be susceptible to inputs from all three water bodies.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flow data. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5.** In the case of Tramore Back Strand (IE_SE_120_0000) tidal flows have been evaluated, to allow for dilution contributions greater than the contributing fluvial flow of less than $1m^3/s$.

The river water body, Leperstown Stream_010 (IE_SE_17L010300) (0.0002 mg/l) has a modelled increase in orthophosphate concentration less than 5% of the Good / High boundary (0.00125 mg/l) following dosing and is not significantly impacted.

The river water bodies Ballygunnermore_010 (IE_SE_17B290990) (0.0013 mg/l) and Monloum_010 (IE_SE_17M060970) (0.0023 mg/l) however, have predicted increase in concentrations which are above 5% of the Good / High boundary. The Monloum_010 river water body contains a high density of watermain in Tramore and much of the load has been reapportioned to Tramore Bay which is located outside the SAC. For both rivers the modelled baseline following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for these river water bodies.

For the coastal water bodies Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000) the modelled additional concentration is insignificant (0.0002 mg/l and 0.0004 mg/l respectively) i.e. within 5% of the Good / High boundary and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for the coastal water bodies assessed.

The groundwater body Dunmore East (IE_SE_G_057) has a modelled post-dosing concentration of 0.0016 mg/l which does not exceed 75% of the Good / Fail boundary, therefore there is no risk in deterioration of the Good (surrogate) indicative quality of the water body.

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

6.2.1.3 (1310) *Salicornia* and other annuals colonising mud and sand

There are no nutrient specific targets in the SSCOs for this habitat; there is a target to maintain the natural tidal regime. The conservation objectives supporting document on coastal habitats for Tramore Dunes and Backstrand SAC (NPWS, 2013[16]) was reviewed, and discusses the flooding regime attribute and associated target in further detail. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Tramore Dunes and Backstrand SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies hydrologically connected to the site include: Ballygunnermore_010 (IE_SE_17B290990), Monloum_010 (IE_SE_17M060970) and Leperstown Stream_010 (IE_SE_17L010300);

[16] NPWS 2013 Tramore Dunes and Backstrand SAC (site code 0671) Conservation Objectives Supporting Document - Coastal Habitats

- The coastal water bodies connected to the site include: Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000); and
- The groundwater body hydrogeologically connected to the site is: Dunmore East (IE_SE_G_057).

The habitat *Salicornia and other annuals colonising mud and sand* is found at two locations within the SAC, on mudflats partially enclosed by the Malcolmson embankment in the south-west section of the site and along the edge of the saltmarsh at Lisselan in the north-east section of the site. The habitat is located in the water body Tramore Back Strand (IE_SE_120_0000). The river water bodies affected by the proposed orthophosphate dosing, Ballygunnermore_010 (IE_SE_17B290990), Monloum_010 (IE_SE_17M060970) and Leperstown Stream_010 (IE_SE_17L010300), do not discharge directly to the habitat however, the habitat is located downstream of these water bodies.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flow data. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5.** In the case of Tramore Back Strand (IE_SE_120_0000) tidal flows have been evaluated, to allow for dilution contributions greater than the contributing fluvial flow of less than $1m^3/s$.

The river water body, Leperstown Stream_010 (IE_SE_17L010300) (0.0002 mg/l) has a modelled increase in orthophosphate concentration less than 5% of the Good / High boundary (0.00125 mg/l) following dosing and is not significantly impacted.

The river water bodies Ballygunnermore_010 (IE_SE_17B290990) (0.0013 mg/l) and Monloum_010 (IE_SE_17M060970) (0.0023 mg/l) however, have predicted increase in concentrations which are above 5% of the Good / High boundary. The Monloum_010 river water body contains a high density of watermain in Tramore and much of the load has been reapportioned to Tramore Bay which is located outside the SAC. For both rivers the modelled baseline following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for these river water bodies.

For the coastal water bodies Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000) the modelled additional concentration is insignificant (0.0002 mg/l and 0.0004 mg/l respectively) i.e. within 5% of the Good / High boundary and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for the coastal water bodies assessed.

The groundwater body Dunmore East (IE_SE_G_057) has a modelled post-dosing concentration of 0.0016 mg/l which does not exceed 75% of the Good / Fail boundary, therefore there is no risk in deterioration of the Good (surrogate) indicative quality of the water body.

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

6.2.1.4 (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

There are no nutrient specific targets in the SSCOs for this habitat; however, there is a target to maintain the natural tidal regime. The conservation objectives supporting document on coastal habitats for Tramore Dunes and Backstrand SAC (NPWS, 2013[16]) was reviewed, and discusses the flooding regime attribute and associated target in further detail. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Tramore Dunes and Backstrand SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies hydrologically connected to the site include: Ballygunnermore_010 (IE_SE_17B290990), Monloum_010 (IE_SE_17M060970) and Leperstown Stream_010 (IE_SE_17L010300);
- The coastal water bodies connected to the site include: Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000); and
- The groundwater body hydrogeologically connected to the site is: Dunmore East (IE_SE_G_057).

The habitat *Atlantic salt meadows (Glauco-Puccinellietalia maritimae)* is found at various locations throughout the SAC. The largest area of Atlantic salt meadows is found at The Cush, where it has developed along the back of the shingle/sand spit that forms Tramore Burrow. The habitat can also be found at Lisselan; at the eastern end of Tramore Burrow; at the north side of the Malcolmson embankment; and, at various locations around the edge of the Backstrand. The habitats are located in the coastal water body Tramore Back Strand (IE_SE_120_0000) and are located downstream of all river water bodies affected by the proposed orthophosphate dosing i.e. Ballygunnermore_010 (IE_SE_17B290990), Monloum_010 (IE_SE_17M060970) and Leperstown Stream_010 (IE_SE_17L010300).

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flow data. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5.** In the case of Tramore Back Strand (IE_SE_120_0000) tidal flows have been evaluated, to allow for dilution contributions greater than the contributing fluvial flow of less than $1m^3/s$.

The river water body, Leperstown Stream_010 (IE_SE_17L010300) (0.0002 mg/l) has a modelled increase in orthophosphate concentration less than 5% of the Good / High boundary (0.00125 mg/l) following dosing and is not significantly impacted.

The river water bodies Ballygunnermore_010 (IE_SE_17B290990) (0.0013 mg/l) and Monloum_010 (IE_SE_17M060970) (0.0023 mg/l) however, have predicted increase in concentrations which are above 5% of the Good / High boundary. The Monloum_010 river water body contains a high density of watermain in Tramore and much of the load has been reapportioned to Tramore Bay which is located outside the SAC. For both rivers the modelled baseline following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for these river water bodies.

For the coastal water bodies Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000) the modelled additional concentration is insignificant (0.0002 mg/l and 0.0004 mg/l respectively) i.e. within 5% of the Good / High boundary and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for the coastal water bodies assessed.

The groundwater body Dunmore East (IE_SE_G_057) has a modelled post-dosing concentration of 0.0016 mg/l which does not exceed 75% of the Good / Fail boundary, therefore there is no risk in deterioration of the Good (surrogate) indicative quality of the water body.

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

6.2.1.5 (1410) Mediterranean salt meadows (*Juncetalia maritimi*)

There are no nutrient specific targets in the SSCOs for this habitat; however, there is a target to maintain the natural tidal regime. The conservation objectives supporting document on coastal habitats for Tramore Dunes and Backstrand SAC (NPWS, 2013[16]) was reviewed, and discusses the flooding regime attribute and associated target in further detail. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Tramore Dunes and Backstrand SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies hydrologically connected to the site include: Ballygunnermore_010 (IE_SE_17B290990), Monloum_010 (IE_SE_17M060970) and Leperstown Stream_010 (IE_SE_17L010300);
- The coastal water bodies connected to the site include: Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000); and
- The groundwater body hydrogeologically connected to the site is: Dunmore East (IE_SE_G_057).

The habitat Mediterranean salt meadow (*Juncetalia maritimi*) is found on the main saltmarsh areas along the northern side of the Backstrand at Tramore Intake and Lisselan. There are a few small clumps of Sea Rush on the main saltmarsh along the back of the shingle/sand spit. The habitat is located in the coastal water body Tramore Back Strand (IE_SE_120_0000) and is located downstream of all river water bodies affected by the proposed orthophosphate dosing i.e. Ballygunnermore_010 (IE_SE_17B290990), Monloum_010 (IE_SE_17M060970) and Leperstown Stream_010 (IE_SE_17L010300).

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flow data. Full details of the assessment

results are provided in **Appendix C** and discussed above in **Section 5.** In the case of Tramore Back Strand (IE_SE_120_0000) tidal flows have been evaluated, to allow for dilution contributions greater than the contributing fluvial flow of less than $1m^3/s$.

The river water body, Leperstown Stream_010 (IE_SE_17L010300) (0.0002 mg/l) has a modelled increase in orthophosphate concentration less than 5% of the Good / High boundary (0.00125 mg/l) following dosing and is not significantly impacted.

The river water bodies Ballygunnermore_010 (IE_SE_17B290990) (0.0013 mg/l) and Monloum_010 (IE_SE_17M060970) (0.0023 mg/l) however, have predicted increase in concentrations which are above 5% of the Good / High boundary. The Monloum_010 river water body contains a high density of watermain in Tramore and much of the load has been reapportioned to Tramore Bay which is located outside the SAC. For both rivers the modelled baseline following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for these river water bodies.

For the coastal water bodies Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000) the modelled additional concentration is insignificant (0.0002 mg/l and 0.0004 mg/l respectively) i.e. within 5% of the Good / High boundary and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for the coastal water bodies assessed.

The groundwater body Dunmore East (IE_SE_G_057) has a modelled post-dosing concentration of 0.0016 mg/l which does not exceed 75% of the Good / Fail boundary, therefore there is no risk in deterioration of the Good (surrogate) indicative quality of the water body.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Adamstown 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 Lower River Suir SAC 002137

6.2.2.1 (1029) Freshwater pearl mussel (*Margaritifera margaritifera*)

Specific targets / environmental quality objectives for the habitat of the species in the Lower River Suir SAC have been set (NPWS, 2017[17]), however an orthophosphate specific level is not defined. Nevertheless, the Freshwater pearl mussel requires High Status conditions. The Surface Water Regulations (2009) set a limit of ≤0.025 (mean) or ≤0.045 (95%ile) for Molybdate Reactive Phosphorus (MRP) (mg P/l) for High Status waters.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Carrick-on-Suir (IE_SE_G_030), Industrial Facility (P0385-01) (IE_SE_G_179), Mullinavat (IE_SE_G_155) and Waterford (IE_SE_G_149).

The freshwater pearl mussel population designated in the Lower River Suir SAC are located in Clodiagh Catchment upstream of the water bodies (located in the Clodiagh (Portlaw) river, a tributary of the River Suir) identified in **Table 5-2**. Therefore, the Freshwater pearl mussel QI of the SAC will not be affected by dosing at Adamstown WTP.

In terms of the potential for impact to Atlantic salmon, which are host to the larval stage of the Freshwater pearl mussel called glochidia, please see **Section 6.2.2.3** below.

6.2.2.2 (1092) White-clawed Crayfish (*Austropotamobius pallipes*)

A review of the targets and measures for the white-clawed crayfish found no nutrient specific targets for the species (NPWS, 2017[17]). However, white-clawed crayfish have a general water quality requirement for moderate to good water quality (i.e. Q3-4 or higher; NPWS, 2013[18]), therefore any reduction in water quality as a result of orthophosphate loading would be contrary to the conservation objectives for this species.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Carrick-on-Suir (IE_SE_G_030), Industrial Facility (P0385-01) (IE_SE_G_179), Mullinavat (IE_SE_G_155) and Waterford (IE_SE_G_149).

[17] NPWS 2017 Lower River Suir SAC 002137 Conservation Objectives

[18] NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. Species Assessments Volume 3. Version 1.0. Unpublished Report, National Parks & Wildlife

White-clawed crayfish occurs extensively on the River Suir and on many of its tributaries. On the River Suir main channel, the species has been recorded on almost the entire length of non-tidal river from the most upstream point at Cabragh, near Thurles, to downstream of Kilsheelan. It is also present on the following tributaries: Anner and Clashawley, Clodiagh and Owenbeg, Multeen, Tar, Nier, and Clodiagh Lower. All locations designated for white-clawed crayfish along the Lower River Suir SAC are located upstream of the water bodies identified in **Table 5-2**.

There is therefore, no potential to the proposed works to affect White-clawed crayfish QI of Lower River Suir SAC.

6.2.2.3 (1095) Sea lamprey (*Petromyzon marinus*), (1096) Brook lamprey (*Lampetra planeri*), (1099) River lamprey (*Lampetra fluviatilis*), (1103) Twaite shad (*Alosa fallax*) and (1106) Atlantic salmon (*Salmo salar*) (only in fresh water)

Water quality is a particular threat to all fish fauna listed as qualifying interests. The latest Red List of Irish amphibians, reptiles and freshwater fish (King *et al*., 2011[19]) highlights the deterioration in water quality and ongoing point and diffuse sources of pollution as a key threat to these species and includes the potential effects from municipal discharges. The SSCO (NPWS, 2017[17]) for these fish species requires that the spawning habitat should not be reduced. Deterioration in water quality has the potential for a detrimental effect on spawning habitats, particularly where nutrient conditions result in excessive algal growth and macrophyte abundance, leading to smothering, shading effects, alteration of macroinvertebrate communities and silt deposition. The SSCO for salmon also requires a Q-value of at least 4, which equates to good ecological status.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Carrick-on-Suir (IE_SE_G_030), Industrial Facility (P0385-01) (IE_SE_G_179), Mullinavat (IE_SE_G_155) and Waterford (IE_SE_G_149).

With the exception of the salmonid Aherlow River (upstream of the East Waterford Regional WSZ), a designated Salmonid Water under the E.U. Freshwater Fish Directive, details on the distribution of Sea lamprey; Brook lamprey; River lamprey; Twaite shad; and Atlantic salmon (only in fresh water) are not provided for the site. It is therefore considered that there is potential for of brook lamprey occurring in all river waterbodies; river lamprey occurring in all transitional and river waterbodies; sea lamprey,

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

twaite shad and Atlantic salmon (designated in freshwater only) occurring in all river, transitional and coastal water bodies identified in **Table 5-2.**

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

The modelled increase in orthophosphate concentration in the river water bodies Faithlegg_010 (IE_SE_16F150440), Halfway House Stream (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400) following dosing at Adamstown WTP are all <5% of the Good / High boundary (<0.00125 mg/l) threshold and considered insignificant.

Similarly, the increases in concentration in the transitional water bodies Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) are less than 5% of the Good / High boundary threshold with post-dosing concentrations modelled to increase by 0.0005 mg/l.

The rivers Glengrant_010 (IE_SE_16G770380, St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) have a modelled additional increase above 5% of the Good / High boundary.

