Irish Water-Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment

039 Ballinamuck WTP - Dungarvan WSZ (3100PUB1039)

Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment 039 Dungarvan (3100PUB1039) WSZ - Ballinamuck WTP

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GLOSSARY OF TERMS & ABBREVIATIONS

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

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

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

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

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

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

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

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

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

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

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

1 INTRODUCTION

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

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

1.1 PURPOSE OF THIS REPORT

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

1.2 THE PLAN

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

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

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

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

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

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

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

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

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

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

Orthophosphate is added in the form of Phosphoric acid, which is approved for use as a food additive (E338) in dairy, cereals, soft drinks, meat and cheese. The average adult person consumes between 1,000 and 1,500 milligrams (mg) of phosphorus every day as part of the normal diet. The quantity of orthophosphate that IW will be required to add to treated water is between 0.5 mg/l to 1.5 mg/l. At Ballinamuck WTP orthophosphate will be added at a rate of 1.0 mg/ l, with seasonal variation in the proposed dose, as set out in 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 46 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Blackwater River (Cork/Waterford) SAC; Ardmore Head SAC; Helvick Head SAC; Glendine Wood SAC; Comeragh Mountains SAC; Tramore Dunes and Backstrand SAC; River Barrow and River Nore SAC; Hook Head SAC; Bannow Bay SAC; Ballyteigue Burrow SAC; Saltee Islands SAC; Tacumshin Lake SAC; Lady's Island Lake SAC; Carnsore Point SAC; Ballymacoda (Clonpriest and Pillmore) SAC; Lough Hyne Nature Reserve and Environs SAC; Roaringwater Bay and Islands SAC; Barley Cove to Ballyrisode Point SAC; Great Island Channel SAC; Courtmacsherry Estuary SAC; Clonakilty Bay SAC; Kilkeran Lakes and Castlefreke Dunes SAC; Myross Wood SAC; and Castletownshend SAC.

- SPA sites: Blackwater Estuary SPA, Helvick Head to Ballyquin SPA; Dungarvan Harbour SPA; Mid-Waterford Coast SPA; Tramore Back Strand SPA; Bannow Bay SPA; Keeragh Islands SPA; Ballyteigue Burrow SPA; Saltee Islands SPA; Tacumshin Lake SPA; Lady's Island Lake SPA; Ballymacoda Bay SPA; Blackwater Callows SPA; Sovereign Islands SPA; Sheep's Head to Toe Head SPA; Galley Head to Duneen Point SPA; Seven Heads SPA; Ballycotton Bay SPA; Cork Harbour SPA; Old Head of Kinsale SPA; Courtmacsherry Bay SPA; and Clonakilty Bay 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, 2019a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2019b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2019c);
- 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 (Cummins et al., 2019); 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**).

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

2.5.2 Conservation Objectives

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

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

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

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

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

For SACs:

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

For SPAs:

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

Favourable Conservation status of a habitat is achieved when:

- Its natural range, and area it covers within that range, are stable or increasing;
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
- The conservation status of its typical species is "favourable".

Favourable Conservation status of a species is achieved when:

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

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

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

2.5.3 Existing Threats and Pressures to EU Protected Habitats and Species

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

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

3 DESCRIPTION OF THE PROJECT

3.1 OVERVIEW OF THE PROPOSAL

IW is proposing to install orthophosphate treatment at the Ballinamuck WTP in Ballynamuck West, Dungarvan, Co. Waterford. The Ballinamuck WTP supplies Dungarvan town and environs (3100PUB1039) [inclusive of Moores Well (3100PUB1137) and Lacken (3100PUB1149)]. Additional WSZs used to calculate the distribution input include LCB Ballyhane (3100PUB1089) and Monamon (3100PUB1148). The distribution input for Dungarvan WSZ is 5,202 m^3/day (68% of which is accounted for) serving a population of about 7,950, as well as a non-domestic demand of 18%. The area is served by Dungarvan WWTP (D0017-01), which is licensed in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 (as amended) and the potential impact of the orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There are no other WWTPs within this WSZ. There are an estimated 530 properties across the WSZ that are serviced by domestic waste water treatment systems (DWWTS) (see **Appendix C**).

Ballinamuck WTP lies in the vicinity of the Colligan River in the Colligan-Mahon catchment (HA17). The EAM process identified 46 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Blackwater River (Cork/Waterford) SAC; Ardmore Head SAC; Helvick Head SAC; Glendine Wood SAC; Comeragh Mountains SAC; Tramore Dunes and Backstrand SAC; River Barrow and River Nore SAC; Hook Head SAC; Bannow Bay SAC; Ballyteigue Burrow SAC; Saltee Islands SAC; Tacumshin Lake SAC; Lady's Island Lake SAC; Carnsore Point SAC; Ballymacoda (Clonpriest and Pillmore) SAC; Lough Hyne Nature Reserve and Environs SAC; Roaringwater Bay and Islands SAC; Barley Cove to Ballyrisode Point SAC; Great Island Channel SAC; Courtmacsherry Estuary SAC; Clonakilty Bay SAC; Kilkeran Lakes and Castlefreke Dunes SAC; Myross Wood SAC; and Castletownshend SAC.

- SPA sites: Blackwater Estuary SPA, Helvick Head to Ballyquin SPA; Dungarvan Harbour SPA; Mid-Waterford Coast SPA; Tramore Back Strand SPA; Bannow Bay SPA; Keeragh Islands SPA; Ballyteigue Burrow SPA; Saltee Islands SPA; Tacumshin Lake SPA; Lady's Island Lake SPA; Ballymacoda Bay SPA; Blackwater Callows SPA; Sovereign Islands SPA; Sheep's Head to Toe Head SPA; Galley Head to Duneen Point SPA; Seven Heads SPA; Ballycotton Bay SPA; Cork Harbour SPA; Old Head of Kinsale SPA; Courtmacsherry Bay SPA; and Clonakilty Bay SPA.

3.2 CONSTRUCTION OF CORRECTIVE WATER TREATMENT WORKS

The corrective water treatment works at Ballinamuck WTP will involve the provision of orthophosphate dosing and associated safety equipment.

There are two possible locations for the orthophosphate dosing system at Ballinamuck WTP both of which will be located within the confines of the existing Ballinamuck WTP boundary. The surrounding landscape is dominated by agricultural grassland. The location of the works is shown on **Figure 3-1**.

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

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

The bulk storage tanks (2 no. tanks, each with a working volume of 750 l) will sit upon skid mounting. The skid mounting will support the combined weight of the storage tanks, electrical and control equipment and total volume of chemical to be stored on one skid. This is metal frame which will be assembled off site including mounting the tanks and associated equipment and set into position at the Ballinamuck WTP.

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

A stable pH is critical to facilitate effective plumbosolvency control. No pH correction works are proposed for the Ballinamuck WTP. Ballinamuck currently does not have any pH correction infrastructure employed on site as it is a groundwater source. The plant operator has stated that the final water pH is quite stable at 7.2 pH units.

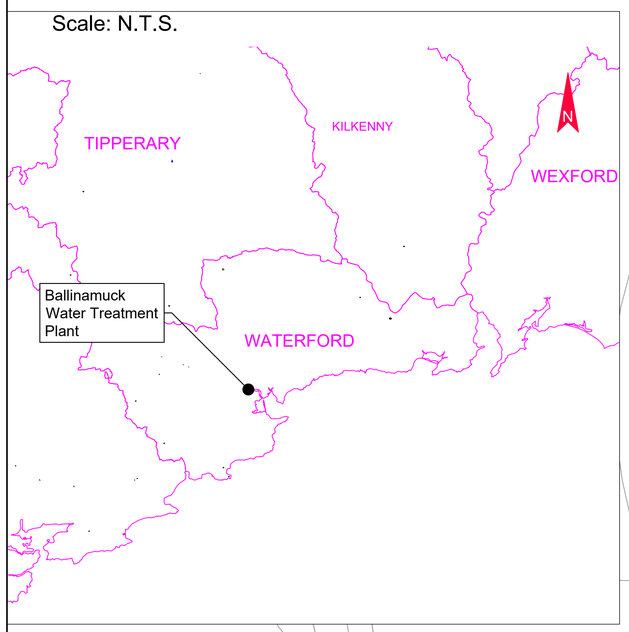
Dosing pipelines, carrier water pipework and electrical cables shall be installed within 100mm diameter ducts, placed in trenches constructed within existing made ground at the Ballinamuck WTP. The ducts will be installed at approximately 700mm below ground level and following installation the trench 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 upon skid mounting to house all electrical and control equipment required for the orthophosphate system. Skid mounting is a metal frame that will be assembled off-site and set into position at the WTP. 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.

CO. WATERFORD

Ballinamuck Water Treatment Plant

Scale: N.T.S.



Lugnagraha

Ford

Groundwater Boreholes x4

Proposed Location of Orthophosphate Dosing Facilities

Dosing Point

SITE BOUNDARY

Distribution to Network

Borehole Control Room

Backup Generator

Cl Kiosk

Fl Kiosk

Cl Day Tank Room

Fl Day Tank Room

8.7

8.6

10.4

15.5

17.3

10m SCALE 1:500

N

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

Client

UISCE ÉIREANN : IRISH WATER

No.	Date	Drn. Chk.	Amendment / Issue	App
F01	AUG 18	JR BL	ISSUED FOR INFORMATION	DC

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

Drawn	JR
Checked	BL
Approved	DC
Date	AUG 18
Scale	1:500 @ A1
	1:1,000 @ A3
Job No.	MDW0766

Project

LEAD MITIGATION PLAN

Figure 3.1 BALLINAMUCK WATER TREATMENT PLANT - SITE LAYOUT

File Ref. MDW0766SK0000 Series.dwg

Drg. No. SK0039 WTP

Rev. F01

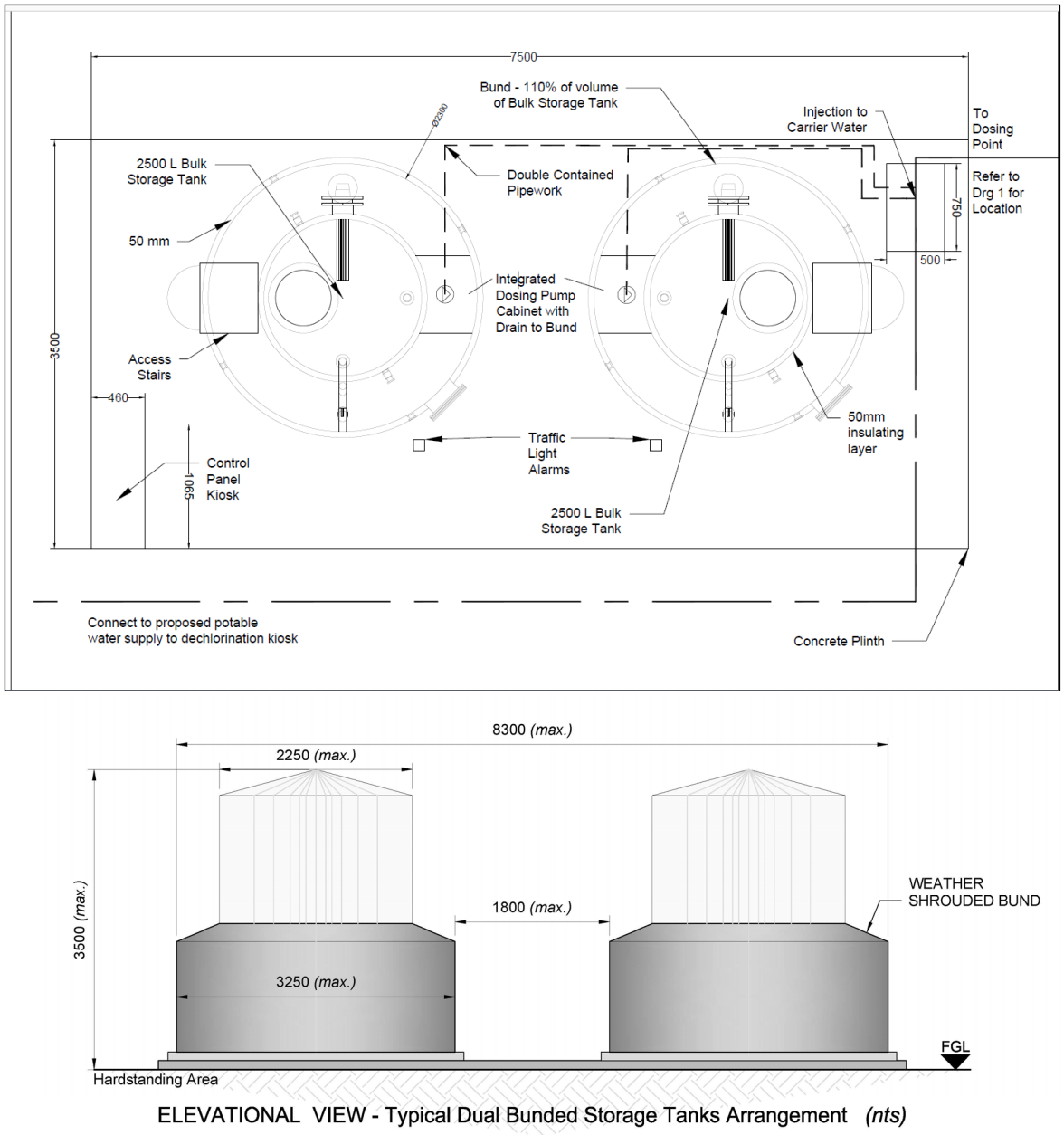


Figure 3-2: Plan and Elevation Drawings of a Typical Orthophosphate Dosing Unit.

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 Ballinamuck 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.

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 Ballinamuck WTP, orthophosphate will be added to treated water at a rate of 1.0 mg/l. The onsite storage tanks have been designed to provide 60 days of storage so it is anticipated that deliveries will be approximately once every two months. All deliveries will be via existing access roads within the boundary of the WTP.

3.5 LDWMP APPROACH TO ASSESSMENT

3.5.1 Work Flow Process

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

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

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

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

Depending on the potential impacts identified, appropriate measures may be built into the project proposal, as part of an iterative process to avoid / reduce those potential impacts for the orthophosphate treatment being proposed. Project measures adopted within the overall design proposal may include selected placement of the orthophosphate treatment point within the WSZ; enhanced wastewater treatment (to potentially remove equivalent phosphorus levels related to the orthophosphate treatment at the WTP); reduced treatment rate; and water network leakage control. The EAM will be the basis of the decision support matrix to inform any programmes developed as part of the LDWMP. Further detail on the model is presented in **Section 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.

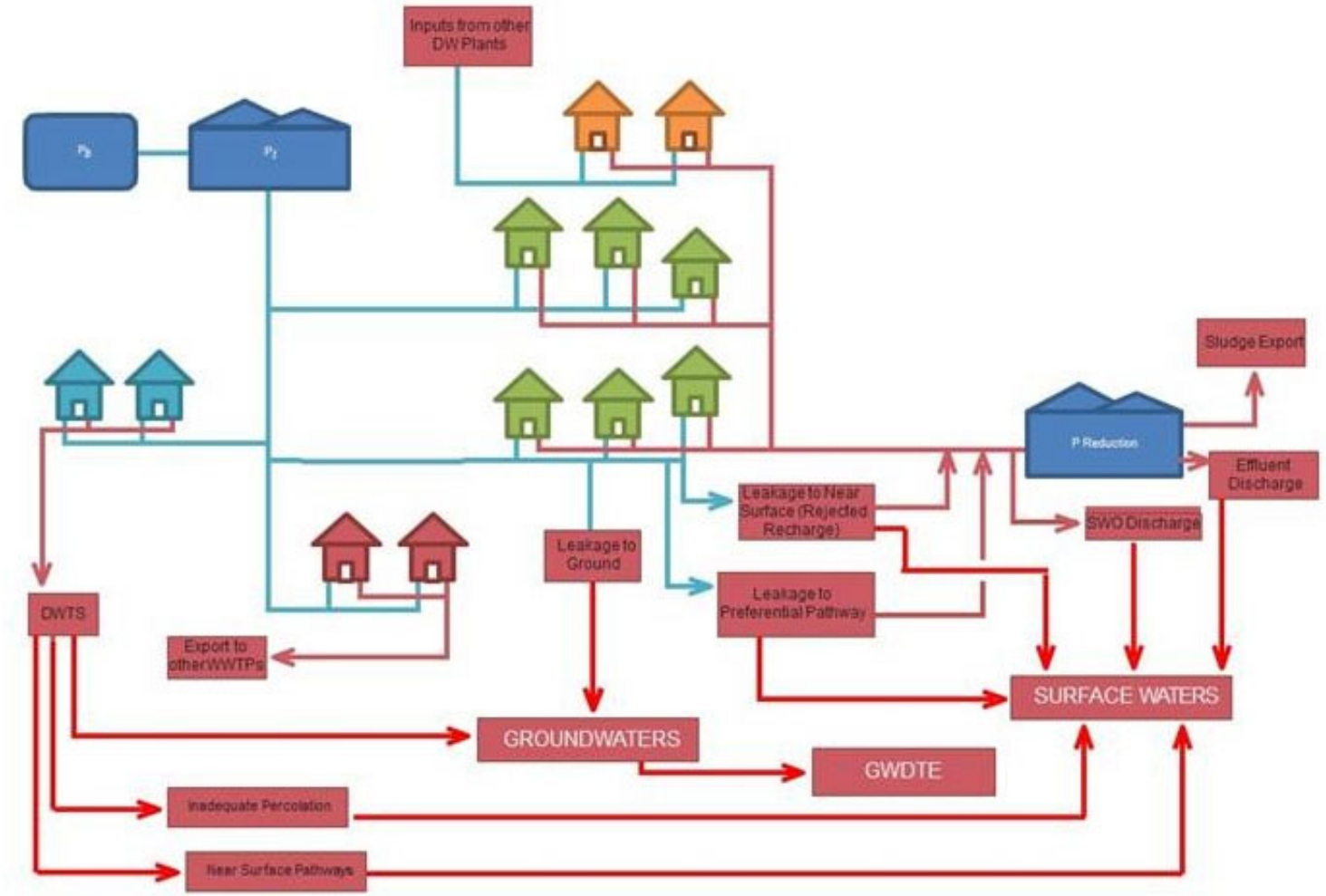


Figure 3-3: Conceptual Model of P Transfer

(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.)

