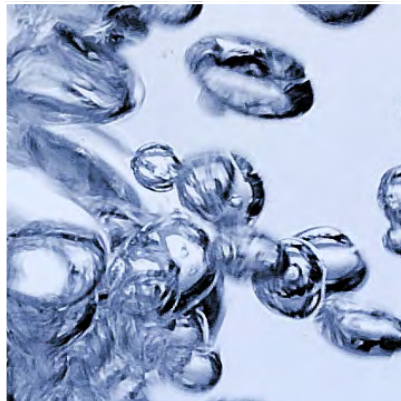
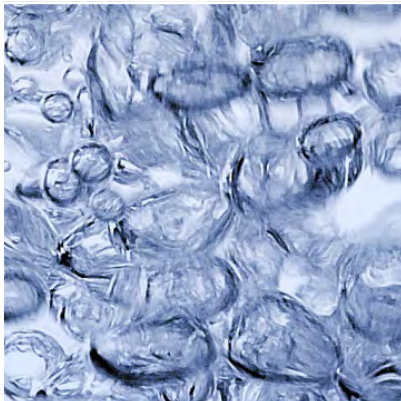
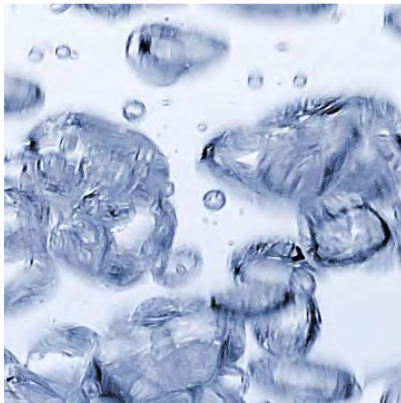




# Uisce Éireann - Lead in Drinking Water Mitigation Plan

## Screening for Appropriate Assessment

032 Listowel/Moyvane 601E\* WSZ- Dromin WTP





# Lead in Drinking Water Mitigation Plan

## Screening for Appropriate Assessment

### 032 Listowel/Moyvane 601E\* WSZ- Dromin 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 Uisce Éireann (UE) to undertake Screening for Appropriate Assessment (AA) for the proposed orthophosphate dosing (herein referred to as the proposed project) of drinking water supplied by Dromin Water Treatment Plant (WTP), Listowel, Co. Kerry.

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

Uisce Éireann, 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 UE 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<sup>1</sup> 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 UE'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 (UE, 2016<sup>2</sup>). 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 UE's ownership in private properties (UE, 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

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<sup>1</sup> Now known as the Department of Housing, Planning and Local Government (DHPLG).

<sup>2</sup> Uisce Éireann (UE) (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 ( $\mu\text{g}/\text{l}$ ) as per the European Union (Drinking Water) Regulations. From 2003 to 2013, the limit was  $25\mu\text{g}/\text{l}$ , which was a reduction on the previous limit (i.e. pre 2003) of  $50\mu\text{g}/\text{l}$ .

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 UE 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 (UE, 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. UE 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 UE. 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.

UE proposes to introduce corrective water treatment at up to 400 water treatment plants. This would be rolled out over an accelerated 3-year programme, subject to site-specific environmental assessments. The corrective water treatment will reduce plumbosolvency risk over the short to medium term in high risk water supplies where it is technically, economically and environmentally viable to do so. This practice is now the accepted method of lead mitigation in many countries e.g. Great Britain and Northern Ireland. The dosing would be required to continue whilst lead pipework is still in use, subject to annual review on a scheme by scheme basis.

Orthophosphate is added in the form of Phosphoric acid, which is approved for use as a food additive (E338) in dairy, cereals, soft drinks, meat and cheese. The average adult person consumes between 1,000 and 1,500 milligrams (mg) of phosphorus every day as part of the normal diet. The quantity of orthophosphate that UE will be required to add to treated water is between  $0.5\text{ mg}/\text{l}$  to  $1.5\text{ mg}/\text{l}$ . At Dromin WTP orthophosphate will be added at a rate of  $1.0\text{ mg}/\text{l}$ .

The typical concentration of phosphorus ingested from drinking 3 litres of water per day that has been treated with food grade phosphoric acid at  $1.5\text{ mg}/\text{l}$  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 15 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Akeragh, Banna and Barrow Harbour SAC, Mount Brandon SAC, Tralee Bay and Magharees Peninsula, West to Cloghane SAC, Lower River Shannon SAC, Blasket Islands SAC, Magharee Islands SAC, Kerry Head Shoal SAC, Moanveanlagh Bog SAC; and
- SPA sites: Akeragh, Banna and Barrow Harbour SPA, Tralee Bay Complex SPA, Loop Head SPA, Magharee Islands SPA, River Shannon and River Fergus Estuary, Kerry Head SPA, Dingle Peninsula SPA, Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle 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 UE, RPS, NPWS, IFI, EPA etc. as part of Plan development.

- Information provided by UE as part of the project;
- Environmental Protection Agency – Water Quality [www.epa.ie](http://www.epa.ie) and [www.catchments.ie](http://www.catchments.ie);
- Geological Survey of Ireland – Geology, Soils and Hydrogeology [www.gsi.ie](http://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](http://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](http://www.housing.gov.ie);
- Ordnance Survey of Ireland – Mapping and Aerial photography [www.osi.ie](http://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](http://www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf).

## 2.5 EVALUATION OF THE RECEIVING ENVIRONMENT

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

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

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

In relation to protected water-dependent habitats and species under the Birds and Habitats Directive, the river basin management planning process contributes towards achieving water related environmental supporting conditions that support Favourable Conservation Status. In preparing the draft RBMP (2018-2021) (DHPLG, 2017<sup>3</sup>) 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**).

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<sup>3</sup> DHPLG (2018) The River Basin Management Plan for Ireland (2018-2021). Available at: [https://www.housing.gov.ie/sites/default/files/publications/files/rbmp\\_report\\_english\\_web\\_version\\_final\\_0.pdf](https://www.housing.gov.ie/sites/default/files/publications/files/rbmp_report_english_web_version_final_0.pdf)

## 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](http://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

Dromin WTP supplies the Listowel area in County Kerry. The distribution input for the Dromin: Listowel/Moyvane 601E\* is 6,639 m<sup>3</sup>/day (41% of which is accounted for) serving a population of in excess of 18,000. The non-domestic demand is 18% of the distribution input. The area is served by WWTPs in Ballybunion (D0183), Listowel (D0179 -01), Ballyheigue (D0186), Ballylongford (D0459) and Tarbert (D0283), which are all 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 smaller agglomerations with a population equivalent of less than 500, i.e. Ballyduff (D0418), Causeway (A0098), Lixnaw (D0462), and Moyvane (A0026). The estimated additional load from these plants from the orthophosphate dosing is considered at the water body level via the surface water. There are an estimated 4,698 properties across the WSZ that are serviced by a DWWTS (see **Appendix C**).

Dromin WTP lies within the Tralee Bay Feale (HA23) and Shannon Estuary South (HA24) catchments and intersects a number of river waterbodies which discharge to the Lower Shannon Estuary and the Mouth of the River Shannon. The EAM process identified 15 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Akeragh, Banna and Barrow Harbour SAC, Mount Brandon, Tralee Bay and Magharees Peninsula, West to Cloghane SAC, Lower River Shannon SAC, Blasket Islands SAC, Magharee Islands SAC, Kerry Head Shoal SAC, Moanveanlagh Bog; and
- SPA sites: Akeragh, Banna and Barrow Harbour SPA, Tralee Bay Complex SPA, Loop Head SPA, Magharee Islands SPA, River Shannon and River Fergus Estuary, Kerry Head SPA, Dingle Peninsula SPA, Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA

### 3.2 CONSTRUCTION OF CORRECTIVE WATER TREATMENT WORKS

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

There are three possible locations for the orthophosphate dosing system at Dromin WTP, each of which will be located within the confines of the existing WTP boundary. The surrounding landscape is dominated by agricultural grassland. The grounds of the WTP consist of built infrastructure, amenity grassland and scrub. The location of the works is shown on **Figure 3-1**.

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

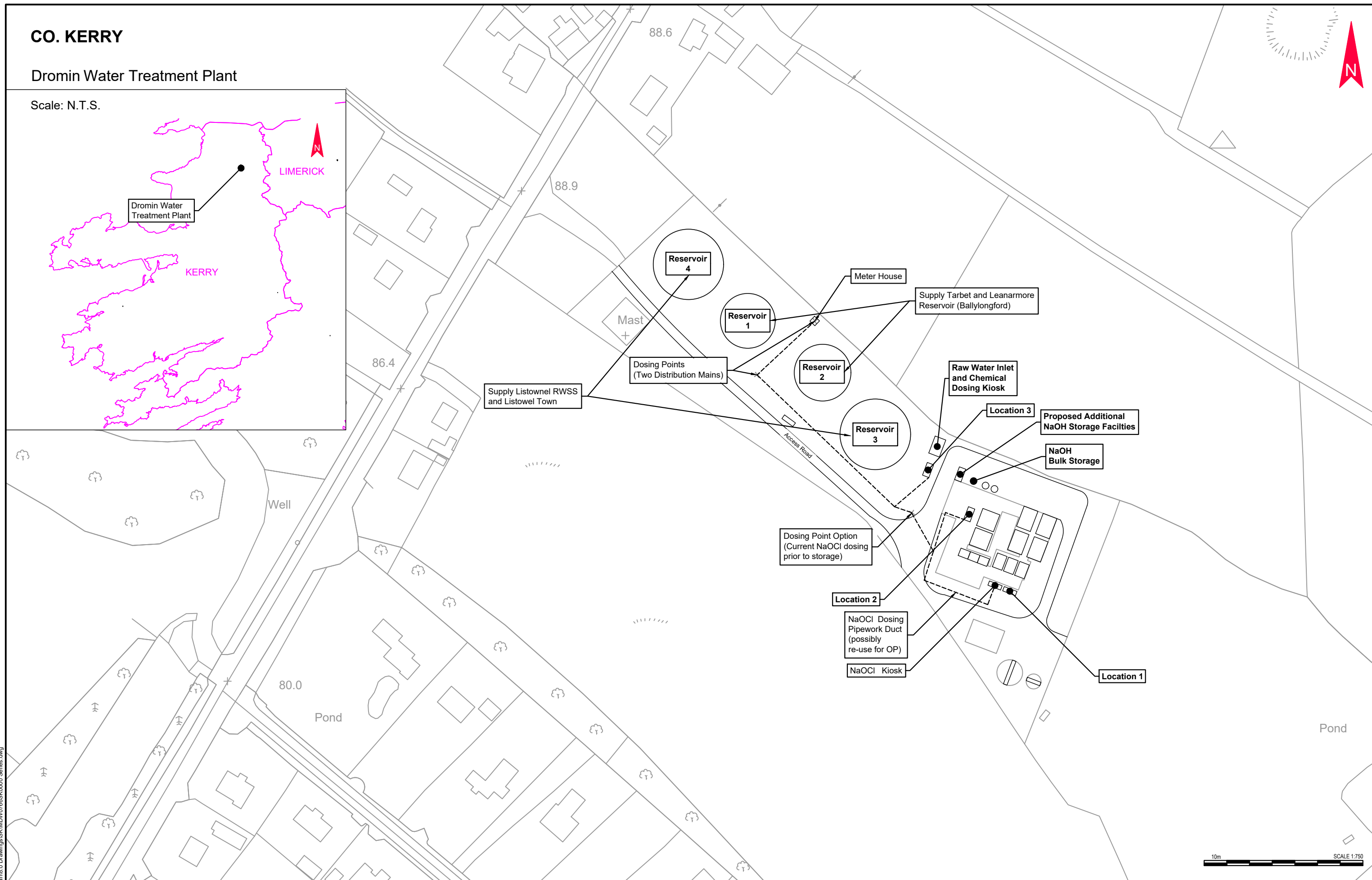
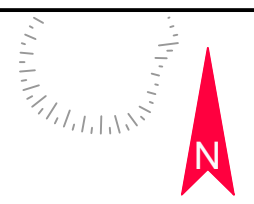
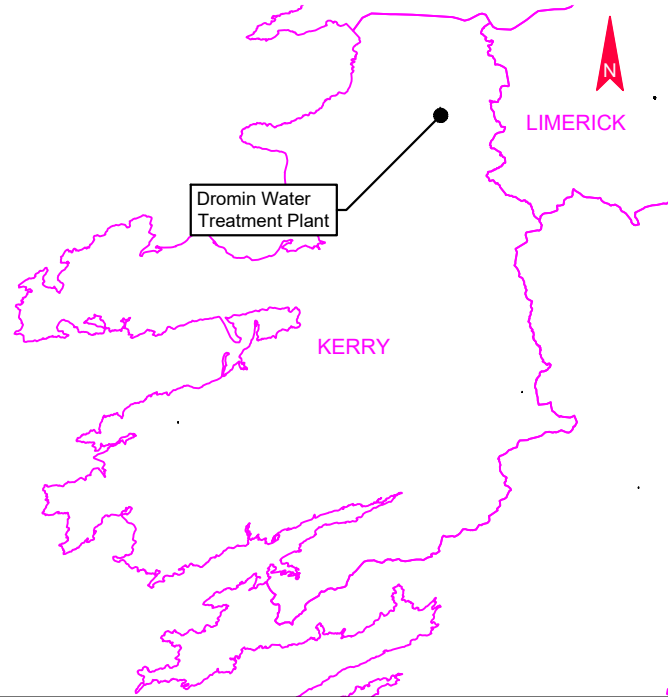
- Bulk Storage Tanks for phosphoric acid;
- Dosing pumps;
- Dosing pipework and carrier water pipework; and
- Associated electrical installation



**CO. KERRY**

**Dromin Water Treatment Plant**

Scale: N.T.S.



10m SCALE 1:750

Client

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(iii) DO NOT SCALE, use figured dimensions only, if in doubt ask.

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No.	Date	Drawn By	Checked By	Amendment / Issue	App
A01	MAR 19	BL	BR	ISSUE FOR CLIENT APPROVAL	GJG
D01	JAN 19	BL	BR	DRAFT	OC

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Drawn	BL	Project	<b>LEAD MITIGATION PLAN</b>				
Checked	BR						
Approved	GJG						
Date	12/03/2019	Fig 3.1 DROMIN WATER TREATMENT PLANT - SITE LAYOUT					
Scale	1:750 @ A1 1:1,500 @ A3						
Job No.	MDW0766	File Ref.	MDW0766SK0000 Series.dwg	Drg. No.	SK0032 WTP	Rev.	F01

R:\MDW0766\_Lead Mitigation Plan\8.0 Drawings\SK0000\MDW0766SK0000 Series.dwg

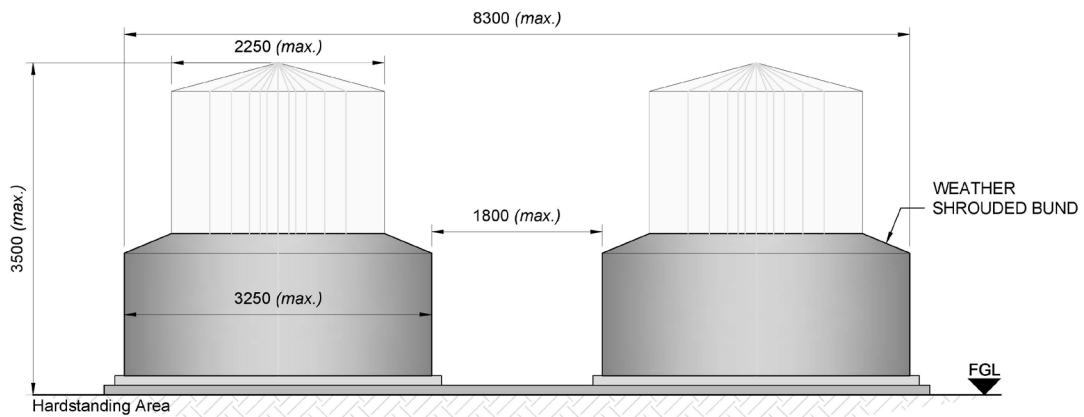
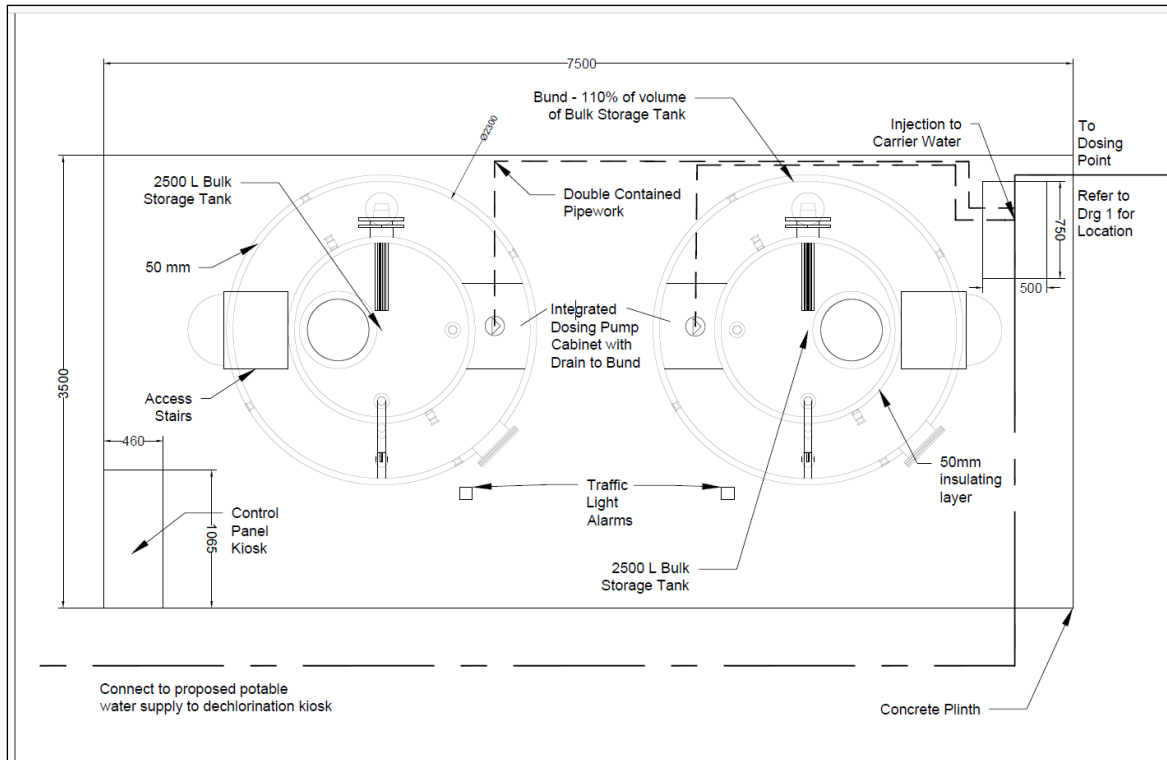
The bulk storage tanks (2 no. tanks, each with a working volume of 1000 l) will sit upon an above ground reinforced concrete plinth, designed to support the combined weight of the storage tanks, equipment and total volume of chemical to be stored (**Figure 3-2**).

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

There is an existing pH correction system at the Dromin WTP. A stable pH is critical to facilitate effective plumbosolvency control. With implementation of orthophosphate dosing it is necessary to ensure a stable pH of the final water. It is proposed that additional sodium hydroxide storage and dosing equipment is installed to allow for the proposed pH elevation for corrective treatment and alleviate the existing storage challenges.

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 Dromin 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. All spillages / leaks from storage tanks, valve connections and dosing pumps shall be contained within bunded areas.

A suitable kiosk will be installed on an above ground concrete plinth to house all electrical and control equipment required for the orthophosphate system. This control system will be incorporated into the existing supervisory control and data acquisition (SCADA) system on site. The proposed automation solution will be managed using a new programmable logic computer (PLC) / human machine interface (HMI) controller.



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

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

### 3.3 CONSTRUCTION METHODOLOGY

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

### 3.4 OPERATION OF CORRECTIVE WATER TREATMENT WORKS

The operational stage for the corrective water treatment works will be a part of the day to day activities of the WTP and will be operated in accordance with the SOPs.

The orthophosphate dosing system will be controlled by the site SCADA system, whereby, orthophosphoric acid will be dosed proportional to the flow of the water being distributed to the network. At Dromin 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, UE 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, UE 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.