In the case of Glengrant_010 (IE_SE_16G770380) this water body has been determined to be at moderate surrogate indicative quality. The modelled baseline following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for this river water body.

St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) are located in the Waterford City Centre, with high density of watermains. St John's_010 (IE_SE_16S030400) is a particularly small water body (4.95km in length). Both water bodies have been assigned a Poor orthophosphate indicative quality and the increase in modelled concentration does not cause the predicted concentrations to exceed 75% of the upper indicative quality threshold. Therefore these water bodies are not at risk of further deterioration or the achievement of the WFD objectives.

St John's river does not form part of the Lower River Suir SAC but discharges to the Middle Suir estuary which is located within the SAC. The modelled additional concentration within this estuary is insignificant as discussed below. St John's river is considered as a supporting habitat for lamprey and salmon however it not of sufficient importance to be designated within the SAC. The current WFD invertebrate status (2016-2021) for St John's_020 of Poor indicates this rivers potential in supporting salmon is limited due to background issues.

The SAC boundary encompasses the Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) transitional water bodies. The river water bodies Faithlegg_010 (IE_SE_16F150440), Halfway House Stream_010 (IE_SE_16H020300) and Luffany_010 (IE_SE_16L680750) all discharge into the Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500). The river water bodies Glengrant_010 (IE_SE_16G770380), St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), (Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400) discharge into the Middle Suir Estuary (IE_SE_100_0550). The orthophosphate load at this point is further diluted by the estuarine system. The modelled additional increase in orthoP in these transitional water bodies is insignificant (0.0005 mg/l), which does not exceed 5% of the Good

/ High boundary (i.e.<0.00125 mg/l). Therefore, there is no risk of deterioration in the indicative quality of these transitional water bodies (High and Good indicative quality) as a result of dosing at Adamstown WTP.

Waterford (IE_SE_G_149) groundwater body underlies a large portion of the WSZ in addition to bordering the Lower River Suir SAC along both sides of the estuary. The modelled increase in concentration post-dosing is 0.0026 mg/l which does exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) however the resultant concentration post dosing will be well within the 75% of the upper indicative quality threshold and therefore does not pose a risk to deterioration in indicative quality for this groundwater body. Mullinavat (IE_SE_G_155) and Carrick-on-Suir (IE_SE_G_030) groundwater bodies intersect a small portion of the WSZ, and border a very small portion of the SAC. The post-dosing concentration is not detectable (0.0000mg/l) in both cases. Therefore, there is no risk of deterioration in the Good orthoP indicative quality of these groundwater bodies as a result of dosing.

For Industrial Facility (P0385-01) (IE_SE_G_179), a surrogate baseline of 0.018 mg/l has been assigned to the groundwater body on the basis of the characterisation process in the WFD App for the groundwater group. The groundwater body from which this corresponding industrial facility was delineated, Waterford (IE_SE_G_149), is at Good groundwater quantitative and chemical status. This smaller groundwater body was most likely delineated to focus on this industrial pressure and to ensure that the entire groundwater body beyond the contaminant plume was not classified as poor. Due to the small delineated area for this GWB, the modelled flow is low and concentration correspondingly high, however the actual loading to this groundwater body is low, 6.3 kg/yr. The test undertaken to assess impact of groundwater on surface water ecological status, where the associated surface water status is less than good, requires that 50% of the load to the surface water comes from groundwater. Based on the current groundwater orthophosphate indicative quality of good and an estimation of the existing loading, using the assumed groundwater flows and a groundwater orthophosphate concentration of 0.018 mg/l, the small additional loads from the dosing to these groundwater bodies will not result in the overall contributing load from groundwater to connected surface waters to exceed 50% (the contribution is already relatively low) and therefore the impact on the associated surface water bodies will be negligible. Therefore, the surface water bodies with which this ground waterbody interacts (Glengrant_010 and Middle Suir Estuary) will not deteriorate in indicative quality as a result of the groundwater pathways from orthophosphate dosing. Whilst the entire groundwater body is located within the WSZ, it borders the SAC along approximately 150 m of the Middle Suir estuary.

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

6.2.2.4 (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), (1410) Mediterranean salt meadows (*Juncetalia maritimi*)

A review of the SSCOs (NPWS, 2017[20]) for the site found no nutrient specific targets for these habitats; however, one attribute common to both habitats under physical structure is flooding regime. The target is to maintain the natural tidal regime. The CO supporting document on coastal habitats (NPWS, 2017)[20] for the Lower River Suir SAC was reviewed, and discusses the flooding regime attribute and

[20] NPWS 2017 Lower River Suir SAC (site code: 002137) Conservation Objectives Supporting Document - Coastal Habitats.

associated target in further detail. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Carrick-on-Suir (IE_SE_G_030), Industrial Facility (P0385-01) (IE_SE_G_179), Mullinavat (IE_SE_G_155) and Waterford (IE_SE_G_149).

The habitat Atlantic salt meadows is located at Belmont House at the north-west end of the Kings Channel in low-lying land to the north of the Little Island slipway (Ballynakill House) and distributed along the southern side of the Kings Channel. The habitat is located within the transitional water body Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) and downstream of the Middle Suir Estuary (IE_SE_100_0550), Glengrant_010 (IE_SE_16G770380), Faithlegg_010 (IE_SE_16F150440), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400) river water bodies.

Mediterranean salt meadows habitat was not recorded in Lower River Suir SAC during the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009[21]). Thus, the total area of the qualifying habitat in the SAC is unknown. An NPWS survey in the 1990s noted stands of sea rush (*Juncus maritimus*), indicative of Mediterranean salt meadows, on the saltmarsh at Grantstown but the habitat was not recorded in the Little Island sub-site during the SMP in 2007 (McCorry and Ryle, 2009). Unsurveyed areas may be present within 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 flow data. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5.**

The modelled increase in orthophosphate concentration in the river water bodies Faithlegg_010 (IE_SE_16F150440), Halfway House Stream (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400) following dosing at Adamstown WTP are all <5% of the Good / High boundary (<0.00125 mg/l) threshold and considered insignificant.

[21] McCorry, M. and Ryle, T. (2009) Saltmarsh monitoring project 2007-2008. Unpublished report to NPWS.

Similarly, the increases in concentration in the transitional water bodies Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) are less than 5% of the Good / High boundary threshold with post-dosing concentrations modelled to increase by 0.0005 mg/l.

The rivers Glengrant_010 (IE_SE_16G770380, St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) have a modelled additional increase above 5% of the Good / High boundary.

In the case of Glengrant_010 (IE_SE_16G770380) this water body has been determined to be at moderate surrogate indicative quality. The modelled baseline following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for this river water body.

St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) are located in the Waterford City Centre, with high density of watermains. St John's_010 (IE_SE_16S030400) is a particularly small water body (4.95km in length). Both water bodies have been assigned a Poor orthophosphate indicative quality and the increase in modelled concentration does not cause the predicted concentrations to exceed 75% of the upper indicative quality threshold. Therefore these water bodies are not at risk of further deterioration or the achievement of the WFD objectives.

St John's river does not form part of the Lower River Suir SAC but discharges to the Middle Suir estuary which is located within the SAC. The modelled additional concentration within this estuary is insignificant as discussed below. St John's river is considered as a supporting habitat for lamprey and salmon however it not of sufficient importance to be designated within the SAC. The current WFD invertebrate status (2016-2021) for St John's_020 of Poor indicates this rivers potential in supporting salmon is limited due to background issues.

The SAC boundary encompasses the Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) transitional water bodies. The river water bodies Faithlegg_010 (IE_SE_16F150440), Halfway House Stream_010 (IE_SE_16H020300) and Luffany_010 (IE_SE_16L680750) all discharge into the Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500). The river water bodies Glengrant_010 (IE_SE_16G770380), St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), (Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400) discharge into the Middle Suir Estuary (IE_SE_100_0550). The orthophosphate load at this point is further diluted by the estuarine system. The modelled additional increase in orthoP in these transitional water bodies is insignificant (0.0005 mg/l), which does not exceed 5% of the Good / High boundary (i.e.<0.00125 mg/l). Therefore, there is no risk of deterioration in the indicative quality of these transitional water bodies (High and Good indicative quality) as a result of dosing at Adamstown WTP.

Waterford (IE_SE_G_149) groundwater body underlies a large portion of the WSZ in addition to bordering the Lower River Suir SAC along both sides of the estuary. The modelled increase in concentration post-dosing is 0.0026 mg/l which does exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) however the resultant concentration post dosing will be well within the 75% of the upper indicative quality threshold and therefore does not pose a risk to deterioration in indicative quality for this groundwater body. Mullinavat (IE_SE_G_155) and Carrick-on-Suir (IE_SE_G_030) groundwater bodies intersect a small portion of the WSZ, and border a very small portion of the SAC. The post-dosing concentration is not detectable (0.0000mg/l) in both cases.

Therefore, there is no risk of deterioration in the Good orthoP indicative quality of these groundwater bodies as a result of dosing.

For Industrial Facility (P0385-01) (IE_SE_G_179), a surrogate baseline of 0.018 mg/l has been assigned to the groundwater body on the basis of the characterisation process in the WFD App for the groundwater group. The groundwater body from which this corresponding industrial facility was delineated, Waterford (IE_SE_G_149), is at Good groundwater quantitative and chemical status. This smaller groundwater body was most likely delineated to focus on this industrial pressure and to ensure that the entire groundwater body beyond the contaminant plume was not classified as poor. Due to the small delineated area for this GWB, the modelled flow is low and concentration correspondingly high, however the actual loading to this groundwater body is low, 6.3 kg/yr. The test undertaken to assess impact of groundwater on surface water ecological status, where the associated surface water status is less than good, requires that 50% of the load to the surface water comes from groundwater. Based on the current groundwater orthophosphate indicative quality of good and an estimation of the existing loading, using the assumed groundwater flows and a groundwater orthophosphate concentration of 0.018 mg/l, the small additional loads from the dosing to these groundwater bodies will not result in the overall contributing load from groundwater to connected surface waters to exceed 50% (the contribution is already relatively low) and therefore the impact on the associated surface water bodies will be negligible. Therefore, the surface water bodies with which this ground waterbody interacts (Glengrant_010 and Middle Suir Estuary) will not deteriorate in indicative quality as a result of the groundwater pathways from orthophosphate dosing. Whilst the entire groundwater body is located within the WSZ, it borders the SAC along approximately 150 m of the Middle Suir estuary.

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

6.2.2.5 (1355) Otter (*Lutra lutra*)

A review of the SSCOs (NPWS, 2017[17]) found no specific attributes or targets relating to water quality. The National Parks and Wildlife Service's 'Threat Response Plan for the Otter' (NPWS, 2009)[22], which comprised a review of and response to the pressures and threats to otters in Ireland, categorized three principal risks to otters: i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution.

There will be no interference with the terrestrial, marine or freshwater habitat of the species as a result of this project. The diet of the species varies locally and seasonally; however, it is dominated by fish, in particular salmonids, eels and sticklebacks in freshwater.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

[22] NPWS (2009) Threat Response Plan: Otter (2009-2011). National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin.

- The river water bodies that are hydrologically connected include: Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Carrick-on-Suir (IE_SE_G_030), Industrial Facility (P0385-01) (IE_SE_G_179), Mullinavat (IE_SE_G_155) and Waterford (IE_SE_G_149).

The distribution of otter throughout the SAC is not identified in SSCOs for the site. It is assumed that otter have the potential to interact with all surface water bodies identified **Table 5-2**.

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

The modelled increase in orthophosphate concentration in the river water bodies Faithlegg_010 (IE_SE_16F150440), Halfway House Stream (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400) following dosing at Adamstown WTP are all <5% of the Good / High boundary (<0.00125 mg/l) threshold and considered insignificant.

Similarly, the increases in concentration in the transitional water bodies Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) are less than 5% of the Good / High boundary threshold with post-dosing concentrations modelled to increase by 0.0005 mg/l.

The rivers Glengrant_010 (IE_SE_16G770380, St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) have a modelled additional increase above 5% of the Good / High boundary.

In the case of Glengrant_010 (IE_SE_16G770380) this water body has been determined to be at moderate surrogate indicative quality. The modelled baseline following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for this river water body.

St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) are located in the Waterford City Centre, with high density of watermains. St John's_010 (IE_SE_16S030400) is a particularly small water body (4.95km in length). Both water bodies have been assigned a Poor orthophosphate indicative quality and the increase in modelled concentration does not cause the predicted concentrations to exceed 75% of the upper indicative quality threshold. Therefore these water bodies are not at risk of further deterioration or the achievement of the WFD objectives.

St John's river does not form part of the Lower River Suir SAC but discharges to the Middle Suir estuary which is located within the SAC. The modelled additional concentration within this estuary is insignificant as discussed below. St John's river is considered as a supporting habitat for lamprey and

salmon however it not of sufficient importance to be designated within the SAC. The current WFD invertebrate status (2016-2021) for St John's_020 of Poor indicates this rivers potential in supporting salmon is limited due to background issues.

The SAC boundary encompasses the Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) transitional water bodies. The river water bodies Faithlegg_010 (IE_SE_16F150440), Halfway House Stream_010 (IE_SE_16H020300) and Luffany_010 (IE_SE_16L680750) all discharge into the Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500). The river water bodies Glengrant_010 (IE_SE_16G770380), St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), (Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400) discharge into the Middle Suir Estuary (IE_SE_100_0550). The orthophosphate load at this point is further diluted by the estuarine system. The modelled additional increase in orthoP in these transitional water bodies is insignificant (0.0005 mg/l), which does not exceed 5% of the Good / High boundary (i.e.<0.00125 mg/l). Therefore, there is no risk of deterioration in the indicative quality of these transitional water bodies (High and Good indicative quality) as a result of dosing at Adamstown WTP.

Waterford (IE_SE_G_149) groundwater body underlies a large portion of the WSZ in addition to bordering the Lower River Suir SAC along both sides of the estuary. The modelled increase in concentration post-dosing is 0.0026 mg/l which does exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) however the resultant concentration post dosing will be well within the 75% of the upper indicative quality threshold and therefore does not pose a risk to deterioration in indicative quality for this groundwater body. Mullinavat (IE_SE_G_155) and Carrick-on-Suir (IE_SE_G_030) groundwater bodies intersect a small portion of the WSZ, and border a very small portion of the SAC. The post-dosing concentration is not detectable (0.0000mg/l) in both cases. Therefore, there is no risk of deterioration in the Good orthoP indicative quality of these groundwater bodies as a result of dosing.