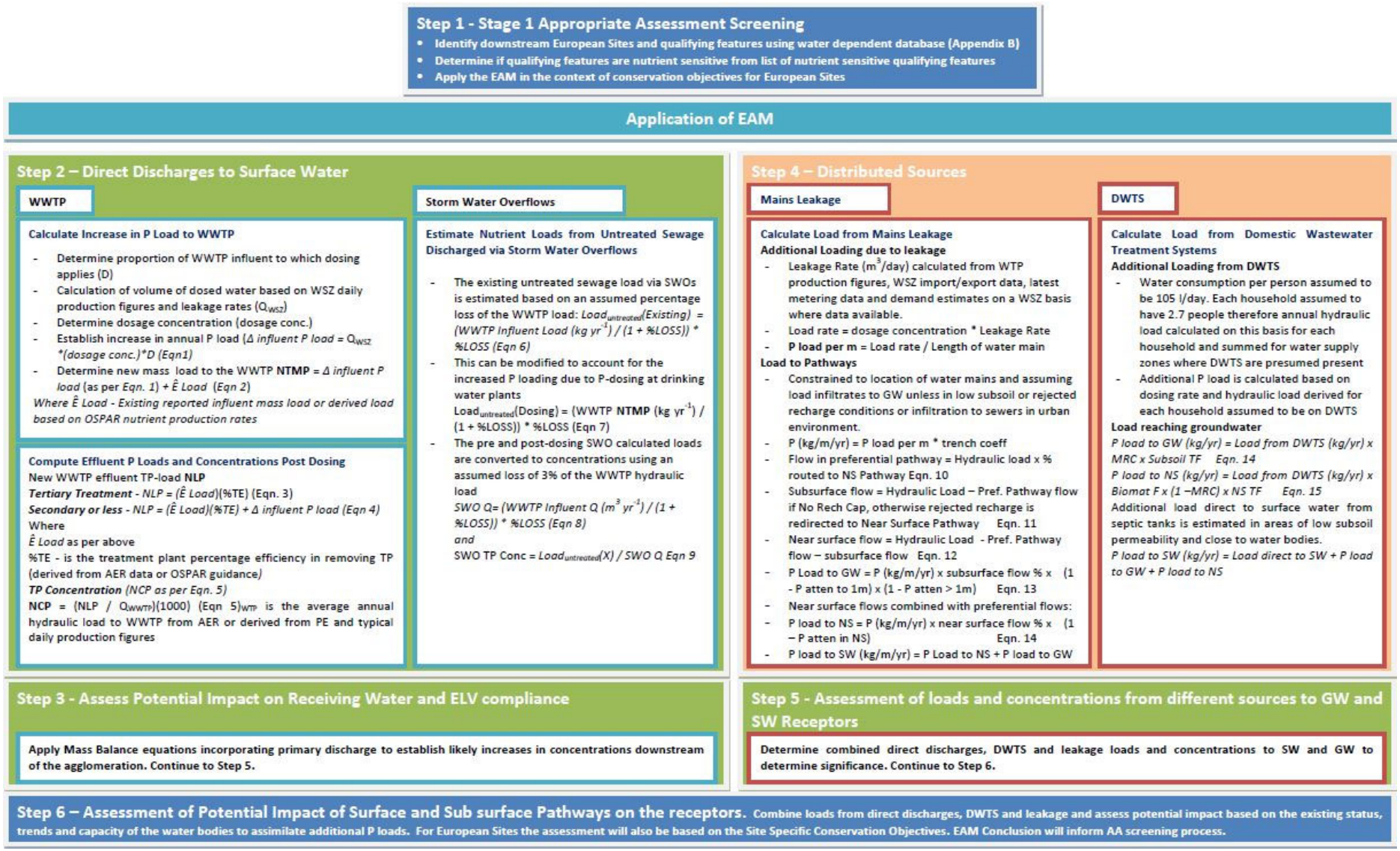


Figure 3-4: Stepwise Approach to the Environmental Assessment Methodology

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 Ballinamuck 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 Ballinamuck WTP followed by a review of hydrological and hydrogeological connectivity between the proposed development site and European Sites. The European Sites within ZoI for the construction phase of the project are listed in **Table 4-1** and displayed in **Figure 4-1.**

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

	Site Name	SAC / SPA Code	Direct Impact	Water Dependent Species / Habitats	Surface Water Connectivity	Groundwater Connectivity[4,5]	Potential Source Pathway Receptor
1	Helvick Head SAC	SAC 000665	No	Yes	Yes (Colligan River, Colligan Estuary, Dungarvan Harbour, Eastern Celtic Sea)	No	Yes
2	Helvick Head to Ballyquin SPA	SPA 004192	No	Yes	Yes (Colligan River, Colligan Estuary, Dungarvan Harbour, Eastern Celtic Sea)	No	Yes
3	Dungarvan Harbour SPA	SPA 004032	No	Yes	Yes (Colligan River, Colligan Estuary)	Yes (Dungarvan)	Yes
4	Glendine Wood SAC	SAC 002324	No	No	No	Yes (Dungarvan)	No

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 Ballinamuck WTP and associated WSZs (Dungarvan, Moores Well, Lacken, LCB Ballyhane and Monamon) and European Sites.

[4] Ballinamuck WTP overlies the Dungarvan (IE_SH_G_052) groundwater body. All European Sites overlying or supporting connectivity to this groundwater body have been assessed to determine potential source pathway receptors. This groundwater body is a regionally important karstified aquifer and flow is generally unconfined. Significant quantities of groundwater from the limestones of the Lismore-Dungarvan syncline are believed to discharge into the Blackwater, Brickey and Lower Finisk and Colligan rivers in addition to Dungarvan Harbour. As a result for European site 4, any groundwater flow will be to the Colligan River and Colligan Estuary, both of which lie between the WTP and Glendine Wood SAC and any potential groundwater flow from the WTP site will join the surface water pathway as discussed.

[5] Dungarvan Groundwater Body: Summary of Initial Characterisation

The ZoI was therefore defined by the surface and groundwater bodies that are hydrologically and hydrogeologically connected with the Project.

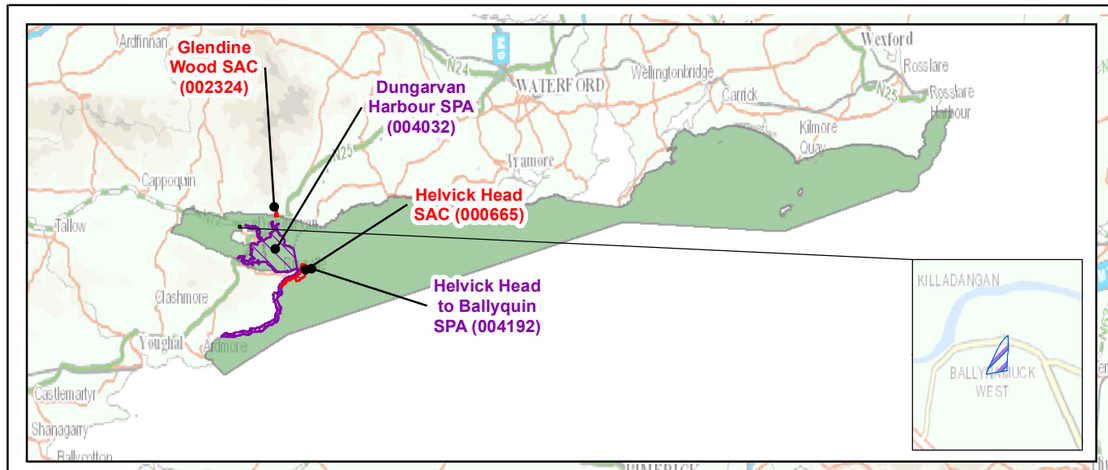
In the EAM, all waterbodies linked to the WSZ have been identified. Downstream waterbodies to the estuary and coastal waterbodies have also been identified. Groundwater bodies intersecting the WSZs are also included in the ZoI. Hydrogeological linkages in karst areas have also been taken into account. 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 / Habitat	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
Blackwater River (Cork/ Waterford) SAC	SAC 002170	Yes	Yes	Yes – RWBs Moneygorm, Finisk	Yes (Lismore, Cappoquin Kiltorcan, Knockmealdown)	Yes
Ardmore Head SAC	SAC 002123	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Helvick Head SAC	SAC 000665	Yes	Yes	Yes – CWBs Dungarvan Harbour & Eastern Celtic Sea	No	Yes
Glendine Wood SAC	SAC 002324	Yes	Yes	Yes – Colligan Estuary & Dungarvan Harbour	Yes (Dungarvan, Ballyknock, Kilrion)	Yes
Comeragh Mountains SAC	SAC 001952	Yes	Yes	Yes – RWBs Araglin (Colligan) & Colligan	Yes (Kilrion)	Yes
Tramore Dunes and Back Strand SAC	SAC 000671	Yes	Yes	Yes – CWB Eastern Celtic Sea & Tramore Bay	No	Yes
River Barrow and River Nore SAC	SAC 002162	Yes	Yes	Yes – CWB Eastern Celtic Sea & Waterford Harbour	No	Yes
Hook Head SAC	SAC 000764	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Bannow Bay SAC	SAC 000697	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Ballyteigue Burrow SAC	SAC 000696	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Saltee Islands SAC	SAC 000707	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Tacumshin Lake SAC	SAC 000709	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Lady's Island Lake SAC	SAC 000704	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Carnsore Point SAC	SAC 002269	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes

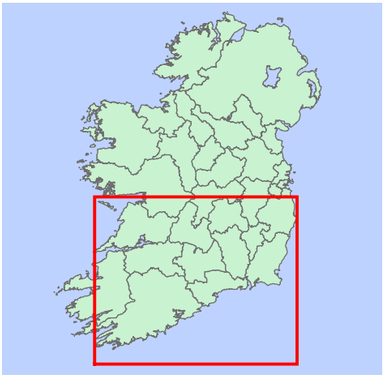
Site Name	SAC / SPA Code	Water Dependent Species / Habitat	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
Ballymacoda (Clonpriest and Pillmore) SAC	SAC 000077	Yes	Yes	Yes – CWB Youghal Bay	No	Yes
Lough Hyne Nature Reserve & Environs SAC	SAC 000097	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
Roaringwater Bay and Islands SAC	SAC 000101	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
Barley Cove to Ballyrisode Point SAC	SAC 001040	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
Great Island Channel SAC	SAC 001058	Yes	Yes	Yes – CWBs Western Celtic Sea, Outer Cork Harbour, Cork Harbour	No	Yes
Courtmacsherry Estuary SAC	SAC 001230	Yes	Yes	Yes – CWBs Western Celtic Sea, Courtmacsherry Bay	No	Yes
Clonakilty Bay SAC	SAC 000091	Yes	Yes	Yes – CWBs Western Celtic Sea, Clonakilty Bay	No	Yes
Kilkeran Lake and Castlefreke Dunes SAC	SAC 001061	Yes	Yes	Yes – CWBs Western Celtic Sea, Roscarberry Bay	No	Yes
Myross Wood SAC	SAC 001070	Yes	Yes	Yes – CWBs Western Celtic Sea, Roscarberry Bay	No	Yes
Castletownshend SAC	001547	Yes	Yes	Yes – CWBs Western Celtic Sea, Roscarberry Bay	No	Yes
Blackwater Estuary SPA	SPA 004028	Yes	Yes	Yes – Lower Blackwater Estuary / Youghal Harbour	No	Yes
Helvick Head to Ballyquin SPA	SPA 004192	Yes	Yes	Yes – CWBs Dungarvan Harbour, Eastern Celtic Sea	No	Yes
Dungarvan Harbour SPA	SPA 004032	Yes	Yes	Yes – CWBs Dungarvan Harbour & Eastern Celtic Sea, TWBs Colligan Estuary, Brickey Estuary	Yes (Dungarvan, Industrial Facility, Waste Facility)	Yes
Mid Waterford Coast SPA	SPA 004193	Yes	Yes	Yes – CWB Eastern Celtic Sea	Yes (Kilrion)	Yes
Tramore Back Strand SPA	SPA 004027	Yes	Yes	Yes – CWB Eastern Celtic Sea & Tramore Bay	No	Yes

Site Name	SAC / SPA Code	Water Dependent Species / Habitat	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
Bannow Bay SPA	SPA 004033	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Keeragh Islands SPA	SPA 004118	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Ballyteigue Burrow SPA	SPA 004020	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Saltee Islands SPA	SPA 004002	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Tacumshin Lake SPA	SPA 004092	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Lady's Island Lake SPA	SPA 004009	Yes	Yes	Yes – CWB Eastern Celtic Sea	No	Yes
Ballymacoda Bay SPA	SPA 004023	Yes	Yes	Yes – TWB Blackwater Est., CWB Youghal Bay	No	Yes
Blackwater Callows SPA	SPA 004094	Yes	Yes	Yes – RWB Blackwater River, TWB Blackwater Est. (Upper & Lower)	Yes (Lismore)	Yes
Sovereign Islands SPA	SPA 004124	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
Sheep's Head to Toe Head SPA	SPA 004156	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
Galley Head to Duneen Point SPA	SPA 004190	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
Seven Heads SPA	SPA 004191	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
Ballycotton Bay SPA	SPA 004022	Yes	Yes	Yes – CWBs Western Celtic Sea, Ballycotton Bay	No	Yes
Cork Harbour SPA	SPA 004030	Yes	Yes	Yes – CWBs Western Celtic Sea, Outer Cork Harbour, Cork Harbour	No	Yes
Old Head of Kinsale SPA	SPA 004021	Yes	Yes	Yes – CWB Western Celtic Sea	No	Yes
Courtmacsherry Bay SPA	SPA 004219	Yes	Yes	Yes – CWBs Western Celtic Sea, Courtmacsherry Bay	No	Yes
Clonakilty Bay SPA	SPA 004081	Yes	Yes	Yes – CWBs Western Celtic Sea. Clonakilty Bay	No	Yes



Zone of Influence (ZoI) for Construction Phase

Zone of Influence (ZoI) for Operational Phase



Legend

LEMA Emission Type

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

Data Source:
Irish Water
NPWS (Jan. 2019)
EPA

N

0 5 10 20 Kilometres

Client: UISCE ÉIREANN : IRISH WATER

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Dungarvan WSZ

European Sites within the ZoI of the Proposed Project

RPS

Scale: 1:800,000 @ A3	Date: 07/06/2019
File Ref: MDW0766Arc0018aF01	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 at this stage of the assessment those sites included for further assessment, are detailed in **Table 4-3** and are displayed in **Figure 4-2**. Three sites are included for further assessment for the construction phase and two sites for the operational phase, with justification provided below.

The construction phase of the proposed project will take place within the confines of the existing Ballinamuck WTP. There is potential for surface water connectivity to Helvick Head SAC, Helvick Head to Ballyquin SPA and Dungarvan Harbour SPA. The WTP is located within the Dungarvan groundwater body (IE_SE_G_052) and there is potential hydrogeological connectivity between the proposed development site and Dungarvan Harbour SPA.

For the operational phase, the WSZ lies upstream of Dungarvan Harbour SPA. Due to surface water connectivity via the Brickey_020, Colligan_040, Colligan Estuary and Dungarvan Harbour, there is potential for impact due to dosing at Ballinamuck WTP, therefore the SPA has been included for further assessment. In addition, a significant area of the IE_SE_G_052 Dungarvan groundwater body is intersected by the Dungarvan WSZ. The IE_SE_G_055 Industrial Facility (P0156-01) groundwater body also intersects the centre of the Dungarvan WSZ and also Dungarvan Harbour SPA. The Dungarvan SPA is also directly adjacent to the IE_SE_G_178 Waste Facility (W0032-02). Due to surface water and groundwater connectivity, this site was included for further assessment in Section 5 and Section 6.

The Blackwater River (Cork/Waterford) SAC intersects the groundwater bodies IE_SE_G_047 Knockmealdown, IE_SE_G_050 Lismore and IE_SW_G_025 Cappoquin Kiltorcan. Given that the WSZ lies upstream of the Blackwater River (Cork/Waterford) SAC, there is therefore potential for impact due to surface water and groundwater pathways. On this basis, the Blackwater River (Cork/Waterford) SAC was included for further assessment in Section 5 and Section 6.

The Comeragh Mountains SAC is connected to the Dungarvan WSZ via the Colligan River (Colligan_010 at the headwaters down to Colligan_040 where it intersects the WSZ). However the SAC lies upstream of the WSZ. A groundwater pathway exists via IE_SE_G_085 Kilrion. However, the extent to which the Kilrion groundwater body is intersected by the WSZ is very small. In addition, the EAM results show that the potential increase in orthophosphate as a result of dosing at Ballinamuck WTP to the groundwater body is undetectable (0.0000 mg/l) (see **Table 5-2** below), there is therefore no risk to the indicative quality of this groundwater body and by extension, the Comeragh Mountains SAC. On this basis, this site is excluded from further assessment.