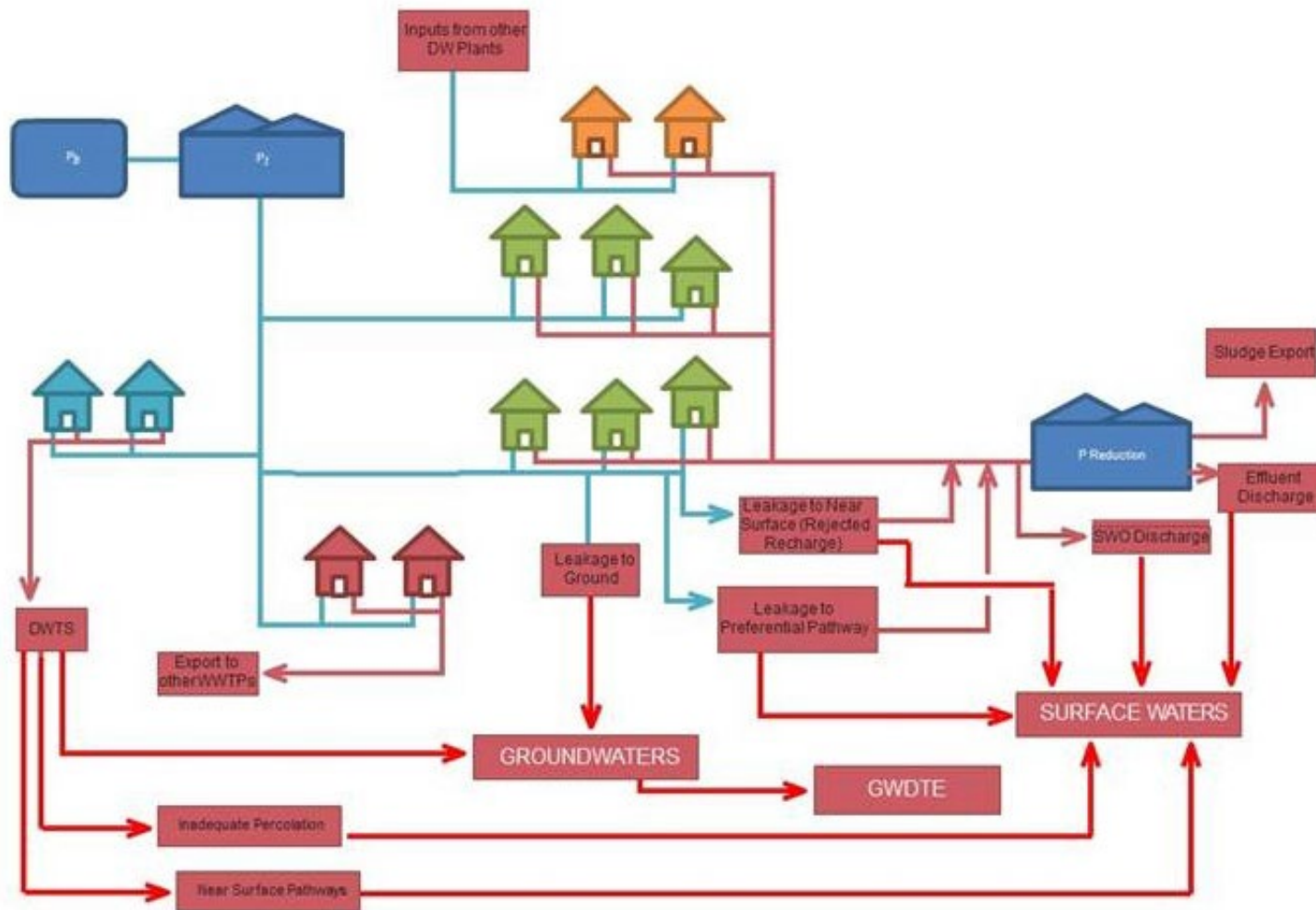
### 3.5.2 Environmental Assessment Methodology

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 DWWTs.
- 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.)

**Step 1 - Stage 1 Appropriate Assessment Screening**

- Identify downstream European Sites and qualifying features using water dependent database (Appendix B)
- Determine if qualifying features are nutrient sensitive from list of nutrient sensitive qualifying features
- Apply the EAM in the context of conservation objectives for European Sites

**Application of EAM**

**Step 2 – Direct Discharges to Surface Water**

**WWTP**

**Calculate Increase in P Load to WWTP**

- Determine proportion of WWTP influent to which dosing applies (D)
  - Calculation of volume of dosed water based on WSZ daily production figures and leakage rates ( $Q_{WSZ}$ )
  - Determine dosage concentration (dosage conc.)
  - Establish increase in annual P load ( $\Delta$  influent P load =  $Q_{WSZ} * (\text{dosage conc.}) * D$  (Eqn 1))
  - Determine new mass load to the WWTP NTMP =  $\Delta$  influent P load (as per Eqn. 1) +  $\hat{E}$  Load (Eqn 2)
- Where  $\hat{E}$  Load - Existing reported influent mass load or derived load based on OSPAR nutrient production rates

**Compute Effluent P Loads and Concentrations Post Dosing**

**New WWTP effluent TP-load NLP**

- Tertiary Treatment - NLP = ( $\hat{E}$  Load)(%TE) (Eqn. 3)**  
**Secondary or less - NLP = ( $\hat{E}$  Load)(%TE) +  $\Delta$  influent P load (Eqn 4)**  
 Where  
 $\hat{E}$  Load as per above  
 %TE - is the treatment plant percentage efficiency in removing TP (derived from AER data or OSPAR guidance)  
**TP Concentration (NCP as per Eqn. 5)**  
 $NCP = (NLP / Q_{WWTP})(1000)$  (Eqn 5)  $Q_{WWTP}$  is the average annual hydraulic load to WWTP from AER or derived from PE and typical daily production figures

**Storm Water Overflows**

**Estimate Nutrient Loads from Untreated Sewage Discharged via Storm Water Overflows**

- The existing untreated sewage load via SWOs is estimated based on an assumed percentage loss of the WWTP load:  $Load_{untreated(Existing)} = (WWTP \text{ Influent Load } (kg \text{ yr}^{-1}) / (1 + \%LOSS)) * \%LOSS$  (Eqn 6)
- This can be modified to account for the increased P loading due to P-dosing at drinking water plants  
 $Load_{untreated(Dosing)} = (WWTP \text{ NTMP } (kg \text{ yr}^{-1}) / (1 + \%LOSS)) * \%LOSS$  (Eqn 7)
- The pre and post-dosing SWO calculated loads are converted to concentrations using an assumed loss of 3% of the WWTP hydraulic load  
 $SWO \text{ Q} = (WWTP \text{ Influent Q } (m^3 \text{ yr}^{-1}) / (1 + \%LOSS)) * \%LOSS$  (Eqn 8)  
 and  
 $SWO \text{ TP Conc} = Load_{untreated(X)} / SWO \text{ Q}$  Eqn 9

**Step 4 – Distributed Sources**

**Mains Leakage**

**Calculate Load from Mains Leakage  
Additional Loading due to leakage**

- Leakage Rate ( $m^3/day$ ) calculated from WTP production figures, WSZ import/export data, latest metering data and demand estimates on a WSZ basis where data available.
  - Load rate = dosage concentration \* Leakage Rate
  - P load per m = Load rate / Length of water main
- Load to Pathways**
- Constrained to location of water mains and assuming load infiltrates to GW unless in low subsoil or rejected recharge conditions or infiltration to sewers in urban environment.
  - P ( $kg/m/yr$ ) = P load per m \* trench coeff
  - Flow in preferential pathway = Hydraulic load x % routed to NS Pathway Eqn. 10
  - Subsurface flow = Hydraulic Load – Pref. Pathway flow if No Rech Cap, otherwise rejected recharge is redirected to Near Surface Pathway Eqn. 11
  - Near surface flow = Hydraulic Load - Pref. Pathway flow – subsurface flow Eqn. 12
  - P Load to GW = P ( $kg/m/yr$ ) x subsurface flow % x (1 - P atten to 1m) x (1 - P atten > 1m) Eqn. 13
  - Near surface flows combined with preferential flows:  
 P load to NS = P ( $kg/m/yr$ ) x near surface flow % x (1 - P atten in NS) Eqn. 14
  - P load to SW ( $kg/m/yr$ ) = P Load to NS + P load to GW

**DWTS**

**Calculate Load from Domestic Wastewater Treatment Systems  
Additional Loading from DWTS**

- Water consumption per person assumed to be 105 l/day. Each household assumed to have 2.7 people therefore annual hydraulic load calculated on this basis for each household and summed for water supply zones where DWTS are presumed present
  - Additional P load is calculated based on dosing rate and hydraulic load derived for each household assumed to be on DWTS
- Load reaching groundwater**  
 $P \text{ load to GW } (kg/yr) = Load \text{ from DWTS } (kg/yr) \times MRC \times Subsoil \text{ TF}$  Eqn. 14  
 $P \text{ load to NS } (kg/yr) = Load \text{ from DWTS } (kg/yr) \times Biomat \text{ F} \times (1 - MRC) \times NS \text{ TF}$  Eqn. 15  
 Additional load direct to surface water from septic tanks is estimated in areas of low subsoil permeability and close to water bodies.  
 $P \text{ load to SW } (kg/yr) = Load \text{ direct to SW} + P \text{ load to GW} + P \text{ load to NS}$

**Step 3 - Assess Potential Impact on Receiving Water and ELV compliance**

Apply Mass Balance equations incorporating primary discharge to establish likely increases in concentrations downstream of the agglomeration. Continue to Step 5.

**Step 5 - Assessment of loads and concentrations from different sources to GW and SW Receptors**

Determine combined direct discharges, DWTS and leakage loads and concentrations to SW and GW to determine significance. Continue to Step 6.

**Step 6 – Assessment of Potential Impact of Surface and Sub surface Pathways on the receptors.** Combine loads from direct discharges, DWTS and leakage and assess potential impact based on the existing status, trends and capacity of the water bodies to assimilate additional P loads. For European Sites the assessment will also be based on the Site Specific Conservation Objectives. EAM Conclusion will inform AA screening process.

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 three possible locations in the confines of the existing Dromin WTP site boundary. 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 Zol was considered to include the footprint of the existing Dromin WTP followed by a review of hydrological and hydrogeological connectivity between the proposed development site and European Sites. The Zol 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 Zol of the Proposed Project – Construction Phase**

	Site Name	SAC / SPA Code	Direct Impact	Water Dependent Species / Habitats	Surface Water Connectivity	Groundwater Connectivity <sup>4,5</sup>	Potential Source Pathway Receptor
1	Moanveanlagh Bog SAC	002351	No	Yes	No	Yes (Abbeyfeale)	Yes
2	Lower River Shannon SAC	002165	No	Yes	No	Yes (Abbeyfeale)	Yes
3	Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	004161	No	Yes	No	Yes (Abbeyfeale)	No

#### 4.1.2 Operational Phase

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

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

<sup>4</sup> Dromin WTP overlies the IE\_SH\_G\_001 Abbeyfeale groundwater body. All European sites overlying or supporting connectivity to these Groundwater Bodies have been assessed to determine potential source pathway receptors. This groundwater body comprises poorly productive bedrock and flow is generally unconfined. Local groundwater flow is towards the rivers and streams and the flow path will not usually exceed a few hundred metres in length. As a result, Site 3 are considered to have no connectivity to the WTP it is they are located 7.5 km from the WTP with no hydrological connectivity and therefore excluded from further assessment. For sites 1 and 2, have been included for hydrogeological connectivity as although there are no surface water bodies within the boundary of the WTP, there may be potential for connection to the Lower Shannon SAC and Moanveanlagh Bog SAC via the Feale\_090, Feale\_080 and Ballaghadigue\_010 which are within 300m of the WTP boundary and ground water is likely to discharge to these water bodies.

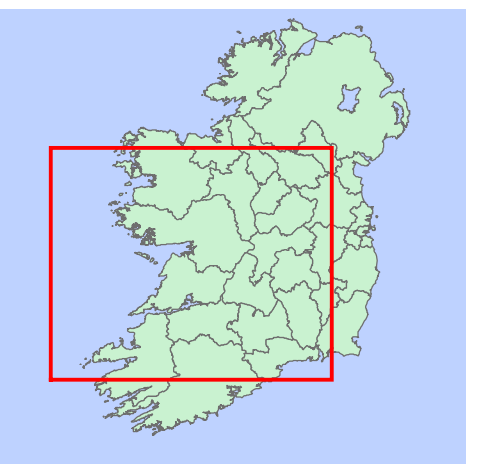
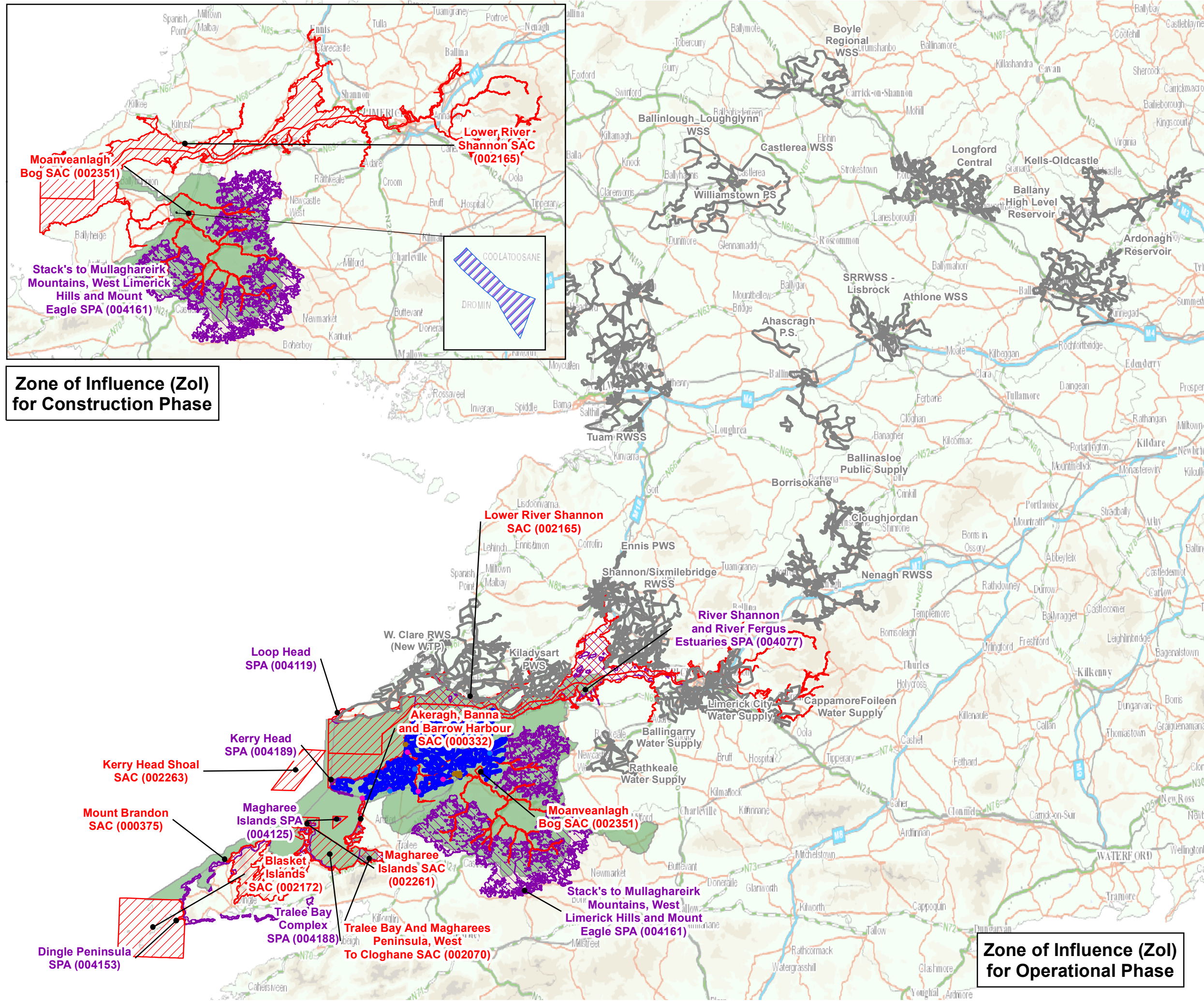
<sup>5</sup> [https://jetstream.gsi.ie/iwdds/delivery/GSI\\_Transfer/Groundwater/GWB/GlenvilleGWB.pdf](https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/GlenvilleGWB.pdf)



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

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

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
1	Akeragh, Banna and Barrow Harbour SAC	SAC 000332	Yes	Yes	Yes – CWB (Outer Tralee Bay)	Yes (Kerry Head)	Yes
2	Mount Brandon SAC	SPA 004028	Yes	Yes	Yes – CWB (Southwestern Atlantic Seaboard)	No	Yes
3	Tralee Bay and Magharees Peninsula, West to Cloghane SAC	SAC 002070	Yes	Yes	Yes – CWB (Various)	No	Yes
4	Lower River Shannon SAC	SAC 002165	Yes	Yes	Yes – RWB (Various)	Yes (Kerry Head, Ballybunnion, Abbeyfeale, Ballylongford)	Yes
5	Blasket Islands SAC	SAC 002172	Yes	Yes	Yes – CWB ((Southwestern Atlantic Seaboard HA 23)	No	Yes
6	Magharee Islands SAC	SAC 002261	Yes	Yes	Yes – CWB (Outer Tralee Bay)	No	Yes
7	Kerry Head Shoal SAC	SAC 002263	Yes	Yes	Yes – CWB (Southwestern Atlantic Seaboard HA 23)	No	Yes
8	Moanveanlagh Bog SAC	SAC 002351	Yes	Yes	Yes – RWB (Ballaghadigue)	Yes (Abbeyfeale)	Yes
9	Tralee Bay Complex SPA	SPA 004188	Yes	Yes	Yes – CWB (Inner/Outer Tralee Bay)	No	Yes
10	Loop Head SPA	SPA 004119	Yes	Yes	Yes – CWB (Mouth of the Shaannon)	No	Yes
11	Magharee Islands SPA	SPA 004125	Yes	Yes	Yes – CWB (Outer Tralee Bay)	No	Yes
12	River Shannon and River Fergus Estuary SPA	SPA 004077	Yes	Yes	Yes – TWB (Lower Shannon Estuary)	Yes (Ballylongford )	Yes
13	Kerry Head SPA	SPA 004189	Yes	Yes	Yes – RWB (Various)	Yes (Kerry Head)	Yes
14	Dingle Peninsula SPA	SAC 004153	Yes	Yes	Yes – CWB (Various)	No	Yes
15	Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	SPA 004161	Yes	Yes	No	Yes (Abbeyfeale)	Yes



- Legend**
- LEMA Emission Type**
- Primary Discharge Point
  - Secondary Discharge Point
  - Storm Water Overflow
  - Waste Water Treatment Plant
- Water Supply Zone Boundary (WSZ)
  - Additional WSZ considered for dosing
  - ▨ Special Area of Conservation (SAC)
  - ▨ Special Protection Area (SPA)
  - Zone of Influence

Data Source:  
 Uisce Éireann  
 NPWS (Jan. 2019)  
 EPA

0 5 10 20 Kilometres



Project: Lead Mitigation Plan  
 Corrective Water Treatment Works

Figure 4.1

### Dromin WTP

European Sites within the Zol of the Proposed Project

<b>RPS</b>	
Scale: 1:900,000 @ A3	Date: 07/02/2019
File Ref: MDW0766Arc0067aF01	Map Projection: Irish National Grid (TM65)
Ordnance Survey Ireland Licence EN 0005019 ©Copyright Government of Ireland.	

**Zone of Influence (Zol) for Construction Phase**

**Zone of Influence (Zol) for Operational Phase**

## 4.2 IDENTIFICATION OF RELEVANT EUROPEAN SITES

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

The construction phase of the proposed project will take place within the confines of the existing Dromin WTP site boundary. There is no potential for hydrological connectivity to European Sites. The WTP is located within the Abbeyfeale groundwater body (IE\_SH\_G\_001) and there is potential hydrogeological connectivity between the proposed development site and Moanveanlagh Bog SAC and Lower River Shannon SAC, therefore these sites have been included for further assessment in **Table 4-1** above.