For Industrial Facility (P0385-01) (IE_SE_G_179), a surrogate baseline of 0.018 mg/l has been assigned to the groundwater body on the basis of the characterisation process in the WFD App for the groundwater group. The groundwater body from which this corresponding industrial facility was delineated, Waterford (IE_SE_G_149), is at Good groundwater quantitative and chemical status. This smaller groundwater body was most likely delineated to focus on this industrial pressure and to ensure that the entire groundwater body beyond the contaminant plume was not classified as poor. Due to the small delineated area for this GWB, the modelled flow is low and concentration correspondingly high, however the actual loading to this groundwater body is low, 6.3 kg/yr. The test undertaken to assess impact of groundwater on surface water ecological status, where the associated surface water status is less than good, requires that 50% of the load to the surface water comes from groundwater. Based on the current groundwater orthophosphate indicative quality of good and an estimation of the existing loading, using the assumed groundwater flows and a groundwater orthophosphate concentration of 0.018 mg/l, the small additional loads from the dosing to these groundwater bodies will not result in the overall contributing load from groundwater to connected surface waters to exceed 50% (the contribution is already relatively low) and therefore the impact on the associated surface water bodies will be negligible. Therefore, the surface water bodies with which this ground waterbody interacts (Glengrant_010 and Middle Suir Estuary) will not deteriorate in indicative quality as a result of the groundwater pathways from orthophosphate dosing. Whilst the entire groundwater body is located within the WSZ, it borders the SAC along approximately 150 m of the Middle Suir estuary.

The modelled concentrations for surface water bodies show that increases in orthophosphate levels will be within acceptable limits and that the overall impact is low. In the absence of any significant effect on water quality or fish species, the main food source for the otter in this SAC, there will be no likely significant effect on the conservation status of otter as a result of this project.

6.2.2.6 (6430) Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

A review of the SSCOs (NPWS, 2017[17]) for this site do not contain nutrient specific water quality targets for this habitat, however an important attribute for the habitat is hydrological regime, namely flooding depth/height of the water table. The habitat relies on winter inundation, which results in deposition of naturally nutrient-rich sediment.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Carrick-on-Suir (IE_SE_G_030), Industrial Facility (P0385-01) (IE_SE_G_179), Mullinavat (IE_SE_G_155) and Waterford (IE_SE_G_149).

The location of this habitat has not been mapped in detail for the Lower River Suir SAC and therefore the total area of the qualifying habitat in the SAC is unknown. It is assumed that the habitat has the potential to be hydrologically connected to all surface water bodies identified **Table 5-2**.

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

The modelled increase in orthophosphate concentration in the river water bodies Faithlegg_010 (IE_SE_16F150440), Halfway House Stream (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400) following dosing at Adamstown WTP are all <5% of the Good / High boundary (<0.00125 mg/l) threshold and considered insignificant.

Similarly, the increases in concentration in the transitional water bodies Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) are less than 5% of the Good / High boundary threshold with post-dosing concentrations modelled to increase by 0.0005 mg/l.

The rivers Glengrant_010 (IE_SE_16G770380, St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) have a modelled additional increase above 5% of the Good / High boundary.

In the case of Glengrant_010 (IE_SE_16G770380) this water body has been determined to be at moderate surrogate indicative quality. The modelled baseline following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for this river water body.

St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) are located in the Waterford City Centre, with high density of watermains. St John's_010 (IE_SE_16S030400) is a particularly small water body (4.95km in length). Both water bodies have been assigned a Poor orthophosphate indicative quality and the increase in modelled concentration does not cause the predicted concentrations to exceed 75% of the upper indicative quality threshold. Therefore these water bodies are not at risk of further deterioration or the achievement of the WFD objectives.

St John's river does not form part of the Lower River Suir SAC but discharges to the Middle Suir estuary which is located within the SAC. The modelled additional concentration within this estuary is insignificant as discussed below. St John's river is considered as a supporting habitat for lamprey and salmon however it not of sufficient importance to be designated within the SAC. The current WFD invertebrate status (2016-2021) for St John's_020 of Poor indicates this rivers potential in supporting salmon is limited due to background issues.

The SAC boundary encompasses the Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) transitional water bodies. The river water bodies Faithlegg_010 (IE_SE_16F150440), Halfway House Stream_010 (IE_SE_16H020300) and Luffany_010 (IE_SE_16L680750) all discharge into the Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500). The river water bodies Glengrant_010 (IE_SE_16G770380), St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), (Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400) discharge into the Middle Suir Estuary (IE_SE_100_0550). The orthophosphate load at this point is further diluted by the estuarine system. The modelled additional increase in orthoP in these transitional water bodies is insignificant (0.0005 mg/l), which does not exceed 5% of the Good / High boundary (i.e.<0.00125 mg/l). Therefore, there is no risk of deterioration in the indicative quality of these transitional water bodies (High and Good indicative quality) as a result of dosing at Adamstown WTP.

Waterford (IE_SE_G_149) groundwater body underlies a large portion of the WSZ in addition to bordering the Lower River Suir SAC along both sides of the estuary. The modelled increase in concentration post-dosing is 0.0026 mg/l which does exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) however the resultant concentration post dosing will be well within the 75% of the upper indicative quality threshold and therefore does not pose a risk to deterioration in indicative quality for this groundwater body. Mullinavat (IE_SE_G_155) and Carrick-on-Suir (IE_SE_G_030) groundwater bodies intersect a small portion of the WSZ, and border a very small portion of the SAC. The post-dosing concentration is not detectable (0.0000mg/l) in both cases. Therefore, there is no risk of deterioration in the Good orthoP indicative quality of these groundwater bodies as a result of dosing.

For Industrial Facility (P0385-01) (IE_SE_G_179), a surrogate baseline of 0.018 mg/l has been assigned to the groundwater body on the basis of the characterisation process in the WFD App for the groundwater group. The groundwater body from which this corresponding industrial facility was delineated, Waterford (IE_SE_G_149), is at Good groundwater quantitative and chemical status. This

smaller groundwater body was most likely delineated to focus on this industrial pressure and to ensure that the entire groundwater body beyond the contaminant plume was not classified as poor. Due to the small delineated area for this GWB, the modelled flow is low and concentration correspondingly high, however the actual loading to this groundwater body is low, 6.3 kg/yr. The test undertaken to assess impact of groundwater on surface water ecological status, where the associated surface water status is less than good, requires that 50% of the load to the surface water comes from groundwater. Based on the current groundwater orthophosphate indicative quality of good and an estimation of the existing loading, using the assumed groundwater flows and a groundwater orthophosphate concentration of 0.018 mg/l, the small additional loads from the dosing to these groundwater bodies will not result in the overall contributing load from groundwater to connected surface waters to exceed 50% (the contribution is already relatively low) and therefore the impact on the associated surface water bodies will be negligible. Therefore, the surface water bodies with which this ground waterbody interacts (Glengrant_010 and Middle Suir Estuary) will not deteriorate in indicative quality as a result of the groundwater pathways from orthophosphate dosing. Whilst the entire groundwater body is located within the WSZ, it borders the SAC along approximately 150 m of the Middle Suir estuary.

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

6.2.2.7 (91E0)* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)

A review of the SSCOs for this habitat found no nutrient specific targets (NPWS, 2017[17]). The habitat is assessed based on woodland structure, and requires periodic flooding to maintain alluvial woodlands along river floodplains. The main threats to this habitat are drainage and reclamation, together with non-native and invasive species encroachment.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Carrick-on-Suir (IE_SE_G_030), Industrial Facility (P0385-01) (IE_SE_G_179), Mullinavat (IE_SE_G_155) and Waterford (IE_SE_G_149).

Alluvial forest was surveyed in Lower River Suir SAC by Perrin *et al*. (2008[23]) as part of the National Survey of Native Woodlands (NSNW) at Fiddown (NSNW site code: 0022), Mountbolton (NSNW site code: 1823) and Ballycanvan Big (NSNW site code: 1839). The area of alluvial woodlands in the surveyed sites within the SAC is estimated to be 32.9ha. It is important to note that further unsurveyed areas of alluvial forest are present within the SAC, for example at islands below Carrick-on-Suir, at Shanbally (Coillte LIFE project site), Tibberaghny Marshes, along the lower stretches of the more westerly of the Suir tributaries and along both banks of the Suir as far east as the Dawn River. Alluvial woodlands as far east as the Dawn River occur in the Middle Suir Estuary (IE_SE_100_0550). However, the habitats are located upstream of the river water bodies Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S03060) and the transitional water body Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500), therefore are not discussed further.

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

The modelled increase in orthophosphate concentration in the river water bodies Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400) following dosing at Adamstown WTP are all <5% of the Good / High boundary (<0.00125 mg/l) threshold and considered insignificant.

The modelled orthophosphate concentrations in the transitional water body Middle Suir Estuary (IE_SE_100_0550) following dosing at Adamstown WTP is insignificant (0.0005 mg/l) which is within 5% of the Good / High boundary threshold (<0.00125mg/l).

Waterford (IE_SE_G_149) groundwater body underlies a large portion of the WSZ in addition to bordering the Lower River Suir SAC along both sides of the estuary. The modelled increase in concentration post-dosing is 0.0026 mg/l which does exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) however the resultant concentration post dosing will be well within the 75% of the upper indicative quality threshold and therefore does not pose a risk to deterioration in indicative quality for this groundwater body. Mullinavat (IE_SE_G_155) and Carrick-on-Suir (IE_SE_G_030) groundwater bodies intersect a small portion of the WSZ, and border a very small portion of the SAC. The post-dosing concentration is not detectable (0.0000mg/l) in both cases. Therefore, there is no risk of deterioration in the Good orthoP indicative quality of these groundwater bodies as a result of dosing.

For Industrial Facility (P0385-01) (IE_SE_G_179), a surrogate baseline of 0.026 mg/l has been assigned to the groundwater body on the basis of the characterisation process in the WFD App for the groundwater group. The groundwater body from which this corresponding industrial facility was delineated, Waterford (IE_SE_G_149), is at Good groundwater quantitative and chemical status. This smaller groundwater body was most likely delineated to focus on this industrial pressure and to ensure that the entire groundwater body beyond the contaminant plume was not classified as poor. Due to the small delineated area for this GWB, the modelled flow is low and concentration correspondingly high, however the actual loading to this groundwater body is low, 6.3 kg/yr. The test undertaken to assess impact of groundwater on surface water ecological status, where the associated surface water

[23] Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A. National survey of native woodlands 2003-2008. Unpublished report to NPWS

status is less than good, requires that 50% of the load to the surface water comes from groundwater. Based on the current groundwater orthophosphate indicative quality of good and an estimation of the existing loading, using the assumed groundwater flows and a groundwater orthophosphate concentration of 0.018 mg/l, the small additional loads from the dosing to these groundwater bodies will not result in the overall contributing load from groundwater to connected surface waters to exceed 50% (the contribution is already relatively low) and therefore the impact on the associated surface water bodies will be negligible. Therefore, the surface water bodies with which this ground waterbody interacts (Glengrant_010 and Middle Suir Estuary) will not deteriorate in indicative quality as a result of the groundwater pathways from orthophosphate dosing. Whilst the entire groundwater body is located within the WSZ, it borders the SAC along approximately 150 m of the Middle Suir estuary.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Adamstown 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 River Barrow and River Nore SAC 002162

6.2.3.1 (1016) Desmoulin's whorl snail (*Vertigo moulinsiana*)

There are no nutrient specific targets for Desmoulin's whorl snail in the SSCO (NPWS, 2011)[24] for the River Barrow and River Nore SAC. The snail is a wetland species, with preference for rich fen and flushes, swamps, marsh, river riparian zones, etc.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

Both known sites for Desmoulin's whorl snail in this SAC are upstream of the WSZ, and therefore, in the absence of pathways for impacts, the conservation status of this Annex II species will not be impacted by the project.

[24] NPWS 2011 River Barrow and River Nore SAC 002162 Conservation Objectives

6.2.3.2 (1029) Freshwater pearl mussel (*Margaritifera margaritifera*) and (1990), Nore freshwater pearl mussel (*Margaritifera durrovensis*)

Specific targets / environmental quality objectives for the habitat of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC have been set, however an orthophosphate specific standard is not defined for the species in the SSCOs (NPWS, 2011)[24]. Nevertheless, the freshwater pearl mussel requires High Status conditions with very low nutrient concentration. The Surface Water Regulations (2009) set a limit of ≤0.025 (mean) or ≤0.045 (95%ile) for Molybdate Reactive Phosphorus (MRP) (mg P/l) for High Status waters.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

The location of Freshwater pearl mussel populations in the Barrow and Nore catchments, including the Nore freshwater pearl mussel population, are upstream of the water bodies identified in **Table 5-2** and therefore in the absence of pathways for impacts, the conservation status of this Annex II species will not be impacted by the project.

In terms of the potential for impact to Atlantic salmon, which are host to the larval stage of the Freshwater pearl mussel called glochidia, please see **Section 6.2.3.4** below.

6.2.3.3 (1092) White-clawed Crayfish (*Austropotamobius pallipes*)

There is no nutrient specific target for white-clawed crayfish in the River Barrow and River Nore SAC SSCOs (NPWS, 2011)[24]. However, white-clawed crayfish have a general water quality requirement of Q3-4 or better, which equates to moderate ecological status (NPWS, 2013)[25]. Any reduction in water quality as a result of P loading would be contrary to the conservation objectives for this species.

[25] NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. Species Assessments Volume 3. Version 1.0. Unpublished Report, National Parks & Wildlife

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

The location of White-clawed crayfish populations in the River Barrow and River Nore SAC are upstream of the water bodies identified in **Table 5-2** and therefore in the absence of pathways for impacts, the conservation status of this Annex II species will not be impacted by the project.

6.2.3.4 (1095) Sea lamprey (*Petromyzon marinus*), (1096) Brook lamprey (*Lampetra planeri*), (1099) River lamprey (*Lampetra fluviatilis*), (1103) Twaite shad (*Alosa fallax*) and (1106) Atlantic salmon (*Salmo salar*) (only in fresh water)

Water quality is a particular threat to all fish fauna listed as qualifying interests. The latest Red List of Irish amphibians, reptiles and freshwater fish (King *et al*., 2011) highlights the deterioration in water quality and ongoing point and diffuse sources of pollution as a key threat to these species and includes the potential effects from municipal discharges. The SSCO (NPWS, 2011)[24] for all of these species requires that the spawning habitat should not be reduced. Deterioration in water quality has the potential for a detrimental effect on spawning habitats, particularly where nutrient conditions result in excessive algal growth and macrophyte abundance, leading to smothering, shading effects, alteration of macroinvertebrate communities and silt deposition. The SSCO for salmon also requires a Q-value of at least 4, which equates to good ecological status.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and

- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

The Barrow is a unique in having, at present, the only known sizeable spawning population of Twaite shad in Ireland. This fish, a member of the herring family, lives at sea or in the lower reaches of Waterford Harbour and ascends the Barrow to spawn in May each year downstream of the weir at St. Mullins. The distribution of sea lamprey; brook lamprey; river lamprey in the Barrow was assessed by King (2006[26]). Five sites in the freshwater tidal reaches of the Barrow downstream of St. Mullins were surveyed. Lamprey was recorded in four of the five sites. The sites surveyed were upstream of the water bodies identified in **Table 5-2** and outside the project ZoI. However**,** in order for Sea lamprey to return to spawn in rivers, they are required to traverse the freshwater tidal reaches of the Barrow that will receive orthophosphate input following dosing at Adamstown WTP.