The Blackwater Callows SPA is connected to the Moores Well, Lacken, LCB Ballyhane and Monamon WSZs via the Upper Blackwater M Estuary. However the SPA lies upstream of the WSZs which are hydrologically connected to the estuary below the SPA via the Moneygorm_010 and the Finisk_030. A groundwater pathway exists via two groundwater bodies, IE_SW_G_050 Lismore and IE_SW_G_025 Cappoquin Kiltorcan. The Lismore groundwater body almost entirely encompasses the SPA, while the extent to which the Cappoquin Kiltorcan groundwater body is intersected by the WSZs is very small. In addition, the EAM results show that the potential increase in orthophosphate as a result of dosing at Ballinamuck WTP to the groundwater bodies is undetectable (0.0000 mg/l) for Lismore and 0.0001 mg/l for Cappoquin Kiltorcan (see **Table 5-2** below), there is therefore no risk to the indicative quality

classification of these groundwater bodies and by extension, the Blackwater Callows SPA. On this basis, this site is excluded from further assessment.

The Dungarvan WSZ intersects five groundwater bodies – IE_SE_G_085 Kilrion, IE_SE_G_014 Ballyknock, IE_SE_G_052 Dungarvan, IE_SE_G_055 Industrial Facility (P0156-01) and IE_SE_G_178 Waste Facility (W0032-02). The Moores Well and Lacken WSZs intersect three groundwater bodies – IE_SW_G_050 Lismore, IE_SW_G_025 Cappoquin Kiltorcan and IE_SW_G_047 Knockmealdown (**Table 3**, **Appendix C**). For European Sites which are hydrogeologically connected (via groundwater) to the WSZs an assessment was made on the direction of flow in the groundwater body forming the connection. Groundwater flows through voids such as connected pore spaces in sand and gravel aquifers and through fissures, faults, joints and bedding planes in bedrock aquifers. Regional groundwater flows tend to follow the regional topography and generally discharge towards main surface water bodies including rivers, lakes and coastal water bodies. In areas of karstified limestones, high permeability zones give rise to rapid groundwater velocities with more complex flow directions, which may vary seasonally and are difficult to predict with certainty. In this case, the assumption is that groundwater flow direction is from areas of higher elevations to lower elevations, unless groundwater specific information indicates otherwise. Groundwater body specific information relating to flow and discharge is available from the GSI[6], and was consulted in making the assessment.

Mid-Waterford Coast SPA does not intersect the WSZ, and is indirectly connected to the proposed works via the IE_SE_G_085 Kilrion and the Eastern Celtic Sea coastal water body. IE_SE_G_085 Kilrion groundwater body shows an undetectable increase (0.0000 mg/l) in potential orthophosphate due to dosing while the Eastern Celtic Sea coastal water body is located beyond the ZoI boundary; therefore there will be no impact on the indicative quality of these water bodies which are good and high respectively, and by extension, the Mid-Waterford Coast SPA. On this basis, this site excluded from further assessment.

The Glendine Wood SAC does not intersect the WSZ. There is a surface water connection between the WSZ and the SAC via Dungarvan Harbour, Colligan Estuary and Deelish Stream_010; however the SAC lies upstream of these water bodies. It is also indirectly connected to the proposed works via the IE_SE_G_085 Kilrion groundwater body. This waterbody shows an undetectable increase (0.0000 mg/l) in potential orthophosphate due to dosing; therefore there will be no impact on the indicative quality of this waterbody which is good, and by extension, the Glendine Wood SAC. The Glendine Wood SAC is also intersected by the groundwater body IE_SE_G_014 Ballyknock. The EAM results show that the potential increase in orthophosphate as a result of dosing at Ballinamuck WTP to the Ballyknock groundwater body is low (0.0003 mg/l). Ballyknock is a regionally important fracture aquifer[7]. Groundwater flow paths are concentrated along fractures and joints in the rock and influenced by topography. The general groundwater flow direction is therefore south towards the valley. It is considered to be closely linked with surface water features (expected in a steep area where the river is incising into the rock). It must also be considered that the groundwater will discharge to the rivers since the Ballysteen limestone is a barrier to groundwater flow. As this groundwater body forms a narrow band to the south of the SAC and the surface water bodies flow away from the SAC towards the coast, it is considered that there will be no impact to the Glendine Wood SAC as flow is downstream.

A significant area of the IE_SE_G_052 Dungarvan is intersected by the Dungarvan WSZ. Glendine Woods SAC also intersects the groundwater body IE_SE_G_052 Dungarvan which has an estimated

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

post-dosing concentration of 0.0003 mg/l. The Dungarvan GWB is a regionally important karstified aquifer[8]. The groundwater gradient is flatter in the more permeable limestone and flow direction in the vicinity of Ballynamuck is eastward towards the sea. A groundwater divide is present to the west of the public supply well in the Whitechurch area. Water to the west of the divide flows towards the River Blackwater and water to the east flows towards Dungarvan Harbour, away from Glendine Wood SAC. On this basis and as discussed above, this site was excluded from further assessment.

Two large coastal water bodies i.e. the Western Celtic Sea and Eastern Celtic Sea lie downstream of the WSZs. However, the Dungarvan WSZ discharges directly into the Colligan and Brickey Estuaries, which join Dungarvan Harbour which lies between the WSZ and the Eastern Celtic Sea. The predicted post-dosing concentration for both the Colligan Estuary and Dungarvan Harbour is not detectable (0.0000 mg/l), while for the Brickey Estuary the modelled concentration is negligible (0.0001 mg/l). The Monamon and LCB Ballyhane WSZs discharge to the Upper Blackwater M Estuary. The Moores Well, Lacken and LCB Ballyhane WSZs discharge to the Lower Blackwater M Estuary before reaching Youghal Bay, both of which lie between the WSZs and the Western Celtic Sea. The EAM results show that the potential increase in orthophosphate as a result of dosing at Ballinamuck WTP to the Lower Blackwater M Estuary is negligible (0.0001 mg/l), whilst for Youghal Harbour lies beyond the ZoI limit and is not affected by dosing at Ballinamuck WTP. As a result, the following five SACs / SPAs are excluded from further assessment at this point: Helvick Head SAC, Ballymacoda (Clonpriest and Pillmore) SAC, Blackwater Estuary SPA, Helvick Head to Ballyquin SPA and Ballymacoda Bay SPA.

The EAM results demonstrate that the Eastern Celtic Sea coastal water body is located beyond the ZoI limit and, therefore, there is no risk to the indicative quality of this large coastal water body. The following 17 sites are excluded from further assessment on this basis as the Eastern Celtic Sea forms the only hydrological connection to the sites and there is no hydrogeological connection: Ardmore Head SAC, Tramore Dunes and Back Strand SAC, River Barrow and River Nore SAC, Hook Head SAC, Bannow Bay SAC, Ballyteigue Burrow SAC, Saltee Islands SAC, Tacumshin Lake SAC, Lady's Island Lake SAC, Carnsore Point SAC, Tramore Back Strand SPA, Bannow Bay SPA, Keeragh Islands SPA, Ballyteigue Burrow SPA, Saltee Islands SPA, Tacumshin Lake SPA and Lady's Island Lake SPA.

The EAM results also demonstrate that the Western Celtic Sea coastal water body is located beyond the ZoI limits and, therefore, there is therefore no risk to the indicative quality of this large coastal water body. The following 17 sites are excluded from further assessment on this basis as the Western Celtic Sea forms the only hydrological connection to the sites and there is no hydrogeological connection: Lough Hyne Nature Reserve and Environs SAC, Roaringwater Bay and Islands SAC, Great Island Channel SAC, Courtmacsherry Estuary SAC, Clonakilty Bay SAC, Kilkeran Lake and Castlefreke Dunes SAC, Myross Wood SAC, Castletownshend SAC, Sovereign Islands SPA, Sheep's Head to Toe Head SPA, Galley Head to Duneen Point SPA, Seven Heads SPA, Ballycotton Bay SPA, Cork Harbour SPA, Old Head of Kinsale SPA, Courtmacsherry Bay SPA and Clonakilty Bay SPA.

On this basis, three sites have been included for further assessment in order to evaluate the significance of potential effects arising during construction phase in section 5 below i.e. Helvick Head SAC, Helvick Head to Ballyquin SPA and Dungarvan Harbour SPA. Two sites has been included for further assessment for the operational phase in Sections 5 and 6 below i.e. Blackwater River (Cork/Waterford) SAC and Dungarvan Harbour SPA.

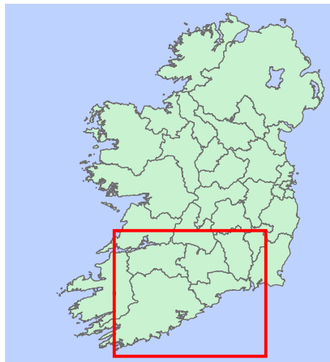
[8] Dungarvan GWB: Summary of Initial Characterisation

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

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
Construction Phase Only								
Helvick Head SAC	000665	21st Nov 2016 Version 1.0	1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	Yes	Yes	Yes	Yes
			4030	European dry heaths	No	Yes		
Helvick Head to Ballyquin SPA	004192	21st Feb 2018 Generic	A017	Cormorant (*Phalacrocorax carbo*)	Yes	Yes	Yes	Yes
			A103	Peregrine (*Falco peregrinus*)	Yes	Yes		
			A184	Herring Gull (*Larus argentatus*)	Yes	Yes		
			A188	Kittiwake (*Rissa tridactyla*)	Yes	Yes		
			A346	Chough (*Pyrrhocorax pyrrhocorax*)	Yes	Yes		
Operation Phase Only								
Blackwater River Cork / Waterford SAC	002170	31st Jul 2012 Version 1.0	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		
			1130	Estuaries	Yes	Yes		
			1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes		

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
			1220	Perennial vegetation of stony banks	Yes	No		
			1310	*Salicornia* and other annuals colonizing 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		
			3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	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		
Construction and Operation Phase								
Dungarvan Harbour SPA	004032	16th Jan 2012 Version 1.0	A005	Great Crested Grebe (*Podiceps cristatus*)	Yes	Yes	Yes	Yes
			A046	Light-bellied Brent Goose (*Branta bernicla hrota*)	Yes	Yes		
			A048	Shelduck (*Tadorna tadorna*)	Yes	Yes		
			A069	Red-breasted Merganser (*Mergus serrator*)	Yes	Yes		
			A130	Oystercatcher (*Haematopus ostralegus*)	Yes	Yes		
			A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes		
			A141	Grey Plover (*Pluvialis squatarola*)	Yes	Yes		

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
			A142	Lapwing (*Vanellus vanellus*)	Yes	Yes		
			A143	Knot (*Calidris canatus*)	Yes	Yes		
			A149	Dunlin (*Calidris alpina alpina*)	Yes	Yes		
			A156	Black-tailed Godwit (*Limosa limosa*)	Yes	Yes		
			A157	Bar-tailed Godwit (*Limosa lapponica*)	Yes	Yes		
			A160	Curlew (*Numenius arquata*)	Yes	Yes		
			A162	Redshank (*Tringa totanus*)	Yes	Yes		
			A169	Turnstone (*Arenaria interpres*)	Yes	Yes		
			A999	Wetlands	Yes	Yes		



Legend

LEMA Emission Type

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

Data Source:
Irish Water
NPWS (Jan. 2019)
EPA

N

0 5 10 20 Kilometres

Client

UISCE ÉIREANN : IRISH WATER

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Dungarvan WSZ

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

RPS

Scale: 1:600,000 @ A3	Date: 07/06/2019
File Ref: MDW0766Arc0018bF01	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 Ballinamuck 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 Ballinamuck 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 Ballinamuck WTP.

5.3.1 Construction Phase

There are two possible locations for the orthophosphate dosing system both of which will be located within the confines of the existing WTP boundary. The assessment of potential significant effects associated with the construction of the corrective water treatment works at Ballinamuck 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 Ballinamuck WTP;
- A review of hydrological connectivity between the proposed works and European Sites using the EPA Mapping Resources: http://gis.epa.ie/; www.Catchments.ie;
- Ordnance Survey Ireland Map viewer: http://maps.osi.ie/publicviewer/#V1,591271,743300,0,10
- Site synopses, conservation objectives and qualifying interest data for European Sites.

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

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Evaluation of Potential Significant Effects
Dungarvan Harbour SPA (004030)	Colligan_040 (IE_SE_17C010300)	RWB	The construction works will be located within the confines of the existing Ballinamuck WTP grounds. The Ballinamuck WTP is not located within or directly adjoining any European Site. **Surface Water** There are no surface waterbodies within the confines of Ballinamuck WTP. However, the footprint of the WTP is located 25m from the Colligan River (Colligan_040). The river flows south eastwards into the Colligan Estuary (IE_SE_140_0110), approximately 1.2km downstream of the WTP. The Colligan Estuary (IE_SE_140_0110) is designated as part of Dungarvan Harbour SPA. The Colligan Estuary flows southeast discharging to Dungarvan Harbour transitional waterbody & Eastern Celtic Sea coastal waterbody. Dungarvan Harbour and the Eastern Celtic Sea support connectivity to Helvick Head to Ballyquin SPA and Helvick Head SAC (>15km downstream). The proximity of the proposed construction works to the Colligan River results in the potential for remote connectivity to European Sites downstream of the Colligan River in Dungarvan Harbour and its associated transitional and coastal waterbodies. Paladin fencing and a narrow strip of broadleaf riparian vegetation (c.10m) separate the WTP boundary from the river. Bulk storage tanks (including associated pumps, electrical and control equipment) will be skid mounted. The skid mounting will be assembled off site
	Dungarvan (IE_SE_G_052)	GWB	
Helvick Head to Ballyquin SPA (004192)	Colligan_040 (IE_SE_17C010300)	RWB	
	Colligan Estuary (IE_SE_140_0110)	TWB	
Helvick Head SAC (000665)	Colligan_040 (IE_SE_17C010300)	RWB	

[9] Monitoring period is annual unless specified.

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Evaluation of Potential Significant Effects
			and the storage tanks/equipment will be mounted before being moved into place. The proposed construction works are small scale in nature and will be undertaken within the confines of the existing built infrastructure associated with Ballinamuck WTP. There will be no aspects of the proposed works that will result in the release of potential impacts sources identified in **Section 5.2.1.** The works will be localised and contained to the immediate development area which comprises buildings and artificial surfaces. Works such as trench excavations to facilitate electrical cabling from the skid mounting will be contained to the defined working area and necessary works with cast in place concrete will be undertaken within sealed shuttered units. The character and extent of works methodologies proposed will retain all potential construction related pollutants at source. **Groundwater** The WTP lies over the Dungarvan GWB (IE_SE_G_052) and Dungarvan Harbour SPA intersects this GWB approximately 1.2km downstream of the WTP. 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. This GWB is a regionally important karstified aquifer. The water table is generally less than 10m below the surface and unconfined. Groundwater generally discharges in a narrow zone along major rivers; this may be in the form of general baseflow, via springs or through sand and gravels that are in continuity with the rivers. A groundwater divide is present in Dungarvan GWB to the west of the public supply well in the Whitechurch area. Water to the east flows toward Dungarvan Harbour. As the excavation works will not be extensive (up to c. 75m for pipework, to an approximate depth of 700mm) and upon made ground; interference with water table will be localised, minor and temporary. Therefore, there is no potential for likely significant effects on the Dungarvan Harbour SPA (located 1.2km downstream from the WTP) as a result of the construction of the corrective water treatment works at Ballinamuck WTP.

5.3.2 Operational Phase

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

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

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

When assessing the increase in orthophosphate concentrations as a result of proposed dosing, an increase which is <5% of the Good / High indicative quality boundary, i.e. 0.00125mg/l, is excluded from further assessment and is assumed to result in no significant impact to a water body. If the baseline orthophosphate concentration in addition to the potential increase in orthophosphate concentration as a result of dosing is less than the 75% upper threshold of the indicative quality band for a water body, this also results in no significant impact. Where a water body does not have monitored orthophosphate concentrations, a conservative approach is used whereby the surrogate indicative quality is calculated based on the ecological status assigned to that water body by the EPA.

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

Where a transitional or coastal water body does not have monitored orthophosphate concentrations or salinity levels, a conservative approach is used whereby the surrogate indicative quality is calculated based on inputting water bodies or pressures acting on the ecological status assigned to that water body by the EPA but the more conservative freshwater orthophosphate limits for the different indicative quality bands are applied[10].

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.

[10] 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.

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

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

This test applies only when the trend for orthophosphate concentration for the water body is considered statistically significant in the WFD App. For surface water bodies, the predicted concentration for 2021 is given and the additional concentration due to orthophosphate dosing is added and assessed as appropriate. If the new calculated predicted concentration prevents the achievement of good indicative quality then this test fails.

This assessment assumes a dosing rate of 1.2 mg/l.