For the operational phase, the Dromin: Listowel/Moyvane 601E WSZ is located adjacent to the mouth of the River Shannon, connected through the Lower Shannon Estuary, the Upper Feale Estuary, and the Cashen transitional water body. As a result, five European Sites are intersected via river pathways i.e. Lower River Shannon SAC, Moanveanlagh Bog SAC, Akeragh, Banna and Barrow Harbour SAC, River Shannon and River Fergus Estuaries SPA, Tralee Bay Complex SPA, and Kerry Head SPA are included for further assessment in Sections 5 and Section 6.

The WSZ also intersects four groundwater bodies – Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027) and Kerry Head (IE\_SW\_G\_075\_Tourig Group 1) (**Table 3, Appendix C**). The following seven European Sites overlay or intersect these groundwater bodies – Lower River Shannon SAC, Moanveanlagh Bog SAC, Akeragh, Banna and Barrow Harbour SAC, Kerry Head SPA, Tralee Bay Complex SPA, River Shannon and River Fergus Estuaries SPA, and Stack's to Mullaghereirk Mountains, West Limerick Hills and Mount Eagle SPA.

Lower River Shannon SAC, Moanveanlagh Bog SAC, , River Shannon and River Fergus Estuaries SPA, and Kerry Head SPA are already included for further assessment in due to surface water connectivity via the Feale, Gally, Brick, and Ballylongford tributaries in addition to IE\_SH\_060\_0100 Cashen, IE\_SH\_010\_0200 Upper Feale Estuary, IE\_SH\_060\_0300 Lower Shannon Estuary, IE\_SH\_23M080580 Meenogahane\_010, IE\_SH\_23D160380 Doonamontane\_010, IE\_SH\_23T120500 Tierahanaghan\_010, and IE\_SH\_23B910900 Ballynoe\_010 river water bodies. Akeragh, Banna and Barrow Harbour SAC and Tralee Bay Complex SPA are hydrogeologically connected via the Kerry Head GWB (IE\_SH\_G\_118), the sites are also hydrologically connected via Ballynoe\_010 (IE\_SH\_23B910900) river water body.

For European Sites which have only hydrogeological connections, i.e. Stack's to Mullaghereirk Mountains, West Limerick Hills and Mount Eagle SPA, an assessment was made of 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<sup>6</sup>, and was consulted in making the assessment.

The Abbeyfeale, Ballylongford, and Kerry Head groundwater bodies are all poorly productive bedrock aquifers, while Ballybunnion is a karst aquifer. The WSZ is large and stretches across all four groundwater bodies.

Stack's to Mullaghereirk Mountains, West Limerick Hills and Mount Eagle SPA lie immediately west and approximately 5km south of the WSZ and intersect the Abbeyfeale and Ballylongford groundwater bodies. The SPA does not intersect any surface water body which might potentially be impacted by the WSZ. For the Abbeyfeale groundwater body, the main discharges are to gaining streams crossing and incising into the rock units and groundwater discharges into streams and small springs. Flow paths are relatively short, typically 30 – 300m, and flow directions are expected to approximately follow the local surface water catchments<sup>7</sup>. In the Ballylongford groundwater body, groundwater discharges to springs within the water body and to rivers and streams crossing the groundwater body and also into the Shannon Estuary. Groundwater flow paths are relatively short, typically 30 – 300m where aquifers are unconfined with flow controlled by the local topography. There is a high degree of interaction between surface water and groundwater in this groundwater body due to the shallow groundwater flow<sup>8</sup>. Given the location Stack's to Mullaghereirk Mountains, West Limerick Hills and Mount Eagle SPA, upstream of the WSZ, with groundwater flow within the Abbeyfeale and Ballylongford groundwater bodies following the surface topography away from the SPA, it has been determined that orthophosphate dosing will not interact with this European site. On this basis, the Stack's to Mullaghereirk Mountains, West Limerick Hills and Mount Eagle SPA is excluded from further assessment.

The Mouth of the Shannon coastal water body lies adjacent to the WSZ and receives input directly through the WSZ and via transitional water bodies: Lower Shannon Estuary, the Upper Feale Estuary, and the Cashen Estuaries. The EAM results demonstrate that dosing at Dromin WTP results in a potential modelled increase in orthophosphate of 0.0003 mg/l for the Cashen, 0.0002 mg/l for the Upper Feale Estuary, and 0.0000 mg/l for Lower Shannon Estuary which discharges to the Mouth of the River Shannon coastal water body. The modelled increase in orthophosphate concentration is also undetectable (0.0000mg/l) in the Mouth of the River Shannon (see **Table 5-2** below). Outer Tralee Bay also receives orthophosphate input from the WSZ via IE\_SH\_23B910900 Ballynoe\_010 river water body modelled to receive an additional concentration of 0.0006mg/l. European sites within this coastal water body are Tralee Bay and Magharees Peninsula, West to Cloghane SAC, Magharee Islands SAC, Magharee Islands SPA, Dingle Peninsula SPA, and Loop Head SPA. Tralee Bay Complex SPA is also connected to this coastal water body and has already been included for further assessment owing to river connectivity to the WSZ.

The ZoI for the operational phase of the project has been determined to terminate at the Mouth of the Shannon and the Outer Tralee Bay coastal water bodies which are both modelled at an undetectable potential increase (0.0000 mg/l) in orthophosphate, and the following coastal The following European Sites connected to these waterbodies are excluded from further assessment: Mount Brandon, Blasket Islands SAC, Kerry Head Shoal SAC, Tralee Bay and Magharees Peninsula, West to Cloghane SAC, Magharee Islands SAC, Magharee Islands SPA, Dingle Peninsula SPA, and Loop

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

<sup>7</sup> [https://jetstream.gsi.ie/iwdds/delivery/GSI\\_Transfer/Groundwater/GWB/AbbeyfealeGWB.pdf](https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/AbbeyfealeGWB.pdf)

<sup>8</sup> [https://jetstream.gsi.ie/iwdds/delivery/GSI\\_Transfer/Groundwater/GWB/BallylongfordGWB.pdf](https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/BallylongfordGWB.pdf)

Head SPA. Tralee Bay Complex SPA is also connected to this coastal water body but has already been included for further assessment owing to river connectivity via IE\_SH\_23B910900 Ballynoe\_010 to the WSZ.

On this basis, two sites have been included for further assessment in order to evaluate the significance of potential effects arising during construction phase in Section 5 below i.e. the Lower River Shannon SAC and Moanveanlagh Bog SAC. Six sites have been included for further assessment for the operational phase in Sections 5 and 6 below i.e., Lower River Shannon SAC, Moanveanlagh Bog SAC, Akeragh, Banna and Barrow Harbour SAC, , Tralee Bay Complex SPA, River Shannon and River Fergus Estuary SPA, and Kerry Head SPA.

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

Site Name	SAC/SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
<b>Construction and Operation Phase</b>								
<b>Lower River Shannon SAC</b>	SAC 002170	07 August 2012 Version 1	1029	Freshwater pearl mussel ( <i>Margaritifera margaritifera</i> )	Yes	Yes	Yes	Yes
			1095	Sea lamprey ( <i>Petromyzon marinus</i> )	Yes	Yes		
			1096	Brook lamprey ( <i>Lampetra planeri</i> )	Yes	Yes		
			1099	River lamprey ( <i>Lampetra fluviatilis</i> )	Yes	Yes		
			1106	Atlantic salmon ( <i>Salmo salar</i> ) (only in fresh water)	Yes	Yes		
			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		
			1220	Perennial vegetation of stony banks	Yes	No		
			1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	Yes	Yes		
			1310	<i>Salicornia</i> and other annuals colonising mud and sand <i>Spartina</i> swards ( <i>Spartinion maritimae</i> )	Yes	Yes		
			1330	Atlantic salt meadows ( <i>Glauco-Puccinellietalia maritimae</i> )	Yes	Yes		
			1349	Bottlenose Dolphin <i>Tursiops truncatus</i>	Yes	Yes		
1355	Otter ( <i>Lutra lutra</i> )	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
			1410	Mediterranean salt meadows ( <i>Juncetalia maritimi</i> )	Yes	Yes		
			3260	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation	Yes	Yes		
			6410	<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils ( <i>Molinion caeruleae</i> )	Yes	Yes		
			91E0	* Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> ( <i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i> )	Yes	Yes		
Moanveanlagh Bog SAC	SAC 002351	07 December 2015 Version 1.0	7110	* Active raised bogs	Yes	Yes	Yes	Yes
			7120	Degraded raised bogs still capable of natural regeneration	Yes	Yes		
			7150	Depressions on peat substrates of the Rhynchosporion	Yes	Yes		
<b>Operation Phase Only</b>								
Arkeragh, Banna and Barrow Harbour SAC	SAC 000332	27 Jan 2017 Version 1.0	1210	Annual vegetation of drift lines			Yes	Yes
			1310	<i>Salicornia</i> and other annuals colonising mud and sand <i>Spartina</i> swards ( <i>Spartinion maritimae</i> )	Yes	Yes		
			1330	Atlantic salt meadows ( <i>Glauco-Puccinellietalia maritimae</i> )	Yes	Yes		
			1410	Mediterranean salt meadows ( <i>Juncetalia maritimi</i> )	Yes	Yes		
			2110	Embryonic shifting dunes	Yes	Yes		
			2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)	Yes	Yes		
			2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*	Yes	Yes		
			2190	Humid dune slacks	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
			4030	European dry heaths	No	Yes		
<b>River Shannon and River Fergus Estuary SPA</b>	SPA 004077	17 <sup>th</sup> September 2012 Version 1.0	A017	Cormorant ( <i>Phalacrocorax carbo</i> )	Yes	Yes	Yes	Yes
			A038	Whooper Swan ( <i>Cygnus cygnus</i> )	Yes	Yes		
			A046	Light-bellied Brent Goose ( <i>Branta bernicla hrota</i> )	Yes	Yes		
			A048	Shelduck ( <i>Tadorna tadorna</i> )	Yes	Yes		
			A050	Wigeon ( <i>Anas penelope</i> )	Yes	Yes		
			A052	Teal ( <i>Anas crecc</i> )	Yes	Yes		
			A054	Pintail ( <i>Anas acuta</i> )	Yes	Yes		
			A056	Shoveler ( <i>Anas clypeata</i> )	Yes	Yes		
			A062	Scaup ( <i>Aythya marila</i> )	Yes	Yes		
			A137	Ringed Plover ( <i>Charadrius hiaticula</i> )	Yes	Yes		
			A140	Golden Plover( <i>Pluvialis apricaria</i> )	Yes	Yes		
			A141	Grey Plover ( <i>Pluvialis squatarola</i> )	Yes	Yes		
			A142	Lapwing ( <i>Vanellus vanellus</i> )	Yes	Yes		
			A143	Knot ( <i>Calidris canutus</i> )	Yes	Yes		
			A149	Dunlin ( <i>Calidris alpina</i> )	Yes	Yes		
			A156	Black-tailed Godwit ( <i>Limosa limosa</i> )	Yes	Yes		
A157	Bar-tailed Godwit ( <i>Limosa lapponica</i> )	Yes	Yes					
A160	Curlew( <i>Numenius arquata</i> )	Yes	Yes					

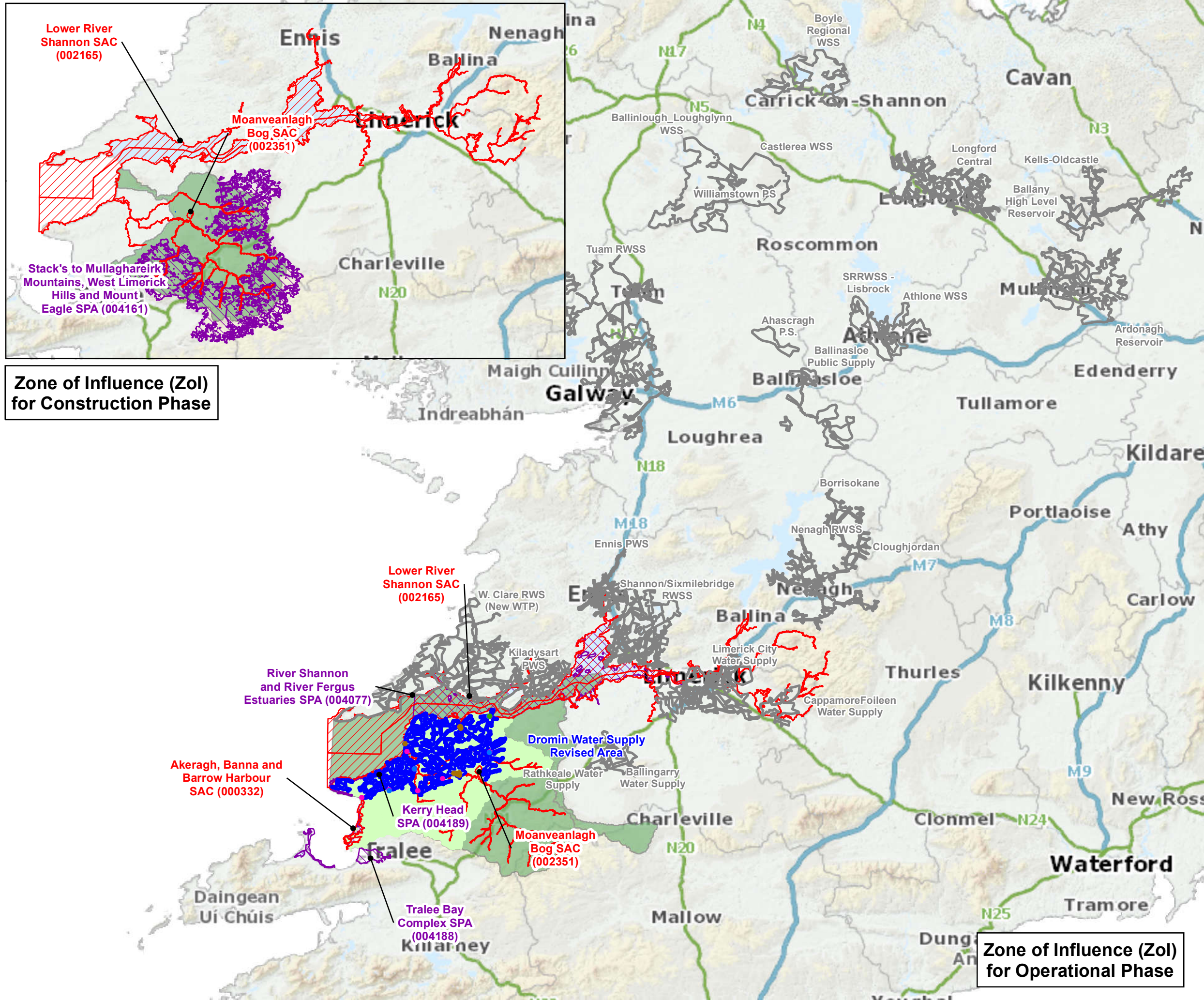


Site Name	SAC/SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
			A162	Redshank ( <i>Tringa totanus</i> )	Yes	Yes		
			A164	Greenshank ( <i>Tringa nebularia</i> )	Yes	Yes		
			A179	Black-headed Gull ( <i>Chroicocephalus ridibundus</i> )	Yes	Yes		
			A999	Wetlands	Yes	Yes		
Kerry Head SPA	SPA	21 <sup>st</sup> Feb 2018 Generic Conservation Objectives	A009	Fulmar ( <i>Fulmarus glacialis</i> )	Yes	Yes	Yes	Yes
			A346	Chough ( <i>Pyrhocorax pyrrhocorax</i> )	Yes	Yes		
Tralee Bay Complex SPA	SPA 004188	22 <sup>nd</sup> April 2014 Version 1.0	A038	Whooper Swan ( <i>Cygnus cygnus</i> )	Yes	Yes	Yes	Yes
			A046	Light-bellied Brent Goose ( <i>Branta bernicla hrota</i> )	Yes	Yes		
			A048	Shelduck ( <i>Tadorna tadorna</i> )	Yes	Yes		
			A050	Wigeon ( <i>Anas penelope</i> )	Yes	Yes		
			A052	Teal ( <i>Anas crecca</i> )	Yes	Yes		
			A053	Mallard ( <i>Anas platyrhynchos</i> )	Yes	Yes		
			A054	Pintail ( <i>Anas acuta</i> )	Yes	Yes		
			A062	Scaup ( <i>Aythya marila</i> )	Yes	Yes		
			A130	Oystercatcher ( <i>Haematopus ostralegus</i> )	Yes	Yes		
			A137	Ringed Plover ( <i>Charadrius hiaticula</i> )	Yes	Yes		
			A140	Golden Plover ( <i>Pluvialis apricaria</i> )	Yes	Yes		
			A141	Grey Plover ( <i>Pluvialis squatarola</i> )	Yes	Yes		
			A142	Lapwing ( <i>Vanellus vanellus</i> )	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
			A144	Sanderling ( <i>Calidris alba</i> )	Yes	Yes		
			A149	Dunlin ( <i>Calidris alpina</i> )	Yes	Yes		
			A156	Black-tailed Godwit ( <i>Limosa limosa</i> )	Yes	Yes		
			A157	Bar-tailed Godwit ( <i>Limosa lapponica</i> )	Yes	Yes		
			A160	Curlew ( <i>Numenius arquata</i> )	Yes	Yes		
			A162	Redshank ( <i>Tringa totanus</i> )	Yes	Yes		
			A169	Turnstone ( <i>Arenaria interpres</i> )	Yes	Yes		
			A179	Black-headed Gull ( <i>Chroicocephalus ridibundus</i> )	Yes	Yes		
			A182	Common Gull ( <i>Larus canus</i> )	Yes	Yes		
			A999	Wetlands	Yes	Yes		

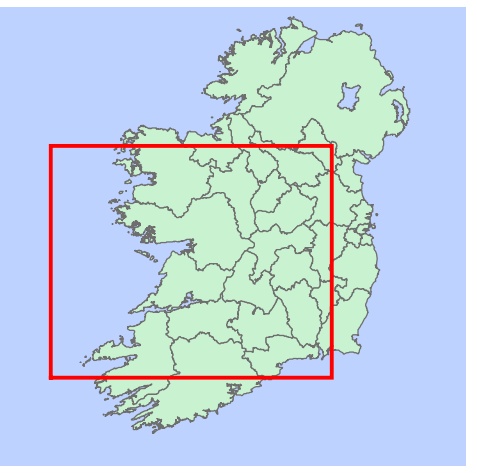
\*Indicates a priority habitat under the habitats directive.

\*\*While this habitat is determined to be non-water dependent, it is included in the assessment sections below in terms of flood risk.



**Zone of Influence (Zol) for Construction Phase**

**Zone of Influence (Zol) for Operational Phase**



**Legend**

**LEMA Emission Type**

- Primary Discharge Point
- Secondary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant

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: Uisce Éireann NPWS (May 2023) EPA

0 5 10 20 Kilometres

Client

Project **Lead Mitigation Plan Corrective Water Treatment Works**

Figure 4.2 **Dromin WTP European Sites within the Zol which are hydro(geo)logically connected**

**RPS**

Scale: 1:900,000 @ A3 Date: 08/06/2023

File Ref: MDW0766Arc0067bF02 Map Projection: Irish National Grid (TM65)

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## 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 Dromin 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 Dromin 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 Dromin WTP.

### 5.3.1 Construction Phase

There are three possible locations for the orthophosphate dosing system both of which will be located within the confines of the existing WTP boundary. The assessment of potential significant effects associated with construction of the corrective water treatment works was conducted taking the whole Dromin WTP into account and therefore included all possible locations. The assessment of impacts associated with the construction of the corrective water treatment works at Dromin 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 Dromin 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](http://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 <sup>9</sup>	Evaluation of Potential Significant Effects
Lower River Shannon SAC (002165)	Abbeyfeale IE_SH_G_001	GWB	<p>The construction works will be located within the confines of the existing Dromin WTP, however, this site is not located within or adjacent to a European Site.</p> <p><b>Surface Water</b></p> <p>There are no surface water bodies within the confines of Dromin WTP. The Feale River (Feale_090 IE_SH_23F010800 &amp; Feale_080 IE_SH_23F010600) lie approximately 250-400m south and south-east of the WTP which discharge to the Lower Shannon SAC (002165) approximately 1.5km south of the WTP. The WTP is separated from the Feale River by a large, potentially disused, wet/rough field with intermittent scrub. Scrub also surrounds a dirt road extending south-east from the WTP.</p> <p>The Ballaghadigue_010 (IE_SH_23B600860) river water body is located approximately 750m north-east of the WTP and adjoins the Moanveanlagh Bog SAC (002351) a further 3km downstream. The northern boundary of the WTP supports hedgerows and several agricultural pastures separate the site from this water course.</p> <p>The WTP grounds consist of built infrastructure, amenity grassland and scrub, providing buffering to any potential pollutants. In addition to the fields and</p>

<sup>9</sup> Monitoring period is annual unless specified.