The freshwater stretches of the River Nore main channel is a designated salmonid river and the COs for this QI applies to freshwater reaches only. The Barrow/Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning (NPWS, 2016[27]). Although all sites identified for salmon are upstream of the ZoI, there is potential for salmon to occur in the water bodies identified in **Table 5-2.** The potential impacts of orthophosphate dosing at Adamstown WTP are assessed in the context of Brook lamprey, River lamprey and Atlantic salmon occurring in all river water bodies, and for Sea lamprey and Twaite shad to occur in all river, transitional and coastal water bodies identified in **Table 5-2.**

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

The modelled additional orthophosphate concentration in the following river water bodies is less than 5% of the Good/High boundary (<0.00125mg/l) following dosing at Adamstown WTP; Halfway House Stream_010 (IE_SE_16H020300), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Luffany_010 (IE_SE_16L680750), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400).

For the river water bodies Cooltegin_010 (IE_SE_17K210690), Glengrant_010 (IE_SE_16G770380), St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) have a modelled additional increase above 5% of the Good / High boundary. However the increase in modelled concentration does not cause the predicted concentrations to exceed 75% of the upper indicative quality threshold. Therefore these water bodies are not at risk of further deterioration or the achievement of the WFD objectives. None of these rivers are located within the SAC, all except the Cooltegin discharge to the Middle and Lower Suir estuaries before reaching the SAC in the Barrow Suir Nore Estuary.

As discussed below the modelled additional concentration in the estuaries is insignificant. The Cooltegin is the only river which discharges directly to the SAC located in the Barrow Suir Nore Estuary and again as discussed below the modelled additional concentration in the estuaries is insignificant. In addition, the modelled concentration following dosing is within 75% of the upper indicative quality

[26] King, J.J. (2006) The status and distribution of lamprey in the River Barrow SAC. *Irish Wildlife Manuals* No. 21. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
[27] NPWS 2016 River Barrow and River Nore SAC 002162 Site Synopsis

threshold and therefore there is no risk of deterioration in the current good, moderate or poor orthoP indicative quality or of the achievement of WFD objectives for these river water bodies. Therefore, it is considered that there will be no impact to the salmonid and lamprey Annex II species.

St John's river does not form part of the River Barrow and River Nore SAC but discharges to the Middle Suir estuary, Lower Suir Estuary and then discharges to the Barrow Suir Nore Estuary which is located within the SAC. The modelled additional concentration within these estuaries is insignificant as discussed below. St John's river is considered as a supporting habitat for lamprey and salmon; however it is not of sufficient quality to warrant designation within the SAC and the current WFD invertebrate status (2016-2021) for St John's_020 of Poor indicates this rivers potential in supporting salmon is limited.

For the transitional water bodies hydrologically connected to the SAC i.e. Middle Suir Estuary (IE_SE_100_0550), Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) and Barrow Suir Nore Estuary (IE_SE_100_0100) the modelled additional concentration is within 5% of the Good / High boundary (0.00125 mg/l) threshold at 0.0005 mg/l ,0.0005 mg/l and 0.0003mg/l respectively. Therefore, there is no risk of deterioration in the indicative quality of these transitional water bodies (High and Good indicative quality) as a result of dosing at Adamstown WTP.

Waterford (IE_SE_G_149) groundwater body underlies a large portion of the WSZ. The modelled increase in concentration post-dosing is 0.0026 mg/l which does exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) however the resultant concentration post dosing will be well within the 75% of the upper indicative quality threshold and therefore does not pose a risk to deterioration in indicative quality for this groundwater body. For the groundwater body Dunmore East (IE_SE_G_057) the modelled additional concentration is within 5% of the Good/Fail indicative quality boundary (<0.00175mg/l).

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

6.2.3.5 (1130) Estuaries

The attributes and targets that will maintain the favourable conservation condition of this habitat in the River Barrow and River Nore SAC do not make specific reference to water quality and nutrient conditions however there is a requirement to conserve community types in their natural conditions (NPWS, 2011)[24]. The COs supporting document for Marine habitats (NPWS, 2011)[24] does 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 surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010

(IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);

- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

The habitat *Estuaries* is located within the transitional water body Barrow Suir Nore Estuary (IE_SE_100_0100) and downstream of Lower Suir Estuary (Little Island – Cheekpoint) (IE_SE_100_0500). The river water bodies Cooltegin_010 (IE_SE_17K210690) and Knockacurrin_010 (IE_SE_17K410990) discharge to the habitat.

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

The modelled additional orthophosphate concentration in the following river water bodies is less than 5% of the Good/High boundary (<0.00125mg/l) following dosing at Adamstown WTP; Halfway House Stream_010 (IE_SE_16H020300), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Luffany_010 (IE_SE_16L680750), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400).

For the river water bodies Cooltegin_010 (IE_SE_17K210690), Glengrant_010 (IE_SE_16G770380), St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) have a modelled additional increase above 5% of the Good / High boundary. However the increase in modelled concentration does not cause the predicted concentrations to exceed 75% of the upper indicative quality threshold. Therefore these water bodies are not at risk of further deterioration or the achievement of the WFD objectives. None of these rivers are located within the SAC, all except the Cooltegin discharge to the Middle and Lower Suir estuaries before reaching the SAC in the Barrow Suir Nore Estuary.

As discussed below the modelled additional concentration in the estuaries is insignificant. The Cooltegin is the only river which discharges directly to the SAC located in the Barrow Suir Nore Estuary and again as discussed below the modelled additional concentration in the estuaries is insignificant. In addition, the modelled concentration following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current good, moderate or poor orthoP indicative quality or of the achievement of WFD objectives for these river water bodies. Therefore, it is considered that there will be no impact to the salmonid and lamprey Annex II species.

St John's river does not form part of the River Barrow and River Nore SAC but discharges to the Middle Suir estuary, Lower Suir Estuary and then discharges to the Barrow Suir Nore Estuary which is located within the SAC. The modelled additional concentration within these estuaries is insignificant as discussed below. St John's river is considered as a supporting habitat for lamprey and salmon; however it is not of sufficient quality to warrant designation within the SAC and the current WFD invertebrate status (2016-2021) for St John's_020 of Poor indicates this rivers potential in supporting salmon is limited.

For the transitional water bodies hydrologically connected to the SAC i.e. Middle Suir Estuary (IE_SE_100_0550), Lower Suir Estuary (Little Island – Cheekpoint) (IE_SE_100_0500) and Barrow Suir Nore Estuary (IE_SE_100_0100) the modelled additional concentration is within 5% of the Good / High boundary (0.00125 mg/l) threshold at 0.0005 mg/l ,0.0005 mg/l and 0.0003mg/l respectively. Therefore, there is no risk of deterioration in the indicative quality of these transitional water bodies (High and Good indicative quality) as a result of dosing at Adamstown WTP.

Waterford (IE_SE_G_149) groundwater body underlies a large portion of the WSZ. The modelled increase in concentration post-dosing is 0.0026 mg/l which does exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) however the resultant concentration post dosing will be well within the 75% of the upper indicative quality threshold and therefore does not pose a risk to deterioration in indicative quality for this groundwater body. For the groundwater body Dunmore East (IE_SE_G_057) the modelled additional concentration is within 5% of the Good/Fail indicative quality boundary (<0.00175mg/l).

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

6.2.3.6 (1140) Mudflats and sandflats not covered by seawater at low tide

The attributes and targets that will maintain the favourable conservation condition of this habitat in the River Barrow and River Nore SAC do not make specific reference to water quality and nutrient conditions however there is a requirement to conserve community types in their natural conditions (NPWS, 2011)[24]. The Cos supporting document for Marine habitats (NPWS, 2011)[28] does 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 surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island – Cheekpoint) (IE_SE_100_0500); and

[28] NPWS 2011 River Barrow and River Nore SAC (site code: 2162) Conservation Objectives Supporting Document - Marine Habitats

- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

The habitat *Mudflats and sandflats not covered by seawater at low tide* are located within the transitional water body Barrow Suir Nore Estuary (IE_SE_100_0100) and downstream of Lower Suir Estuary (Little Island – Cheekpoint) (IE_SE_100_0500). The river water bodies Cooltegin_010 (IE_SE_17K210690) and Knockacurrin_010 (IE_SE_17K410990) discharge to the habitat.

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

The modelled additional orthophosphate concentration in the following river water bodies is less than 5% of the Good/High boundary (<0.00125mg/l) following dosing at Adamstown WTP; Halfway House Stream_010 (IE_SE_16H020300), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Luffany_010 (IE_SE_16L680750), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400).

For the river water bodies Cooltegin_010 (IE_SE_17K210690), Glengrant_010 (IE_SE_16G770380), St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) have a modelled additional increase above 5% of the Good / High boundary. However the increase in modelled concentration does not cause the predicted concentrations to exceed 75% of the upper indicative quality threshold. Therefore these water bodies are not at risk of further deterioration or the achievement of the WFD objectives. None of these rivers are located within the SAC, all except the Cooltegin discharge to the Middle and Lower Suir estuaries before reaching the SAC in the Barrow Suir Nore Estuary.

As discussed below the modelled additional concentration in the estuaries is insignificant. The Cooltegin is the only river which discharges directly to the SAC located in the Barrow Suir Nore Estuary and again as discussed below the modelled additional concentration in the estuaries is insignificant. In addition, the modelled concentration following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current good, moderate or poor orthoP indicative quality or of the achievement of WFD objectives for these river water bodies. Therefore, it is considered that there will be no impact to the salmonid and lamprey Annex II species.

St John's river does not form part of the River Barrow and River Nore SAC but discharges to the Middle Suir estuary, Lower Suir Estuary and then discharges to the Barrow Suir Nore Estuary which is located within the SAC. The modelled additional concentration within these estuaries is insignificant as discussed below. St John's river is considered as a supporting habitat for lamprey and salmon; however it is not of sufficient quality to warrant designation within the SAC and the current WFD invertebrate status (2016-2021) for St John's_020 of Poor indicates this rivers potential in supporting salmon is limited.

For the transitional water bodies hydrologically connected to the SAC i.e. Middle Suir Estuary (IE_SE_100_0550), Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) and Barrow Suir Nore Estuary (IE_SE_100_0100) the modelled additional concentration is within 5% of the Good / High boundary (0.00125 mg/l) threshold at 0.0005 mg/l ,0.0005 mg/l and 0.0003mg/l respectively. Therefore, there is no risk of deterioration in the indicative quality of these transitional water bodies (High and Good indicative quality) as a result of dosing at Adamstown WTP.

Waterford (IE_SE_G_149) groundwater body underlies a large portion of the WSZ. The modelled increase in concentration post-dosing is 0.0026 mg/l which does exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) however the resultant concentration post dosing will be well within the 75% of the upper indicative quality threshold and therefore does not pose a risk to deterioration in indicative quality for this groundwater body. For the groundwater body Dunmore East (IE_SE_G_057) the modelled additional concentration is within 5% of the Good/Fail indicative quality boundary (<0.00175mg/l).

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

6.2.3.7 (1310) *Salicornia* and other annuals colonising mud and sand

There are no nutrient specific targets in the SSCOs for this habitat (NPWS, 2011)[24]; however there is a target to maintain the natural tidal regime. The conservation objectives (CO) supporting document on coastal habitats (NPWS, 2011)[29] for the River Barrow and River Nore SAC was reviewed, and discusses the flooding regime attribute and associated target in further detail. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- • The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

The location of this habitat in the River Barrow and River Nore SAC is upstream of the water bodies identified in **Table 5-2** and therefore in the absence of pathways for impacts, the conservation status of this Annex I habitat will not be impacted by the project.

[29] NPWS 2011 River Barrow and River Nore SAC (site code: 2162) Conservation Objectives Supporting Document - Coastal Habitats

6.2.3.8 (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

There are no nutrient specific targets in the SSCOs for this habitat (NPWS, 2011)[24]; however, there is a target to maintain the natural tidal regime. The conservation objectives (CO) supporting document on coastal habitats (NPWS, 2011)[29]29 for the River Barrow and River Nore SAC was reviewed, and discusses the flooding regime attribute and associated target in further detail. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

Most of this habitat is located outside the ZoI of the project; however, there is one patch that is located within the transitional water body Barrow Suir Nore Estuary (IE_SE_100_0100) and downstream of Lower Suir Estuary (Little Island – Cheekpoint) (IE_SE_100_0500). The river water bodies Cooltegin_010 (IE_SE_17K210690) and Knockacurrin_010 (IE_SE_17K410990) are downstream of the habitat and therefore not considered further as part of this assessment.

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

The modelled increase in orthophosphate concentration in the transitional water bodies Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) are less than 5% of the Good / High boundary (0.00125 mg/l) threshold at 0.0003 mg/l and 0.0005 mg/l respectively, and therefore there is no risk of deterioration in indicative quality for this water body.

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

6.2.3.9 (1410) Mediterranean salt meadows (*Juncetalia maritimi*)

There are no nutrient specific targets in the SSCOs for this habitat (NPWS, 2011)[24]; however, there is a target to maintain the natural tidal regime. The conservation objectives (CO) supporting document on coastal habitats (NPWS, 2011)[29] for the River Barrow and River Nore SAC was reviewed, and discusses the flooding regime attribute and associated target in further detail. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

Most of this habitat is located outside the ZoI of the project; however, there is one patch that is located within the transitional water body Barrow Suir Nore Estuary (IE_SE_100_0100) and downstream of Lower Suir Estuary (Little Island – Cheekpoint) (IE_SE_100_0500). The river water bodies Cooltegin_010 (IE_SE_17K210690) and Knockacurrin_010 (IE_SE_17K410990) are downstream of the habitat and therefore not considered further as part of this assessment.

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

The modelled increase in orthophosphate concentration in the transitional water bodies Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) are less than 5% of the Good / High boundary (0.00125 mg/l) threshold at 0.0003 mg/l and 0.0005 mg/l respectively, and therefore there is no risk of deterioration in indicative quality for this water body.

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

6.2.3.10 (1355) Otter (*Lutra lutra*)

A review of the SSCOs for otter (NPWS, 2011)[24] found no specific attributes or targets relating to water quality. The National Parks and Wildlife Service's 'Threat Response Plan for the Otter' (NPWS, 2009[30]), which comprised a review of and response to the pressures and threats to otters in Ireland, categorized three principal risks to otters: i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution. There will be no interference with the terrestrial, marine or freshwater habitat of the species as a result of this project. The diet of the species varies locally and seasonally; however, it is dominated by fish, in particular salmonids, eels and sticklebacks in freshwater.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

The distribution of otter throughout the SAC is not identified in SSCOs for the site. It is assumed that otter have the potential to interact with all surface water bodies identified **Table 5-2**.