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

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

Table 5-2: Surface and groundwater bodies within the WSZ with a hydrological or hydrogeological connection to European Sites

Site Name (Code)	Contributing WB Code_Name	WB Type[11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline[14] Ortho P Conc.[15] (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.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
Blackwater River (Cork / Waterford) SAC (002170)	Moneygorm_010 IE_SW_18M260940	RWB	*Good*	*0.030*	*0.033*	*5.5*	*0.0012*	*0.031*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	Finisk_030 IE_SW_18F020500	RWB	Good Upwards Far	0.030	0.033	1.9	0.0000	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

[11] Monitoring period is annual unless specified.
[12] Surrogate Indicative Quality in italic.
[13] Distance to threshold.
[14] Baseline year is 2014 for surface water bodies and 2012 for groundwater bodies.
[15] Surrogate concentration is given in italic mg/l
[16] 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.
[17] 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[11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline[14] Ortho P Conc.[15] (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.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
	Lower Blackwater M Estuary / Youghal Harbour IE_SW_020_0100	TWB Summer	High (S) Downwards Far	0.021	0.023	7.4	0.0000	0.021	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good (W) Upwards Far	0.034	0.053			0.034	
	Cappoquin Kiltorcan IE_SW_G_025	GWB	Failing to achieve good Upwards Far	0.055	-	2.9	0.0001	0.055	Existing baseline is Failing to Achieve Good Ortho P indicative quality; however the modelled increase in concentration does not exceed 5% of the High / Good indicative quality boundary and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.011	0.026			0.011	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[11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline[14] Ortho P Conc.[15] (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.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
	Knockmealdown IE_SW_G_047	GWB	Good Upwards Far	0.014	0.026	0.0	0.0000	0.014	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	Lismore IE_SW_G_050	GWB	Good Upwards Far	0.005	0.026	0.0	0.0000	0.005	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.006	0.026			0.006	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Dungarvan Harbour SPA (004032)	Brickey_020 IE_SE_17B010090	RWB (Multiple monitoring points)	Good Upwards Far	0.029	0.033	2.4	0.0001	0.029	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			High Downwards Near	0.022	0.019			0.022	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline

Site Name (Code)	Contributing WB Code_Name	WB Type[11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline[14] Ortho P Conc.[15] (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.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
									ortho P conc. The modelled conc. is 0.0001mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	Colligan_040 IE_SE_17C010300	RWB (Multiple monitoring points)	High Upwards Far	0.014	0.019	12.2	0.0001	0.014	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			High Upwards Far	0.015	0.019			0.015	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards	0.030	0.033			0.030	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[11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline[14] Ortho P Conc.[15] (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.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
	Colligan Estuary IE_SE_140_0100	TWB Summer	High (S) Upwards Far	0.009	0.019	16.3	0.0000	0.009	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	High (W) Downwards Far	0.021	0.019			0.021	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	Brickey Estuary IE_SE_140_0200	TWB	*Poor*	*0.077*	*0.087*	*2.4*	*0.0001*	*0.077*	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[11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline[14] Ortho P Conc.[15] (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.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
	Dungarvan Harbour IE_SE_140_0000	CWB Summer	High (S) Downwards Far	0.004	0.019	390.4	0.0000	0.004	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		CWB Winter	High (W) Downwards Far	0.022	0.019			0.022	The post dosing conc. exceeds the 75% upper indicative quality threshold; however, this is due to the baseline ortho P conc. The modelled conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	Dungarvan IE_SE_G_052	GWB	Good Upwards Far	0.009	0.026	6.7	0.0003	0.009	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[11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline[14] Ortho P Conc.[15] (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.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
	Waste Facility (W0032-02) IE_SE_G_178	GWB	*Good*	*0.018*	*0.026*	*0.3*	*0.0012*	*0.019*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	Industrial Facility (P0156-01) IE_SE_G_055	GWB	*Good*	*0.018*	*0.026*	*5.2*	*0.0026*	*0.020*	The GWB has been delineated due to the industrial facility. The modelled concentration is >5% Good/Fail indicative quality boundary but is within 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.

‡ Load from WWTP / SWO following treatment added

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

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

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

For the purposes of assessing the potential impact on the receiving environment a number of scenarios have been assessed at the agglomerations which receive water from the WSZ (**Table 5-3**). The existing baseline prior to orthophosphate dosing is established and compared to the potential impact on the receiving waters post-dosing. In-combination effects of the operation of the SWO and the continuous discharge from the WWTP were also assessed.

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

Table 5-3 provides the data used for the WWTP continuous discharge, and the SWO intermittent discharge, to compare with the emission limit values (ELVs) from the waste water discharge licence (WWDL) (if it has been set) that are applicable to the agglomeration discharge to transitional waters or freshwaters. The resultant concentration in the waters downstream of the discharge point from the agglomerations is provided in **Table 5-4**, assuming mean flows.

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

Table 5-3: Increased loading/concentration due to Orthophosphate Dosing – Dosing rate = 1.0 mg/l

Agglom. and Discharge Type	ELV from WWDL	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***
Dungarvan Primary Discharge	N/A	Existing	5922.1	0.760	0.608	1.034
		Post Dosing	6649.3	0.853	0.683	1.161
Dungarvan SWOs (4 no.)	N/A	Existing	257.4	1.134	0.908	1.543
		Post Dosing	278.6	1.228	0.982	1.670

Table 5-4: Mass balance assessment based on 1.0 mg/l dosing using available background concentrations and tidal flow information

Agglom.	RWB Name / Code for Primary Discharge	Background Conc. (mg/l) (annual mean from AER u/s monitoring point)	Resultant Conc. Existing (mg/l)	Resultant Conc. Post Dosing (mg/l)	% Inc
Dungarvan	Dungarvan Harbour IE_SE_140_0000	0.0220	0.0222	0.0222	0.10

Dungarvan Agglomeration

Dungarvan agglomeration discharges into IE_SE_140_0000 Dungarvan Harbour which is hydrologically connected to the Blackwater River (Cork/Waterford) SAC, Ardmore Head SAC, Helvick Head SAC, Ballymacoda (Clonpriest and Pillmore) SAC, Blackwater Estuary SPA, Helvick Head to Ballyquin SPA, Dungarvan Harbour SPA and Ballymacoda Bay SPA. Dungarvan WWTP has secondary treatment and it is assumed that the additional orthophosphate load is not removed in the treatment process and is added to the effluent loads from the WWTP. There is no total phosphorus ELV set in the WWDL. When tidal flows are taken into account the increase in the receiving water is negligible (0.10%) (**Table 5-4**). There is no risk of failing WFD objectives and deterioration in the current high indicative quality for Dungarvan Harbour and its hydrologically connected European Sites as a result of dosing at Ballinamuck WTP.

5.3.4 Assessment of Potential Indirect Impact from Subsurface Flow

5.3.4.1 Sub surface flows from leakage and DWWTP

Step 4 of the EAM model assesses the distributed inputs to surface waterbodies from sub-surface pathways. The modelled increases in concentrations in the subsurface pathways are insignificant for all river water bodies (less than 0.00125 mg/l, which is 5% of orthophosphate Good/High Indicative Quality boundary for surface waterbodies). The highest increase was in IE_SW_18M260940 Moneygorm_010 at 0.0012 mg/l.

Step 4 of the EAM model also outlines the distributed inputs to transitional and coastal waterbodies from sub surface pathways. Transitional water bodies directly affected by this WSZ are Colligan Estuary (IE_SE_140_0100) and Brickey Estuary (IE_SE_140_0200). The modelled increases in orthophosphate concentrations are also insignificant in these water bodies. For transitional waterbodies, the post-dosing orthophosphate concentration due to subsurface pathways was undetectable (0.0000 mg/l) for the Colligan Estuary (IE_SE_140_0100) and was 0.0001 mg/l for the Brickey Estuary (IE_SE_140_0200).

Therefore there will be no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives within waterbodies hydrologically/ hydrogeologically connected.

5.3.4.2 Groundwater Assessment

The groundwater bodies IE_SE_G_085 Kilrion, IE_SW_G_047 Knockmealdown and IE_SW_G_050 Lismore have modelled concentrations which are undetectable following dosing (0.0000mg/l), as shown in **Table 3 of Appendix C**.

The groundwater bodies IE_SE_G_014 Ballyknock, IE_SE_G_052 Dungarvan and IE_SW_G_025 Cappoquin Kiltorcan have low modelled concentrations following dosing (0.0001 mg/l - 0.0003 mg/l), as shown in **Table 3 of Appendix C**. This does not exceed 5% of the Good/Fail indicative quality boundary (i.e.<0.00175mg/l).

For IE_SE_G_055 Industrial Facility (P0156-01) the modelled additional concentration is >5% Good/Fail indicative quality boundary (0.0026 mg/l). This GWB was delineated to separate the pressures from the Industrial Facility from other GWBs. The modelled increase in concentrations in neighbouring groundwater bodies are more representative of impact of the orthophosphate dosing on the groundwater body scale. The initial characterisation undertaken by the EPA also established that the orthophosphate indicative quality for this ground water body was good and the further characterisation has established that it is not at risk.

The modelled increase in concentration for the overlying surface water body, IE_SE_17C010300 (COLLIGAN_040), is modelled to be 0.0001 mg/l (see Table 5.2) which is a negligible increase and therefore there is not impacted by the contributing groundwater loads from these GWBs. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, there is no risk of impact on groundwater receptors due to orthophosphate dosing. The post dosing concentration is within 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.

The groundwater body IE_SE_G_178 Waste Facility (W0032-02) has also been delineated as it receives inputs from a waste facility. It has been given a surrogate orthophosphate indicative quality of Good. The post-dosing concentration is 0.0012 mg/l which does not exceed the 5% of the Good/Fail indicative quality boundary (i.e.<0.00175mg/l).

Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives within the hydrogeologically connected groundwater bodies due to orthophosphate dosing as indicated in **Table 3, Appendix C**. The overlying surface water bodies are not at risk of failing WFD objectives for orthophosphate.

5.3.5 Combined Assessment

Table 4A of **Appendix C** provides details of the combined orthophosphate inputs to river waterbodies from direct discharges, DWWTSs and leakage loads. There are no river waterbodies with predicted concentrations above 5% of the Good / High indicative quality boundary (<0.00125 mg/l) following the assessment of combined loads. The dosing therefore poses no risk of deterioration in orthophosphate indicative quality of the river waterbodies identified in **Table 5-2** or of preventing their achievement of WFD objectives**.**

Table 4B of **Appendix C** outlines the increased loading and concentrations to transitional and coastal waterbodies receiving flows from river waterbodies connected to the WSZ. In the transitional waterbodies (Colligan Estuary IE_SE_140_0100 and Brickey Estuary IE_SE_140_0200), and coastal

waterbodies (Colligan Estuary IE_SE_140_0100 and Brickey Estuary IE_SE_140_0200), the post-dosing concentrations (0 - 0.0001 mg/l) are within 5% of the High/Good indicative quality boundary and therefore, there will be no likely significant effect to the receiving water bodies as a result of dosing at Ballinamuck WTP.

5.3.6 Assessment of Cumulative Impacts from other WSZs

The cumulative loads from other dosed WTPs and associated water supply zones in the Colligan-Mahon Catchment (HA 17), Blackwater (Munster) catchment (HA18), the Lee, Cork Harbour & Youghal (HA19) and the Bandon-Ilen catchment (HA20) catchments have been assessed. These include:

- 4 Lee Road WTP - Cork City Water Supply
- 6 Inniscarra WTP – Zone 2 Cork City and Harbour
- 010 Adamstown WTP – East Waterford
- 26 Glashaboy WTP – Zone 3 Glashaboy
- 30 Innishannon WTP – Zone 2 Innishannon
- 36 Clonakilty RWSS WTP (Jones Bridge WTP) - Zone 1 Clonakilty
- 54 Mallow WTP (Ballyellis WTP) – Zone 4 Mallow
- 59 Glendine WTP - Zone3 Youghal Regional
- 60 Ballyhilty WTP - Zone 1 Skibbereen Ballyhilty
- 72 Kilva Reservoir Site – Zone 3 Whitegate Regional
- 78 Midleton WTP – Zone 3 Midleton
- 83 Tibbetstown WTP - Tibbotstown
- 118 Macroom WTP – Zone 2 Macroom
- 157 Carriglusky Reservoir Site, Cloyne - Zone3 Cloyne
- 161 Freemount WTP – Zone 4 Allow Regional
- 165 Knockraha WTP -Zone3 Glanmire
- 180 Mitchelstown South WTP – Zone 4 Mitchelstown South
- 192 Michelstown Galtee WTP - Cappamore Foileen Water Supply
- 236 Mountnorth Reservoir – Zone 4 Mount North
- 324 Killdorrery WTP – Zone 4 Kildorrery
- 333 Shrone WTP - Shrone PWSS 078A
- 359 Ballymacoda Road Borehole – Zone 3 Killeagh
- 363 Hammond Place Pump Station – Zone 4 Dromahane
- 370 LCB Cappoquin Pump Station - LCB Cappoquin
- 376 Tallow WTP - Tallow
- 386 Drimoleague WTP, Deelish - Zone1 Drimoleague
- 400 Bweeng WTP - Zone4 Bweeng

The winter baseline concentrations for the following transitional water bodies; Colligan Estuary (IE_SE_140_0100) and Dungarvan Harbour (IE_SE_140_0000) are above 75% of the upper orthophosphate indicative quality threshold. The modelled post dosing concentration is undetectable (0.0000mg/l) and will not cause a deterioration in the orthophosphate indicative quality of these water bodies or prevent the achievement of their WFD objectives.

The impact to the remaining receiving waters is also not significant as outlined in **Table 5, Appendix C** and **Table 5-5** below given that predicted increased in orthophosphate as a result of dosing are all <5% of the Good / High indicative quality boundary i.e. 0.00125mg/l and will not cause a deterioration in the orthophosphate indicative quality or prevent the achievement of the WFD objectives of the water bodies.

Table 5-5: Cumulative assessment of the increased loading and concentrations to water bodies effected by 039 Ballinamuck WTP – Dungarvan WSZ and other WSZs proposed for corrective water treatment in the upstream catchments

NAME / EU_CD	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	Conc. Using Flows (30%ile tidal or gauged) mg/l	PO4 Potential Baseline Conc. following dosing mg/l
Colligan Estuary / IE_SE_140_0100	TWB Summer	High (S) Upwards Far	0.009	0.019	20.3	0.0000	0.009
	TWB Winter	High (W) Downwards Far	0.021	0.019			0.021
Brickey Estuary IE_SE_140_0200	TWB Summer	*Poor*	*0.077*	*0.087*	4.1	0.0002	0.077
Dungarvan Harbour IE_SE_140_0000	TWB Summer	High (S) Downwards Far	0.004	0.019	394.5	0.0000	0.004
	TWB Winter	High (W) Upwards near	0.021	0.019			0.021
Lower Blackwater M Estuary / Youghal Harbour IE_SW_020_0100	TWB Summer	High (S) Downwards Far	0.014	0.019	506.3	0.0001	0.014
	TWB Winter	High (W) Upwards Near	0.028	0.019			0.028
Youghal Bay IE_SW_020_0000	CWB Summer	High Upwards Far	0.009	0.019	517.9	0.0000	0.009
	CWB Winter	High Downwards Far	0.014	0.019			0.014
Eastern Celtic Sea (HAs 13;17) IE_SE_050_0000	CWB	*High*	*0.013*	*0.019*	*4715.3*	*0.0000*	*0.013*
Western Celtic Sea (HAs 18;19;20) IE_SW_010_0000	CWB	*High*	*0.013*	*0.019*	*9694.9*	*0.0001*	*0.013*

‡ Load from WWTP / SWO following treatment added

5.3.7 Conclusions

The modelled increased orthophosphate dosing concentrations from direct discharges from agglomerations do not result in a noticeable effect with orthophosphate concentrations in the receiving Dungarvan Harbour started at 0.1%, as shown by the mass balance assessment in **Table 2 Appendix C**.

All river waterbodies within the WSZ have a modelled increase in concentration of 0.0000mg/l to 0.0012mg/l which is below 5% of the Good / High indicative quality boundary (0.00125 mg/l) following dosing at Ballinamuck WTP. The Brickey_020 (IE_SE_17B010090) has an existing baseline concentration that exceeds 75% of the orthophosphate indicative quality threshold however as the modelled increase is negligible (0.0001 mg/l) there is no risk of deterioration in the orthophosphate indicative quality of the river water bodies, or of preventing the achievement of their WFD objectives.

For transitional waterbodies, the post-dosing orthophosphate concentration due to subsurface pathways was undetectable (0.0000 mg/l) for the Colligan Estuary (IE_SE_140_0100) and the Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) and was 0.0001 mg/l for the Brickey Estuary (IE_SE_140_0200). In coastal waterbodies (Dungarvan Harbour IE_SE_140_0000), the post-dosing orthophosphate concentration due to subsurface pathways was undetectable (0.0000 mg/l) due to the high level of estimated flows, including tidal flows. The post-dosing concentrations for Dungarvan Harbour and Colligan Estuary waterbodies exceed 75% of the upper orthophosphate indicative quality threshold. However, this is due to their existing baseline Ortho P concentrations. The modelled concentration increase for both waterbodies is not detectable at 0.0000mg/l and hence there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives. Therefore there is no risk of deterioration in the orthophosphate indicative quality of the transitional and coastal water bodies, or of preventing the achievement of their WFD objectives.

One groundwater body [IE_SE_G_055 Industrial Facility (P0156-01)] is at good indicative quality. It has a modelled concentration above 5% of the Good / Fail indicative quality boundary following dosing (0.0026mg/l). However, the post dosing concentration of the groundwater body is within 75% of the upper orthophosphate indicative quality threshold. A second groundwater body, IE_SE_G_178 Waste Facility (W0032-02), is at Good indicative quality (surrogate). The baseline concentration does not exceed 75% of the upper orthophosphate indicative quality threshold. The predicted modelled concentration is 0.0012 mg/l, which is within 75% of the upper indicative quality threshold, therefore there is no risk of deterioration in indicative quality in either of these Groundwater bodies. The modelled post-dosing concentrations in all remaining groundwater bodies range from not detectable (0.0000 mg/l) to insignificant (0.0003 mg/l). Therefore there is no risk of deterioration in the orthophosphate indicative quality of the groundwater bodies, or of preventing the achievement of their WFD objectives.

The cumulative assessment of dosing at Ballinamuck 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

Ballinamuck WTP is not located within or directly adjacent to the boundary of any European Site. The closest sites with connectivity to the proposal are Dungarvan Harbour SPA, Helvick Head to Ballyquin SPA, Helvick Head SAC and Glendine Wood SAC located at a distance of 1.2 km, 15.5 km, 15.5 km and 8 km, respectively. Therefore, there is no potential for direct impacts to the European Sites as a result of the construction of the corrective water treatment works at Ballinamuck WTP.