Site Name (Code)	Contributing WB Code_Name	WB Type <sup>9</sup>	Evaluation of Potential Significant Effects
<p><b>Moanveanl agh Bog SAC (002351)</b></p>	<p>Abbeyfeale IE_SH_G_001</p>	<p>GWB</p>	<p>hedgerows between the WTP and nearby water courses, these features comprise a boundary of separation, isolating any surface water pathway from the works area to the European Sites and Feale (Feale_090 IE_SH_23F010800 &amp; Feale_080 IE_SH_23F010600) and Ballaghadigue (Ballaghadigue_010 IE_SH_23B600860) rivers.</p> <p>Owing to the small scale nature of the proposed works, the significant distance between the WTP and any European Sites, absence of hydrological connections, as well as existing natural and built barriers, there is no potential for likely significant effects on qualifying interests of any European Site through sediment laden run-off, dust emissions or environmental incidents.</p> <p><b>Groundwater</b>                      Dromin WTP overlies the Abbeyfeale (IE_SH_G_001) groundwater body which is a sizeable groundwater body encapsulating the mountainous landscape of the Stack's, Glannaruddery and Mullaghareik ranges, and Mount Eagle and Knockfeha.</p> <p>All European Sites overlying or supporting connectivity to the groundwater body have been assessed to determine potential source pathway receptor. The excavation works to install dosing pipelines, carrier water pipework and electrical cables to involve the excavation of trenches to a depth of 700mm below ground level. As these excavation works will not be extensive and upon made ground; interference with water table through potential groundwater drawdown will be unlikely to occur. Any interference would be localised, minor and temporary.</p> <p>The Abbeyfeale (IE_SH_G_001) groundwater body comprises poorly productive bedrock and flow is generally to the west. Local groundwater flow is towards the rivers and streams and the flow path is between 30 and 300 metres in length.</p> <p>The Feale (Feale_090 IE_SH_23F010800) river is the closest watercourse to the WTP, within a potential 300m groundwater flow path, providing connectivity to the Lower River Shannon SAC a further 1.5km downstream. However, as discussed above, the excavation works will not be extensive, and any interference would be localised, minor and temporary. Therefore, there is no potential for likely significant effects to the underlying groundwater body, the receiving surface water feature and subsequently those European Sites screened in for further assessment, as a result of the construction of the corrective water treatment works at Dromin WTP.</p>

### 5.3.2 Operational Phase

In the case of the additional orthophosphate load due to dosing at Dromin 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<sup>10</sup>.

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

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

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

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

This assessment assumes a dosing rate of 1 mg/l orthophosphate at the Dromin WTP.

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 2014 baseline provided in the WFD App.

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<sup>10</sup> 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. 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.

**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 <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. <sup>15</sup> (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
<b>Lower River Shannon SAC (002165)</b>	IE_SH_23A150660 AHALAHANA_010	RWB	<i>Moderate</i>	<i>0.046</i>	<i>0.051</i>	19.1	0.0011	0.047	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23B030500 BRICK_030	RWB	<i>Good</i>	<i>0.030</i>	<i>0.033</i>	0.2	0.0000	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23B030700 BRICK_040	RWB	Moderate Upwards Near	0.052	0.051	30.0	0.0002	0.052†	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Poor Upwards Far	0.064	0.087			0.064	

<sup>11</sup> Monitoring period is annual unless specified.

<sup>12</sup> Surrogate Indicative Quality in italic.

<sup>13</sup> Distance to threshold.

<sup>14</sup> Baseline year is 2014 for surface water bodies and 2012 for groundwater bodies.

<sup>15</sup> Surrogate concentration is given in italic mg/l

<sup>16</sup> 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.

<sup>17</sup> 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 <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
	IE_SH_23B600860 BALLAGHADIGUE_010	RWB	Poor	0.077	0.087	9.0	0.0008	0.077	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23D090580 DERRA_WEST_010	RWB	Moderate	0.046	0.051	64.9	0.0004	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23F010550 FEALE_070	RWB	High Upwards Near	0.020	0.019	0.1	0.0000	0.020	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23F010600 FEALE_080	RWB	High Upwards Near	0.023	0.019	3.7	0.0000	0.023	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of

Site Name (Code)	Contributing WB Code_Name	WB Type <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
									preventing the achievement of WFD objectives.
	IE_SH_23F010800 FEALE_090	RWB Multiple Monitoring Points	Moderate	0.046	0.051	185.5	0.0003	0.046†	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
High None Near			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 0.0003mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.	
High Downwards Near			0.023	0.019	0.023			The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled conc. is 0.0003mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.	
High Upwards Near			0.022	0.019	0.022			The post dosing conc. exceeds the 75% upper indicative quality	

Site Name (Code)	Contributing WB Code_Name	WB Type <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
									threshold; however this is due to the baseline ortho P conc. The modelled conc. is 0.0003mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23G010300 GALEY_020	RWB	Good	0.030	0.033	2.1	0.0000	0.030‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23G010400 GALEY_030	RWB	Moderate	0.046	0.051	19.4	0.0002	0.046‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23G010500 GALEY_040	RWB	Good	0.030	0.033	38.7	0.0002	0.030‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23G010700 GALEY_050	RWB	Poor Upwards Far	0.059	0.087	54.3	0.0004	0.059	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23G750710 GLOURIA_010	RWB	Moderate	0.046	0.051	8.3	0.0017	0.047	The modelled concentration is >5% High/Good indicative quality boundary but is within

Site Name (Code)	Contributing WB Code_Name	WB Type <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
									75% of the upper indicative quality threshold therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23I100800 Island Sack Little_010	RWB	Moderate	0.046	0.051	7.0	0.0011	0.047	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23K030850 KILCONLY_SOUTH_010	RWB	Moderate	0.046	0.051	8.9	0.0018	0.047	The modelled concentration is >5% High/Good 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.
	IE_SH_23K120820 KNOPPOGE_SOUTH_010	RWB	Moderate	0.046	0.051	48.7	0.0004	0.046†	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23M080580 MEENOGAHANE_010	RWB	Poor	0.077	0.087	3.9	0.0009	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 <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
	IE_SH_23M440980 MOUNTCOAL_010	RWB	Moderate	0.046	0.051	1.8	0.0001	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23T030500 TARMON STREAM_010	RWB	Poor	0.077	0.087	11.7	0.0011	0.078	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_24B030400 BALLYLONGFORD_010	RWB	Moderate	0.046	0.051	7.3	0.0008	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_24B030700 BALLYLONGFORD_020	RWB	Poor Upwards Far	0.082	0.087	18.0	0.0007	0.083	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_24B030860 BALLYLONGFORD_030	RWB	Good	0.030	0.033	44.1	0.0010	0.031†	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_24F320750 FARRANMILLER_010	RWB	Good	0.030	0.033	2.9	0.0003	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_24R300270 RALAPPANE_010	RWB	Moderate	0.046	0.051	0.8	0.0001	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
	IE_SH_24T010100 TARBERT_010	RWB	Poor Upwards Far	0.071	0.087	8.0	0.0012	0.072	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23T120500 TIERSHANAGHAN_010	RWB	Good	0.030	0.033	2.2	0.0002	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_24A270640 ASTEE_WEST_010	RWB	Good	0.030	0.033	13.3	0.0009	0.031	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_060_0100 Cashen	TWB Summer	Good (S)  Far	0.035	0.052	344.9	0.0003	0.036 <sup>‡</sup>	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good (W)  Far	0.037	0.053			0.037 <sup>‡</sup>	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_060_0200 Upper Feale Estuary	TWB Summer	High (S)  Near	0.022	0.019	180.4	0.0002	0.023 <sup>‡</sup>	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 0.0002mg/l therefore there is no risk of deterioration in the



Site Name (Code)	Contributing WB Code_Name	WB Type <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
									Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	High (W) Far	0.018	0.019			0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_060_0300 Lower Shannon Estuary	TWB Summer	High (S) Far	0.012	0.020	75.1	0.0000	0.012‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good (W) Far	0.025	0.036			0.025‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_060_0000 Mouth of the Shannon (HAs 23;27)	CWB Summer	High (S)	0.008	0.019	445.3	0.0000	0.008‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		CWB Winter	Good (W)	0.033	0.040			0.033‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_030 Ballylongford	GWB	Good None Far	0.019	0.026	12.9	0.0004	0.019‡	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 <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
	IE_SH_G_001 Abbeyfeale	GWB	Good	0.018	0.026	25.8	0.0003	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_027 Ballybunnion	GWB	Good Downwards Far	0.007	0.026	31.5	0.0015	0.008	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_118 Kerry Head	GWB	Good	0.018	0.026	6.3	0.0003	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
<b>Moanveanlag h Bog (002351)</b>	IE_SH_23B600860 BALLAGHADIGUE_010	RWB	Poor	0.077	0.087	9.0	0.0008	0.077	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_001 Abbeyfeale	GWB	Good	0.018	0.026	25.8	0.0003	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
<b>Akeragh, Banna and Barrow Harbour SAC (000332)</b>	IE_SH_23B910900 BALLYNOE_010	RWB	Moderate	0.046	0.051	12.6	0.0006	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_040_0000 Outer Tralee Bay	CWB Summer	High (S) Far	0.009	0.019	17.4	0.0000	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 <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
		CWB Winter	High (W)  Far	0.019	0.019			0.019	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_118 Kerry Head	GWB	Good	0.018	0.026	6.3	0.0003	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
<b>River Shannon and River Fergus Estuary SPA (004077)</b>	IE_SH_24F320750 FARRANMILLER_010	RWB	Good	0.030	0.033	2.9	0.0003	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_24T010100 TARBERT_010	RWB	Poor Upwards Far	0.071	0.087	8.0	0.0012	0.072	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_24R300270 RALAPPANE_010	RWB	Moderate	0.046	0.051	0.8	0.0001	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_24B030400 BALLYLONGFORD_010	RWB	Moderate	0.046	0.051	7.3	0.0008	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_24B030700 BALLYLONGFORD_020	RWB	Poor Upwards Far	0.082	0.087	18.0	0.0007	0.083	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 <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
	IE_SH_24B030860 BALLYLONGFORD_030	RWB	Good	0.030	0.033	44.1	0.0010	0.031†	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_24A270640 ASTEE_WEST_010	RWB	Good	0.030	0.033	13.3	0.0009	0.031	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_060_0300 Lower Shannon Estuary	TWB Summer	High (S) Far	0.012	0.020	75.1	0.0000	0.012	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good (W) Far	0.025	0.036			0.025	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_060_0000 Mouth of the Shannon (HAs 23;27)	CWB Summer	High (S)	0.008	0.019	445.3	0.0000	0.008	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		CWB Winter	Good (W)	0.033	0.040			0.033	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_030 Ballylongford	GWB	Good None Far	0.019	0.026	12.9	0.0004	0.019	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 <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
<b>Kerry Head SPA (004189)</b>	IE_SH_23M080580 MEENOGAHANE_010	RWB	Poor	0.077	0.087	3.9	0.0009	0.077	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23T120500 TIERSHANAGHAN_010	RWB	Good	0.030	0.033	2.2	0.0002	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_23D160380 DOONAMONTANE_010	RWB	Moderate	0.046	0.051	3.0	0.0004	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_060_0000 Mouth of the Shannon (HAs 23;27)	CWB Summer	High (S)	0.008	0.019	445.3	0.0000	0.008‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		CWB Winter	Good (W)	0.033	0.040			0.033	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
IE_SH_G_118 Kerry Head	GWB	Good	0.018	0.026	6.3	0.0003	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.	
<b>Tralee Bay Complex SPA (004188)</b>	IE_SH_23B910900 BALLYNOE_010	RWB	Moderate	0.046	0.051	12.6	0.0006	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type <sup>11</sup>	Ortho P Indicative Quality <sup>12</sup> and Trends <sup>13</sup>	Baseline <sup>14</sup> Ortho P Conc. (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc. <sup>16</sup> (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l) <sup>17</sup>	Evaluation
	IE_SH_23D160380 DOONAMONTANE_010	RWB	Moderate	0.046	0.051	3.0	0.0004	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_040_0000 Outer Tralee Bay	CWB Summer	High (S) Far	0.009	0.019	17.4	0.0000	0.009‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		CWB Winter	High (W) Far	0.019	0.019			0.019	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_118 Kerry Head	GWB	Good	0.018	0.026	6.3	0.0003	0.018	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 (mg/l) (Ortho P unless otherwise stated)	Scenario	TP Load Kg/Yr	Ortho P Concentration mg/l TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
				0.5	0.4	0.68
Ballybunion Primary Discharge	n/a	Existing	1694.2	0.939	0.751	1.277
		Post Dosing	1857.8	1.030	0.824	1.400
Ballybunion SWOs (2 no.)	n/a	Existing	107.3	2.041	1.633	2.776
		Post Dosing	112.0	2.132	1.705	2.899
Listowel Primary Discharge	2 mg/l Compliance with ELV for orthoP in 2017 AER	Existing	2055.0	0.691	0.553	0.940
		Post Dosing	2403.0	0.808	0.647	1.099
Listowel SWOs (10 no.)	n/a	Existing	128.2	1.480	1.184	2.013

Agglom. and Discharge Type	ELV from WWDL (mg/l) (Ortho P unless otherwise stated)	Scenario	TP Load Kg/Yr	Ortho P Concentration mg/l TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
				0.5	0.4	0.68
		Post Dosing	138.3	1.597	1.278	2.172
Ballyheigue Primary Discharge	n/a	Existing	851.3	1.342	1.074	1.825
		Post Dosing	854.6	1.347	1.078	1.832
Ballyheigue SWOs (3 no.)	n/a	Existing	53.1	2.873	2.299	3.908
		Post Dosing	53.2	2.879	2.303	3.915
Ballylongford Primary Discharge	8	Existing	147.3	0.292	0.234	0.398
		Post Dosing	180.1	0.358	0.286	0.486
Ballylongford SWOs (3 no.)	n/a	Existing	9.2	0.626	0.501	0.851
		Post Dosing	10.1	0.691	0.553	0.940
Tarbert Primary Discharge	n/a	Existing	331.0	1.148	0.918	1.561
		Post Dosing	369.3	1.281	1.025	1.742
Tarbert SWOs (3 no.)	n/a	Existing	20.6	2.458	1.967	3.343
		Post Dosing	21.8	2.591	2.073	3.524

Table 5-4: Mass balance assessment based on 1.0 mg/l dosing using available background concentrations and mean flow information from Hydrotool and as assumed daily tidal exchange volume.

Agglom.	RWB Name / Code for Primary Discharge	Background Conc. <sup>18</sup> (mg/l)	Modelled conc. Existing (mg/l)	Modelled conc. Post Dosing (mg/l)	% Inc
Ballybunion	Cashen Estuary IE_SH_060_0100	0.0370	0.0378	0.0378	0.2
Listowel	Feale_090 IE_SH_23F010800	0.0232	0.0246	0.0248	0.9
Ballyheigue	Outer Tralee Bay IE_SH_040_0000	0.0193	0.0194	0.0194	0.0
Ballylongford	Ballylongford_030 IE_SH_24B030860	0.0822	0.0838	0.0843	0.6
Tarbert	Lower Shannon Estuary IE_SH_060_0300	0.0245	0.0245	0.0245	0.0

### Ballybunion Agglomeration

Ballybunion agglomeration (D0183-01) receives secondary treatment only and therefore it is assumed that the additional load from orthophosphate dosing is not removed in the treatment process but rather is added to the existing effluent loads. Effluent concentrations are compliant with ELVs in the 2021 AER. The agglomeration discharges to the Cashen Estuary (IE\_SH\_060\_0100) which is hydrologically connected to the Lower River Shannon SAC. When mean flow and assumed daily tidal exchange volume are taken into account the increase in the receiving water is negligible (0.2%) (Table 5-4). Therefore, there is no risk of failing to achieve WFD objectives for the Cashen Estuary

<sup>18</sup> Annual mean from AER u/s monitoring point



(IE\_SH\_060\_0100) and its hydrologically connected European Sites as a result of dosing at Dromin WTP.

### **Listowel Agglomeration**

Listowel agglomeration (D0179-01) receives secondary treatment only and therefore it is assumed that the additional load from orthophosphate dosing is not removed in the treatment process but rather is added to the existing effluent loads. Effluent concentrations are compliant with ELVs in the 2021 AER. The agglomeration discharges to the Feale\_090 (IE\_SH\_23F010800) river water body which is hydrologically connected to the Lower River Shannon SAC. When mean flows are taken into account the increase in the receiving water is negligible (0.9%) (**Table 5-4**). Therefore, there is no risk of failing to achieve WFD objectives for the Feale\_090 (IE\_SH\_23F010800) and its hydrologically connected European Sites as a result of dosing at Dromin WTP.

### **Ballyheigue Agglomeration**

Ballyheigue agglomeration (D0186-01) receives secondary treatment only and therefore it is assumed that the additional load from orthophosphate dosing is not removed in the treatment process but rather is added to the existing effluent loads. Effluent concentrations are compliant with ELVs in the 2021 AER. The agglomeration discharges to the Outer Tralee Bay (IE\_SH\_040\_0000) coastal water body which is hydrologically connected to the Magharee Islands SAC, Lower River Shannon SAC, Akeragh, Banna and Barrow Harbour SAC, Tralee Bay and Magharees Peninsula, West to Cloghane SAC, Lower River Shannon SAC, Tralee Bay Complex SPA, Magharee Islands SAC, Kerry Head SAC. When mean flow and as assumed daily tidal exchange volume are taken into account the increase in the receiving water is undetectable (0.0%) (**Table 5-4**). Therefore, there is no risk of failing to achieve WFD objectives for the Outer Tralee Bay (IE\_SH\_040\_0000) and its hydrologically connected European Sites as a result of dosing at Dromin WTP.

### **Ballylongford Agglomeration**

Ballylongford agglomeration (D0459-01) receives secondary treatment only and therefore it is assumed that the additional load from orthophosphate dosing is not removed in the treatment process but rather is added to the existing effluent loads. Effluent concentrations are compliant with ELVs in the 2021 AER. The agglomeration discharges to the Ballylongford\_030 (IE\_SH\_24B030860) river water body which is hydrologically connected to the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA. When mean flows are taken into account the increase in the receiving water is negligible (0.6%) (**Table 5-4**). Therefore, there is no risk of failing to achieve WFD objectives for the Ballylongford\_030 (IE\_SH\_24B030860) and its hydrologically connected European Sites as a result of dosing at Dromin WTP.

### **Tarbert Agglomeration**

Tarbert agglomeration (D0283-01) receives secondary treatment only and therefore it is assumed that the additional load from orthophosphate dosing is not removed in the treatment process but rather is added to the existing effluent loads. Effluent concentrations are compliant with ELVs in the 2021 AER. The agglomeration discharges to the Lower Shannon Estuary (IE\_SH\_060\_0300) water body which is hydrologically connected to the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA. When mean flow and as assumed daily tidal exchange volume are taken into account the increase in the receiving water is undetectable (0.0%) (**Table 5-4**). Therefore, there is no risk of

failing to achieve WFD objectives for the Lower Shannon Estuary (IE\_SH\_060\_0300) and its hydrologically connected European Sites as a result of dosing at Dromin WTP.

### 5.3.4 Assessment of Potential Indirect Impact from Subsurface Flow

#### 5.3.4.1 Sub surface flows from leakage and DWWT

Step 4 of the EAM model assesses the distributed inputs to river water bodies from subsurface pathways (**Appendix C**). For the majority of water bodies, the increased loads due to orthophosphate dosing are not predicted to be significant i.e. are <0.00125 mg/l (5% of High / Good indicative quality boundary). The exceptions include IE\_SH\_23G750710 (Glouria\_010) with 0.0017 mg/l potential increase in concentration and IE\_SH\_23K030850 (Kilonly\_South\_010) with 0.0018 mg/l potential increase in concentration. Both water bodies directly intersect the Lower River Shannon SAC (002165). However, the potential increase does not cause risk of failing WFD Objectives as the potential baseline after dosing would stay below 75% of the upper threshold for Orthophosphate Indicative Quality.