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

The modelled additional orthophosphate concentration in the following river water bodies is less than 5% of the Good/High boundary (<0.00125mg/l) following dosing at Adamstown WTP; Halfway House Stream_010 (IE_SE_16H020300), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Luffany_010 (IE_SE_16L680750), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400).

For the river water bodies Cooltegin_010 (IE_SE_17K210690), Glengrant_010 (IE_SE_16G770380), St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) have a modelled additional increase above 5% of the Good / High boundary. However the increase in modelled concentration does not cause the predicted concentrations to exceed 75% of the upper indicative quality threshold.

[30] NPWS (2009) Threat Response Plan: Otter (2009-2011). National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin.

Therefore these water bodies are not at risk of further deterioration or the achievement of the WFD objectives. None of these rivers are located within the SAC, all except the Cooltegin discharge to the Middle and Lower Suir estuaries before reaching the SAC in the Barrow Suir Nore Estuary.

As discussed below the modelled additional concentration in the estuaries is insignificant. The Cooltegin is the only river which discharges directly to the SAC located in the Barrow Suir Nore Estuary and again as discussed below the modelled additional concentration in the estuaries is insignificant. In addition, the modelled concentration following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current good, moderate or poor orthoP indicative quality or of the achievement of WFD objectives for these river water bodies. Therefore, it is considered that there will be no impact to the salmonid and lamprey Annex II species.

St John's river does not form part of the River Barrow and River Nore SAC but discharges to the Middle Suir estuary, Lower Suir Estuary and then discharges to the Barrow Suir Nore Estuary which is located within the SAC. The modelled additional concentration within these estuaries is insignificant as discussed below. St John's river is considered as a supporting habitat for lamprey and salmon; however it is not of sufficient quality to warrant designation within the SAC and the current WFD invertebrate status (2016-2021) for St John's_020 of Poor indicates this rivers potential in supporting salmon is limited.

For the transitional water bodies hydrologically connected to the SAC i.e. Middle Suir Estuary (IE_SE_100_0550), Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) and Barrow Suir Nore Estuary (IE_SE_100_0100) the modelled additional concentration is within 5% of the Good / High boundary (0.00125 mg/l) threshold at 0.0005 mg/l ,0.0005 mg/l and 0.0003mg/l respectively. Therefore, there is no risk of deterioration in the indicative quality of these transitional water bodies (High and Good indicative quality) as a result of dosing at Adamstown WTP.

Waterford (IE_SE_G_149) groundwater body underlies a large portion of the WSZ. The modelled increase in concentration post-dosing is 0.0026 mg/l which does exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) however the resultant concentration post dosing will be well within the 75% of the upper indicative quality threshold and therefore does not pose a risk to deterioration in indicative quality for this groundwater body. For the groundwater body Dunmore East (IE_SE_G_057) the modelled additional concentration is within 5% of the Good/Fail indicative quality boundary (<0.00175mg/l).

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

6.2.3.11 (1421) Killarney fern (*Trichomanes speciosum*)

A review of the SSCOs for Killarney fern (NPWS, 2011)[24] found no specific attributes or targets relating to nutrients or water quality. There are currently three locations known where this species occurs within this SAC – two on the River Barrow and one on the River Nore downstream of Inistioge. The species is also known to occur within the Annex I oak woodland habitat which occurs within this SAC on the steep slopes of the lower courses of the River Barrow and River Nore.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

All known locations of Killarney fern are upstream of the water bodies identified in **Table 5-2** and therefore in the absence of pathways for impacts, the conservation status of this Annex II species will not be adversely affected by the project.

6.2.3.12 (6430) Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

The SSCOs (NPWS, 2011)[24] for the River Barrow and River Nore do not contain any nutrient specific water quality targets for this habitat, however an important attribute for the habitat is hydrological regime, namely flooding depth/height of the water table. The habitat relies on winter inundation, which results in deposition of naturally nutrient-rich sediment.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

The distribution of this habitat in this site is currently unknown; however, it is considered to occur in association with some riverside woodland, unmanaged river islands and in narrow bands along the

floodplain of slow-flowing stretches of the river. It is assumed that the water bodies identified in **Table 5-2** are hydrologically or hydrogeologically connected to the habitat.

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

The modelled additional orthophosphate concentration in the following river water bodies is less than 5% of the Good/High boundary (<0.00125mg/l) following dosing at Adamstown WTP; Halfway House Stream_010 (IE_SE_16H020300), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Luffany_010 (IE_SE_16L680750), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400).

For the river water bodies Cooltegin_010 (IE_SE_17K210690), Glengrant_010 (IE_SE_16G770380), St John's_010 (IE_SE_16S030400) and St John's_020 (IE_SE_16S030600) have a modelled additional increase above 5% of the Good / High boundary. However the increase in modelled concentration does not cause the predicted concentrations to exceed 75% of the upper indicative quality threshold. Therefore these water bodies are not at risk of further deterioration or the achievement of the WFD objectives. None of these rivers are located within the SAC, all except the Cooltegin discharge to the Middle and Lower Suir estuaries before reaching the SAC in the Barrow Suir Nore Estuary.

As discussed below the modelled additional concentration in the estuaries is insignificant. The Cooltegin is the only river which discharges directly to the SAC located in the Barrow Suir Nore Estuary and again as discussed below the modelled additional concentration in the estuaries is insignificant. In addition, the modelled concentration following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current good, moderate or poor orthoP indicative quality or of the achievement of WFD objectives for these river water bodies. Therefore, it is considered that there will be no impact to the salmonid and lamprey Annex II species.

St John's river does not form part of the River Barrow and River Nore SAC but discharges to the Middle Suir estuary, Lower Suir Estuary and then discharges to the Barrow Suir Nore Estuary which is located within the SAC. The modelled additional concentration within these estuaries is insignificant as discussed below. St John's river is considered as a supporting habitat for lamprey and salmon; however it is not of sufficient quality to warrant designation within the SAC and the current WFD invertebrate status (2016-2021) for St John's_020 of Poor indicates this rivers potential in supporting salmon is limited.

For the transitional water bodies hydrologically connected to the SAC i.e. Middle Suir Estuary (IE_SE_100_0550), Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) and Barrow Suir Nore Estuary (IE_SE_100_0100) the modelled additional concentration is within 5% of the Good / High boundary (0.00125 mg/l) threshold at 0.0005 mg/l ,0.0005 mg/l and 0.0003mg/l respectively. Therefore, there is no risk of deterioration in the indicative quality of these transitional water bodies (High and Good indicative quality) as a result of dosing at Adamstown WTP.

Waterford (IE_SE_G_149) groundwater body underlies a large portion of the WSZ. The modelled increase in concentration post-dosing is 0.0026 mg/l which does exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) however the resultant concentration post dosing will be well within the 75% of the upper indicative quality threshold and therefore does not pose a risk to deterioration in indicative quality for this groundwater body. For the groundwater body Dunmore East

(IE_SE_G_057) the modelled additional concentration is within 5% of the Good/Fail indicative quality boundary (<0.00175mg/l).

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

6.2.3.13 (7220)* Petrifying springs with tufa formation (*Cratoneurion*)

The SSCOs (NPWS, 2011)[24] for this habitat include the maintenance of an appropriate hydrological and hydrogeological regime; although current regime requirements are unknown and vary widely (petrifying springs rely on permanent irrigation, usually from upwelling groundwater sources or seepage sources). An additional target is to maintain oligotrophic and calcareous conditions. Spring water chemistry requirements are outlined in Lyons and Kelly (2016[31]), which includes a target of no increase [in phosphorus] from baseline and not above 15 µg/l.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

The habitat *Petrifying springs with tufa formations* occur at Dysart Wood along the River Nore, between Thomastown and Inistioge which is located upstream of the water bodies identified in **Table 5-2.** Therefore, in the absence of pathways for impacts, the conservation status of this Annex II species will not be impacted by the project.

6.2.3.14 (91E0)* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

The SSCOs (NPWS, 2011)[24] for the River Barrow and River Nore SAC do not contain any nutrient specific targets for this habitat. A review of the SSCOs for this habitat in other SACs found no nutrient specific targets. The CO supporting document for woodland habitats in this SAC (NPWS, 2011)[24] identified fertiliser drift from agriculture as a potential threat to this habitat. Fertiliser drift may increase the

[31] https://www.npws.ie/sites/default/files/publications/pdf/IWM94.pdf

trophic status of the wood leading to the stronger growth of nitrophilous species and loss of less vigorous species, and herbicide drift, which may kill vegetation on the woodland edge.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Barrow and River Nore SAC and will receive inputs from the proposed orthophosphate dosing at Adamstown WTP:

- The river water bodies that are hydrologically connected include: Cooltegin_010 (IE_SE_17K210690), Knockacurrin_010 (IE_SE_17K410990), Faithlegg_010 (IE_SE_16F150440), Glengrant_010 (IE_SE_16G770380), Halfway House Stream_010 (IE_SE_16H020300), Luffany_010 (IE_SE_16L680750), St John's_010 (IE_SE_16S030400), St John's_020 (IE_SE_16S030600), Dawn_010 (IE_SE_16D040300), Dawn_20 (IE_SE_16D040500), Darrigal_010 (IE_SE_16D290570) and Whelan's Bridge Stream_010 (IE_SE_16W010400);
- The transitional water bodies connected to the site include: Middle Suir Estuary (IE_SE_100_0550), Barrow Suir Nore Estuary (IE_SE_100_0100) and Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500); and
- The groundwater bodies hydrogeologically connected to the site include: Dunmore East (IE_SE_G_057) and Waterford (IE_SE_G_149).

The Annex I habitat alluvial forest are recorded from Rathsnagadan, Murphy's of the River, in Abbeyleix estate and along other shorter stretches of both the tidal and freshwater elements of the site. All identified locations of the habitat (NPWS, 2011)[24] are upstream of the water bodies identified in **Table 5-2** and therefore in the absence of pathways for impacts, the conservation status of this Annex I habitat will not be impacted by the project.

6.2.4 Tramore Back Strand SPA 004027

The SSCOs for Tramore Back Strand SPA (NPWS, 2013)[32] list targets for each species, specifically:

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

Water quality was an issue at this SPA in the past and was most often linked to inadequate waste water treatment; wastewater from Tramore being collected and pumped untreated into the bay via a short outfall pipe below low water level. Changes in organic and nutrient loading to an estuary may have various consequences for the ecology of the estuarine system including changes in the abundances of some benthic invertebrates that form prey species for waterbirds (e.g. Burton *et al.* 2002). This could have knock-on effects upon waterbird foraging distribution, prey intake rates, and ultimately upon survival and fitness.

Related to this is the subject of macroalgal mats which are a common feature across Tramore Back Strand. Macroalgal mats of species such as *Ulva* spp. can have both negative and positive effects upon waterbird foraging ecology; some species avoiding them or being negatively affected by lowered invertebrate abundances beneath them while herbivores such as Light-bellied Brent Geese and

[32] NPWS 2011 Tramore Back Strand SPA 004027 Conservation Objectives.

Wigeon benefit from the algae being a source of food. Given that sustained high levels of macroalgal growth is linked to organic enrichment, there is a potential for alterations in macroalgal abundance as a result of changes to organic and nutrient loading (NPWS, 2013[33]).

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

- The river water bodies hydrologically connected to the site include: Ballygunnermore_010 (IE_SE_17B290990), Monloum_010 (IE_SE_17M060970) and Leperstown Stream_010 (IE_SE_17L010300);
- The coastal water bodies connected to the site include: Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000); and
- The groundwater body that is hydrogeologically connected to the site is: Dunmore East (IE_SE_G_057).

The EAM has assessed the potential for impact on water quality and nutrient conditions and has based this assessment on a conservative basis using all available riverine flows. In the case of Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000) tidal flows have been considered as the conservative assessments result in very high orthophosphate concentrations as the contributing fluvial flows were less than $1m^3/s$.

The river water body, Leperstown Stream_010 (IE_SE_17L010300) (0.0002 mg/l) has a modelled increase in orthophosphate concentration less than 5% of the Good / High boundary (0.00125 mg/l) following dosing and is not significantly impacted.

The river water bodies Ballygunnermore_010 (IE_SE_17B290990) (0.0013 mg/l) and Monloum_010 (IE_SE_17M060970) (0.0023 mg/l) however, have predicted increase in concentrations which are above 5% of the Good / High boundary. The Monloum_010 river water body contains a high density of watermain in Tramore and much of the load has been reapportioned to Tramore Bay which is located outside the SAC. For both rivers the modelled baseline following dosing is within 75% of the upper indicative quality threshold and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for these river water bodies.

For the coastal water bodies Tramore Bay (IE_SE_110_0000) and Tramore Back Strand (IE_SE_120_0000) the modelled additional concentration is insignificant (0.0002 mg/l and 0.0004 mg/l respectively) i.e. within 5% of the Good / High boundary and therefore there is no risk of deterioration in the current moderate orthoP indicative quality or of the achievement of WFD objectives for the coastal water bodies assessed.

The groundwater body Dunmore East (IE_SE_G_057) has a modelled post-dosing concentration of 0.0016 mg/l which does not exceed 75% of the Good / Fail boundary, therefore there is no risk in deterioration of the Good (surrogate) indicative quality of the water body.

In light of the EAM assessment which has determined that there is no risk of deterioration in the orthophosphate indicative quality of the water bodies that support the structure and function of the

[33] NPWS 2013 Tramore Back Strand SPA (site code: 4027) Conservation Objectives Supporting Document

SPA, or of preventing their achievement of WFD objectives. The additional loading from the orthophosphate dosing is not likely to have significant effects on the favourable conservation status of its SCIs; either in terms of individual bird species or wetland habitats.