The Ballinamuck WTP lies within 25 m of the Colligan River (Colligan_040) (IE_SE_17C010300). This river water body is hydrologically connected to Dungarvan Harbour SPA, Helvick Head to Ballyquin SPA and Helvick Head SAC via the transitional waterbody Colligan Estuary (IE_SE_140_0110). The WTP is located approximately 1.2 km, 15.5 km, 15.5 km upstream of Dungarvan Harbour SPA, Helvick Head to Ballyquin SPA and Helvick Head SAC, respectively. The WTP overlies the Dungarvan GWB and is hydrogeologically connected to Dungarvan Harbour SPA.

From the minor scale of the proposed construction works, the riparian vegetation and built environment which will act as a barrier to prevent surface run-off from the works area to the river and impact assessment presented in **Section 5.3.1** above; there are no impact pathways identified which give rise to connectivity between the proposed construction works and any other European Sites.

Therefore, it has been determined that the construction of the corrective water treatment works at Ballinamuck WTP, individually or in combination with other plans or projects, will not to give rise to any likely significant effects on the qualifying interests/special conservation interests of the Dungarvan Harbour SPA, Helvick Head to Ballyquin SPA and Helvick Head SAC as a result of the proposed construction works.

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

6.2 OPERATIONAL PHASE

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

6.2.1 Blackwater River (Cork / Waterford) SAC 002170

6.2.1.1 [1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)

Conservation objectives for the species in the Blackwater River SAC have been set; however an orthophosphate specific level is not defined. In addition, the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations S.I. No. 296 of 2009, set ecological quality objectives for the freshwater pearl mussel habitat, which are the equivalent of high status. The European Communities Environmental Objectives (Surface Water) Regulations S.I. No. 272 of 2009 (as amended) set a limit of ≤0.025 (mean) or ≤0.045 (95%ile) mg/l for Molybdate Reactive Phosphorus (MRP) (mg P/l) for High Status waters, however the level required by the freshwater pearl mussel is likely to be even lower than this standard. These objectives have framed the impact assessment for this species within this SAC for this proposed project.

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

- The river waterbodies that are hydrologically connected include: IE_SW_18M260940 Moneygorm_010 and IE_SW_18F020500 Finisk_030.
- The transitional waterbody connected to the site is: IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour.
- The coastal waterbodies connected to the site are: IE_SW_020_0000_Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20).
- The groundwater bodies connected to the site are: IE_SW_G_050 Lismore, IE_SW_G_025 Cappoquin Kiltorcan and IE_SW_G_047 Knockmealdown.

The Freshwater pearl mussel in this SAC is known from the main Blackwater River, two tributaries (Owentaraglin and Allow) and the Licky River, which discharges into the Upper Blackwater Estuary. Under the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, S.I. No. 296 of 2009 populations in the following rivers are designated; the Blackwater (main channel), the Allow and the Licky. In total 168 km encompasses the length of channel from the most upstream records of the freshwater pearl mussel to the most downstream records of live mussels.

The Allow population lies upstream of Kanturk in North Cork which is upstream of Dungarvan, Moores Well and Lacken WSZs and therefore will not be impacted by the project. The Blackwater population extends from approximately Ballydesmond on the western side of Mallow, as far downstream as Ballyduff, all upstream of the WSZs and therefore will not be impacted by the project.

The Licky population lies on the eastern side of the Blackwater Estuary, with no direct hydrological connection to Moores Well or Lacken WSZs (tributary flowing into the Blackwater Estuary downstream) and no hydrological connection to the Dungarvan WSZ, therefore this population will not be impacted by the project.

In terms of host fish for Freshwater pearl mussel larval glochidia (salmonids including Atlantic salmon); 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. Full details of the assessment are provided in **Appendix C**.

The modelled orthophosphate concentration in the river water bodies Moneygorm_010 (IE_SW_18M260940) and Finisk_030 (IE_SW_18F020500), are 0.0012 mg/l and 0.0000mg/l respectively and are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentration of both river water bodies does not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies which are at moderate (surrogate) and good indicative quality respectively.

For groundwater bodies, the predicted loads to groundwater bodies are undetectable or negligible; 0.0000 mg/l for IE_SW_G_050, Lismore and IE_SW_G_047, Knockmealdown GWBs, and 0.0001 mg/l for IE_SW_G_025, Cappoquin Kiltorcan GWB. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant. Post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies or of preventing the achievement of WFD objectives.

The modelled orthophosphate concentration in the transitional waterbody IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour is undetectable at 0.0000 mg/l and post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

For coastal waterbodies, both the IE_SW_020_0000 Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 19;19;20) exhibit modelled Ortho P concentrations which are not detectable (Youghal Bay; 0.0000mg/l) and negligible (0.0001mg/l). The modelled concentrations are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

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

6.2.1.2 [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, 2012[18]). However, white-clawed crayfish have a general water quality requirement for moderate to good water quality (i.e. Q3-4 or higher; NPWS, 2013[19]), therefore any reduction in water quality as a result of orthophosphate dosing 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 Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at Ballinamuck WTP:

[18] NPWS 2012 Blackwater River (Cork/Waterford) SAC 002170 Conservation Objectives
[19] NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. Species Assessments Volume 3. Version 1.0. Unpublished Report, National Parks & Wildlife

The white-clawed crayfish is a river species only, therefore the relevant waters for assessment are river water bodies and groundwater bodies (in terms of surface – groundwater interactions);

- The river waterbodies that are hydrologically connected include: IE_SW_18M260940 Moneygorm_010 and IE_SW_18F020500 Finisk_030.
- The groundwater bodies connected to the site are: IE_SW_G_050 Lismore, IE_SW_G_025 Cappoquin Kiltorcan and IE_SW_G_047 Knockmealdown.

Within the Blackwater River system, white-clawed crayfish is present only in the Awbeg River. The main Blackwater River is considered chemically unsuitable for the white-clawed crayfish, however, there have been some records from other parts of the river system e.g. downstream of the confluence of the Awbeg and Blackwater Rivers which may represent a specimen moving out of the Awbeg, and the second was upstream of Mallow[18] and this may represent a new population or an introduction. Both locations are upstream of the Dungarvan, Moores Well and Lacken WSZs. All known and potential locations of the species are a considerable distance upstream of the Dungarvan WSZ, and there is no intersection between the river and groundwater bodies which intersect the WSZ and the Awbeg white-clawed crayfish population. Therefore, the white-clawed crayfish will not be affected by this Project.

The modelled orthophosphate concentration in the river water bodies Moneygorm_010 (IE_SW_18M260940) and Finisk_030 (IE_SW_18F020500), are 0.0012 mg/l and 0.0000mg/l respectively and are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentration of both river water bodies does not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies which are at moderate (surrogate) and good indicative quality respectively.

For groundwater bodies, the predicted loads to groundwater bodies are undetectable or negligible; 0.0000 mg/l for IE_SW_G_050, Lismore and IE_SW_G_047, Knockmealdown GWBs, and 0.0001 mg/l for IE_SW_G_025, Cappoquin Kiltorcan GWB. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant. Post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies or of preventing the achievement of WFD objectives.

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

6.2.1.3 [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*) (freshwater only)

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[20]) highlights the deterioration in water quality and ongoing point and diffuse sources of pollution as a key threat to these species and includes

[20] 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.

the potential effects from municipal discharges. The SSCOs (NPWS, 2012[18]) 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 SSCOs for salmon also requires a Q-value of at least 4, which equates to good ecological status.

Sea lamprey, river lamprey and brook lamprey have a mapped distribution throughout the SAC, including some tributaries (as per Map 10, NPWS, 2012[18]). The distribution of Atlantic salmon is not provided in the SSCO report, however it is noted that large weirs on the Blackwater may delay salmon upstream migration in certain water conditions but do not generally prevent access to spawning areas. For Twaite shad, again there is no distribution provided and the species is also impacted by large weirs on the Blackwater which prevents potential exploitation of adult spawning grounds[18]. It is assumed for the purposes of this assessment, that all species have access to the water bodies which may potentially be impacted by the proposed dosing at Ballinamuck WTP, thereby providing a conservative assessment of impacts.

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

- The river waterbodies that are hydrologically connected include: IE_SW_18M260940 Moneygorm_010 and IE_SW_18F020500 Finisk_030.
- The transitional waterbody connected to the site is: IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour.
- The coastal waterbodies connected to the site are: IE_SW_020_0000_Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20).
- The groundwater bodies connected to the site are: IE_SW_G_050 Lismore, IE_SW_G_025 Cappoquin Kiltorcan and IE_SW_G_047 Knockmealdown.

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. Full details of the assessment are provided in **Appendix C**.

The modelled orthophosphate concentration in the river water bodies Moneygorm_010 (IE_SW_18M260940) and Finisk_030 (IE_SW_18F020500), are 0.0012 mg/l and 0.0000mg/l respectively and are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentration of both river water bodies does not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies which are at moderate (surrogate) and good indicative quality respectively.

For groundwater bodies, the predicted loads to groundwater bodies are undetectable or negligible; 0.0000 mg/l for IE_SW_G_050, Lismore and IE_SW_G_047, Knockmealdown GWBs, and 0.0001 mg/l for IE_SW_G_025, Cappoquin Kiltorcan GWB. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant. Post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies or of preventing the achievement of WFD objectives.

The modelled orthophosphate concentration in the transitional waterbody IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour is undetectable at 0.0000 mg/l and post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

For Coastal waterbodies, both the IE_SW_020_0000 Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 19;19;20) exhibit modelled Ortho P concentrations which are not detectable (Youghal Bay; 0.0000mg/l) and negligible (0.0001mg/l). The modelled concentrations are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Ballinamuck WTP, it has been demonstrated that the potential for likely significant effects on these Annex II fish species can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation status of Sea lamprey and Twaite shad or the maintenance of the favourable conservation status of Brook lamprey, River lamprey and Atlantic salmon.

6.2.1.4 [1130] Estuaries

The attributes and targets that will maintain the favourable conservation condition of this habitat in the Blackwater River 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, 2012[18]). The COs supporting document for Marine habitats (NPWS, 2012[21]) 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 Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at Ballinamuck WTP:

- The river waterbodies that are hydrologically connected include: IE_SW_18M260940 Moneygorm_010 and IE_SW_18F020500 Finisk_030.
- The transitional waterbody connected to the site is: IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour.
- The coastal waterbodies connected to the site are: IE_SW_020_0000_Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20).
- The groundwater bodies connected to the site are: IE_SW_G_050 Lismore, IE_SW_G_025 Cappoquin Kiltorcan and IE_SW_G_047 Knockmealdown.

The habitat *Estuaries* is estimated as 1,208 Ha using OSi data and the transitional water body area as defined under the WFD[18]. The habitat encompasses the Annex I habitat of Mudflats and sandflats not

[21] https://www.npws.ie/sites/default/files/publications/pdf/002170_Blackwater%20River%20(Cork-Waterford)%20SAC%20Marine%20Supporting%20Doc_V1.pdf

covered by seawater at low tide. The estuary is connected to the Moores Well and Lacken WSZs via the IE_SW_18M260940 Moneygorm_010 and the IE_SW_18F020500 Finisk_030, which flow into the northern point of the estuary from the east.

The modelled orthophosphate concentration in the river water bodies Moneygorm_010 (IE_SW_18M260940) and Finisk_030 (IE_SW_18F020500), are 0.0012 mg/l and 0.0000mg/l respectively and are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentration of both river water bodies does not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies which are at moderate (surrogate) and good indicative quality respectively.

For groundwater bodies, the predicted loads to groundwater bodies are undetectable or negligible; 0.0000 mg/l for IE_SW_G_050, Lismore and IE_SW_G_047, Knockmealdown GWBs, and 0.0001 mg/l for IE_SW_G_025, Cappoquin Kiltorcan GWB. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant. Post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies or of preventing the achievement of WFD objectives.

The modelled orthophosphate concentration in the transitional waterbody IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour is undetectable at 0.0000 mg/l and post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

For coastal waterbodies, both the IE_SW_020_0000 Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 19;19;20) exhibit modelled Ortho P concentrations which are not detectable (Youghal Bay; 0.0000mg/l) and negligible (0.0001mg/l). The modelled concentrations are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Ballinamuck 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 estuaries in this SAC.

6.2.1.5 [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 Blackwater River 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, 2012[18]). The COs supporting document for Marine habitats (NPWS, 2012[21]) 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 Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at Ballinamuck WTP:

- The river waterbodies that are hydrologically connected include: IE_SW_18M260940 Moneygorm_010 and IE_SW_18F020500 Finisk_030.
- The transitional waterbody connected to the site is: IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour.
- The coastal waterbodies connected to the site are: IE_SW_020_0000_Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20).
- The groundwater bodies connected to the site are: IE_SW_G_050 Lismore, IE_SW_G_025 Cappoquin Kiltorcan and IE_SW_G_047 Knockmealdown.

The habitat is encompassed within Estuaries as discussed above. The estuary is connected to the Moores Well and Lacken WSZs via the IE_SW_18M260940 Moneygorm_010 and the IE_SW_18F020500 Finisk_030, which flow into the northern point of the estuary from the east. The habitat Mudflats and sandflats not covered by seawater at low tide represent approximately 284 Ha and is located along the periphery of the estuary itself.

The modelled orthophosphate concentration in the river water bodies Moneygorm_010 (IE_SW_18M260940) and Finisk_030 (IE_SW_18F020500), are 0.0012 mg/l and 0.0000mg/l respectively and are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentration of both river water bodies does not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies which are at moderate (surrogate) and good indicative quality respectively.

For groundwater bodies, the predicted loads to groundwater bodies are undetectable or negligible; 0.0000 mg/l for IE_SW_G_050, Lismore and IE_SW_G_047, Knockmealdown GWBs, and 0.0001 mg/l for IE_SW_G_025, Cappoquin Kiltorcan GWB. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant. Post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies or of preventing the achievement of WFD objectives.

The modelled orthophosphate concentration in the transitional waterbody IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour is undetectable at 0.0000 mg/l and post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

For Coastal waterbodies, both the IE_SW_020_0000 Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 19;19;20) exhibit modelled Ortho P concentrations which are not detectable (Youghal Bay; 0.0000mg/l) and negligible (0.0001mg/l). The modelled concentrations are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

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

6.2.1.6 [1310] *Salicornia* and other annuals colonising mud and sand, [1330] Atlantic salt meadows and [1410] Mediterranean salt meadows

There are no nutrient specific targets in the SSCOs for these saltmarsh habitats (NPWS, 2012[18]); however there is a target relevant to all three habitats to maintain the natural tidal regime i.e. regular tidal inundation. The CO supporting document on coastal habitats (NPWS, 2012[22]) for the Blackwater River 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.

Salicornia habitat was not recorded by McCorry and Ryle (2009) during the Saltmarsh Monitoring Project at Kinsalebeg estuary, but is known to occur at Foxhole (above Youghal), Blackbog, and Tourig estuary (Curtis and Sheehy-Skeffington, 1998)[18]. However, the full extent is un-mapped and further surveyed areas maybe present within the site. It is estimated that the Kinsalebeg sub-site represents less than 10% of the total area of saltmarsh within this SAC[22].

For Atlantic salt meadows, and based on the Saltmarsh Monitoring Project, one sub-site that supports the habitat was mapped (Kinsalebeg) (2.77ha) and additional areas of potential saltmarsh (28.13ha) were identified from an examination of aerial photographs. The habitat also occurs at Tourig Hall and Ballintray House (Curtis and Sheehy-Skeffington, 1998). As with *Salicornia* habitat, further unsurveyed areas may be present within the site.

For Mediterranean salt meadows, one sub-site supporting the habitat was mapped as part of the Saltmarsh Monitoring Project (1.36ha) (Kinsalebeg) and additional areas of potential saltmarsh (8.67ha) were identified from an examination of aerial photographs. Further unsurveyed areas may be present within the site.

On the basis of the information above, and using a precautionary approach, it was determined that the three habitat types have the potential to occur along any part of the coastline that is covered by the tide (following McCorry and Ryle, 2009[23]).

The overall objective for *Salicornia* and other annuals colonising mud and sand, and Mediterranean salt meadows is to maintain favourable conservation status. For Atlantic salt meadows, it is to restore the favourable conservation status of the habitat.

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

- The river waterbodies that are hydrologically connected include: IE_SW_18M260940 Moneygorm_010 and IE_SW_18F020500 Finisk_030.

[22] NPWS 2012 Blackwater River (Cork/Waterford) SAC (site code 2170) Conservation Objectives Supporting Document - Coastal Habitats
[23] McCorry, M. & Ryle, T. (2009). Saltmarsh Monitoring Project 2007-2008 - Volume 1, Final Report

- The transitional waterbody connected to the site is: IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour.
- The coastal waterbodies connected to the site are: IE_SW_020_0000_Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20).
- The groundwater bodies connected to the site are: IE_SW_G_050 Lismore, IE_SW_G_025 Cappoquin Kiltorcan and IE_SW_G_047 Knockmealdown.

The modelled orthophosphate concentration in the river water bodies Moneygorm_010 (IE_SW_18M260940) and Finisk_030 (IE_SW_18F020500), are 0.0012 mg/l and 0.0000mg/l respectively and are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentration of both river water bodies does not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies which are at moderate (surrogate) and good indicative quality respectively.

For groundwater bodies, the predicted loads to groundwater bodies are undetectable or negligible; 0.0000 mg/l for IE_SW_G_050, Lismore and IE_SW_G_047, Knockmealdown GWBs, and 0.0001 mg/l for IE_SW_G_025, Cappoquin Kiltorcan GWB. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant. Post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies or of preventing the achievement of WFD objectives.