The baseline concentration for the Feale (090 IE\_SH\_23F010800) exceeds the 75% upper indicative quality threshold; the modelled additional concentration is undetectable (0.0000mg/l) therefore there is no risk of deterioration in the Ortho P High indicative quality or of preventing the achievement of WFD objectives.

The BRICK\_040 (IE\_SH\_23B030700) also exceeds the 75% upper threshold for orthophosphate indicative quality. The additional concentration is within the 5% of the High / Good indicative quality boundary for surface water bodies (<0.00125mg/l). The insignificant increase in orthophosphate concentration will not increase the risk of deterioration in the indicative quality and therefore will not impact on the orthophosphate supporting conditions, which are currently consistent with the achievement of the values specified for good status of the biological elements.

The FEALE\_070 (IE\_SH\_23F010550) and FEALE\_080 (IE\_SH\_23F010600) both exceed the 75% upper indicative quality threshold; the modelled additional concentration is undetectable (0.0000mg/l) therefore there is no risk of deterioration in the Ortho P High indicative quality or of preventing the achievement of WFD objectives.

The FEALE\_090 (IE\_SH\_23B030800) also exceeds the 75% upper threshold for orthophosphate indicative quality at three monitoring points. The additional concentration is within the 5% of the High / Good indicative quality boundary for surface water bodies (<0.00125mg/l). The insignificant increase in orthophosphate concentration will not increase the risk of deterioration in the indicative quality and therefore will not impact on the orthophosphate supporting conditions, which are currently consistent with the achievement of the values specified for good status of the biological elements.

Transitional and Coastal water bodies directly affected by this WSZ are: Upper Feale Estuary (IE\_SH\_060\_0200). The baseline summer orthophosphate indicative quality within Upper Feale Estuary (IE\_SH\_060\_0200) exceeds the 75% upper indicative quality threshold; The modelled additional concentration is insignificant or undetectable (0.0002mg/l) therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives. The modelled additional concentrations in the remaining transitional receiving water bodies are all insignificant (below 0.00125 mg/l).

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

Therefore there will be no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives within water bodies hydrologically / hydrogeologically connected to any European Site.

#### 5.3.4.2 Groundwater Assessment

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

The groundwater body with the highest modelled additional increase in orthophosphate concentration due to dosing is IE\_SH\_G\_027 Ballybunnion (0.0015mg/l) which is well below the 5% Good / Fail indicative quality boundary.

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**.

#### 5.3.5 Combined Assessment

**Table 4A of Appendix C** provides details of the combined orthophosphate inputs to river water bodies from direct discharges, DWWTSs and leakage loads. For the majority of water bodies, the increased loads due to orthophosphate dosing are not predicted to be significant i.e. are  $<0.00125$  mg/l (5% of High / Good indicative quality boundary). The exceptions include IE\_SH\_23G750710 (Glouria\_010) with 0.0017 mg/l potential increase in concentration and IE\_SH\_23K030850 (Kilconly\_South\_010) with 0.0018 mg/l potential increase in concentration. Both water bodies directly intersect the Lower River Shannon SAC (002165). However, the potential increase does not cause risk of failing WFD Objectives as the potential baseline after dosing would stay below 75% of the upper threshold for orthophosphate indicative quality.

The baseline concentration for the Feale (090 IE\_SH\_23F010800) exceeds the 75% upper indicative quality threshold; the modelled additional concentration is undetectable (0.0000mg/l) therefore there is no risk of deterioration in the Ortho P High indicative quality or of preventing the achievement of WFD objectives.

The BRICK\_040 (IE\_SH\_23B030700) also exceeds the 75% upper threshold for orthophosphate indicative quality. The additional concentration is within the 5% of the High / Good indicative quality boundary for surface water bodies ( $<0.00125$ mg/l). The insignificant increase in orthophosphate concentration will not increase the risk of deterioration in the indicative quality and therefore will not impact on the orthophosphate supporting conditions, which are currently consistent with the achievement of the values specified for good status of the biological elements.

The FEALE\_070 (IE\_SH\_23F010550) and FEALE\_080 (IE\_SH\_23F010600) both exceed the 75% upper indicative quality threshold; the modelled additional concentration is undetectable (0.0000mg/l) therefore there is no risk of deterioration in the Ortho P High indicative quality or of preventing the achievement of WFD objectives.

The FEALE\_090 (IE\_SH\_23B030800) also exceeds the 75% upper threshold for orthophosphate indicative quality at three monitoring points. The additional concentration is within the 5% of the High / Good indicative quality boundary for surface water bodies) (<0.00125mg/l). The insignificant increase in orthophosphate concentration will not increase the risk of deterioration in the indicative quality and therefore will not impact on the orthophosphate supporting conditions, which are currently consistent with the achievement of the values specified for good status of the biological elements.

Transitional and Coastal water bodies directly affected by this WSZ are: Upper Feale Estuary (IE\_SH\_060\_0200). The baseline summer orthophosphate indicative quality within Upper Feale Estuary (IE\_SH\_060\_0200) exceeds the 75% upper indicative quality threshold; The modelled additional concentration is insignificant or undetectable (0.0002mg/l) therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives. The modelled additional concentrations in the remaining transitional receiving water bodies are all insignificant (below 0.00125 mg/l).

The dosing therefore poses no risk of deterioration in the orthophosphate indicative quality of the river water bodies identified in **Table 5-2**, or of preventing their achievement of WFD objectives.

**Table 4B of Appendix C** gives the loads and concentrations to Transitional / Coastal WBs. These are: Cashen (IE\_SH\_060\_0100), Upper Feale Estuary (IE\_SH\_060\_0200), Lower Shannon Estuary (IE\_SH\_060\_0300), and Outer Tralee Bay (IE\_SH\_040\_0000), and Mouth of the Shannon (HAs 23:27) (IE\_SH\_060\_0000). The baseline summer orthophosphate indicative quality within Upper Feale Estuary (IE\_SH\_060\_0200) exceeds the 75% upper indicative quality threshold. However, the modelled additional concentration in this waterbody is insignificant (0.0002mg/l). Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives. The modelled additional concentrations in the remaining receiving water bodies are all insignificant (<5% Good High indicative quality boundary i.e. 0.00125 mg/l). Therefore, there would be no risk of failing WFD objectives for these receiving water bodies as a result of dosing at Dromin WTP.

There are no lake bodies directly affected by the WSZ.

### 5.3.6 Assessment of Cumulative Impacts from other WSZs

The cumulative loads to the Tralee Bay-Feale catchment (HAs 23) and the Shannon Catchments (HAs 24, 25, 26, 27), associated with the corrective water treatment at the following additional WTPs have been assessed in combination with the proposed dosing at Dromin WTP. The common water bodies evaluated within the WSZs supplied by these WTPs have been summarised in **Conclusions**

The modelled increased orthophosphate dosing concentrations are insignificant in most water bodies, i.e. < 0.00125 mg/l (5% of the High / Good indicative quality boundary for surface water bodies). The exceptions include IE\_SH\_23G750710 (Glouria\_010) and IE\_SH\_23K030850 (Kilconly\_South\_010) river water bodies. Both water bodies directly intersect the Lower River Shannon SAC (002165). The potential baseline after dosing would stay below 75% of the upper threshold for Orthophosphate Indicative Quality and therefore 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.

Water bodies exceeding the 75% upper threshold for Orthophosphate Indicative Quality include river waterbodies; BRICK\_040 (IE\_SH\_23B030700, one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800, 3 monitoring points) river water bodies, and the summer baseline concentration for the following transitional waterbody; Upper Feale Estuary (IE\_SH\_060\_0200). The baseline concentration in all water bodies is already higher than 75% of the upper threshold for orthophosphate Indicative Quality. The potential increase in concentration is insignificant for all of the listed waterbodies and below 5% of the Good / High boundary (0.00125mg/l) so there would be no risk of failing WFD objectives for these receiving water bodies.

Table 5-5.

### **HA 23 - Tralee Bay-Feale catchment**

- 008 Lough Guitane Headworks – Central Regional Lisloose 405F\*

### **HAs 24, 25, 26, 27 - Shannon Catchment**

- 005 Clareville WTP – Limerick City Water Supply
- 012 Tuam WTP – Tuam RWSS
- 013 Portloman WTP – Ardonagh Reservoir
- 017 Drumcliffe WTP - Ennis PWS
- 019 New Doolough WTP - W.Clare RWS (New WTP)
- 020 Castle Lake WTP - Shannon/Sixmilebridge RWSS
- 027 Athlone WTP – Athlone WSS
- 034 Lough Forbes WTP – Longford Central
- 040 Coolbawn – Nenagh RWSS
- 049 Ballany WTP – Ballany High Level Reservoir
- 058 Ballinasloe Town WTP - Ballinasloe Public Supply
- 068 Rockingham WTP - Boyle Regional WSS
- 128 Longford Springs WTP Future Supply - Castlerea WSS
- 140 Lisbrock WTP - SRRWSS Lisbrock
- 178 Clavin's Bridge WTP – Kells/Oldcastle WS
- 184 Foileen WTP - CappamoreFoileen Water Supply
- 185 Ballinlough/ Loughglynn (Ballybane Springs) - Ballinlough/Loughglynn
- 216 Kylebeg WTP – Borrisokane
- 237 Killadysert WTP - Killadysert PWS
- 238 Williamstown WTP - Williamstown PS3
- 246 Ballingarry Spring WTP - Ballingarry Water Supply
- 260 Kilcolman PS - Rathkeale Water Supply
- 267 Cloughjordan Pump Station – Cloughjordan
- 321 Ahascragh WTP - Ahascragh P.S.

The baseline concentration for the following river waterbody; BRICK\_040 (IE\_SH\_23B030700, one monitoring point) and the summer baseline concentration for the following transitional waterbody; Upper Feale Estuary (IE\_SH\_060\_0200) are above 75% of the upper orthophosphate indicative quality threshold. The modelled increase in post dosing concentration is insignificant (0.0009 mg/l and 0.0002 mg/l respectively) so there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

The impact to the remaining receiving waters is not significant as outlined in **Table 5, Appendix C and Conclusions**

The modelled increased orthophosphate dosing concentrations are insignificant in most water bodies, i.e. < 0.00125 mg/l (5% of the High / Good indicative quality boundary for surface water bodies). The exceptions include IE\_SH\_23G750710 (Glouria\_010) and IE\_SH\_23K030850 (Kilconly\_South\_010) river water bodies. Both water bodies directly intersect the Lower River Shannon SAC (002165). The potential baseline after dosing would stay below 75% of the upper threshold for Orthophosphate Indicative Quality and therefore 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.

Water bodies exceeding the 75% upper threshold for Orthophosphate Indicative Quality include river waterbodies; BRICK\_040 (IE\_SH\_23B030700, one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800, 3 monitoring points) river water bodies, and the summer baseline concentration for the following transitional waterbody; Upper Feale Estuary (IE\_SH\_060\_0200). The baseline concentration in all water bodies is already higher than 75% of the upper threshold for orthophosphate Indicative Quality. The potential increase in concentration is insignificant for all of the listed waterbodies and below 5% of the Good / High boundary (0.00125mg/l) so there would be no risk of failing WFD objectives for these receiving water bodies.

Table 5-5 below given that predicted increases in orthophosphate as a result of dosing are <5% of the Good / High indicative quality boundary i.e. 0.00125mg/l in all water bodies and will not cause a deterioration in the orthophosphate indicative quality or prevent the achievement of the WFD objectives of the water bodies.

### 5.3.7 Conclusions

The modelled increased orthophosphate dosing concentrations are insignificant in most water bodies, i.e. < 0.00125 mg/l (5% of the High / Good indicative quality boundary for surface water bodies). The exceptions include IE\_SH\_23G750710 (Glouria\_010) and IE\_SH\_23K030850 (Kilconly\_South\_010) river water bodies. Both water bodies directly intersect the Lower River Shannon SAC (002165). The potential baseline after dosing would stay below 75% of the upper threshold for Orthophosphate Indicative Quality and therefore 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.

Water bodies exceeding the 75% upper threshold for Orthophosphate Indicative Quality include river waterbodies; BRICK\_040 (IE\_SH\_23B030700, one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800, 3 monitoring points) river water bodies, and the summer baseline concentration for the following transitional waterbody; Upper Feale Estuary (IE\_SH\_060\_0200). The baseline concentration in all water bodies is already higher than 75% of the upper threshold for orthophosphate Indicative Quality. The potential increase in concentration is insignificant for all of the listed waterbodies and below 5% of the Good / High boundary (0.00125mg/l) so there would be no risk of failing WFD objectives for these receiving water bodies.



**Table 5-5: Cumulative assessment of the increased loading and concentrations from Dromin: Listowel/Moyvane 601E\* 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 Status indicative quality indicated in <i>italic</i> ]	Baseline Year 2014 and Conc. mg/l [Surrogate Conc. given in <i>italic</i> ]	75% of Ortho P Indicative Quality Upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Potential Increase in Ortho P Conc. due to Dosing mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l
IE_SH_23B030500 BRICK_030	RWB	<i>Good</i>	<i>0.030</i>	0.033	75.3	0.0011	0.031
IE_SH_23B030700 BRICK_040	RWB	Moderate Upwards Near	0.052	0.051	119.7	0.0009	0.053
		Poor Upwards Far	0.064	0.087			0.065
IE_SH_23D090580 DERRA_WEST_010	RWB	<i>Moderate</i>	<i>0.046</i>	0.051	95.4	0.0006	0.046
IE_SH_23G010500 GALEY_040	RWB	<i>Good</i>	<i>0.030</i>	0.033	69.2	0.0004	0.030
IE_SH_23G010700 GALEY_050	RWB	Poor Upwards Far	0.059	0.087	84.8	0.0006	0.059
IE_SH_23K120820 KNOPPOGE_SOUTH_010	RWB	<i>Moderate</i>	<i>0.046</i>	0.051	139.1	0.0012	0.047
IE_SH_23B910900 BALLYNOE_010	RWB	<i>Moderate</i>	<i>0.046</i>	0.051	25.8	0.0012	0.047
IE_SH_040_0000 Outer Tralee Bay	CWB Summer	High Far	0.009	0.019	244.4	0.0000	0.009
	CWB Winter	High Far	0.019	0.019			0.019
IE_SH_060_0200 Upper Feale Estuary	TWB Summer	High Near	0.022	0.019	191.0	0.0002	0.023
	TWB Winter	High Far	0.018	0.019			0.018
IE_SH_060_0100 Cashen	TWB Summer	Good Far	0.035	0.052	525.0	0.0002	0.036
	TWB Winter	Good Near	0.037	0.053			0.037
IE_SH_060_0300 Lower Shannon Estuary	TWB Summer	High Far	0.012	0.020	12412.9	0.0002	0.012

NAME / EU_CD	Period	Ortho P Indicative Quality and Trends (distance to threshold) [Surrogate Status indicative quality indicated in <i>italic</i> ]	Baseline Year 2014 and Conc. mg/l [Surrogate Conc. given in <i>italic</i> ]	75% of Ortho P Indicative Quality Upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Potential Increase in Ortho P Conc. due to Dosing mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l
	TWB Winter	Good Far	0.025	0.036			0.025
IE_SH_060_0000 Mouth of the Shannon (HAs 23;27)	CWB Summer	High	0.008	0.019	13317.6	0.0001	0.008
	CWB Winter	Good	0.033	0.040			0.033

The predicted loads to groundwater bodies are insignificant (i.e. < 0.00175 mg/l = 5% of the Good / Fail boundary). The IE\_SH\_G\_027 (Ballybunnion) groundwater body exhibits upward trends breaking the upper threshold for Good Ortho P indicative quality by 2021 and 2027, hence potentially Failing the Achieve Good status and Reverse Upward Trend tests. Predicted increases are below significant levels at 0.0015mg/l, hence orthophosphate dosing is not increasing the risk of failing WFD objectives.

The cumulative assessment of dosing at Dromin 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 most. The maximum modelled increases in concentration for KILCONLY\_SOUTH\_010 (IE\_SH\_23K030850) and GLOURIA\_010 (IE\_SH\_23G750710) are 0.0018 mg/l and 0.0017 mg/l respectively. However this does not result in the post dosing concentrations to exceed 75% of the indicative quality upper threshold and will therefore not result in a deterioration of these 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

Dromin WTP is not located within or directly adjacent to the boundary of any European Site. The WTP is within close proximity to Feale\_080 (IE\_SH\_23F010600) and Feale\_090 (IE\_SH\_23F010800) river water bodies. Both tributaries of the Feale river flow south of the WTP and are hydrologically connected to the Lower River Shannon SAC (002165), the WTP is approximately 1.5km upstream of the SAC with a further 200-450m distance from the source of each tributary, connected via the Abbeyfeale groundwater body (IE\_SH\_G\_001). In addition, The Ballaghadigue\_010 (IE\_SH\_23B600860) river water body is located approximately 750m north-east of the WTP and adjoins the Moanveanlagh Bog SAC (002351) a further 3km downstream. The proposed works will be localised and contained to the immediate development area which supports amenity grassland / buildings and artificial surfaces. Works such as excavations will be contained to the defined working area and necessary works with cast in place concrete will be undertaken within sealed shuttered units. Such works practices will retain all potential construction related pollutants at source.

The Abbeyfeale groundwater body is a large water body intersecting three European Sites: Lower Shannon SAC, Moanveanlagh Bog SAC, and Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA. Potential source receptor pathways have been ruled out for Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA. For the remaining European Sites, the interference with the underlying water table will be unlikely to occur owing to the nature of the construction works. Any interference would be localised, minor and temporary with several buffers between the WTP and the water sources.

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

## 6.2 OPERATIONAL PHASE

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

### 6.2.1 Lower River Shannon

SAC 002165

#### 6.2.1.1 (1029) Freshwater pearl mussel (*Margaritifera margaritifera*)

The population of the freshwater pearl mussel in this SAC lies within the Cloon River, Co. Clare only. The Cloon population is confined to the main channel and is distributed from Croany Bridge to approx. 1.5 km upstream of Clonderalaw Bridge. The Environmental Quality Ratios for the water quality parameters monitored within freshwater pearl mussel catchments correspond to high ecological status. Orthophosphate specific targets are not defined in the SSCOs (NPWS, 2012<sup>19</sup>). Nevertheless, the freshwater pearl mussel requires High Status conditions. The Surface Water Regulations (2009) set a limit of  $\leq 0.025$  (mean) or  $\leq 0.045$  (95%ile) for Molybdate Reactive Phosphorus (MRP) (mg P/l) for High Status waters. The habitat in the Cloon failed both standards during 2009 sampling undertaken to inform the preparation of the sub-basin management plan for this site.

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

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580), Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).
- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, HAS 23;27 (IE\_SH\_060\_0000).

<sup>19</sup> [NPWS 2012 Lower River Shannon SAC 002165 Conservation Objectives](#)

- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

The Cloon River is located in the Shannon Estuary North catchment. The river discharges to Clonderalaw Bay in the Lower Shannon Estuary however is located on the opposite side of the estuary from the WSZ. The WSZ and water bodies affected by dosing at Dromin WTP are located in separate catchments (Shannon Estuary South and Tralee Bay-Feale catchments) and there is no hydrological pathway between the WSZ and Cloon River.

The rivers listed above and WSZ are also located in separate GWBs and therefore there is no hydrogeological connection between the sites.

The population is located upstream on the Cloon River which discharges to the Lower Shannon Estuary from the opposite side of the estuary. The modelled post-dosing increase in concentration in the Mouth of the River Shannon estuary is undetectable (0.0000mg/l). Therefore there is no risk of deterioration in the indicative quality of the estuary or of failing to achieve WFD objectives.

In terms of the potential for impact to Atlantic salmon, which are host to the larval stage of the Freshwater pearl mussel (glochidia), please see **Section 6.2.1.2** below.

In the absence of pathways for impacts, it has been demonstrated that the potential for likely significant effects on this Annex II species can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the species.