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

In order to ensure all potential impacts upon European Sites within the project's ZoI were considered, including those direct and indirect impacts that are a result of cumulative or in-combination effects, 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 Waterford County 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 effects 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
Waterford City and County Development Plan 2022 - 2028 The policies, objectives and zonings of relevance in the Waterford City and County Development Plan 2022 - 2028 include under Infrastructure and Water Services: **UTL02 Water Services** To collaborate support and work, in conjunction with Irish Water, to ensure the timely delivery and provision, extension and upgrading of existing and new high quality, climate resilient, water services infrastructure, in order to facilitate the sustainable growth and development of our City and County, in accordance with an ecosystem services and integrated catchment management approach, and the Development Plan Core and Settlement strategies. **UTL03 Water Supply & Drinking Water Regulations** We will collaborate with Irish Water in contributing towards compliance with the European Union (Drinking Water) Regulations Drinking Water Regulations 2014 (as amended) and compliance of water supplies with the parameters identified in these Regulations. **UTL04 Drinking Water Report for Public Water Supplies** In conjunction with Irish Water, we will have regard to the EPA 2020 publication "Drinking Water Report for Public Water Supplies 2019" (and any subsequent update) in the establishment and maintenance of water sources in the County. **UTL05 EPA's Remedial Action List** In conjunction with Irish Water, undertake recommendations made by the EPA arising from any failure to meet drinking water standards and any enlistment on the EPA's Remedial Action List. **UTL08 Protection of Water Resources** To work together with Irish Water towards a common goal of protecting our drinking water sources. This will be achieved by: • Supporting the preparation and implementation of Drinking Water Protection Plans by Irish Water, to protect sources of public water supply, in accordance with the requirements of the Water Framework Directive. • Having regard to the EPA 2019 publication 'Drinking Water Report for Public Water Supplies 2018' (and any subsequent update) in the	▪ N/A	Waterford City and County Development Plan 2022 - 2028 emphasis the objectives of their water services which include the enhancement and improved quality of the service to its consumers. The plans also outline the importance of compliance with the National River Basin Management Plan 2018-2021), and emphasis compliance with environmental objectives. There is no potential for cumulative impacts with these plans.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
establishment and maintenance of water sources in the County in conjunction with Irish Water. • Protecting both ground and surface water resources including taking account of the impacts of climate change, the cumulative impacts of septic tanks and waste water treatment systems, and to work with and support Irish Water to develop and implement Water Safety Plans to protect sources of public water supply and their contributing catchment. The Waterford City and County Development Plan 2022 - 2028 outlines it's function in the delivery of water supply, water conservation, water quality monitoring, main drainage and waste water treatment provision. The Adamstown water treatment plant supplies all the drinking water for Waterford City and infrastructure investments secure Waterford City's water supply, quantity and quality into the future.		
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.	▪ N/A	The objectives of the RBMP are to • Prevent deterioration; • Restore good status; • Reduce chemical pollution; and • Achieve water related protected areas objectives The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each water body. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of this plan will have a positive impact on biodiversity and the Project will not affect the achievement of the RBMP objectives given the detailed assessment of the effects of dosing on water body environmental objectives under the EAM.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
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.		
Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive The Office of Public Works (OPW) is responsible for the implementation of the Floods Directive 2007/60/EC which is being carried out through a Catchment based Flood Risk Assessment and Management (CFRAM) Programme. As part of the directive Ireland is required to undertake a Preliminary Flood Risk Assessment, to identify areas of existing or potentially significant future flood risk and to prepare flood hazard and risk maps for these areas. Following this, flood risk management plans are developed for these areas setting objectives for managing the flood risk and setting out a prioritised set of measures to achieve the objectives. The CFRAM programme is currently being rolled out and Draft Flood Risk Management Plans have been prepared. These plans have been subject AA.	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Alterations to water quality and/or water movement; ▪ Disturbance; ▪ In-combination impacts within the same scheme.	CFRAM Studies and their product Flood Risk Management Plans will each undergo AA. Any future flood plans will have to take into account the design and implementation of water management infrastructure as it has the potential to impact on hydromorphology and potentially on the ecological status and favourable conservation status of water bodies. The establishment of how flooding may be contributing to deterioration in water quality in areas where other relevant pressures are absent is a significant consideration in terms of achieving the objectives of the WFD. The AA of the plans will need to consider the potential for impacts from hard engineering solutions and how they might affect hydrological connectivity and hydromorphological supporting conditions for protected habitats and species. There is no potential for cumulative impacts with the CFRAMS programme as no infrastructure is proposed as part of this project.
Foodwise 2025 Foodwise 2025 strategy identifies significant growth opportunities across all subsectors of the Irish agri-food industry. Growth Projection includes increasing the value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition;	Foodwise 2025 was subject to its own AA[34]. 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

[34] 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
	▪ Disturbance to habitats / species.	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.
Rural Development Policy 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	▪ Overgrazing; ▪ Land use change or ▪ intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	The RDP for 2014 – 2020 has been subject to SEA[35], and AA[36]. 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.

35

36 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
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 farmyard manures. Within the TAMS scheme are two further schemes; the Animal Welfare, Safety and Nutrient Storage Scheme and the Low Emission Slurry Spreading Scheme. Both schemes are focused on productivity for farmers but have the ability to contribute towards a reduction in point and diffuse source pollution through improved nutrient management.		
National Nitrates Action Programme Article 28 of the Good Agricultural Practice Regulations, in line with the Nitrates Directive (91/676/EEC), requires the Minister for Housing, Local Government and Heritage, in consultation with the Minister for Agriculture, Food and the Marine, to review the Nitrates Action Programme every four years. Ireland has published the Fifth Nitrates Action Programme on the 11th March 2022. The Programme sets out new measures that have been introduced since the Fourth Programme. This iteration of the NAP is developed in the context of significantly greater environmental ambition in the Programme for Government and at EU level. The key issues considered in the fifth iteration of the NAP include: ▪ Better Policy Alignment; ▪ Compliance and Enforcement; ▪ Climate Action Measures. ▪ Biodiversity Measures; and ▪ Nitrates Derogation.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	In accordance with the Directive 2001/42/EC on the assessment of effects of certain plans and programmes, as transposed into Irish law, a Strategic Environmental Assessment (SEA) is being undertaken and an Environmental Report has been prepared. Appropriate Assessment under EU Directive 92/43/EEC, as transposed into Irish law, is also being undertaken and a Natura Impact Statement (NIS) has been prepared It concluded that the NAP was an environmental programme which imposes environmental constraints on all agricultural systems in the state. Consultation and submission on the 5th NAP have been considered in the SEA Statement and the Natura Impact Statement of the adopted fifth Nitrates Action Programme. These documents provide information on the decision-making process and documents how environmental considerations, the views of consultees/stakeholders and the recommendations of the SEA Environmental Report and the assessment carried out under Article 6 of the Habitats Directive have influenced the final adopted Plan. Adherence to the recommendations in these documents and incorporation into he Plan will ensure that there is no potential for cumulative impacts with the proposed project.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) / Forestry Programme 2014 - 2020 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 loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Water quality changes; ▪ Disturbance to species.	Ireland's Forestry Programme 2014 – 2020 has undergone AA[37]. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts 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	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity;	The overarching strategy was subject to AA 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.

[37] 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
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 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.	▪ Nutrient enrichment /eutrophication.	
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.

7 SCREENING CONCLUSION STATEMENT

This Screening to inform the AA process has considered whether the proposed construction works and orthophosphate dosing at the Adamstown WTP, within the East Waterford Regional WSZ, in combination with other plans or projects, is likely to have a significant effect on European Sites.

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

During the construction phase of the corrective water treatment works at Adamstown WTP the potential for direct, indirect and cumulative impacts affecting European Sites within the ZoI (i.e. Lower River Suir SAC, River Barrow and River Nore SAC) 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 Tramore Dunes and Backstrand SAC; Lower River Suir SAC; River Barrow and River Nore SAC; and, Tramore Backstrand SPA has been assessed. The EAM identified that as a result of dosing alone there are no water bodies at risk of deterioration in the orthophosphate indicative quality or of preventing the achievement of WFD objectives following dosing at Adamstown WTP. It has been determined this will not result in potential significant direct, indirect or cumulative impacts that will result in likely significant effects to the qualifying interests/special conservation interests of the European Sites within the ZoI. This is concluded with regard to the range, population densities and overall conservation status of the habitats and species for which these sites are designated (i.e. Conservation Objectives).

The screening has been carried out on the basis of the information presented in the Project Description. It has been concluded that the project it is not connected or necessary to the management of any European Site. It can be concluded on the basis of objective scientific information and in view of best scientific knowledge, the proposed orthophosphate dosing and associated construction works at the Adamstown 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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NPWS (2013b) Article 17 Habitat Conservation Assessments (Vol. 2) Version 1.1. The Status of EU Protected Habitats and Species in Ireland.

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

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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
Tramore Dunes and Backstrand SAC (000671)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000671.pdf
Lower River Suir SAC (002137)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002137.pdf
River Barrow and River Nore SAC (002162)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002162.pdf
Tramore Back Strand SPA (004027)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004027.pdf

APPENDIX B

Nutrient Sensitive Qualifying Interests

Water dependant and nutrient sensitive SAC species

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

Water dependant and nutrient sensitive SAC habitats

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

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

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

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

Water dependant and nutrient sensitive SPA birds

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

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

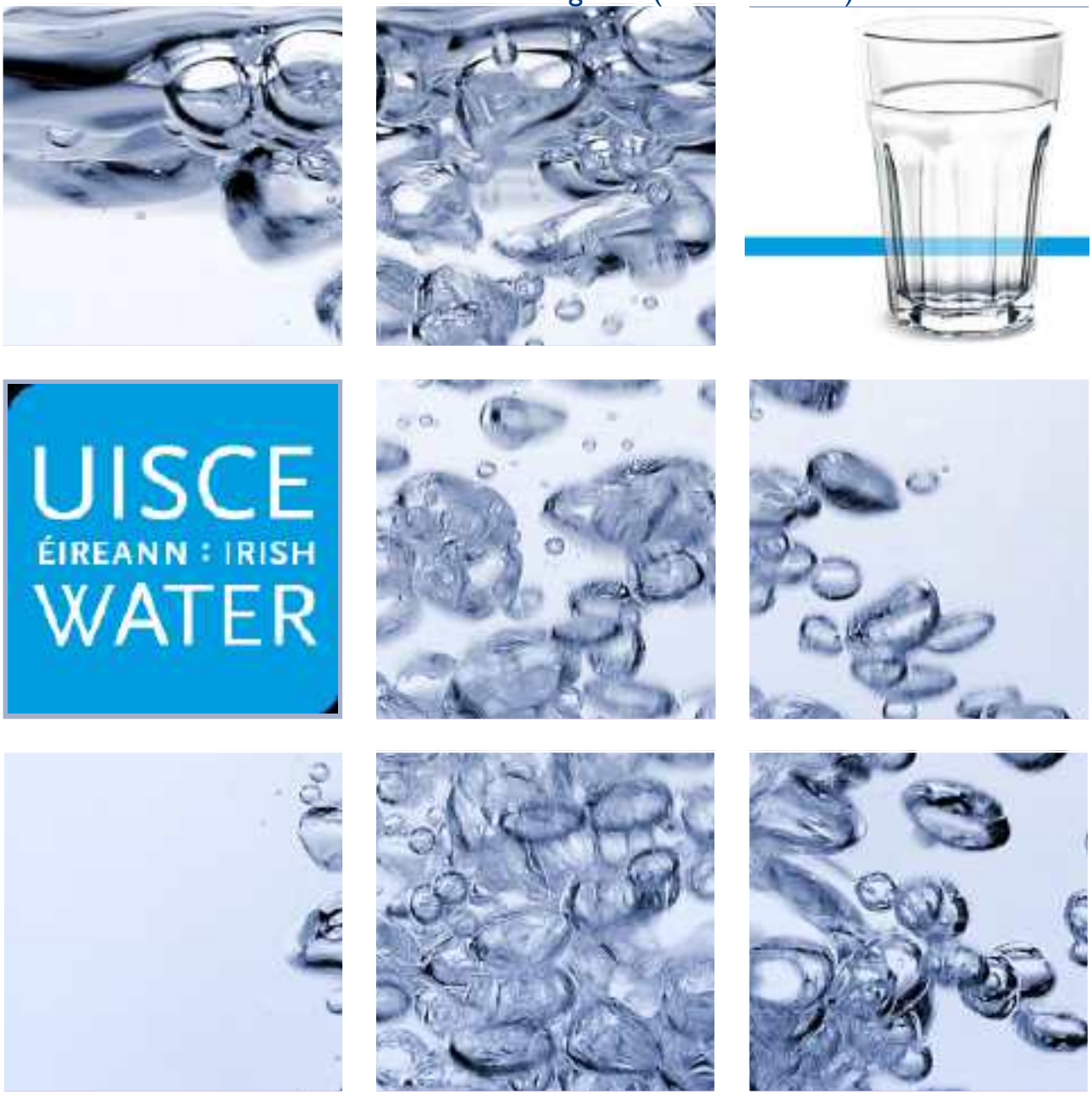
APPENDIX C

EAM Summary Report

Irish Water - Lead in Drinking Water Mitigation Plan

Environmental Assessment Methodology (EAM) Summary Report

010 Adamstown WTP - East Waterford Regional (3100PUB1110)



National Lead in Water Mitigation Strategy

Environmental Assessment Methodology Report: 010 Adamstown WTP – East Waterford Regional (3800PUB1110)

Document Control Sheet

Client:	Irish Water
Project Title:	National Lead in Water Mitigation Strategy
Document Title:	Environmental Assessment Methodology Report: 010 Adamstown WTP – East Waterford Regional (3800PUB1110)
Document No:	MDW0766RP_5.1_EAM_010_Adamstown_F08

Text Pages:	13	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F04	Final	11th July 2019	IP		MM		MM	
F05	Final	09th Aug 2019	IP		MM		GJG	
F06	Final	25th Nov 2022	YE		IP		MM	
F07	Final	09th Jan 2023	YE		IP		MM	
F08	Final	09th Feb 2023	YE		IP		MM	

010 East Waterford Regional (3800PUB1110) – Adamstown WTP

Supporting spreadsheet: 010 Adamstown - East Waterford Regional_rev15

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

Adamstown WTP supplies parts of Waterford City and coastal areas of east County Waterford. The daily production and distribution input for the WTP is 26,800 m^3/day (52% of which is accounted for, with the remainder assumed to be lost through leakage) serving a population of approximately 57,000.

The area is served by Waterford City (D0022-01), Tramore (D0015-01) and Dunmore East (D0170-01) which are all licenced in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended. The impact of the orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There are smaller agglomerations with a population equivalent of less than 500, i.e., Cheekpoint, Crooke and Passage East and the estimated additional load from these plants from the orthophosphate dosing is considered at the water body level via the surface water pathways. There are an estimated 1,602 properties across both WSZs 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 11).