The modelled orthophosphate concentration in the transitional waterbody IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour is undetectable at 0.0000 mg/l and post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

For Coastal waterbodies, both the IE_SW_020_0000 Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 19;19;20) exhibit modelled Ortho P concentrations which are not detectable (Youghal Bay; 0.0000mg/l) and negligible (0.0001mg/l). The modelled concentrations are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

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

6.2.1.7 [1355] Otter (*Lutra lutra*)

A review of the SSCOs (NPWS, 2012[18]) 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[24]), which comprised a review of and response to the pressures and threats to otters in Ireland, categorized three

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

principal risks to otters: i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution.

The extent of terrestrial habitat within the site includes all areas within a 10m terrestrial buffer along the shoreline (above the high water mark and along river banks) identified as critical for otters. The extent of marine habitat is areas within 80m of the shoreline (high water mark). The extent of freshwater (river) habitat is calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (NPWS, 2012[18]). 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 Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at Ballinamuck WTP:

- The river waterbodies that are hydrologically connected include: IE_SW_18M260940 Moneygorm_010 and IE_SW_18F020500 Finisk_030.
- The transitional waterbody connected to the site is: IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour.
- The coastal waterbodies connected to the site are: IE_SW_020_0000_Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20).
- The groundwater bodies connected to the site are: IE_SW_G_050 Lismore, IE_SW_G_025 Cappoquin Kiltorcan and IE_SW_G_047 Knockmealdown.

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. Full details of the assessment are provided in **Appendix C**.

The modelled orthophosphate concentration in the river water bodies Moneygorm_010 (IE_SW_18M260940) and Finisk_030 (IE_SW_18F020500), are 0.0012 mg/l and 0.0000mg/l respectively and are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentration of both river water bodies does not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies which are at moderate (surrogate) and good indicative quality respectively.

For groundwater bodies, the predicted loads to groundwater bodies are undetectable or negligible; 0.0000 mg/l for IE_SW_G_050, Lismore and IE_SW_G_047, Knockmealdown GWBs, and 0.0001 mg/l for IE_SW_G_025, Cappoquin Kiltorcan GWB. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant. Post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies or of preventing the achievement of WFD objectives.

The modelled orthophosphate concentration in the transitional waterbody IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour is undetectable at 0.0000 mg/l and post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

For Coastal waterbodies, both the IE_SW_020_0000 Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 19;19;20) exhibit modelled Ortho P concentrations which are not detectable (Youghal Bay; 0.0000mg/l) and negligible (0.0001mg/l). The modelled concentrations are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

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

6.2.1.8 [1421] Killarney fern (*Trichomanes speciosum*)

Killarney fern is a type of filmy fern. It grows in deeply shaded, humid situations such as dripping caves, crevices and overhangs on cliffs and rocky slopes, in stream gullies, by waterfalls and in woodlands, and occasionally occurs under fallen trees and on the floor of damp woodlands[25]. There are currently two locations known within the SAC where this species occurs: one near Glendine, adjacent to IE_SW_020_0400_Lackaroe (Glendine Estuary), and the second site at Glengarra, north of Lismore. The site north of Lismore is located on the IE_SW_O080140 Owennashad_020, which is a tributary of the main Blackwater channel. The site is located upstream of the WSZs (Moores Well and Lacken) and does not intersect the WSZs at any point. Whilst the second location (near Glendine) is downstream of the WSZs, it is located at the uppermost point of IE_SW_18G0703000 Glendine (Blackwater)_010 – a river water body which is not intersected by the WSZ and lies within a separate river subcatchment.

Therefore there is no potential for the supporting habitat at either location to be impacted by orthophosphate dosing at Ballinamuck WTP.

6.2.1.9 [3260] Watercourses of plain to montane levels with *Ranunculion fluitantis* and *Callitrichio-Batrachion* vegetation

The full distribution of this habitat and its sub-types in this site are currently unknown. The basis of the selection of the SAC for the habitat was the presence of plant species listed in the Interpretation Manual (European Commission, 2007), recorded during the Natural Heritage Area (NHA) survey of the river (internal NPWS files)[18]. The dominant floating-leaved species appears to be the common and widespread stream water-crowfoot (*Ranunculus penicillatus* subsp. *Penicillatus*) (Green, 2008; O'Mahoney, 2009)[18]. No high conservation value sub-types are known to occur in the SAC and further survey is required to determine whether any such are present. Only one rare / threatened vascular plant species is known to occur in the SAC, the protected opposite-leaved pondweed (*Groenlandia densa*), which is abundant in the tidal stretches around Cappoquin (Green, 2008)[18], which is upstream of the ZoI for the Moores Well and Lacken WSZs.

The SSCOs[18] for this site include a target that the concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition. Water quality should reach a minimum of WFD 'good status', in terms of nutrient and oxygenation standards and ecological quality ratios (EQRs) for macroinvertebrates and phytobenthos.

[25] NPWS (2013). The Status of Protected EU Habitats and Species in Ireland, Overview Vol. 1. Unpublished Report, NPWS.

On the basis of the uncertainty associated with the distribution of this habitat within the Blackwater River SAC, and for the purposes of this assessment and following a precautionary approach, it has been assumed that this habitat could occur in any water body which is hydrologically connected to the WSZ.

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

- The river waterbodies that are hydrologically connected include: IE_SW_18M260940 Moneygorm_010 and IE_SW_18F020500 Finisk_030.
- The transitional waterbody connected to the site is: IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour.
- The coastal waterbodies connected to the site are: IE_SW_020_0000_Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20).
- The groundwater bodies connected to the site are: IE_SW_G_050 Lismore, IE_SW_G_025 Cappoquin Kiltorcan and IE_SW_G_047 Knockmealdown.

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. Full details of the assessment are provided in **Appendix C**.

The modelled orthophosphate concentration in the river water bodies Moneygorm_010 (IE_SW_18M260940) and Finisk_030 (IE_SW_18F020500), are 0.0012 mg/l and 0.0000mg/l respectively and are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentration of both river water bodies does not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies which are at moderate (surrogate) and good indicative quality respectively.

For groundwater bodies, the predicted loads to groundwater bodies are undetectable or negligible; 0.0000 mg/l for IE_SW_G_050, Lismore and IE_SW_G_047, Knockmealdown GWBs, and 0.0001 mg/l for IE_SW_G_025, Cappoquin Kiltorcan GWB. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant. Post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies or of preventing the achievement of WFD objectives.

The modelled orthophosphate concentration in the transitional waterbody IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour is undetectable at 0.0000 mg/l and post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

For Coastal waterbodies, both the IE_SW_020_0000 Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 19;19;20) exhibit modelled Ortho P concentrations which are not detectable (Youghal Bay; 0.0000mg/l) and negligible (0.0001mg/l). The modelled concentrations are below 5% of the Good/ High boundary (0.00125 mg/l. The post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

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

6.2.1.10 [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. 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.

There are six known sites within the SAC with a minimum area of 19.2 Ha; although there are likely to be further unsurveyed areas present[18]. A target within the SSCOs[18] for this habitat is to maintain the appropriate hydrological regime necessary for maintenance of alluvial vegetation. The woodlands supporting document for this site lists fertiliser drift and water pollution as indirect threats to the habitat, which may increase trophic status of the wood leading to the stronger growth of nitrophilous species and loss of less vigorous species. However, as these are naturally eutrophic systems the impact associated with occasional inundation is likely to be minimal[26]. On the basis of the uncertainty related to the distribution of this habitat in this SAC, it is assumed on a precautionary basis, that the habitat may occur in some or all of the river water bodies hydrologically connected to the WSZ.

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

- The river waterbodies that are hydrologically connected include: IE_SW_18M260940 Moneygorm_010 and IE_SW_18F020500 Finisk_030.
- The transitional waterbody connected to the site is: IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour.
- The coastal waterbodies connected to the site are: IE_SW_020_0000_Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20).
- The groundwater bodies connected to the site are: IE_SW_G_050 Lismore, IE_SW_G_025 Cappoquin Kiltorcan and IE_SW_G_047 Knockmealdown.

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. Full details of the assessment are provided in **Appendix C**.

The modelled orthophosphate concentration in the river water bodies Moneygorm_010 (IE_SW_18M260940) and Finisk_030 (IE_SW_18F020500), are 0.0012 mg/l and 0.0000mg/l respectively and are below 5% of the Good/ High boundary (0.00125 mg/l). The post dosing concentration of both river water bodies does not exceed 75% of the upper orthophosphate indicative

[26] NPWS 2012 River Blackwater (Cork/Waterford) SAC (site code 2170) Conservation Objectives Supporting Document - Woodland Habitats

quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies which are at moderate (surrogate) and good indicative quality respectively.

For groundwater bodies, the predicted loads to groundwater bodies are undetectable or negligible; 0.0000 mg/l for IE_SW_G_050, Lismore and IE_SW_G_047, Knockmealdown GWBs, and 0.0001 mg/l for IE_SW_G_025, Cappoquin Kiltorcan GWB. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant. Post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration of the current indicative quality of these water bodies or of preventing the achievement of WFD objectives.

The modelled orthophosphate concentration in the transitional waterbody IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour is undetectable at 0.0000 mg/l and post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

For Coastal waterbodies, both the IE_SW_020_0000 Youghal Bay and IE_SW_010_0000 Western Celtic Sea (HAs 19;19;20) exhibit modelled Ortho P concentrations which are not detectable (Youghal Bay; 0.0000mg/l) and negligible (0.0001mg/l). The modelled concentrations are below 5% of the Good/ High boundary (0.00125 mg/l) although this boundary is dependent on salinity of the waterbody. The post dosing concentrations do not exceed 75% of the upper orthophosphate indicative quality threshold. Therefore, there is no risk of deterioration in the current high indicative quality of these waterbodies or of preventing the achievement of WFD objectives.

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

6.2.2 Dungarvan Harbour SPA 004032

The Dungarvan Harbour SPA is located in the south-west of Co. Waterford (NPWS 2011[27]). It is a large C-shaped harbour, extending east as far as Ballynacourty Point in the north and Helvick Head in the south. The harbour is almost entirely dissected by the linear north-south orientated Cunnigar Spit which provides shelter to the inner harbour. The site includes three estuaries. The River Colligan, which runs south from the Comeragh Mountains, enters the north side of Dungarvan Bay at Dungarvan Town. The River Brickey enters the harbour in the west and the Glendine River enters in the northeast. As these three rivers are relatively small, freshwater input relative to the size of the site is low, resulting in a largely marine-influenced site. The intertidal habitats are dominated by sandflats, including the extensive 'Whitehouse Bank' which is a relatively stable sand bank on the eastern side of the Cunnigar spit. The inner harbour (west of Cunnigar spit), being more sheltered, has mudflats fringed in places by saltmarsh habitat, which is also found in the Brickey and Colligan estuaries.

The site is a SPA under the E.U. Birds Directive, of special conservation interest for the following species: Great Crested Grebe, Light-bellied Brent Goose, Shelduck, Red-breasted Merganser, Oystercatcher, Golden Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew,

[27] NPWS 2012 Dungarvan Harbour SPA 004032 Conservation Objectives

Redshank and Turnstone. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds[27]. All species and the wetland are considered to be both water dependent and nutrient sensitive (see **Appendix B**). The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. Furthermore, both Light-bellied Brent Goose and Black-tailed Godwit occur here in internationally important numbers. A further 13 species occur here in nationally important numbers, including: Great Crested Grebe, Shelduck, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Bar-tailed Godwit, Curlew, Redshank and Turnstone. Little Egret, a species which has recently colonised Ireland also occurs at the site. The SPA is an important site for wintering waterfowl, providing good quality feeding areas and roost sites for an excellent diversity of waterfowl species. Dungarvan Harbour is a Ramsar Convention site.

The SSCOs for the SPA (NPWS, 2012[27]) outlines the attributes and targets of population trend and distribution for each SCI as follows:

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

There is also a target for the wetland habitat that supports the SPA in which the permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 2,219 hectares, other than that occurring from natural patterns of variation.

No nutrient specific targets have been set for this SPA site. However, the river basin management planning process contributes towards achieving water conditions that support Favourable Conservation Status. In preparing the RBMP (2018-2021) (DHPLG, 2018) the risk assessment carried out by the EPA for these water dependent European Site protected areas has focussed on looking at the risks to the water standards/objectives established for the purpose of supporting Good Ecological Status (GES). GES, which is the default objective of the WFD, is considered adequate for supporting many water dependent European Site protected areas where site specific environmental supporting conditions have not been defined within SSCOs by the NPWS.

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

- River water bodies within the WSZ which are hydrologically connected to this site are: Brickey_020 (IE_SE_17B010090) and Colligan_040 (IE_SE_17C010300).
- Transitional water bodies within the WSZ which are hydrologically connected to this site are: the Colligan Estuary (IE_SE_140_0100) and the Brickey Estuary (IE_SE_140_0200).
- The coastal waterbody connected to the site is: Dungarvan Harbour (IE_SE_140_0000).
- The groundwater bodies hydrogeologically connected to the site include: Dungarvan (IE_SE_G_052), Waste Facility (W0032-02) (IE_SE_G_178) and Industrial Facility (P0156-01) (IE_SE_G_055).

For river waterbodies, Brickey_020 (IE_SE_17B010090) and Colligan_040 (IE_SE_17C010300) the modelled concentrations were 0.0001mg/l, which is below the 5% Good / High boundary of 0.00125mg/l. While post dosing concentrations for the Colligan_040 did not exceed 75% of the upper

orthophosphate indicative quality threshold, the post dosing concentration for Brickey_020 exceeded the threshold. However, this was due to the baseline Ortho P concentration. The modelled concentration increase was 0.0001mg/l which is negligible and therefore there will therefore be no risk of deterioration in the indicative quality of any RWB as a result of orthophosphate dosing at Ballinamuck WTP or of preventing the achievement of WFD objectives.

For transitional waterbodies, Colligan Estuary (IE_SE_140_0100) and Brickey Estuary (IE_SE_140_0200), the modelled concentrations were not detectable (0.0000mg/l) and negligible (0.0001mg/l) respectively. Post dosing concentrations, with the exception of Colligan Estuary during winter, do not exceed 75% of the upper orthophosphate indicative quality threshold. The post dosing concentration during winter for Colligan Estuary exceeds the 75% of the upper orthophosphate indicative quality threshold. However, this is due to the baseline Ortho P concentration. The modelled increase in concentration is 0.0000mg/l which is not detectable and therefore there will therefore be no risk of deterioration in the indicative quality of any TWB as a result of orthophosphate dosing at Ballinamuck WTP or of preventing the achievement of WFD objectives.

For the Coastal waterbody, Dungarvan Harbour (IE_SE_140_0000), the modelled increase in concentrations was undetectable i.e. 0.0000mg/l. While the post dosing concentration for Dungarvan Harbour during summer does not exceed the 75% of the upper orthophosphate indicative quality threshold, the post dosing concentration for winter does exceed the threshold. However, this was due to the baseline Ortho P concentration. The modelled concentration increase was 0.0000mg/l which is not detectable and therefore there will therefore be no risk of deterioration in the indicative quality of this CWB as a result of orthophosphate dosing at Ballinamuck WTP or of preventing the achievement of WFD objectives.

For groundwater bodies, IE_SE_G_052 Dungarvan had a modelled concentration of 0.0003mg/l and IE_SE_G_178 Waste Facility (W0032-02) had a modelled concentration of 0.0012mg/l, which are below 5% of the Good/Fail boundary (0.00175mg/l). Industrial Facility (P0156-01) had a modelled concentration of 0.0026mg/l which exceeded the threshold for 5% of the Good/Fail boundary; however, the post dosing concentration for Industrial Facility does not exceed 75% of the indicative quality threshold. Post dosing concentrations in the other groundwater bodies also do not exceed 75% of the indicative quality threshold. There will therefore be no risk of deterioration in the indicative quality of any GWB as a result of orthophosphate dosing at Ballinamuck WTP or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Ballinamuck WTP, it has been demonstrated that the potential for likely significant effects on this SPA can be excluded. Furthermore, orthophosphate dosing will have no likely significant effect on the maintenance of the favourable conservation status of its SCIs; either in terms of individual bird species or wetland habitats.