#### **6.2.1.2 (1095) Sea Lamprey (*Petromyzon marinus*), (1096) Brook lamprey (*Lampetra planeri*), (1099) River lamprey (*Lampetra fluviatilis*), (1106) Atlantic salmon (*Salmo Salar*) freshwater only**

Artificial barriers can block or cause difficulties to the upstream migration of Atlantic salmon and lamprey species; thereby limiting the species to lower stretches and restricting access to spawning areas. Specific barriers serve to constrain the up-river migration of lamprey species in this SAC. Within the extent of the SAC as a whole, the designated site boundary in the River Fergus is delineated by a barrier to lamprey migration. Significant barriers for lamprey migration are also present in the Mulkear and Feale rivers. For salmon, the large hydro-electric station at Ardnacrusha and the Parteen regulating weir present considerable obstructions to upstream passage of salmon and lamprey species on the Shannon main channel. While both features have fish passes installed, upstream migration of salmon is still problematical (NPWS 2012<sup>20</sup>). No obstacles causing significant fish passage issues for salmon are present on the Feale and Mulkear rivers.

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<sup>21</sup>) highlights the deterioration in water quality and ongoing point and diffuse sources of pollution as a key threat to these species and includes

<sup>20</sup> [NPWS 2012 Lower River Shannon SAC 002165 Conservation Objectives](#)

<sup>21</sup> 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 SSCO (NPWS, 2012<sup>20</sup>) states that lampreys and salmon spawn in clean gravels. Deterioration in water quality has the potential for a detrimental effect on spawning habitats, particularly where nutrient conditions result in excessive algal growth and macrophyte abundance, leading to smothering, shading effects, alteration of macroinvertebrate communities and silt deposition. The SSCO for salmon also requires a Q-value of at least 4, which equates to good ecological status.

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

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580), Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).
- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, HAS 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

The potential impacts of orthophosphate dosing at Dromin WTP are assessed in the context of brook lamprey occurring in all river waterbodies; river lamprey occurring in all transitional and river waterbodies; sea lamprey and Atlantic salmon (designated in freshwater only) occurring in all river, transitional and coastal water bodies identified in **Table 5-2**.

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

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010

(IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongford\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase

in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

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

### 6.2.1.3 (1110) Sandbanks which are slightly covered by sea water all the time

The habitat area of sandbanks in this SAC is estimated at 1.353ha, and are located within the coastal water body Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000) in the area from Kerry Head to Beal Head).

Annex I habitat structure and function, and the extent and quality of all habitats varies considerably in space and time and marine habitats are particularly prone to such variation. Anthropogenic disturbance may be considered significant when it causes a change in biotic and/or abiotic variables in excess of what could reasonably be envisaged under natural processes. The attributes and targets that will maintain the favourable conservation condition of this habitat does not make specific reference to water quality and nutrient conditions. The COs supporting document for Marine habitats (NPWS, 2013 ) does require that proposed activities or operations that cause significant disturbance to the community 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 the Lower River Shannon SAC and will receive inputs from the proposed orthophosphate dosing at Dromin WTP:

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580), Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).



- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

The habitat Sandbanks is located approximately 6km downstream of the WSZ and all water bodies identified as being connected to the SAC are listed in **Table 5-2**.

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

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongford\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Dromin WTP, it has been demonstrated that the potential for likely significant effects on these species can be excluded. Dosing inputs are present in upstream water bodies, however upon discharge into the Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000), post-dosing increases in orthophosphate concentration are modelled as undetectable (0.0000 mg/l). As such, dosing will not prevent the maintenance or restoration of the favourable conservation condition of this habitat.

#### **6.2.1.4 (1130) Estuaries and (1140) Mudflats and sandflats not covered by seawater at low tide**

The extent of the habitat Estuaries area in this SAC is estimated as 24,273ha, and uses Water Framework Transitional water body delineation to define extent. The habitat extends from Limerick Dock on the eastern side of the site, to almost Kilrush on the western side of the site. The habitat also encompasses the Annex I habitat of Mudflats and sandflats not covered by seawater at low tide which has an area of 8,808ha. The attributes and targets that will maintain the favourable conservation condition of this habitat does not make specific reference to water quality and nutrient conditions, however a search of other SAC with the same QI indicates that there is a water quality objective to maintain appropriate water quality, particularly nutrient levels, to support the natural structure and functioning of the habitat. The COs supporting document for Marine habitats (NPWS, 2013 ) does require that proposed activities or operations that cause significant disturbance to the community 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 the Lower River Shannon SAC and will receive inputs from the proposed orthophosphate dosing at Dromin WTP:

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580), Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).
- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, HAS 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnon (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

The habitats Estuaries and Mudflats and sandflats not covered by seawater are located downstream of the WSZ and all water bodies identified as being connected to the SAC are listed in **Table 5-2**.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is

0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongford\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The river water bodies Tiershanaghan\_010 (IE\_SH\_23T120500), Meenogahane\_010 (IE\_SH\_23M080580), and Kilconly\_South\_010 (IE\_SH\_23K030850) are hydrologically connected to the SAC and receive orthophosphate dosing. These water bodies do not intersect mapped QIs; however, they may intersect unmapped estuarine habitat areas. These waterbodies are addressed in the text above and there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118) and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

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

#### **6.2.1.5 (1150) Coastal lagoons**

“Coastal lagoons” is a priority habitat in Annex I of the Habitats Directive. A coastal lagoon is a lake or pond that is fully or partially separated from the sea by a permeable barrier that can be entirely natural such as shingle, or can be an artificial embankment. Salinity varies depending on such factors such as freshwater inputs and barrier permeability.

There are four coastal lagoons – Quayfield and Poulaweala Loughs, Shannon Airport lagoon, Scattery Lagoon and Cloonconeen Pool, located within this site.

Shannon Airport lagoon lies to the east of the Fergus estuary, and north of the Upper Shannon estuary. The site is also situated only a few hundred metres southwest of Shannon Airport. The lagoon constitutes a small (2ha) artificial lagoon with a sluiced inlet, formed behind a coastal embankment (artificial). There has been considerable debate and controversy in relation to this lagoon, and the possible safety threat of waterbirds colliding with aircraft. When visited briefly in 1996, salinity measured 13psu and water depth was approximately 1m, but when sampled in 2002, a large part of the lagoon was dry and salinity measured 0psu<sup>22</sup>.

Scattery Island lagoon is situated on Scattery Island in the River Shannon, 2.5km southwest of Kilrush, Co. Clare. The lagoon is a small (10ha), shallow, “estuarine” natural sedimentary lagoon with a cobble/shingle barrier. A relatively large natural inlet allows most tides to enter through the barrier, and salinity is generally high, ranging from 29-32psu at the time of sampling (18-21/9/03).

Cloonconeen pool lies on the Shannon estuary, just west of Kilcredaun Point, 2km southwest of Carrigaholt. It is a small (7ha) natural sedimentary lagoon with a cobble barrier in an area of partially cut peat bog which has become flooded by seawater. Salinity was high at the time of sampling (9-10/8/96<sup>22</sup>) and ranged from 32-34psu in the main pool but is probably less for much of the time. There is a drowned forest of pine, some 4,000 years old on the beach. Further offshore is another barrier of rock, which possibly represents the position of a former complete barrier, enclosing a larger lagoon. The lagoon and cobble barrier, together with the drowned forest, is of great geomorphological interest.

Structure and functions relates to the physical components of a habitat (“structure”) and the ecological processes that drive it (“functions”). For lagoons these include attributes such as salinity,

<sup>22</sup> [NPWS 2012 Lower River Shannon SAC 002165 Conservation Objectives Supporting Document - Lagoons](#)

hydrology and various water quality attributes. Lagoons can vary considerably in salinity both within and between sites depending on the volume and timing of inflowing and outflowing fresh and seawater. Salinity is probably the most important variable in the classification of lagoon types (Roden and Oliver, 2010<sup>22</sup>). All the lagoons identified within the Lower River Shannon SAC can be classified as shallow, thus even small changes in water depth can cause significant losses in habitat area.

In the COs supporting document for coastal lagoons for the site<sup>22</sup>, the target for the attribute water quality Molybdate Reactive Phosphorus (MRP) is: annual median MRP within natural ranges and less than 0.1 mg/L. The target is based on Roden and Oliver (2010<sup>23</sup>). This limit is required to ensure that excessive shading from phytoplankton does not reduce submergent colonisation of the littoral zone.

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

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580), Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).
- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, Has 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality

<sup>23</sup> Roden, C.M. and Oliver, G. 2010. Monitoring and assessment of Irish Lagoons for the purpose of the EU Water Framework Directive.

boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongord\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

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

### 6.2.1.6 (1230) Vegetated sea cliffs of Atlantic and Baltic coasts

Most of the Lower River Shannon SAC west of Kilcredaun Point/Kilconly Point is bounded by high rocky sea cliffs. There are some areas where the hard rock is overlain by soft rock and some other small areas dominated by soft rock. The cliffs support a typical maritime flora and habitat for a diversity of cliff nesting birds including peregrine falcon (*Falco peregrinus*) and chough (*Pyrhocorax pyrrhocorax*) (NPWS, 2012<sup>24</sup>). The cliffs in the outer part of the site are sparsely vegetated with lichens, Red Fescue, Sea Beet (*Beta vulgaris* subsp. *Maritima*), Sea Campion (*Silene vulgaris* subsp. *Maritima*), Thrift and plantains (*Plantago* spp.). A rare endemic type of sea-lavender, *Limonium recurvum* subsp. *Pseudotranswallianum*, occurs on cliffs near Loop Head. Cliff-top vegetation usually consists of either grassland or maritime heath. The boulder clay cliffs further up the estuary tend to be more densely vegetated, with swards of Red Fescue and species such as Kidney Vetch (*Anthyllis vulneraria*) and Common Bird's-foot-trefoil (*Lotus corniculatus*) (NPWS, 2013<sup>25</sup>).

The overall objective for vegetated sea cliffs in Lower River Shannon SAC is to maintain favourable conservation condition<sup>20</sup>. The objective is based on an assessment of the current condition of the habitat under a range of attributes and targets. There are no nutrient specific targets for this habitat. There is however, a target for the attribute negative indicator species which states that negative indicator species should make up less than 5% of the vegetation cover. Negative indicator species can include species indicative of changes in nutrient status (e.g. *Urtica dioica*).

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

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580),

<sup>24</sup> [NPWS 2012 Lower River Shannon SAC \(site code 2165\) Conservation objectives supporting document - coastal habitats](#)

<sup>25</sup> [NPWS 2013 Lower River Shannon SAC 002165 Site Synopsis](#)



Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).

- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, HAS 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongford\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do

not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

There is direct hydrological connectivity between the mapped habitats and four river water bodies receiving dosing Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640) and Meenogahane\_010 (IE\_SH\_23M080580). These waterbodies are addressed in the text above and there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives. In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Dromin WTP, it has been demonstrated that the potential for likely significant effects on these species can be excluded. Furthermore, dosing will not prevent the maintenance or restoration of the favourable conservation condition of these species.

#### **6.2.1.7 (1160) Large shallow inlets and bays**

The habitat area was estimated as 35,282ha in this SAC. The site supports an excellent example of a large shallow inlet and bay, which is contained within the coastal water body IE\_SH\_060\_0000\_Mouth of the Shannon (HAs 23;27). Littoral sediment communities in the mouth of the Shannon Estuary occur in areas that are exposed to wave action and also in areas extremely sheltered from wave action. Characteristically, exposed sediment communities are composed of coarse sand and have a sparse fauna. Species richness increases as conditions become more sheltered. All shores in the site have a

zone of sand hoppers at the top, and below this each of the shores has different characteristic species giving a range of different shore types.

This habitat also encompasses the Annex I habitats mudflats and sandflats not covered by water at low tide, sandbanks which are slightly covered by sea water all the time and reefs<sup>26</sup> (discussed in section 6.2.1.4). As for estuaries, sandbanks, and mudflats above, the attributes and targets that will maintain the favourable conservation condition of this habitat does not make specific reference to water quality and nutrient conditions, a target for this habitat (under conservation of the community type) states that proposed activities or operations that cause significant disturbance to the community 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 the Lower River Shannon SAC and will receive inputs from the proposed orthophosphate dosing at Dromin WTP:

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580), Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).
- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, HAS 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

The habitat large shallow inlets and bays is located downstream of the WSZ and all water bodies identified as being connected to the SAC are listed in **Table 5-2**. All water bodies receiving

<sup>26</sup>[NPWS 2012 Lower River Shannon SAC 002165 Conservation Objectives Supporting Document - Marine Habitats](#)

orthophosphate dosing, ultimately discharge into the Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000) containing this Annex I habitat.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongford\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above,

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

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Dromin WTP, it has been demonstrated that the potential for likely significant effects on these species can be excluded. Dosing inputs are present in upstream water bodies, however upon discharge into the Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000), post-dosing increases in orthophosphate concentration are modelled as undetectable (0.0000 mg/l). As such, dosing will not prevent the maintenance or restoration of the favourable conservation condition of this habitat.

#### 6.2.1.8 (1170) Reefs

This habitat area within the Lower River Shannon SAC is estimated as 21,421ha, and is found within the Shannon estuary and Mouth of the Shannon water bodies. There are no nutrient specific targets in the SSCO (NPWS, 2012<sup>20</sup>) for this habitat. The attributes and targets that will maintain the favourable conservation condition of this habitat do not make specific reference to water quality or nutrient conditions. The COs supporting document for marine habitats (NPWS, 2012<sup>26</sup>) 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 the Lower River Shannon SAC and will receive inputs from the proposed orthophosphate dosing at Dromin WTP:

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island

Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850),  
Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580),  
Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500),  
Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700),  
Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750),  
Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010  
(IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010  
(IE\_SH\_24A270640).

- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

The habitat reefs is located downstream of the WSZ and all water bodies identified as being connected to the SAC are listed in in **Table 5-2**. All water bodies receiving orthophosphate dosing, ultimately discharge into the Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000) or/and the Lower Shannon Estuary (IE\_SH\_060\_0300) containing this Annex I habitat.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongford\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not

cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Dromin WTP, it has been demonstrated that the potential for likely significant effects on these species can be excluded. Dosing inputs are present in upstream water bodies, however upon discharge into the Mouth of the Shannon Has 23;27 (IE\_SH\_060\_0000) and Lower Shannon Estuary (IE\_SH\_060\_0300) encompassing these habitats, post-dosing increases in orthophosphate concentration are modelled as undetectable (0.0000 mg/l). As such, dosing will not prevent the maintenance or restoration of the favourable conservation condition of this habitat.

#### **6.2.1.9 (1310) Salicornia and other annuals colonising mud and sand *Spartina* swards (*Spartinion maritimae*), (1330) Atlantic salt meadows and (1410) Mediterranean salt meadows**

There are three saltmarsh habitats within this site, and the Saltmarsh Monitoring Project (SMP)<sup>27</sup> has documented an estimated area of 0.223ha for *Salicornia* habitat. For Atlantic salt meadows, the SMP mapped 119.36ha and additional areas of potential saltmarsh (376.07ha) were identified from an examination of aerial photographs, giving a total estimated area of 495.43ha.

For Mediterranean salt meadows, eight sub-sites that support the habitat were mapped (22.379ha) as part of the SMP and additional areas of potential saltmarsh (25.646ha) were identified from an examination of aerial photographs, giving a total estimated area of 48.025ha. Saltmarsh habitat also occurs at 11 other sub-sites within the SAC. Further unsurveyed areas supporting these saltmarsh habitat types maybe present within the site.

While there are no nutrient specific targets set for these habitats, the location, character and dynamic behaviour of saltmarshes are governed by sediment supply, tidal regime, wind-wave climate and sea level change. A target has been set (under structure and function) to maintain the physical structure: flooding regime of the habitats. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

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

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580), Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).
- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, Has 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

<sup>27</sup> Saltmarsh Monitoring Project 2006, Mark Mc Corry 2007. A Report for Research Branch, National Parks and Wildlife Service.

[https://www.npws.ie/sites/default/files/publications/pdf/McCorry\\_2007\\_Saltmarsh\\_survey.pdf](https://www.npws.ie/sites/default/files/publications/pdf/McCorry_2007_Saltmarsh_survey.pdf)



The saltmarsh habitats are located downstream of the WSZ and all water bodies identified as being connected to the SAC are listed in **Table 5-2**. The majority water bodies receiving orthophosphate dosing, discharge into the transitional water bodies containing this Annex I habitat.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongord\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The river water bodies Tiershanaghan\_010 (IE\_SH\_23T120500), Meenogahane\_010 (IE\_SH\_23M080580), and Kilconly\_South\_010 (IE\_SH\_23K030850) are hydrologically connected to the SAC and receive orthophosphate dosing. These water bodies do not intersect mapped Qis however may intersect unmapped areas. These waterbodies are addressed in the text above and there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon Has 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

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

#### **6.2.1.10 (1349) Bottlenose dolphin (*Tursiops truncatus*)**

The bottlenose dolphin habitat extends throughout the Lower River Shannon SAC and the dolphins are known to range widely throughout the site. Critical habitat areas<sup>28</sup> are between Tarbert Island and Scatterry Island, and in the Mouth of the Shannon (HAs 23;27) (IE\_SH\_060\_0000) (as far as Kerry Head and Loop Head). The population is described as resident within the site with dolphin groups present in the estuary throughout the year, repeated occurrence of known individuals within the between years, and a fine scale genetic distinction evident between members of the Shannon population and populations or communities occurring outside the estuary (NPWS, 2012<sup>26</sup>). A target has been established for this species which states that human activities should occur at levels that do not significantly affect the bottlenose dolphin population at the site. While the target predominantly

<sup>28</sup> Critical areas are described within NPWS (2012) as representing high value habitats used preferentially by the species within its overall range at the site and they broadly coincide with areas of steep benthic (i.e. seafloor) slope, greater depth and stronger currents. See [https://www.npws.ie/sites/default/files/publications/pdf/002165\\_Lower%20River%20Shannon%20SAC%20Marine%20Supporting%20Doc\\_V1.pdf](https://www.npws.ie/sites/default/files/publications/pdf/002165_Lower%20River%20Shannon%20SAC%20Marine%20Supporting%20Doc_V1.pdf), Figure 7.

relates to preventing impacts from man-made energy e.g. aerial or underwater noise, light or thermal energy, it also includes for proposed activities or operations that may result in the deterioration of key resources (e.g. water quality, feeding etc.), upon which the bottlenose dolphin depends. It is not fully known what the ecological requirements of the species are; therefore assessment needs to be on a case by case basis where appropriate.

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

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580), Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).
- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

Bottlenose dolphins are known to range widely throughout the Lower Shannon SAC. The COs have mapped habitat for the bottlenose dolphin as extending from the coastal water bodies up to the transitional water bodies within the SAC. Critical habitat is mapped within the Mouth of the River Shannon and the downstream end of the Lower Shannon Estuary.

All water bodies receiving orthophosphate dosing, ultimately discharge into the Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000) or/and the Lower Shannon Estuary (IE\_SH\_060\_0300) containing this Annex I habitat.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongford\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75%

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

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Dromin WTP, it has been demonstrated that the potential for likely significant effects on these species can be excluded. Dosing inputs are present in upstream water bodies, however upon discharge into the Mouth of the Shannon Has 23;27 (IE\_SH\_060\_0000) and Lower Shannon Estuary (IE\_SH\_060\_0300) encompassing these habitats, post-dosing increases in orthophosphate concentration are modelled as undetectable (0.0000 mg/l). As such, dosing will not prevent the maintenance or restoration of the favourable conservation condition of this habitat.

#### 6.2.1.11 (1355) Otter (*Lutra lutra*)

A review of the SSCOs (NPWS, 2012<sup>20</sup>) found no specific attributes or targets relating to water quality for the species however the NPWS Threat Response Plan for the Otter (NPWS, 2009<sup>29</sup>) review of and response to the pressures and threats to otters in Ireland, categorized three principal risks to otters: i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution.

The extent of terrestrial, marine and freshwater (river) 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; areas within 80m of the shoreline (high water mark) and river length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (NPWS, 2012<sup>20</sup>). 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 the Lower River Shannon SAC and will receive inputs from the proposed orthophosphate dosing at Dromin WTP:

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580),

<sup>29</sup> NPWS (2009) Threat Response Plan: Otter (2009-2011). National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin.

Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).

- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, Has 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

As the habitat of the otter extends all throughout the Lower River Shannon SAC, there is potential for all water bodies identified in **Table 5-2** as connected to the SAC to affect the species.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongord\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550),

FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon Has 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Dromin WTP, it has been demonstrated that the potential for likely significant effects on this species can be excluded. Furthermore, dosing will not interfere with the terrestrial, marine or freshwater habitat of the species. In the absence of any likely significant effect on water quality or fish species, the main food source for the otter in this SAC, there is no potential for likely significant effects on the conservation status of otter as a result of this project.

#### **6.2.1.12 (3260) Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation**

There are three sub-types of high conservation value known to occur in this site i.e. *Groenlandia densa*, *Schoenoplectus triqueter* and bryophyte-rich streams and rivers. The full distribution of this habitat

and its sub-types in this site are currently unknown<sup>30</sup>. There are stretches of six main rivers in the Lower River Shannon SAC: the Shannon, the Cloon, the Fergus, the Mulkear, the Maigue and the Feale, of which only the Cloon intersects the New Doolough WSZ. The high conservation value areas influenced by the tide are found, most notably, in the Shannon, the Fergus and the Maigue. The catchments of these three rivers are dominated by limestone geology. Significant non-tidal stretches of the Cloon are also included in the site. The Cloon is a fast, short, coastal river with a small (c. 59 km<sup>2</sup>), lowland catchment.

Land drainage, particularly of peatlands, has severely impacted the Cloon. These drainage activities will have altered distribution and species composition of the aquatic plant communities. The Cloon supports a small population of *Margaritifera margaritifera* the freshwater pearl mussel, and is listed on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. It should be noted that rooted macrophytes should be absent or trace (< 5% cover) in freshwater pearl mussel (*Margaritifera margaritifera*) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Cloon River within this SAC, because the mussel requires environmental conditions closer to natural background levels.

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

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580), Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).
- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

<sup>30</sup>[NPWS 2012 Lower River Shannon SAC 002165 Conservation Objectives Supporting Document - Water courses of plain to montane levels with the \*Ranunculion fluitantis\* and \*Callitricho Batrachion\* vegetation \(habitat code 3260\)](#)



While the known extent of the three sub-types has been broadly mapped within the SAC (NPWS 2012<sup>30</sup>), occur significantly upstream of the WSZ, the exact area of each has not been quantified. The area of the *Schoeoplectus triqueter* sub-type is likely to be smaller than the mapped range; however, as both the *Groenlandia densa* and the bryophyte-rich sub-types are presumed to be more widespread than mapped, it is not possible to comment on their areas at this time. For this reason, and on a precautionary basis, the assessment included all surface waters with hydrological connectivity to this site as identified in **Table 5-2**.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongford\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the

Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

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

#### **6.2.1.13 (6410) *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)**

*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils is a semi-natural grassland listed on Annex I of the Habitats Directive. Areas of *Molinia-Succisa* grassland are often seasonally flooded and can be managed as rough grazing or through a traditional regime of mowing during the drier summer months. They occur primarily in the midlands and the north-west, and less often in the south and east. The main negative impacts recorded for Annex I grassland habitats are species composition change (succession) and problematic native species (e.g. bracken). *Molinia* meadows are a groundwater dependent terrestrial ecosystem (GWDTE) and have low to moderate sensitivity to changes in groundwater quantity and quality<sup>31</sup>.

The Irish Semi-Natural Grasslands Survey (ISGS) 2007 – 2012 included within it surveys undertaken in Co. Clare, Co. Limerick and Co. Tipperary<sup>32</sup>. Ten sites in Co. Clare, 3 sites in Co. Limerick and 1 site in

<sup>31</sup>[Working Group on Groundwater \(2005\) WFD Pressures and Impacts Assessment Methodology, Guidance Document no. GW11](#)

<sup>32</sup>[O'Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. \(2013\) The Irish semi-natural grasslands survey 2007-2012. Irish Wildlife Manuals, No. 78. NPWS, Department of Arts, Heritage and the Gaeltacht, Ireland.](#)

Co. Tipperary were recorded<sup>33</sup>. The habitat has been recorded on the eastern bank of the Shannon, just north of Castleconnell, Co. Limerick and on the West bank of Lough Derg near Garrerghter (Figure 20, 21, O'Neill *et. al.*, 2013<sup>32</sup>). Two other locations in Co. Limerick are located adjacent to Shannon North and South of Montpelier; there is a history of flooding in the vicinity of the grassland sites<sup>34</sup>.

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

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580), Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).
- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

The location of the *Molinia* meadows in the SAC is downstream of the water bodies that connect the WSZ to the SAC. The full extent of the habitat is currently unknown (NPWS, 2012<sup>20</sup>). Therefore it is considered that all surface water bodies associated with the WSZ have the potential to contain this habitat type.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550),

<sup>33</sup> [Devaney, F.M., Martin, J.R., O'Neill, F.H. & Delaney, A. \(2013\) Irish Semi-natural Grasslands Survey, Annual Report No. 4](#)

<sup>34</sup> <http://www.floodmaps.ie/View/Default.aspx>

Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongford\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

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

#### **6.2.1.14 (91E0) Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)**

The Lower River Shannon SAC lies mostly within an intensively managed agricultural region and it contains only a small amount of woodland. This occurs principally along the banks of the River Shannon upstream of Limerick and in the uplands, mostly in the upper reaches of deeply incised tributaries on the Limerick/Tipperary border and in a few smaller areas along the River Feale and its tributaries in North Kerry/West Limerick<sup>35</sup>. In most cases the individual woodlands are small.

Within the SAC, five sites<sup>35</sup> surveyed as part of the National Survey of Native Woodlands (NSNW, Perrin et al., 2008) contain discrete areas of alluvial woodlands (Clare Glen, Doonass Demesne, Newgarden North, Knockanavar and Gortnaskehy). These are small stands, restricted to narrow bands where the ground is subject to flooding or flushing. The total area of these is only c.8.5ha but another site, Gortnageragh River Valley (NSNW code 1284) covering 56.4ha, is a complex of old oak woodland, alluvial woodland and ash/hazel woodland. While the total extent within the SAC is likely to be somewhat greater there is an absence of suitable terrain for the occurrence of extensive alluvial woodland. Continuity of woodland cover is provided by oak woodlands, ash woodlands and conifer plantations.

The Clare Glens lie close to Murroe village, Co. Limerick, and the Annagh River (Tributary of the Mulkear River). Doonass Demense and Newgarden North are located downstream of Castleconnell, Co. Limerick, on the River Shannon. Knockanavar is located on the Cahernahallia River (tributary of the Dead River), located between Doon, Co. Limerick and Cappagh White in south Co. Tipperary. Gortnaskehy is located on the Allaghaun River (tributary of the Feale River), near Toornafulla, Co. Limerick.

A review of the SSCOs for this habitat found no nutrient specific targets. The SCCOs target indicates that an appropriate hydrological regime is necessary for maintenance of alluvial vegetation, with periodic flooding essential to maintaining the alluvial woodlands along the river floodplains. The main pressures on this habitat are invasive alien species; grazing; forest management; agriculture; urban development; and, sewage and slurry discharges.

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<sup>35</sup>[NPWS 2012 Lower River Shannon SAC 002165 Conservation Objectives Supporting Document - Woodland Habitats](#)

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

- The river water bodies hydrologically connected to the site are: Ahalahana\_010 (IE\_SH\_23A150660), BRICK\_030 (IE\_SH\_23B030500), Brick\_040 (IE\_SH\_23B030700), Ballaghadigue\_010 (IE\_SH\_23B600860), Derra\_West\_010 (IE\_SH\_23D090580), Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), Feale\_090 (IE\_SH\_23F010800), Galey\_020 (IE\_SH\_23G010300), Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Galey\_050 (IE\_SH\_23G010700), Glouria\_010 (IE\_SH\_23G750710), Island Sack Little\_010 (IE\_SH\_23I100800), Kilconly\_South\_010 (IE\_SH\_23K030850), Knoppoge\_South\_010 (IE\_SH\_23K120820), Meenogahane\_010 (IE\_SH\_23M080580), Mountcoal\_010 (IE\_SH\_23M440980), Tarmon Stream\_010 (IE\_SH\_23T030500), Ballylongford\_010 (IE\_SH\_24B030400), Ballylongford\_020 (IE\_SH\_24B030700), Ballylongford\_030 (IE\_SH\_24B030860), Farranmiller\_010 (IE\_SH\_24F320750), Ralappane\_010 (IE\_SH\_24R300270), Ballynoe\_010 (IE\_SH\_23B910900), Tarbert\_010 (IE\_SH\_24T010100), Tiershanaghan\_010 (IE\_SH\_23T120500), Astee\_West\_010 (IE\_SH\_24A270640).
- The transitional water bodies hydrologically connected to the site are: Upper Feale Estuary (IE\_SH\_060\_0200), Cashen (IE\_SH\_060\_0100), and Lower Shannon Estuary (IE\_SH\_060\_0300).
- The coastal water body hydrological connected to the site is the Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000).
- The groundwater bodies hydrogeologically connected to the site are: Ballylongford (IE\_SH\_G\_030), Abbeyfeale (IE\_SH\_G\_001), Ballybunnion (IE\_SH\_G\_027), and Kerry Head (IE\_SH\_G\_118).

The habitat alluvial forest is located upstream of the water bodies that connect the WSZ to the SAC (NPWS, 2012<sup>20</sup>). It is noted that further areas are likely to be present within the SAC therefore all water bodies are considered.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

Most of the modelled post-dosing increases in orthophosphate concentration for river water bodies hydrologically connected to these habitats do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Feale\_070 (IE\_SH\_23F010550), Feale\_080 (IE\_SH\_23F010600), and Galey\_020 (IE\_SH\_23G010300) is not detectable (0.0000 mg/l). The modelled increase in concentration for Mountcoal\_010 (IE\_SH\_23M440980), and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Brick\_040 (IE\_SH\_23B030700) and Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l. The modelled increase in concentration for Feale\_090 (IE\_SH\_23F010800), and Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l. The modelled increase in concentration for Galey\_030 (IE\_SH\_23G010400), Galey\_040 (IE\_SH\_23G010500), Knoppoge\_South\_010 (IE\_SH\_23K120820) is 0.0004 mg/l. The modelled increase in concentration for Galey\_050 (IE\_SH\_23G010700) is 0.0005 mg/l, Derra\_West\_010 (IE\_SH\_23D090580) is 0.0006 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010

(IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongord\_030 (IE\_SH\_24B030860) and Meenogahane\_010 (IE\_SH\_23M080580) are 0.0010 mg/l. Modelled increases in orthophosphate concentrations for Tarmon Stream\_010 (IE\_SH\_23T030500), Island Sack Little\_010 (IE\_SH\_23I100800), and Ahalahana\_010 (IE\_SH\_23A150660) are 0.0011 mg/l, and Tarbert\_010 (IE\_SH\_24T010100) is 0.0012 mg/l.

For river waterbodies, both Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) exhibit modelled increases in concentration which exceed 5% of the High / Good indicative quality boundary, at 0.0017 mg/l and 0.0018 mg/l respectively. However, this does not cause the post-dosing baseline concentration for either water body to exceed 75% of the indicative quality upper threshold for orthophosphate, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. Additionally, the BRICK\_040 (IE\_SH\_23B030700; at one monitoring point), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600) and FEALE\_090 (IE\_SH\_23B030800; at three monitoring points) exhibit existing baseline concentration values which exceed the 75% upper threshold for orthophosphate indicative quality. However the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for transitional water bodies do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Lower Shannon Estuary (IE\_SH\_060\_0300), is not detectable (0.0000 mg/l), the Cashen (IE\_SH\_060\_0100) is 0.0003mg/l, and the Upper Feale Estuary (IE\_SH\_060\_0200) is 0.0002 mg/l.

For Upper Feale Estuary (IE\_SH\_060\_0200), the existing baseline concentration exceeds 75% of the indicative quality upper threshold in summer. However, the modelled post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the transitional water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for the coastal water bodies, does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000) and Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the coastal water bodies or of preventing the achievement of WFD objectives.

The modelled post-dosing increases in orthophosphate concentration for groundwater bodies does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l). The modelled increase in concentration for Kerry Head (IE\_SH\_G\_118), and Abbeyfeale (IE\_SH\_G\_001) is 0.0003 mg/l, Ballylongford (IE\_SH\_G\_030) is 0.0004 mg/l, and Ballybunnion (IE\_SH\_G\_027) is 0.0015 mg/l. The existing baseline concentrations are below 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the indicative quality of the groundwater bodies or of preventing the achievement of WFD objectives.

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

## 6.2.2 Moanveanlagh Bog SAC

SAC 002351

### 6.2.2.1 (7110) Active raised bogs\* and (7120) Degraded raised bogs still capable of natural regeneration

Moanveanlagh Bog is situated in Co. Kerry approximately 6 km east of Listowel, mainly within the townlands of Carhoeara and Bunagarha. The site comprises a raised bog that includes both areas of high bog and cutover bog<sup>36</sup>. Active raised bog comprises areas of high bog that are wet and actively peat-forming, where the percentage cover of bog mosses (*Sphagnum* spp.) is high, and where some or all of the following features occur: hummocks, pools, wet flats, *Sphagnum* lawns, flushes and soaks. This is a listed priority habitat on Annex I of the E.U. Habitats Directive. Degraded raised bog corresponds to those areas of high bog whose hydrology has been adversely affected by peat cutting, drainage and other land use activities, but which are capable of regeneration. ARB currently occurs mainly on the south-western part of Moanveanlagh Bog while DRB occurs more widely over the bog.

Active Raised Bog (ARB) habitat was mapped at 4.6ha and the area of Degraded Raised Bog (DRB) on the High Bog (HB) has been modelled as 14.7ha. It is estimated that 4.4ha of this is potentially restorable to ARB by drain blocking. Eco-hydrological assessments of the cutover bog estimates that an additional area of 3.8ha of bog forming habitats could be restored. The long term target for ARB is therefore 12.8ha.

Within the SSCOs (NPWS 2015), the attributes and targets that will maintain the favourable conservation condition of ARBs indicate that the main source of nutrient enrichment in raised bogs is from the atmospheric deposition of Nitrogen. In terms of water quality, the water chemistry in raised bogs is influenced by atmospheric inputs (rainwater) and water chemistry in areas surrounding the high bog varies due to influences of different water types (bog water, regional groundwater, and runoff from surrounding mineral lands). The supporting document further states that in the marginal areas there may be increased mineral and nutrient content of the water due to regional groundwater influences, runoff from surrounding mineral soils, and the release of nutrients through oxidation of peat resulting from reduced water levels. In addition the national target for the attribute 'high bog' habitat is to ensure no decline in extent of high bog to support the development and maintenance of active raised bog. It is considered that should favourable conservation condition for Active Raised Bogs be achieved on the site, then, as a consequence, favourable conservation condition for Degraded Raised Bog would also be achieved.

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

- The river water body hydrologically connected to the site is: Ballaghadigue\_010 (IE\_SH\_23B600860)

<sup>36</sup> [NPWS 2015 Moanveanlagh Bog SAC 002351 Site Synopsis](#)



- The groundwater body hydrogeologically connected to the site is: Abbeyfeale (IE\_SH\_G\_001)

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

These habitats will be subject to direct discharges from the proposed dosing activities via the Ballaghadigue\_010 (IE\_SH\_23B600860). However, the modelled post-dosing concentration in the river water bodies connected to the SAC are within 5% of the High/ Good boundary with a concentration of <0.00125 mg/l therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives. The modelled post-dosing increases in orthophosphate concentration for the Abbeyfeale (IE\_SH\_G\_001) groundwater body connected to the SAC, also does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l) at 0.0003 mg/l.

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

#### 6.2.2.2 (7150) Depressions on peat substrates of the *Rhynchosporion*

The *Rhynchosporion* habitat occurs in wet depressions, pool edges and erosion channels in Moanveanlagh Bog SAC habitats where the vegetation includes White Beak-sedge (*Rhynchospora alba*) and/or Brown Beak-sedge (*R. fusca*), and at least some of the following associated species, Bog Asphodel (*Narthecium ossifragum*), sundews (*Drosera spp.*), Deergrass (*Scirpus cespitosus*) and Carnation Sedge (*Carex panicea*).

SSCOs for this habitat within Moanveanlagh SAC are not set. The CO document (NPWS 2015<sup>37</sup>) states that depressions on peat substrates of the *Rhynchosporion* is an integral part of good quality Active raised bogs (7110) and thus a separate conservation objective has not been set for the habitat. It is considered that should favourable conservation condition for Active Raised Bogs be achieved on the site, then, as a consequence, favourable conservation condition for Depressions on Peat Substrates of the *Rhynchosporion* would also be achieved.

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

- The river water body hydrologically connected to the site is: Ballaghadigue\_010 (IE\_SH\_23B600860)
- The groundwater body hydrogeologically connected to the site is: Abbeyfeale (IE\_SH\_G\_001)

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water

<sup>37</sup> [NPWS 2015 Moanveanlagh Bog SAC 002351 Conservation Objectives](#)

bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

These habitats will be subject to direct discharges from the proposed dosing activities via the Ballaghadigue\_010 (IE\_SH\_23B600860). However, the modelled post-dosing concentration in the river water bodies connected to the SAC are within 5% of the High/ Good boundary with a concentration of <0.00125 mg/l therefore there is no risk of deterioration in the indicative quality of the river water body or of preventing the achievement of WFD objectives. The modelled post-dosing increases in orthophosphate concentration for the Abbeyfeale (IE\_SH\_G\_001) groundwater body connected to the SAC, also does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l) at 0.0003 mg/l.

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

### 6.2.3 Akeragh, Banna and Barrow Harbour SAC

SAC 000332

#### 6.2.3.1 (1310) *Salicornia* and other annuals colonising mud and sand, (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) and (1410) Mediterranean salt meadows (*Juncetalia maritimi*)

Akeragh, Banna and Barrow Harbour SAC is a large coastal site covering a 10 km section of coastline in Co. Kerry, these habitats are present in a graduation from fixed dune and dune slack to saltmarsh at Carrahane. Saltmarsh here is particularly well-developed but also occurs at Barrow Harbour. Common saltmarsh species include Thrift (*Armeria maritima*), Red Fescue, Sea Plantain (*Plantago maritima*), Saltmarsh Rush (*Juncus gerardi*) and Sea Rush (*Juncus maritima*). A number of scarce species are associated with the saltmarsh, notably Hard-grass (*Parapholis strigosa*), Saltmarsh Flat-sedge (*Blysmus rufus*), Strawberry Clover (*Trifolium fragiferum*) and a species of sea-lavender (*Limonium recurvum*). Glassworts (*Salicornia* spp.) occur on the edges of the saltmarsh and in sheltered areas extending onto the intertidal muds.

There are no nutrient specific targets in the SSCOs for this habitat; there is a target to maintain the favourable conservation condition of the habitats and to maintain the range of coastal habitats. The conservation objectives supporting document on coastal habitats for Akeragh, Banna and Barrow Harbour SAC (NPWS, 2017)<sup>38</sup> was reviewed, and the objectives are based on an assessment of the recorded condition of the habitat under a range of attributes and targets (area, range, structure and function). While there are no nutrient specific targets set for this habitat, the location, character and dynamic behaviour of saltmarshes are governed by sediment supply, tidal regime, wind-wave climate and sea level change. A target has been set (under structure and function) to maintain the physical structure and flooding regime of the habitats. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

<sup>38</sup> [NPWS 2017 Akeragh, Banna and Barrow Harbour SAC 000332 Conservation Objectives](#)

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

- The river water body hydrologically connected to the site is: Ballynoe\_010 (IE\_SH\_23B910900),
- The coastal water body hydrologically connected to the site is Outer Tralee Bay (IE\_SH\_040\_0000).
- The groundwater body hydrogeologically connected to the site is: Kerry Head (IE\_SH\_G\_118).