<table>
<tr><td>Water Supply Zone</td><td colspan="3">East Waterford Regional (3800PUB1110)
See Figure 4.1 / 4.2 of the AA Screening for a map of the WSZ and ZoI</td></tr>
<tr><td rowspan="3">Step 1 - Appropriate Assessment Screening</td><td colspan="3">European Sites within the Zone of Influence</td></tr>
<tr><td colspan="2">List of SAC Sites:
Ardmore Head SAC, Bannow Bay SAC, Ballyteige Burrow SAC, Carnsore Point SAC, Helvick Head SAC, Hook Head SAC, Hugginstown Fen SAC, Tacumshin Lake SAC, Lady’s island Lake SAC, Lower River Suir SAC, River Barrow and River Nore SAC, Saltee Island’s SAC, Tramore Dunes and Backstrand SAC</td><td>List of SPA Sites
Bannow Bay SPA, Ballyteige Burrow SPA, Helvick Head to Ballyquin SPA, Dungarvan Harbour SPA, Mid-Waterford Coast SPA, Keeragh Islands SPA, Lady's Island Lake SPA, Saltee Islands SPA, Tacumshin Lake SPA, Tramore Back Strand SPA</td></tr>
<tr><td colspan="3">Appropriate Assessment Required – see AA screening report for details</td></tr>
<tr><td rowspan="2">Step 2 – Direct Inputs to Surface Water</td><td>Agglomerations within WSZ</td><td colspan="2">Increased loading/concentration due to Orthophosphate Dosing – Dosing rate = 0.5 mg/l</td></tr>
<tr><td>Waterford City</td><td colspan="2">Table 1: Waterford City Primary Discharge
<table>
<tr><td></td><td>TP Load kg/yr</td><td colspan="3">Ortho P concentration mg/l TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)</td></tr>
<tr><td></td><td></td><td>0.5</td><td>0.4</td><td>0.68</td></tr>
<tr><td>Existing</td><td>18008</td><td>0.67</td><td>0.53</td><td>0.91</td></tr>
<tr><td>Post Dosing</td><td>19816</td><td>0.73</td><td>0.62</td><td>1.05</td></tr>
</table>
Note – No ELVs set in WWDL</td></tr>
</table>

Table 2: Waterford City SWOs (39 no.)

	TP Load kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	1873.3	2.38	1.91	3.24
Post Dosing	1925.9	2.45	1.99	3.38

Tramore

Table 3: Tramore Primary Discharge

	TP Load kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	1385	0.33	0.26	0.45
Post Dosing	1753	0.42	0.37	0.64

Note – No ELVs set in WWDL

Table 4: Tramore SWOs (5 no.)

	TP Load kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	237.2	1.94	1.55	2.63
Post Dosing	248.0	2.02	1.66	2.82

Dunmore East

Table 5: Dunmore East Primary Discharge

	TP Load kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	1754	5.50	3.74	6.35
Post Dosing	1845	5.79	4.03	6.85

Note – No ELVs set in WWDL

Table 6: Dunmore East SWOs (3 no.)

	TP Load kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
		0.5	***0.4***	***0.68***
Existing	92.9	10.00	8.00	13.60
Post Dosing	95.53	10.29	8.36	14.22

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

Table 7: Mass balance assessment based on 0.5 mg/l dosing using available background concentrations and mean flow information for fluvial flows from Hydrotool with tidal volumes estimated from tidal prism

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.
Waterford City	Lower Suir Estuary (Little Island - Cheekpoint) IE_SE_100_0500	0.053	0.055	0.055	0.5
Tramore	Tramore Bay IE_SE_110_0000	0.021	0.022	0.022	0.5
Dunmore East	Waterford Harbour IE_SE_100_0000	0.020	0.020	0.020	0.0

Surface Assessment

Waterford City **(IE_SE_100_0500)** – No ELVs have been set for this agglomeration. Impact from orthophosphate dosing causes an estimated 10% increase in concentration levels in the effluent (Table 1), that translates to a maximum increase of less than 1% in the receiving water when low flows are taken into account (Table 7).

Tramore Bay **(IE_SE_110_0000)** – Impact from orthophosphate dosing causes 26.6% increase in concentration levels at the plant (Table 3). The impact of the orthophosphate dosing on the receiving waters is negligible due to the large tidal volumes available to assimilate the discharge from the agglomeration.

Dunmore East **(IE_SE_100_0000)** – The increase in load and concentration due to orthophosphate dosing is 5% at the plant (Table 5). There is no impact on the receiving water body as a result of the additional loading to the agglomeration from orthophosphate dosing (Table 7).

Step 4 - Distributed Inputs to River Water Bodies

Subsurface Assessment - Rivers

River waterbodies with significant predicted concentration above 5% of the Good / High boundary (0.00125 mg/l) are:

IE_SE_16G770380	GLENGRANT_010
IE_SE_16S030400	ST JOHN'S_010
IE_SE_16S030600	ST JOHN'S_020
IE_SE_17B290990	BALLYGUNNERMORE_010
IE_SE_17K210690	COOLTEGIN_010
IE_SE_17M060970	MONLOUM_010

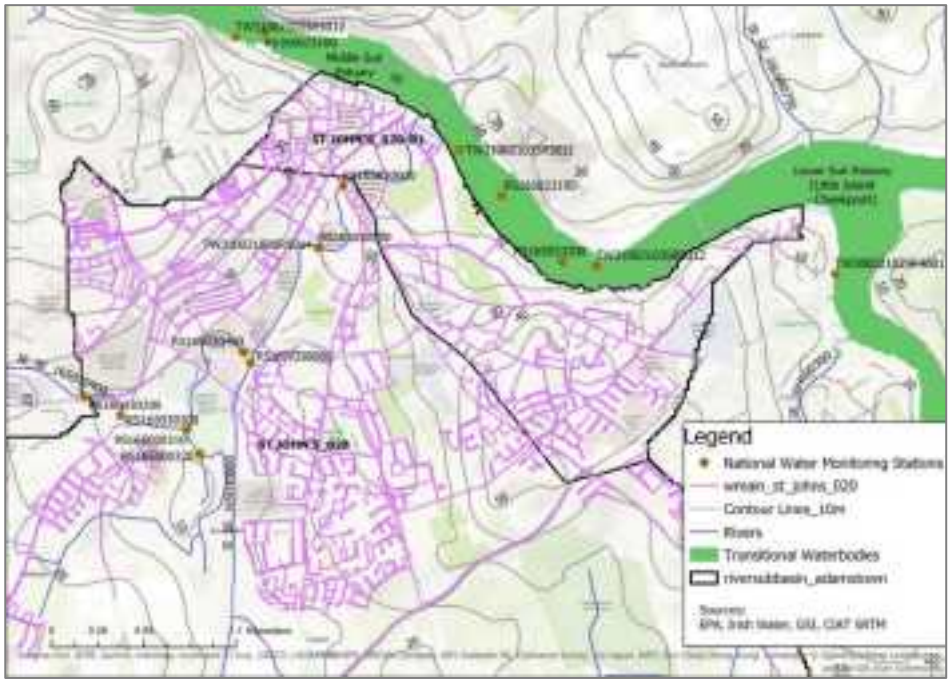
For the above waterbodies, the predicted increase in concentration does not raise baseline levels above 75% of the upper threshold for the given indicative quality. In IE_SE_16G770380 (GLENGRANT_010) the increase in concentration is 0.0025mg/l, raising the baseline concentration to just on the limit of the 75% threshold. The surrogate used is from the EPA Ecological status, set to Good with Low Confidence, additionally, gauged flows are not available, so the catchment flow has been estimated from effective rainfall. Both assumptions give a conservative result, so it can be concluded dosing will not have an impact on this waterbody.

Normally it is assumed that the entire leakage load (following attenuation) enters the main river within a sub-catchment. In the case of estuarine or coastal catchments this is not always appropriate, as part of the basin may be drained by a large number of small, unmonitored, channels leading directly to marine (estuarine or coastal) waters. Where this is the case part of the load is "reapportioned" direct to the receiving transitional or Coastal waterbody.

The catchment of RWB IE_SE_16H020300 (HALFWAY HOUSE STREAM_010) contains a high density of watermain close to the Lower Suir Estuary. However, much of the load in this catchment has been reapportioned to the neighbouring estuary, the area labelled IE_SE_16H020300_1 in Figure 1 below.

Similarly, the river IE_SE_17M060970 (MONLOUM_010) contains a high density of watermain in Tramore and much of the load has been reapportioned to Tramore Bay, see the area labelled IE_SE_17M060970_1 in Figure 1.

Figure 1: Load re-apportionment from the HALFWAY HOUSE STREAM_010 water body (IE_SE_16H020300) and MONLOUM_010 water body (IE_SE_17M060970)

	IE_SE_16S030400 (ST JOHN'S_010) and IE_SE_16S030600 (ST JOHN'S_020) are also located in the Waterford City Centre, with high density of watermains. Load from IE_SE_16S030600 (ST JOHN'S_020) has been reapportioned to the Middle Suir Estuary, labelled ST JOHN'S_020-R1 in Figure 2. The remaining load in IE_SE_16S030600, including load from IE_SE_16S030400 (ST JOHN'S_010), results in an increase in concentration which is just above the level considered as significant; however it is likely to be undetectable against normal background variations.  **Figure 2: Load re-apportionment from the ST JOHN'S_020 water body (IE_SE_16S030600)**
Step 4 - Distributed Inputs to Lake, Transitional And Coastal Water Bodies	**Subsurface Assessment – Receiving Waters** There are 3 lakes in the WSZ, however no loading due to orthophosphate dosing is assumed in these water bodies from leakage or DWWTS as there are in the headwaters, remote from these pressures and do not have any inputting water bodies. Predicted increases in concentrations to transitional and coastal waterbodies all have undetectable impact (0.0000 mg/l) except in IE_SE_120_0000 (Tramore Back Strand), IE_SE_100_0550 (Middle Suir Estuary), IE_SE_100_0500 (Lower Suir Estuary (Little Island – Cheekpoint)), and IE_SE_100_0000 (Waterford Harbour) that have insignificant impacts (at most 0.0005 mg/). The impact is low due to the flows calculated from the tidal prism for these waterbodies.
Step 5 and 6 - Combined Inputs to Groundwater Bodies	**Groundwater Bodies as receptors connected to WSZ** The predicted increases in concentrations to some groundwater bodies (GWBs) are significant due to the susceptibility and hydrological conditions in general as shown in Table 8. In most cases, however, the increase in concentrations is low due to high flows and no significant impact from orthophosphate dosing is seen on the groundwater bodies. For IE_SE_G_146, Tramore, the baseline concentration for one monitoring point is just over the Poor lower threshold. However modelled increase in concentration is below 5% of the Good / Poor threshold boundary (0.00175mg/l) and not significant.

For IE_SE_G_149, Waterford, the baseline concentration is at Good OP indicative quality. The modelled increase in OP concentration is significant, but the increase does not cause the resulting baseline concentration to rise above 75% of the Good / Poor threshold.

Table 8: 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 given in italic]*	Baseline Ortho P Conc. mg/l *[Surrogate Conc. given in italic]*	75% of indicative quality upper threshold mg/l	Ortho P load to GW 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_SE_G_030 Carrick-on Suir	Good Upwards Far	0.035	0.026	1.5	0.0000	0.035	
IE_SE_G_057 Dunmore East	*Good*	0.018	0.026	16.3	0.0016	0.019	
IE_SE_G_146 Tramore	Poor Upwards Near	0.037	0.051	31.9	0.0006	0.038	MP1
	Good Upwards Far	0.018	0.026			0.019	MP2
IE_SE_G_149 Waterford	Good Upwards Far	0.008	0.026	130.3	0.0026	0.010	
IE_SE_G_155 Mullinavat	Good Upwards Far	0.019	0.026	0.1	0.0000	0.019	
IE_SE_G_175 Kilbarry Landfill Waste Facility (W0018-01)	*Good*	*0.018*	0.026	7.4	0.0173	0.0348	†
IE_SE_G_176 Ibrook Industrial Facility (P0157-02)	*Good*	*0.018*	0.026	3.5	0.0139	0.0314	†
IE_SE_G_179 Galco Ltd Industrial Facility (P0385-01)	*Good*	*0.018*	0.026	6.3	0.0670	0.0845	†

MP: multiple Monitoring Points given for waterbody

† Surrogate status and baseline assigned from Groundwater Status analysis (see text)

	Waterford GWB also encloses three GWBs nominated as industrial or waste facilities delineated to focus on these industrial pressures and to ensure that the entire groundwater body beyond the contaminant plume was not classified as Poor. IE_SE_G_175 (Kilbarry Landfill Waste Facility), IE_SE_G_176 (Ibrook Industrial Facility) are classified at Poor Overall Groundwater Status due to Poor chemical status, but Orthophosphate is not listed as a Status Failure Reason. IE_SE_G_179 (Galco Ltd Industrial Facility) is at good overall groundwater status. Information reported by the EPA under the further characterisation process suggests that these GWBs were at Good OP indicative status in the WFD Cycle 2. A surrogate status of Good has therefore been assigned to their OP indicative quality. Their small volume and the relatively small loading from leakage of dosed water into these GWB's results in large increases in OP concentration, highlighted in Table 8. However, due to their low groundwater flows and limited contributing loads to surface waters they will not have a significant effect on the wider environment. As a result, as shown in Table 9, the surface water bodies with which these GWBs interact (St John's_010, St Johns_020 and Glengrant_010) will not be significantly impacted and WFD objectives will not be put at risk as a result of the orthophosphate dosing. It is therefore concluded that the appropriate RAG status for these GWBs are GREEN.