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

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

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

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

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

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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Waterford City Development and Waterford County Development Plan 2022 – 2028 (amalgamated and extended as of 2014) The policies, objectives and zonings of relevance in the Waterford County Development Plan include under water quality: **WQ 01 - Water Framework Directive and Associated Legislation** We will contribute towards, as appropriate, the protection of existing and potential water resources, and their use by humans and wildlife, including rivers, streams, wetlands, the coastline, groundwater and associated habitats and species in accordance with the requirements and guidance in the EU Water Framework Directive 2000 (2000/60/EC), the European Union (Water Policy) Regulations 2003 (as amended), the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended), the Groundwater Directive 2006/118/EC and the European Communities Environmental Objectives (groundwater) Regulations 2010 (as amended) and other relevant EU Directives, including associated national legislation and policy guidance (including any superseding versions of same). To support the application and implementation of a catchment planning and management approach to development and conservation, including the implementation of Sustainable Drainage System techniques for new development. **WQ 02 - Achieving High/ Good Water Quality Status** In order to maintain water quality at high status and a return to good status for rivers that are not meeting this threshold at present we will: • Provide for the efficient and sustainable use and development of water resources and water services infrastructure. • Manage and conserve water resources in a manner that supports a healthy society, economic development requirements and a cleaner environment.	▪ N/A	The Development Plan emphasises 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 River Basin Management Plan (2018-2021) and emphasises compliance with environmental objectives. The Plan also seeks to ensure the protection, integrity and conservation of European Sites and Annex I and II species listed in EU Directives. There is no potential for cumulative impacts with these plans.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
• Ensure that all development does not negatively impact on water quality and quantity, including surface water, ground water, designated source protection areas, river corridors and associated wetlands, estuarine waters, coastal and transitional waters. • Ensure new development complies with the relevant EPA Code of Practice: Domestic Wastewater Treatment Systems (PE ≤ 10) (2021).or any amendments thereto. • Screen planning applications according to their Water Framework Directive status and have regard to their status and objectives to achieve 'good' status or protect and improve 'high or good status'. A catchment-based approach shall be applied to the assessment of planning applications which may impact on water quality, and to ensure that the development would not result in a reduction in the water quality status of a waterbody in that catchment. • Seek to protect, enhance and restore all groundwaters and ensure a balance of abstraction and recharge, with the aim of achieving good groundwater status and to reverse any significant and sustained upward trends in the concentration of pollutants in groundwater. • Work with the Local Authority Waters Programme and other relevant State agencies and local communities to achieve the objectives for the Areas for Action[1] identified in the River Basin Management Plans 2018-2021 and 2022-2027 to ensure that new development do not result in a deterioration of water quality in these areas. • Develop the associated Blue Dot Catchment network programme under the River Basin Management Plan 2018-2021 to protect and maintain the excellent quality of 'High' status water bodies. **WQ 03 - River Basin Management Plan**		

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Support the implementation of the relevant recommendations and measures as outlined in the River Basin Management Plan 2018-2021, and associated Program of Measures, or any such plan that may supersede same during the lifetime of the plan. Proposed plans, program and projects shall not have an unacceptable impact on the water environment, including surface waters, groundwater quality and quantity, river corridors and associated woodlands. Also, to have cognisance of, where relevant, the EU's Common Implementation Strategy Guidance Document No. 20 and 36 which provide guidance on exemptions to the environmental objectives of the Water Framework Directive. **WQ 04 - Catchment-sensitive Farming Practices** We will encourage the use of catchment-sensitive farming practices, in order to meet Water Framework Directive targets and comply with the River Basin Management Plan. **WQ 05 - Bathing Water Quality** We will maintain Bathing Water standards in line with the EU Bathing Water Directive and increase the number of blue flag beaches.		
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,	▪ 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
53% of surface waters are in good or high ecological status while the remaining 47% are in unsatisfactory ecological status. For groundwater bodies, 92% are in good chemical and quantitative status. Chapter 3 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each water body that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2027. This work was presented in the RBMP for 4,842 water bodies nationally. 1,603 water bodies were classed *At Risk* or 33%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 1,000 water bodies that are *At Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.		
Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive The Office of Public Works (OPW) is responsible for the implementation of the Floods Directive 2007/60/EC which is being carried out through a Catchment based Flood Risk Assessment and Management (CFRAM) Programme. As part of the directive Ireland is required to undertake a Preliminary Flood Risk Assessment, to identify areas of existing or potentially significant future flood risk and to prepare flood hazard and risk maps for these areas. Following this, flood risk management plans are developed for these areas setting objectives for managing the flood risk and setting out a prioritised set of measures to achieve the objectives. The CFRAM programme is currently being rolled out and Draft Flood Risk Management Plans have been prepared. These plans have been subject AA.	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Alterations to water quality and/or water movement; ▪ Disturbance; ▪ In-combination impacts within the same scheme	CFRAM Studies and their product Flood Risk Management Plans will each undergo appropriate assessment. Any future flood plans will have to take into account the design and implementation of water management infrastructure as it has the potential to impact on hydromorphology and potentially on the ecological status and favourable conservation status of water bodies. The establishment of how flooding may be contributing to deterioration in water quality in areas where other relevant pressures are absent is a significant consideration in terms of achieving the objectives of the WFD. The AA of the plans will need to consider the potential for impacts from hard engineering solutions and how they might affect hydrological connectivity and hydromorphological supporting conditions for protected habitats and species. There is no potential for cumulative impacts with the CFRAMS programme as no infrastructure is proposed as part of this project.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Foodwise 2025 Foodwise 2025 strategy identifies significant growth opportunities across all subsectors of the Irish agri-food industry. Growth Projection includes increasing the value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.	▪ Land use change or intensification ▪ Water pollution ▪ Nitrogen deposition ▪ Disturbance to habitats / species	Foodwise 2025 was subject to its own AA[28]. Growth is to be achieved through sustainable intensification to maximise production efficiency whilst minimising the effects on the environment however there is increased risk of nutrient discharge to receiving waters and in turn a potential risk to biodiversity and Europe Sites if not controlled. With the required mitigation in the Food Wise Plan, no significant in-combination impacts are predicted. Mitigation measures included cross compliance with 13 Statutory Management Requirements, EIA Agricultural Regulations 2011, GLAS, and AA Screening of licencing and permitting in the forestry and seafood sectors.
Rural Development Programme 2014 – 2020 The agricultural sector is actively enhancing competitiveness whilst trying to achieve more sustainable management of natural resources. The common set of objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2020 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while improvements are sought in relation to water management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and Targeted Agriculture Modernisation Scheme (TAMS). They provide the role of a supportive measure to improve water quality and thus provide direct benefits in achieving the measures within the RBMP. The achievement of the objectives outlined within GLAS, to improve water quality, mitigate against climate change and promote biodiversity will be of direct positive benefit in achieving the measures within the RBMP and the goals of the Natura Directives. The scheme has an expected participation for 2014-	• Overgrazing; • Land use change or intensification; • Water pollution; • Nitrogen deposition; • Disturbance to habitats / species;	The RDP for 2014 – 2020 has been subject to SEA[29], and AA[30]. 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.

[28] http://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/environmentalanalysis/AgriFoodStrategy2025NISDRAFT300615.pdf
[29] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf
[30] 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
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 waterbodies from pollution through limiting the amount of fertiliser that is placed on the land. The scheme prioritises farms in vulnerable catchments with 'high status' waterbodies 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 Ireland is obliged under the Nitrates Directive 91/676/EEC to prepare a National Nitrates Action Programme which is designed to prevent pollution of surface and ground waters from agricultural sources. This will directly contribute to the improvement of water quality and thus the objectives within the RBMP. Ireland's third Nitrates Action Programme came into operation in 2014 and has a timescale up to 2017. The Agricultural Catchments Programme is an ongoing programme that monitors the efficiency of various measures within the nitrate regulations. It is spread across six catchments and encompasses approximately 300 farmers.	• Land use change or intensification • Water pollution • Nitrogen deposition • Disturbance to habitats / species	This programme has been subject to a Screening for Appropriate Assessment and it concluded that the NAP will not have a significant effect on the Natura 2000 network and a Stage 2 AA was not required[31]. It concluded that the NAP was an environmental programme which imposes environmental constraints on all agricultural systems in the state. It therefore benefits Natura 2000 sites and their species. In terms of in-combination effects, it stated that the Food Wise 2025 strategy would have to operate within the constraints of the NAP.
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	• Habitat loss or destruction;	Ireland's Forestry Programme 2014 – 2020 has undergone AA[32]. 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

[31] http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad,35218,en.PDF
[32] 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
People – A Renewed Vision (2014) is to increase the level of afforestation annually over time and support afforestation and mobilisation measures under the Forestry Programme 2014-2020. Two key objectives within the Forestry Programme 2014-2020 that will influence the RBMP are to increase Ireland's forest cover to 18% and to establish 10,000 ha of new forests and woodlands per annum. As part of this programme there are a number of schemes that promote sustainable forest management and they include the Afforestation Scheme, the Woodland Improvement Scheme, the Forest Road Scheme and the Native Woodland Conservation Scheme. Under the Native Woodland Conservation Scheme funding is provided to restore existing native woodland which promotes Ireland's native woodland resource and associated biodiversity. Native woodlands provide wider ecosystem functions and services which once restored can contribute to the protection and enhancement of water quality and aquatic habitats. New guidance and plans are also being developed to address forestry adjacent to water bodies, Freshwater Pearl Mussel Plans for 8 priority catchments and a Hen Harrier Threat Response Plan (NPWS). The mitigation measures within these plans will be particularly important in terms of protecting sensitive habitats and species from such forestry increases.	• Habitat fragmentation or degradation; • Water quality changes; • Disturbance to species.	be taken into account when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there is no potential for cumulative impacts with the proposed project.
Water Services Strategic Plan (WSSP, 2015) Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and WFD requirements. The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short, medium and long term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to be used for key water service areas such as water resource management, wastewater compliance and sludge management. The WSSP also sets out the strategic objectives against which the Irish Water Capital Investment Programme is developed. The current version of the CAP outlines	• Habitat loss and disturbance from new / upgraded infrastructure; • Species disturbance; • Changes to water quality or quantity; • Nutrient enrichment /eutrophication.	The overarching strategy was subject to Appropriate Assessment and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
the proposals for capital expenditure in terms of upgrades and new builds within the Irish Water owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.		
National Wastewater Sludge Management Plan (2016) The National Wastewater Sludge Management Plan was prepared in 2015, outlining the measures needed to improve the management of wastewater sludge.	• Habitat loss and disturbance from new / upgraded infrastructure; • Species disturbance; • Changes to water quality or quantity; • Nutrient enrichment /eutrophication.	The plan was subject to both AA and SEA and includes a number of mitigation measures which were identified in relation to transport of materials, land spreading of sludge and additional education and research requirements. This plan does not specifically address domestic wastewater loads, only those relating to Irish Water facilities. In relation to the plan as it stands, no in-combination effects are expected with the implementation of proposed mitigation measures.
National Water Resources Plan (in prep.) 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 will need to take 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 potential for in-combination impacts are unclear as the plan is not sufficiently developed at this stage.
Planning Applications There are a number of planning applications pending or recently approved in Waterford County. The applications are predominantly for the construction of new infrastructure or renovations to existing infrastructure. In the case of new infrastructure, the applications are predominantly for the construction of new infrastructure or renovations to existing infrastructure in the Dungarvan area. In the wider area there are planning applications for renewable energy infrastructure i.e. wind farms and associated ancillary works.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; • Nutrient enrichment /eutrophication.	Adherence to the overarching policies and objectives of the Waterford City Development Plan 2013-2019 will ensure that local planning applications and subsequent grant of planning will comply with the requirements of relevant environmental legislation including the WFD and Habitats Directive. The Dungarvan Town Development Plan 2012-2018 acknowledges that a changing environment demands changing infrastructure and adapting policies and programmes to meet the challenges posed by the environment at a global, national and county scale. Key challenges include adaption to climate change and the related areas of Flood Risk Management and Coastal Zone Management. The WFD and its associated River Basin Management Plans and Programmes of Measures set down significant challenges in attaining the required standard

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
		of water quality. At policy and project level, the requirement to screen and carry out SEA and EIA serve to identify any adverse environmental impacts and an early state and plan mitigation measures to offset or reduce such adverse effects and achieve sustainable and environmentally benign development as far as possible.
Integrated Pollution Control (IPC) Licensing There are several IPC licensed facilities within the Dungarvan, Moores Well and Lacken WSZs. Licensed activities include polymer recycling, joinery, engineering, land drainage, emissions to water etc. Under the Industrial Emissions Directive 2010/75/EU and Environmental Protection Agency Act, 1992 (as amended) certain agricultural activities (e.g. pig and poultry farms) are licensed by the EPA to prevent or reduce emissions to air, water and land, reduce water and use energy/resources efficiently. An IPC licence is a single integrated licence which covers all emissions from the facility and its environmental management. All related operations that the licence holder carries in connection with the activity are controlled by this licence.	▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	The EPA is responsible for monitoring emissions and dealing with any infringements on IPC licences. All emissions must be within set limits which must not be contravened. Limits are set for phosphorus where relevant. Compliance with the limits set for phosphorus will ensure that there will be no significant in-combination impacts on Natura 2000 sites.

7 SCREENING CONCLUSION STATEMENT

This Screening to inform the AA process has considered whether the proposed construction works and operational orthophosphate dosing at the Ballinamuck WTP, within the Dungarvan WSZ (including Moores Well and Lacken WSZs), in combination with other plans or projects, is likely to have a significant effect on European Sites.

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

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

During the operational phase, the potential for direct, indirect and cumulative impacts affecting European Sites within the ZoI including; Blackwater River (Cork/Waterford) SAC and Dungarvan Harbour SPA have been assessed. Due to the low orthophosphate inputs following dosing at Ballinamuck WTP and no risk of deterioration in the indicative quality of the receiving waterbodies or of preventing the achievement of WFD objectives, there will be no significant direct, indirect or cumulative impacts that will result in likely significant effects to the qualifying interests/special conservation interests of the European Sites within the ZoI. This is concluded with regard to the range, population densities and overall conservation status of the habitats and species for which these sites are designated (i.e. Conservation Objectives).

The screening has been carried out on the basis of the information presented in the Project Description. It has been concluded that the project it is not connected or necessary to the management of any European Site. It can be concluded on the basis of objective scientific information and in view of best scientific knowledge, the proposed orthophosphate dosing and associated construction works at the Ballinamuck 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.

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APPENDIX A

European Sites –Conservation Objectives

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 AA Screening are provided below.

Site Name (Code)	Conservation Objectives Source
Blackwater River (Cork/Waterford) SAC (002170)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
Dungarvan Harbour SPA (004032)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004032.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 nigra*)	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

039 Ballinamuck WTP - Dungarvan (3100PUB1039)

National Lead in Water Mitigation Strategy

Environmental Assessment Methodology Report: 039 Ballinamuck WTP – Dungarvan (3100PUB1039)

Document Control Sheet

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F03	Final	23rd Aug 2019	IP		MM		GJG	
F04	Final	23rd Jan 2023	YE		IP		MM	

039 Ballinamuck WTP – Dungarvan (3100PUB1039)

Supporting spreadsheet: 039 Ballinamuck WTP - Dungarvan V21

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

Ballinamuck WTP supplies Dungarvan town and environs in County Waterford. The distribution input for Dungarvan is 5,202 m^3/day (68% of which is accounted for with the remainder assumed to be lost through leakage) serving a population of approximately 7,950. The non-domestic demand is 18% of the distribution input. The area is served by Dungarvan WWTP (D0017-01); which is 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 no other WWTPs within this WSZ. There are an estimated 530 properties across the WSZ that are serviced by a DWWTS.

This assessment has been undertaken for the WSZ in isolation. However, if corrective water treatment is proposed for WTPs in the same catchment area, the cumulative impact from the combined loads to downstream water bodies are assessed. The WTPs listed in the summary and mitigation section are currently being considered for corrective water treatment in the Colligan-Mahon Catchment (HA 17). An assessment of these cumulative loads has been undertaken and is detailed in the summary and mitigation section.

<table>
<tr><td>Water Treatment Plant</td><td colspan="2">Ballinamuck WTP</td></tr>
<tr><td>Water Supply Zone</td><td colspan="2">Dungarvan (3100PUB1039)
Moores Well (3100PUB1137)
Lacken (3100PUB1149)
Additional WSZ used to calculate Distribution Input:
LCB Ballyhane (3100PUB1089)
Monamon (3100PUB1148)
See Figure 4.1 / 4.2 of the AA Screening for a map of the WSZ and ZoI</td></tr>
<tr><td rowspan="2">Step 1 Appropriate Assessment Screening</td><td colspan="2">European Sites within Zone of Influence</td></tr>
<tr><td colspan="2">SACs</td></tr>
<tr><td colspan="2">Helvick Head
Ballyteige Burrow
Bannow Bay
Lady's Island Lake
Saltee Islands
Ballymacoda (Clonpriest and Pillmore) SAC
Glendine Wood SAC
Tramore Dunes and Backstrand SAC
River Barrow and River Nore SAC
Tacumshin Lake
Lough Hyne Nature Reserve and Environs SAC
Roaringwater Bay and Islands SAC</td><td>Hook Head
Comeragh Mountains
Ardmore Head
Blackwater River (Cork/Waterford)
Carnsore Point
Glendine Wood
Barley Cove to Ballyrisode Point SAC
Great Island Channel SAC
Clonakilty Bay SAC
Kilkeran Lakes and Castlefreke Dunes SAC
Myross Wood SAC
Castletownshend SAC</td></tr>
</table>

SPAs

• Ballyteigue Burrow SPA	• Keeragh Islands SPA
• Bannow Bay SPA	• Saltee Islands SPA
• Dungarvan Harbour SPA	• Tacumshin Lake SPA
• Helvick Head Coast SPA	• Tramore Back Strand SPA
• Blackwater Estuary SPA	• Lady's Island Lake SPA
• Helvick Head to Ballyquin SPA	• Ballymacoda Bay SPA
• Mid-Waterford Coast SPA	• Sovereign Islands SPA
• Blackwater Callows SPA	• Sheep's Head to Toe Head SPA
• Galley Head to Duneen Point SPA	• Seven Heads SPA
• Ballycotton Bay SPA	• Old Head of Kinsale SPA
• Cork Harbour SPA	• Clonakilty Bay SPA.
• Courtmacsherry Bay SPA	

Appropriate Assessment Required – see AA screening report for details

Step 2 – Direct Inputs to Surface Water

Table 1: Increased loading/concentration to agglomerations due to Orthophosphate Dosing – Dosing rate = 1.0 mg/l

Agglomeration and discharge type	ELV (Ortho-P unless otherwise stated) from WWDL (mg/l)	Scenario	TP Load kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, and 68%)*		
				0.5	*0.4*	*0.68*
Dungarvan Primary Discharge	n/a	Existing	5922.1	0.760	0.608	1.034
		Post Dosing	6649.3	0.853	0.683	1.161
Dungarvan SWOs (4 no.)	n/a	Existing	257.4	1.134	0.908	1.543
		Post Dosing	278.6	1.228	0.982	1.670

Note: There are no orthophosphate ELVs for this agglomeration.

Dungarvan WWTP receives secondary treatment and it is assumed that the additional orthophosphate load is not removed in the treatment process and is added to the existing effluent loads from the WWTP.