Step 5 and 6 - Combined Inputs to River Water Bodies

Table 9: 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 indicative quality / Ecological status of upstream/downstream 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 Year Conc. mg/l *[Surrogate Conc. given in italic]*	75% of indicative quality upper threshold mg/l	Cumulative Ortho P load to SW from leakage & DWWTS kg/yr	Conc. using flows (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SE_16B020500 BLACKWATER (KILMACOW)_050	Good Downwards Far	0.031	0.033	0.7	0.0000	0.031	
IE_SE_16B080100 Ballymoat (Stream)_010	*Moderate*	*0.046*	*0.051*	*8.3*	*0.0007*	*0.047*	
IE_SE_16F150440 FAITHLEGG_010	*Moderate*	*0.046*	*0.051*	*6.0*	*0.0011*	*0.047*	
IE_SE_16G770380 GLENGRANT_010	*Good*	*0.030*	*0.033*	*21.9*	*0.0025*	*0.033*	^
IE_SE_16H020300 HALFWAY HOUSE STREAM_010	Moderate None Far	0.037	0.051	9.7	0.0009	0.038	^†
IE_SE_16L680750 Luffany_010	*Moderate*	*0.046*	*0.051*	*5.8*	*0.0005*	*0.046*	
IE_SE_16S030400 ST JOHN'S_010	*Poor*	*0.077*	*0.087*	*8.4*	*0.0023*	*0.079*	#
IE_SE_16S030600 ST JOHN'S_020	*Poor*	*0.077*	*0.087*	*70.5*	*0.0018*	*0.078*	#

IE_SE_17B290990 BALLYGUNNERMORE_010	*Moderate*	*0.046*	*0.051*	*23.7*	*0.0013*	*0.047*	
IE_SE_17B400790 BALLYMABIN_010	*Moderate*	*0.046*	*0.051*	*5.9*	*0.0007*	*0.046*	^
IE_SE_17F070820 FENNOR_NORTH_010	*Good*	*0.030*	*0.033*	*6.2*	*0.0012*	*0.031*	
IE_SE_17K210690 COOLTEGIN_010	*Good*	*0.030*	*0.033*	*13.8*	*0.0013*	*0.031*	
IE_SE_17K410990 KNOCKACURRIN_010	*Poor*	*0.077*	*0.087*	*6.7*	*0.0012*	*0.078*	^
IE_SE_17L010300 LEPERSTOWN STREAM_010	*Poor*	*0.077*	*0.087*	*0.7*	*0.0002*	*0.077*	^
IE_SE_17M060970 MONLOUM_010	*Moderate*	*0.046*	*0.051*	*20.9*	*0.0023*	*0.048*	†
IE_SE_16D040300 DAWN_010	High Far	0.015	0.019	3.4	0.0001	0.016	
IE_SE_16D040500 DAWN_020	High Near	0.024	0.019	6.0	0.0002	0.024	
IE_SE_16D290570 DARRIGAL_010	*Good*	*0.030*	*0.033*	*0.8*	*0.0001*	*0.030*	
IE_SE_16W010400 WHELAN'S BRIDGE STREAM_010	Good Far	0.029	0.033	8.3	0.0005	0.029	

^ Effective Rainfall used to calculate concentration
† Reapportionment of loads to estuaries undertaken
# Assigned from EPA Ecological status as no recent monitoring data available

Step 5 and 6 - Combined Impact on SW Receptor Assessment – Receiving Water Bodies

Table 10: 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 indicative quality / Ecological status of upstream/downstream 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 indicative quality upper threshold mg/l	Cumulative Ortho P load to SW from leakage & DWWTS kg/yr	Conc. using flows (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SE_100_0600 Upper Suir Estuary	High (S) None Far	0.006	0.019	48.1	0.0000	0.006	ǂ
	High (W) None Near	0.023	0.019			0.023	
IE_SE_100_0550 Middle Suir Estuary	High (S) Upwards Near	0.029	0.023	1029.0	0.0004	0.029	‡
	Good (W) Downwards Far	0.037	0.053			0.037	

IE_SE_100_0500 Lower Suir Estuary (Little Island - Cheekpoint)	High (S) Upwards Near	0.026	0.023	1055.4	0.0004	0.027	‡ *
	Good (W) Downwards Near	0.053	0.053			0.053	
IE_SE_100_0100 Barrow Suir Nore Estuary	High (S) Upwards Far	0.019	0.020	1092.9	0.0002	0.019	‡
	Good (W) None Far	0.045	0.042			0.046	
IE_SE_120_0000 Tramore Back Strand	*High*	*0.013*	*0.019*	*234.1*	*0.0004*	*0.013*	ǂ
IE_SE_110_0000 Tramore Bay	*Good*	*0.033*	*0.036*	*234.1*	*0.0001*	*0.033*	ǂ
IE_SE_100_0000 Waterford Harbour	High (S) Downwards Far	0.005	0.019	1329.6	0.0002	0.006	‡
	High (W) Downwards Far	0.020	0.019			0.020	
IE_SE_050_0000 Eastern Celtic Sea (HAs 13;17)	*Good*	*0.033*	*0.036*	*1380.3*	*0.0000*	*0.033*	‡

‡ Load from WWTP / SWO following treatment added
† Upper Threshold adjusted to 0.030 mg/l as Median salinity <17 PSU
(S) = Summer monitoring period, (W) = Winter monitoring period

Combined Assessment

Table 9 gives the loads and modelled increase in concentrations for the combined assessment to rivers. The appropriate reapportionment of loads directly to the marine water bodies from coastal river basins has reduced the load from subsurface pathways so that none of the RWBs are at risk of deterioration in indicative quality.

For the transitional WBs shown in Table 10, the predicted increase in concentrations have been calculated using flows from the tidal prism. Some of the baseline concentrations following dosing are predicted to exceed the relevant Ortho P indicative quality upper threshold (adjusted for salinity as required) but in all cases the original baseline concentration is already above 75% of the relevant threshold and the predicted increase in concentration is below 5% of the Good / High boundary (0.00125 mg/l), so below significant levels.

Summary and Mitigation Proposed

The breakdown of loads from source to pathway is depicted in Figure 3 and the fate of P loads from East Waterford Regional is shown in Figure 4.

Considering Adamstown WTP in isolation, orthophosphate dosing is predicted to have an insignificant impact on the receiving surface waterbodies. The modelled increases in load and concentrations to both groundwater and surface water receptors is insignificant, except in the following cases.

- Some small groundwater bodies (GWB) have a Poor chemical groundwater status, however these GWB were delineated due to specific industrial pressures and not due to orthophosphate pressures and the characterisation process has established that they are at Good orthophosphate indicative quality. The small additional loads from the dosing to these groundwater bodies will not increase the risk to the achievement of the WFD objectives in these water bodies or the associated surface water bodies.

The cumulative impacts on Colligan-Mahon (HA 17) and Suir Catchment (HA 16) associated with phosphate dosing from following additional WTPs plus loads impacting on the Ballyteigue-Bannow (HA 13), Barrow (HA 14), Nore (HA 15) catchments are summarised in Table 11 below:

- 021 Rossadrehid WTP - Galtee Regional (2900PUB0130)
- 041 Glenary WTP – Glenary (2000PUB1009)
- 047 Goatenbridge WTP - Ardfinnan Regional (2900PUB0102)
- 098 Mooncoin WTP - Mooncoin Regional WS 1012 (1500PUB1012)
- 115 Springmount Pump Station - Springmount Source (2900PUB_TEMP_002)
- 138 Thurles WTP [Thurles (ZONE 1)] (2800PUB1012)
- 177 Linguan WTP - Carrick-on-Suir [Linguan River] (2900PUB0108)
- 190 Ironmills Pump Station – Ironmills (2900PUB0146)
- 399 Portlaw WTP – Portlaw (3100PUB1081)

Table 11: Cumulative assessment of the increased loading and concentrations to water bodies impacted by 010 East Waterford Regional - Adamstown and other WSZs proposed for corrective water treatment in the upstream catchments ***(note: where existing monitoring data is not available, a surrogate indicative quality is derived from ecological status of the WB or Ortho P indicative quality / ecological status of upstream and downstream WBS, the mid-range of that indicative quality is used as Baseline Concentration)***

NAME / EU_CD	Ortho P Indicative Quality and Trends (distance to threshold) [*Surrogate indicative quality given in italic*]	Baseline Conc. mg/l [*Surrogate Conc. given in italic*]	75% of 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	Notes
IE_SE_16B020500 BLACKWATER (KILMACOW)_050	Good Downwards Far	0.031	0.033	19.9	0.0002	0.031	
IE_SE_16L680750 Luffany_010	*Moderate*	*0.046*	*0.051*	*8.5*	*0.0008*	*0.046*	

IE_SE_100_0600 Upper Suir Estuary	High (S) None Far	0.006	0.019	535.9	0.0002	0.006	‡	
	High (W) None Near	0.023	0.019			0.023	‡	
IE_SE_100_0550 Middle Suir Estuary	High (S) Upwards Near	0.029	0.023	2618.7	0.0010	0.030	‡	
	Good (W) Downwards Far	0.037	0.053			0.038	‡	
IE_SE_100_0500 Lower Suir Estuary (Little Island - Cheekpoint)	High (S) Upwards Far	0.026	0.023	2647.8	0.0010	0.032	‡*	‡
	Good (W) Downwards Near	0.053	0.053			0.033	‡	
IE_SE_100_0100 Barrow Suir Nore Estuary	High (S) Upwards Far	0.019	0.020	3752.2	0.0004	0.020	‡	‡
	Good (W) None Far	0.045	0.042			0.046	‡	
IE_SE_100_0000 Waterford Harbour	High (S) Downwards Far	0.005	0.019	3851.9	0.0003	0.006	‡	‡
	High (W) Downwards Far	0.020	0.019			0.020	‡	
IE_SE_050_0000 Eastern Celtic Sea (HAs 13;17)	*Good*	*0.033*	*0.036*	*4716.3*	*0.0000*	*0.033*	‡	‡

*Trends are statistically significant
‡ Load from WWTP / SWO following treatment added

The cumulative assessment has demonstrated that there will not be significant impact on the receiving waters and the dosing will not cause deterioration in orthophosphate indicative quality or prevent the achievement of the WFD objectives.

MITIGATION OPTIONS - None required

RAG STATUS – Green

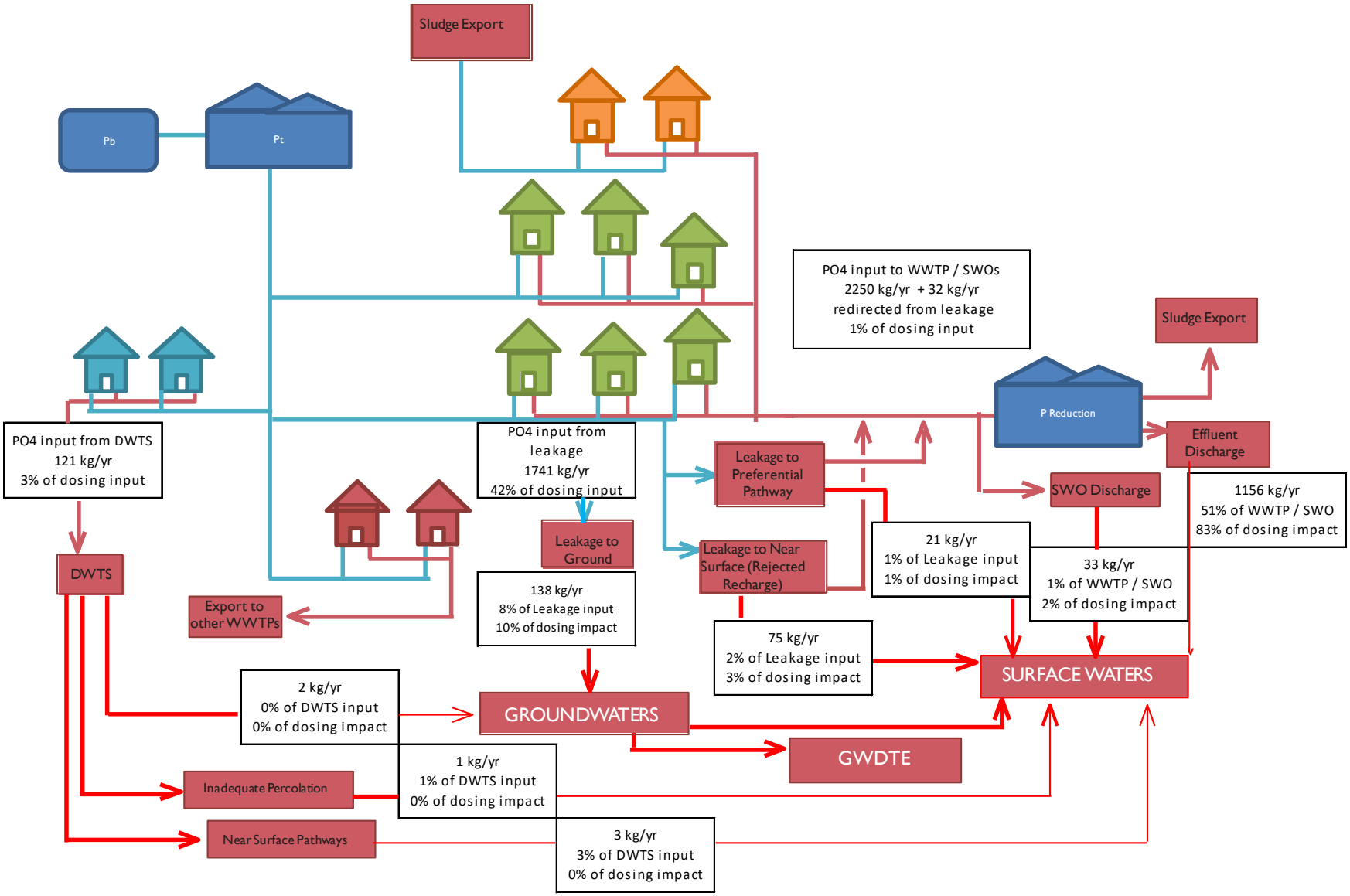
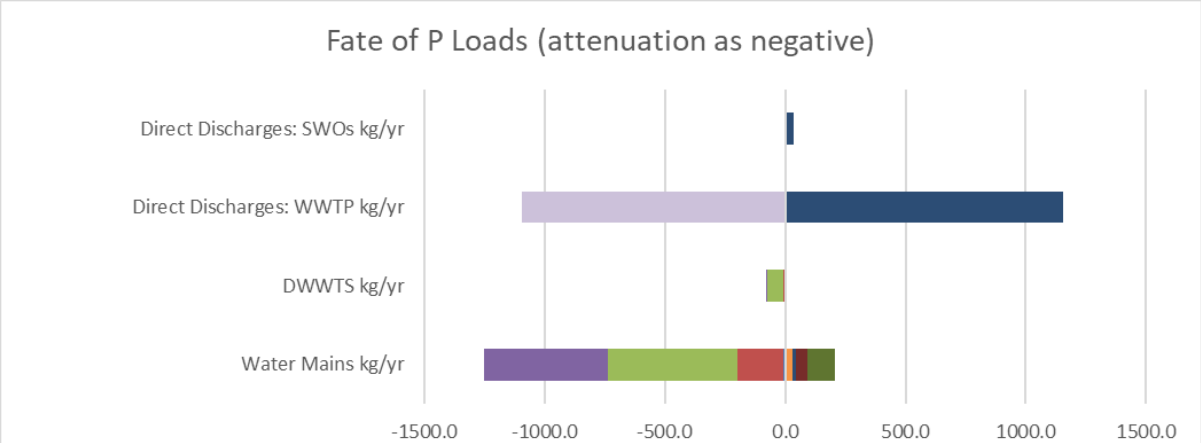


Figure 3 – Source Pathway Receptor model for East Waterford Regional WSZ illustrating key sources and pathways to the Eastern Celtic Sea



	Water Mains kg/yr	DWWTS kg/yr	Direct Discharges: WWTP kg/yr	Direct Discharges: SWOs kg/yr
Load attenuated in Preference (inadequate percolation) pathway	-8.0	-0.8		
Load attenuated in Near Surface Pathway	-192.3	-5.6		
Load attenuated in 1m below trench	-536.5	-68.1		
Load attenuated in Subsurface Pathway	-513.4	-4.0		
Load intercepted by gravity main in Preference Pathway	3.2			
Load intercepted by gravity main in Near Surface Pathway	25.0			
Load reaching SW direct or via Preference (inadequate percolation) Pathway	19.0	0.8	1155.6	33.0
Load reaching SW via Near Surface Pathway	44.0	2.2		
Load reaching SW via Subsurface Pathway	116.7	1.4		
Load treated in WWTP			-1094.2	

Figure 4 – Fate of orthophosphate loads modelled for East Waterford Regional WSZ (impacting on the Eastern Celtic Sea) due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.