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

Table 2: Mass balance assessment based on 1.0 mg/l dosing using available background concentrations and tidal flow information

Agglom.	RWB Name / Code for Primary Discharge	Background Conc. (mg/l) (Annual mean from AER u/s monitoring point)	Resultant Conc. existing (mg/l)	Resultant Conc. Post Dosing (mg/l)	% Inc.
Dungarvan	IE_SE_140_0000	0.0220	0.0222	0.0222	0.10

Surface Assessment

Dungarvan Harbour (IE_SE_140_0000) – Dungarvan WWTP has secondary treatment, and it is assumed that the additional orthophosphate load is not removed in the treatment process and is added to the effluent loads from the WWTP. Based on the additional loading and the available dilution in Dungarvan Harbour when considering

	tidal influences there will be no impact on the receiving water body as a result of the additional load from orthophosphate dosing. The dosing will therefore have an insignificant impact on the direct discharges to surface water from agglomerations within the WSZ.

Step 4 Distributed Inputs to surface water bodies from sub surface pathways	**<u>Subsurface Assessment</u>** The modelled increments in concentrations in the subsurface pathways are insignificant for all river water bodies (less than 0.00125 mg/l, which is 5% of Ortho P Good/High Indicative Quality boundary for surface water bodies), with highest increase equal to 0.0012 mg/l, taking place in IE_SW_18M260940 (Moneygorm_010). Transitional water bodies directly affected by this WSZ are Colligan Estuary (IE_SE_140_0100), and Brickey Estuary (IE_SE_140_0200). The modelled increments in orthophosphate concentrations are also insignificant in these water bodies.
Step 5 and 6: Combined Inputs to Groundwater Bodies	**<u>Groundwater Bodies as receptors connected to WSZ</u>** Table 3 gives the loads and modelled concentrations for the assessment of groundwater bodies. The predicted increases in concentrations for most groundwater bodies are below significant levels (5% of the Good/Fail Ortho P Indicative Quality boundary for groundwater - 0.00175 mg/l). IE_SW_G_025 (Cappoquin Kiltorcan) is currently failing to achieve good orthophosphate indicative quality at one of its monitoring stations, but as the potential Increase in Orthophosphate concentrations is negligible (0.0001mg/l) there is deemed to be no further risk to this waterbody due to orthophosphate dosing. There are two small GWBs, IE_SE_G_178 (Waste Facility (W0032-02) and IE_SE_G_055 (Industrial Facility (P0156-01), delineated as they receive inputs from industry or a waste facility. Both are of Good indicative quality for orthophosphate. In the case of IE_SE_G_055 the increase due to orthophosphate dosing is potentially significant; however, the assessment of the orthophosphate dosing has demonstrated that neither are at risk of failing WFD objectives or increase the risk of failing to achieve the WFD objectives for surface waters. The modelled increase in concentration for the overlying surface water body, IE_SE_17C010300 (COLLIGAN_040), is modelled to be 0.0001 mg/l (see Table 4.A) which is a negligible increase and therefore there is not impacted by the contributing groundwater loads from these GWBs. The orthophosphate dosing will not have a significant impact on the orthophosphate indicative quality or the groundwater status. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, there is no risk of impact on groundwater receptors due to orthophosphate dosing.

Table 3: Increased loading and concentrations to groundwater bodies connected to the WSZs ***(note: where existing monitoring data is not available, a surrogate indicative quality is derived from initial characterisation or chemical status of the GWB and related pressures, 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 Year 2018 Ortho P Conc. mg/l *[Surrogate Conc. given in italic]*	75% of Ortho P 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_014 Ballyknock	*Good*	*0.018*	*0.026*	*1.2*	*0.0003*	*0.018*	
IE_SE_G_052 Dungarvan	Good Upwards Far	0.009	0.026	6.7	0.0003	0.009	
IE_SE_G_055 Industrial Facility (P0156-01)	*Good*	*0.018*	*0.026*	*5.2*	*0.0026*	*0.020*	
IE_SE_G_085 Kilrion	*Good*	*0.018*	*0.026*	*0.0*	*0.0000*	*0.018*	
IE_SE_G_178 Waste Facility (W0032-02)	*Good*	*0.018*	*0.026*	*0.3*	*0.0012*	*0.019*	
IE_SW_G_025 Cappoquin Kiltorcan	Failing to achieve good Upwards Far	0.055	-	2.9	0.0001	0.055	MP1
	Good Upwards Far	0.011	0.026			0.011	MP2
IE_SW_G_047 Knockmealdown	Good Upwards Far	0.014	0.026	0.0	0.0000	0.014	
IE_SW_G_050 Lismore	Good Upwards Far	0.005	0.026	0.0	0.0000	0.005	MP1
	Good Upwards Far	0.006	0.026			0.006	MP2

MP: multiple Monitoring Points given for waterbody

Step 5 and 6: Combined Inputs to Surface Water Bodies

Combined Assessment

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

Table 4-A: Increased loading and concentrations to River water bodies connected to the WSZs ***(note: where existing monitoring data is not available, a surrogate indicative quality is derived from ecological status of the WB or Ortho P indicative quality / ecological status of upstream and 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 given in italic]*	Baseline Conc. mg/l *[Surrogate Conc. given in italic]*	75% of indicative quality upper Threshold mg/l	Total Ortho P Load in receiving waters kg/ yr	Conc. using flows (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SE_17B010090 BRICKEY_020	Good Upwards Far	0.029	0.033	2.4	0.0001	0.029	MP1
	High Downwards Near	0.022	0.019			0.022	MP2
IE_SE_17C010300 COLLIGAN_040	High Upwards Far	0.014	0.019	12.2	0.0001	0.014	MP1
	High Upwards Far	0.015	0.019			0.015	MP2
	Good Upwards	0.030	0.033			0.030	MP3
IE_SE_17D030100 DEELISH STREAM_010	*Moderate*	*0.046*	*0.051*	*1.6*	*0.0001*	*0.046*	
IE_SE_17K380650 KILLONGFORD_010	*Good*	*0.030*	*0.033*	*0.0*	*0.0000*	*0.030*	
IE_SW_18F020500 FINISK_030	Good Upwards Far	0.030	0.033	1.9	0.0000	0.030	
IE_SW_18G100200 GLENNAFALLIA_020	Good Upwards Far	0.030	0.033	0.0	0.0000	0.030	
IE_SW_18M260940 MONEYGORM_010	*Good*	*0.030*	*0.033*	*5.5*	*0.0012*	*0.031*	

MP: multiple Monitoring Points given for waterbody

Table 4-B: Increased loading and concentrations to Transitional and Coastal water bodies connected to the WSZs ***(note: where existing monitoring data is not available, a surrogate indicative quality is derived from ecological status of the WB or Ortho P indicative quality / ecological status of upstream and 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 given in italic]*	Baseline Conc. mg/l *[Surrogate Conc. given in italic]*	75% of Ortho P indicative quality upper threshold mg/l	Total Ortho P Load in receiving waters kg/ yr	Conc. using flows (30%ile , tidal or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SE_140_0100 Colligan Estuary	High (S) Upwards Far	0.009	0.019	16.3	0.0000	0.009	
	High (W) Downwards Far	0.021	0.019			0.021	
IE_SE_140_0200 Brickey Estuary	*Poor*	*0.077*	*0.087*	*2.4*	*0.0001*	*0.077*	
IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour	High (S) Downwards Far	0.021	0.023	7.4	0.0000	0.021	
	Good (W) Upwards Far	0.034	0.053			0.034	
IE_SE_140_0000 Dungarvan Harbour	High (S) Downwards Far	0.004	0.019	390.4	0.0000	0.004	‡
	High (W) Upwards Near	0.021	0.019			0.021	

‡ Load from WWTP / SWO following treatment added.

S = Summer monitoring period, W = Winter monitoring period

Summary and Mitigation Proposed

Considering Ballinamuck WTP in isolation, orthophosphate dosing is predicted to have an insignificant impact on the receiving waterbodies. The modelled load and increase in concentrations to both groundwater and surface water receptors do not cause a risk to WFD objectives.

The breakdown from source to pathway is shown in Figure 1 and the fate of P loads from Ballinamuck WTP is depicted in Figure 2.

The cumulative impacts on Colligan-Mahon Catchment (HA 17), Blackwater (Munster) catchment (HA18), the Lee, Cork Harbour & Youghal (HA19) and the Bandon-Ilen catchment (HA20), associated with the corrective water treatment, including those at the following WTPs, have been assessed in combination with Ballinamuck WTP.

- 4 Lee Road WTP - Cork City Water Supply
- 6 Inniscarra WTP – Zone 2 Cork City and Harbour
- 010 Adamstown WTP – East Waterford
- 26 Glashaboy WTP – Zone 3 Glashaboy

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

The cumulative loads to water bodies that are impacted by the WSZs supplied by these WTPs have been summarised in Table 5 below.

The cumulative assessment using 2014 baseline data has demonstrated that there will not be a 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.

Table 5: Cumulative assessment of the increased loading and concentrations to water bodies impacted by 039 Ballinamuck WTP - Dungarvan WSZ 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).***

EU_CD / NAME	Ortho P indicative quality and Trends (distance to threshold) Surrogate indicative quality indicated in italic	Baseline Conc. Surrogate Conc. given in *italic* mg/l	75% of Ortho P indicative quality upper threshold mg/l	Cumulative Ortho P Load to SW from leakage, DWWTS & agglomerations kg/yr	Conc. using flows (30%ile tidal or gauged) mg/l	PO4 Potential Baseline Conc. following dosing mg/l	Notes
IE_SE_140_0100 Colligan Estuary	High (S) Upwards Far	0.009	0.019	20.3	0.0000	0.009	

		High (W) Downwards Far	0.021	0.019			0.021	
	IE_SE_140_0200 Brickey Estuary	*Poor*	*0.077*	*0.087*	4.1	0.0002	0.077	
	IE_SE_140_0000 Dungarvan Harbour	High (S) Downwards Far	0.004	0.019	394.5	0.0000	0.004	
		High (W) Upwards near	0.021	0.019			0.021	
	IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour	High (S) Downwards Far	0.021	0.023	506.3	0.0001	0.021	
		Good (W) Upwards Far	0.034	0.053			0.034	
	IE_SW_020_0000 Youghal Bay	High Upwards Far	0.009	0.019	517.9	0.0000	0.009	
		High Downwards Far	0.014	0.019			0.014	
	IE_SE_050_0000 Eastern Celtic Sea (HAs 13;17)	*High*	*0.013*	*0.019*	*4715.3*	*0.0000*	*0.013*	
	IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20)	*High*	*0.013*	*0.019*	*9694.9*	*0.0001*	*0.013*	

S = Summer monitoring period, W = Winter monitoring period

‡ Load from WWTP / SWO following treatment added.

MITIGATION OPTIONS – None required

RAG STATUS – GREEN

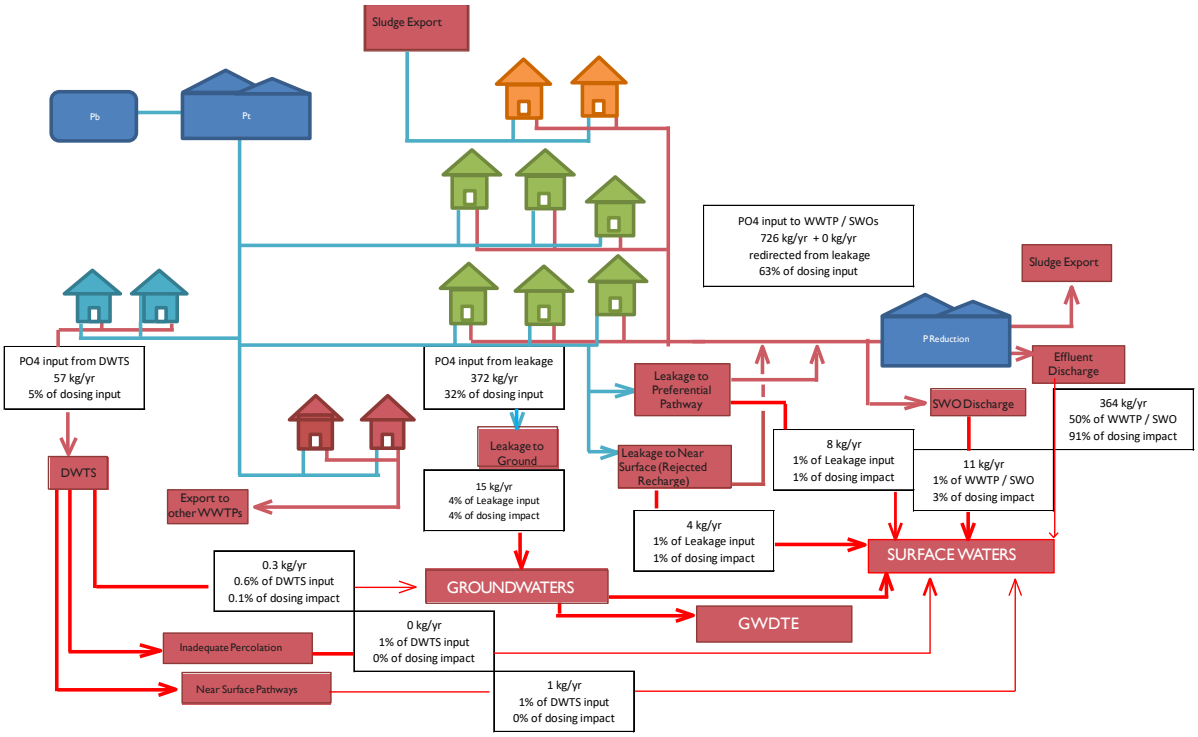
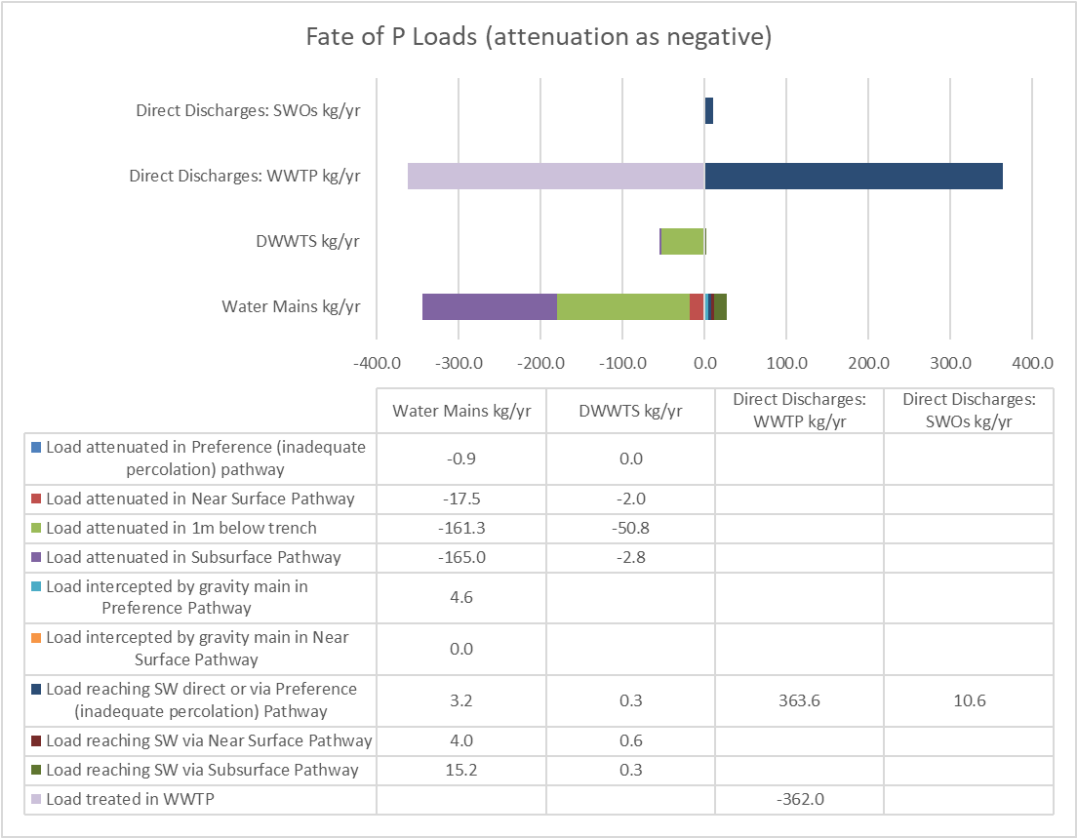


Figure 1 – Source Pathway Receptor model for Ballinamuck WTP Regional WSZ illustrating key sources and pathways to the associated WSZs.



	Water Mains kg/yr	DWWTS kg/yr	Direct Discharges: WWTP kg/yr	Direct Discharges: SWOs kg/yr
Load attenuated in Preference (inadequate percolation) pathway	-0.9	0.0		
Load attenuated in Near Surface Pathway	-17.5	-2.0		
Load attenuated in 1m below trench	-161.3	-50.8		
Load attenuated in Subsurface Pathway	-165.0	-2.8		
Load intercepted by gravity main in Preference Pathway	4.6			
Load intercepted by gravity main in Near Surface Pathway	0.0			
Load reaching SW direct or via Preference (inadequate percolation) Pathway	3.2	0.3	363.6	10.6
Load reaching SW via Near Surface Pathway	4.0	0.6		
Load reaching SW via Subsurface Pathway	15.2	0.3		
Load treated in WWTP			-362.0	

Figure 2 – Fate of orthophosphate loads modelled for Ballinamuck WTP impacting on Colligan Estuary (IE_SE_140_0100) [via Brickey Estuary (IE_SE_140_0200)] and Moneygorm_010 (IE_SW_18M260940) due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.