Atlantic salt meadows are mapped along the course of Ballynoe\_010 (IE\_SH\_23B910900) with remaining habitats not recorded at the sub-site Ballyheige (SMP site ID: SMP0077). The subsite Ballyheige (SMP site ID: SMP0077) that supports Atlantic Salt Meadows (ASM) was mapped (1.02ha) and additional areas of potential ASM habitat (21.24ha) were identified from an examination of aerial photographs, giving a total estimated area of 22.26ha within Akeragh, Banna and Barrow Harbour SAC. Further unmapped habitats may be present with the SAC, as the full extent of the habitat is currently unknown (NPWS, 2012<sup>38</sup>). Therefore it is considered that all surface water bodies associated with the WSZ have the potential to contain this habitat type.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

The Ballynoe\_010 (IE\_SH\_23B910900) is currently at moderate status, and discharges into the SAC near the mapped (1330) Atlantic salt meadows habitat. The modelled post-dosing concentration in this river water body connected to the SAC is 0.0006 mg/l, therefore within 5% of the High/ Good boundary with a concentration of <0.00125 mg/l and posing no risk of deterioration in the indicative quality of the river water body to bad status or of preventing the achievement of WFD objectives. Ballynoe\_010 (IE\_SH\_23B910900) discharges into the Outer Tralee Bay (IE\_SH\_040\_0000) coastal body connected to the SAC and all habitats within. The modelled post-dosing increases in orthophosphate concentration for this coastal water body is undetectable (0.0000 mg/l) and thus poses no risk of deterioration.

The modelled post-dosing increases in orthophosphate concentration for the Kerry Head (IE\_SH\_G\_118) groundwater body connected to the SAC, also does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l) at 0.0003 mg/l.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Dromin WTP, it has been demonstrated that the potential for significant adverse effects on this habitat can be excluded as orthophosphate concentration increase are low or undetectable. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these habitats.

**6.2.3.2 (1210) Annual vegetation of drift lines, (2110) Embryonic shifting dunes, (2120) Shifting dunes along the shoreline with *Ammophila arenaria* [white dunes], (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes), and (2190) Humid dune slacks.**

The overall objective for Annual vegetation of drift lines, Embryonic shifting dune, Shifting dunes along the shoreline, Fixed coastal dunes with herbaceous vegetation, and Humid dune slacks is to maintain the favourable conservation condition of the habitats. There are no nutrient specific targets for these habitats in the SSCOs for the Akeragh, Banna and Barrow Harbour SAC (NPWS, 2017). There is however, a target for negative indicator species to represent less than 5% cover. Negative indicators include species indicative of changes in nutrient status.

The COs supporting document for coastal habitats (NPWS, 2017<sup>39</sup>) does not outline any objectives in relation to water quality and nutrient requirements for the habitats. It does however, outline the following with regard to nutrient development on the dunes systems - decaying detritus in the tidal litter releases nutrients into what would otherwise be a nutrient-poor environment. The habitat is often represented as patchy, fragmented stands of vegetation that are short-lived and subject to frequent re-working of the sediment. The supporting document also indicates that: species diversity and plant distribution in dunes is strongly controlled by a range of factors, including mobility of the substrate, grazing intensities, moisture gradients, nutrient gradients and human disturbance.

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

- The river water body hydrologically connected to the site is: Ballynoe\_010 (IE\_SH\_23B910900)
- The coastal water body hydrologically connected to the site is Outer Tralee Bay (IE\_SH\_040\_0000).
- The groundwater body hydrogeologically connected to the site is: Kerry Head (IE\_SH\_G\_118).

Annual vegetation of drift lines was mapped at two sub-sites, Ballyheige (CMP site ID: 078) and Banna Strand (SDM site ID: 077), giving a total estimated area of 0.48ha within Akeragh, Banna and Barrow Harbour SAC. Embryonic shifting dunes habitat also mapped at the sub-site Banna Strand (SDM site ID: 077) to give a total estimated area of 2.38h. Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) are mapped at both sub-sites giving a total estimated area of 5.91ha. These habitats however are highly dynamic in nature therefore causing difficulties in measurement.

The largest proportion of the sand dune system is fixed dune grassland made up of a mosaic of Marram (*Ammophila arenaria*) tussocks interspersed with low-lying patches of a Red Fescue-Lady's Bedstraw (*Festuca rubra-Galium verum*) community. These Fixed coastal dunes with herbaceous vegetation (grey dunes) was mapped across both sub-sites giving a total estimated area of 155.83ha within the SAC. Humid dune slacks are present amongst these fixed dunes at both sub-sites over a 5.65ha area.

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

The Ballynoe\_010 (IE\_SH\_23B910900) is currently at moderate status, and discharges into the SAC near the most northerly mapped (2130) Fixed dunes and (2190) Humid dune slacks habitats. However, the modelled post-dosing concentration in this river water body connected to the SAC is 0.0006 mg/l,

<sup>39</sup> [Akeragh, Banna and Barrow Harbour SAC 000332 Conservation Objectives Supporting Document Coastal Habitats](#)

therefore within 5% of the High/ Good boundary with a concentration of <0.00125 mg/l and posing no risk of deterioration in the indicative quality of the river water body to bad status or of preventing the achievement of WFD objectives. Ballynoe\_010 (IE\_SH\_23B910900) discharges into the Outer Tralee Bay (IE\_SH\_040\_0000) coastal water body connected to the SAC. The modelled post-dosing increases in orthophosphate concentration for this water body is undetectable (0.0000 mg/l) and thus poses no risk of deterioration.

The modelled post-dosing increases in orthophosphate concentration for the Kerry Head (IE\_SH\_G\_118) groundwater body connected to the SAC, also does not exceed 5% of the High / Good indicative quality boundary (0.00175 mg/l) at 0.0003 mg/l.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Dromin WTP, it has been demonstrated that the potential for significant adverse effects on this habitat can be excluded as orthophosphate concentration increase are low or undetectable. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these habitats.

#### 6.2.4 River Shannon and River Fergus Estuaries

SPA 004077

The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland (NPWS, 2015)<sup>40</sup>. The site comprises the entire estuarine habitat from Limerick City westwards as far as Doonaha in Co. Clare and Dooneen Point in Co. Kerry.

The site has vast expanses of intertidal flats which contain a diverse macro-invertebrate community, e.g. *Macoma-Scrobicularia-Nereis*, which provides a rich food resource for the wintering birds. Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Elsewhere in the site the shoreline comprises stony or shingle beaches.

The site is an SPA under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Whooper Swan, Light-bellied Brent Goose, Shelduck, Wigeon, Teal, Pintail, Shoveler, Scaup, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank and Black-headed Gull. It is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetlands and Waterbirds.

The site is the most important coastal wetland site in the country and regularly supports in excess of 50,000 wintering waterfowl, a concentration of international importance. The site has internationally important populations of: Light-bellied Brent Goose, Dunlin, Black-tailed Godwit and Redshank. A further 17 species of national importance include: Cormorant, Whooper Swan, Shelduck, Wigeon, Teal, Pintail, Shoveler, Scaup, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Bar-tailed Godwit, Curlew, Greenshank and Black-headed Gull. The site is among the most important in the country for several of these species, notably Dunlin, Lapwing and Redshank. The site also supports a nationally important breeding population of Cormorant.

Other species include Mute Swan, Mallard, Red-breasted Merganser, Great Crested Grebe, Grey Heron, Oystercatcher, Turnstone and Common Gull. Apart from this, large numbers of some species

<sup>40</sup> [NPWS 2015 River Shannon and River Fergus Estuaries SPA 004077 Site Synopsis](#)

also pass through the site whilst on migration in spring and/or autumn. Parts of the River Shannon and River Fergus Estuaries SPA are Wildfowl Sanctuaries.

River Shannon and River Fergus Estuaries SPA has 21 SCIs all of which are considered nutrient sensitive (see **Appendix B**). The SSCOs for the SPA (NPWS, 2012<sup>41</sup>) outline 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 32,261 hectares, other than that occurring from natural patterns of variation.

There are no nutrient specific targets for the SCIs. In relation to protected water-dependent habitats and species under the Birds and Habitats Directive the river basin management planning process contributes towards achieving water conditions that support Favourable Conservation Status. In preparing the RBMP (2018-2021) (DHPLG, 2017<sup>42</sup>) 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 River Shannon and River Fergus Estuaries SPA and will receive inputs from the proposed orthophosphate dosing at Dromin WTP:

- The river water bodies hydrologically connected to the site include: Farranmiller\_010 (IE\_SH\_24F320750); Tarbert\_010 (IE\_SH\_24T010100); Ralappane\_010 (IE\_SH\_24R300270); Ballylongford\_010 (IE\_SH\_24B030400); Ballylongford\_020 (IE\_SH\_24B030700); Ballylongford\_030 (IE\_SH\_24B030700); Astee\_West\_010 (IE\_SH\_24A270640); and
- The transitional water body hydrologically connected to the site include: Lower Shannon Estuary (IE\_SH\_060\_0300); and
- The coastal water body hydrologically connected to the site include: Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000); and
- The groundwater body hydrogeologically connected to the site include: Ballylongford (IE\_SH\_G\_030).

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

All river water bodies connected to the site have modelled post-dosing concentrations below 5% of the High/Good threshold ( $\leq 0.00125$  mg/l) which are also below the 75% upper baseload threshold.

<sup>41</sup> [NPWS 2010 River Shannon and River Fergus Estuaries SPA 004077 Conservation Objectives](#)

<sup>42</sup> [DHPLG \(2018\) The River Basin Management Plan for Ireland \(2018-2021\)](#)

The modelled increase in concentration for Tarbert\_010 (IE\_SH\_24T010100) and Ralappane\_010 (IE\_SH\_24R300270) is negligible (0.0001 mg/l). The modelled increase in concentration for Farranmiller\_010 (IE\_SH\_24F320750) is 0.0003 mg/l, Ballylongford\_020 (IE\_SH\_24B030700) is 0.0007 mg/l, Ballylongford\_010 (IE\_SH\_24B030400) is 0.0008 mg/l, Astee\_West\_010 (IE\_SH\_24A270640) is 0.0009 mg/l, and Ballylongford\_030 (IE\_SH\_24B030700) is 0.0010 mg/l are all categorised with a low increase amount. Therefore, there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

The only transitional water body connected to this site is Lower Shannon Estuary (IE\_SH\_060\_0300). Post-dosing orthophosphate concentrations are modelled as undetectable (0.0000 mg/l). Discharging into the Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000) coastal water body, post-dosing concentrations are also modelled as undetectable (0.0000 mg/l). The existing baseline concentrations does not exceed the 75% of the indicative quality upper threshold and remains below 5% of the High / Good indicative quality boundary. Therefore there is no risk of deterioration in the indicative quality of the water bodies or of preventing the achievement of WFD objectives.

There is one groundwater body hydrogeologically connected to the site, Ballylongford (IE\_SH\_G\_030). Intersecting the most northerly portion of the WSZ, this groundwater body has a modelled post-dosing concentration for orthophosphate that 0.0004 mg/l. As this is below 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the water body or of preventing the achievement of WFD objectives.

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

## 6.2.5 Kerry Head

## SPA 004189

Kerry Head SPA is situated on the south side of the mouth of the River Shannon in north Co. Kerry. It encompasses the sea cliffs from just west of Ballyheigue, around the end of Kerry Head to the west and north-eastwards as far as Kilmore. The site includes the sea cliffs and land adjacent to the cliff edge.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the Chough and Fulmar. The population of breeding Chough supported at Kerry Head is of international importance, with the density of such pairs is particularly noted. Kerry Head SPA is one of the most important sites in the country for Chough, and is therefore of valuable conservation interest. The site also supports a nationally important population of Fulmar, as well as a small population of Shag and Peregrine<sup>43</sup>. The presence of Chough and Peregrine, both species that are listed on Annex I of the E.U. Birds Directive, is of particular significance, both of which are considered nutrient sensitive (see **Appendix B**).

There are no SSCOs for the site (NPWS, 2018<sup>44</sup>); however, there is an overall objective to maintain or restore the favourable conservation condition of the bird species listed as SCIs for the SPA.

<sup>43</sup> [Kerry Head SPA 004189 Site Synopsis](#)

<sup>44</sup> [Kerry Head SPA 004189 Generic Conservation Objectives](#)

In relation to protected water-dependent habitats and species under the Birds and Habitats Directive, the river basin management planning process contributes towards achieving water conditions that support Favourable Conservation Status. In preparing the draft RBMP (2018-2021) (DHPLG, 2018<sup>42</sup>) the risk assessment carried out by the EPA for these water dependent European Site protected areas has focussed on looking at the risks to the water standards/objectives established for the purpose of supporting Good Ecological Status (GES). GES, which is the default objective of the WFD, is considered adequate for supporting many water dependent European Site protected areas where site specific environmental supporting conditions have not been defined within SSCOs by the NPWS. This is the case for SPA birds and wetlands.

Error! Reference source not found. identifies the surface and groundwater bodies that have the potential to be impacted by the orthophosphate dosing and which are hydrologically or hydrogeologically connected to Kerry Head SPA:

- The river water bodies hydrologically connected to the site are: Meenigahane\_010 (IE\_SH\_23M080580), Tiershanaghan\_010 (IE\_SH\_23T120500), and Doonamontane\_010 (IE\_SH\_23D160380),
- The coastal water body connected to the site is: Mouth of the Shannon, HAs 23;27 (IE\_SH\_060\_0000),
- The groundwater body connected to the site is: Kerry Head (IE\_SH\_G\_118).

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

All of the modelled post-dosing increases in orthophosphate concentration for the above river, coastal, and groundwater bodies hydrologically connected to these habitats are less than 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Tiershanaghan\_010 (IE\_SH\_23T120500) is 0.0002 mg/l, the Doonamontane\_010 (IE\_SH\_23D160380) is 0.0004 mg/l, and the Meenigahane\_010 (IE\_SH\_23M080580) is 0.0009 mg/l, therefore they do not pose any risk to the deterioration in the orthophosphate indicative quality of these water bodies.

The modelled post-dosing increases in orthophosphate concentration for the coastal water body, Mouth of the Shannon HAs 23;27 (IE\_SH\_060\_0000), is undetectable (0.0000 mg/l) and therefore does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The existing baseline concentration does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the indicative quality of the river water bodies or of preventing the achievement of WFD objectives.

There is one groundwater body hydrogeologically connected to the site, Ballylongford (IE\_SH\_G\_030). Intersecting the south-westerly portion of the WSZ, this groundwater body has a modelled post-dosing concentration for orthophosphate that 0.0003 mg/l. As this is below 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the water body or of preventing the achievement of WFD objectives.

In light of the EAM assessment which has determined that there is no risk of deterioration in the water quality status of the water bodies that support the structure and function of the SPA, the additional



loading from the orthophosphate dosing will not result in likely significant effects to the favourable conservation status of its SCIs; either in terms of individual bird species or wetland habitats.

## 6.2.6 Tralee Bay Complex

SPA 004188

The Tralee Bay Complex SPA is located along the coast of north Co. Kerry between Ballyheige in the north, Tralee in the east and Stradbally in the west. The site includes the inner part of Tralee Bay, including Derrymore Island, the inlets of Barrow Harbour and Carrahane Strand, Akeragh Lough, Lough Gill, and much of the intertidal habitat from Scraggane Point at the northern end of the Magharees Peninsula around the coast to c. 2 km south of Ballyheige. Inner Tralee Bay is well sheltered by the Derrymore Island peninsula. The intertidal sediments vary from muddy sands on the upper shore to firm rippled sands on the lower, more exposed shore. The sediments have a diverse macro-invertebrate fauna, with such species as Cockle (*Cerastoderma edule*), Lugworm (*Arenicola marina*), Ragworm (*Hediste diversicolor*), Baltic Tellin (*Macorna balthica*) and Shrimp (*Crangon crangon*) occurring. The intertidal flats have extensive beds of Eelgrass (*Zostera* spp.)<sup>45</sup>.

Tralee Bay Complex is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Whooper Swan, Light-bellied Brent Goose, Shelduck, Wigeon, Teal, Mallard, Pintail, Scaup, Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Sanderling, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Turnstone, Black-headed Gull and Common Gull. The site is a highly diverse coastal wetland site and regularly supports in excess of 20,000 wintering waders and waterfowl, a concentration of international importance. 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.

It is of note that three of the species that regularly occur, Whooper Swan, Golden Plover and Bar-tailed Godwit, are listed on Annex I of the E.U. Birds Directive. Tralee Bay is a Ramsar Convention site and parts of the Tralee Bay Complex SPA are designated as Nature Reserves. Lough Gill is a Wildfowl Sanctuary.

Tralee Bay Complex SPA has 23 SCIs all of which are considered nutrient sensitive (see **Appendix B**). The SSCOs for the SPA (NPWS, 2014<sup>46</sup>) outline 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 3,657 hectares, other than that occurring from natural patterns of variation.

There are no nutrient specific targets for the SCIs. In relation to protected water-dependent habitats and species under the Birds and Habitats Directive the river basin management planning process contributes towards achieving water conditions that support Favourable Conservation Status. In

<sup>45</sup> [Tralee Bay Complex SPA 004188 Site Synopsis](#)

<sup>46</sup> [Tralee Bay Complex SPA 004188 Conservation Objectives](#)

preparing the RBMP (2018-2021) (DHPLG, 2017<sup>52</sup>) 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.

Error! Reference source not found. identifies the surface and groundwater bodies that have the potential to be impacted by the orthophosphate dosing and which are hydrologically or hydrogeologically connected to Kerry Head SPA:

- The river water bodies hydrologically connected to the site are: Ballynoe\_010 (IE\_SH\_23B910900) and Doonamontane\_010 (IE\_SH\_23D160380),
- The coastal water body connected to the site is: Outer Tralee Bay (IE\_SH\_040\_0000),
- The groundwater body connected to the site is: Kerry Head (IE\_SH\_G\_118).

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. In the case of transitional water bodies, tidal flows have been taken into account. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

All of the modelled post-dosing increases in orthophosphate concentration for each of the above river, coastal, and groundwater bodies hydrologically connected to these habitats are less than 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration for Ballynoe\_010 (IE\_SH\_23B910900) is 0.0006 mg/l, Doonamontane\_010 (IE\_SH\_23D160380) is (0.0004mg/l), Kerry Head (IE\_SH\_G\_118) is 0.0003 mg/l. Therefore they do not pose any risk to the deterioration in the orthophosphate indicative quality of these water bodies.

The modelled post-dosing increases in orthophosphate concentration for the coastal water body, Outer Tralee Bay (IE\_SH\_040\_0000) is undetectable at 0.0000 mg/l. Post dosing concentrations are also less than 75% of the indicative quality upper threshold, therefore do not pose any risk to the deterioration in the orthophosphate indicative quality of these water bodies.

There is one groundwater body hydrogeologically connected to the site, Kerry Head (IE\_SH\_G\_118). This groundwater body has a modelled post-dosing concentration for orthophosphate that 0.0003 mg/l. As this is below 5% of the High / Good indicative quality boundary, as discussed above, therefore there is no risk of deterioration in the indicative quality of the water body or of preventing the achievement of WFD objectives.

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

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

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

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

A search of Kerry 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 effects with the proposed project was generated as listed in **Table 6-1** below.

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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
<p><b>Kerry County Development Plan 2022-2028<sup>47</sup></b>                      The plan outlines under Chapter 13: Water Supply , the following objectives:</p> <ul style="list-style-type: none"> <li>a) WS-1: Ensure compliance with the Water Framework Directive.</li> <li>b) WS-2: Achieve water quality targets by implementing the national River Basin Management Plan (and associated programmes of measures).</li> <li>c) WS-3: Facilitate Irish Water [Uisce Éireann 2023] investment in capital projects over the lifetime of this plan to facilitate the population growth targets outlined in the Core Strategy of this plan.</li> <li>d) WS-4: Prohibit any form of development within the catchment area of Lough Guitane (including the lake itself) that will have a potentially detrimental effect on the objectives of the WFD (Map 13.1).</li> <li>e) WS-5: Ensure that planning applications are assessed with regard to the Groundwater Protection Scheme and the potential impacts the development may have on groundwater quality.</li> <li>f) WS-6: Protect all sources and potential sources of public water supply, including their zones of contribution within the County from pollution resulting from any development and/or land use.</li> <li>g) WS-7: Protect existing and potential water resources for the county, in accordance with the EU Water Framework Directive (2000/60/EC), the current National River Basin Management Plan and any amending or replacement version, the Pollution Reduction Programmes for designated shellfish waters, the provisions of the Groundwater Protection Scheme for the county and any other protection plans for water supply sources, with an aim to improving all water quality.</li> <li>h) WS-8: Protect rivers, streams and other watercourses and where applicable ensure developments follow guidelines outlined in the IFI's <i>Planning for Watercourses in the Urban Environment, 2020</i>.</li> </ul>	<ul style="list-style-type: none"> <li>▪ N/A</li> </ul>	<p>The Kerry County Development Plan emphasis the objectives for water services in the county which include the enhancement and improved quality of the service to its consumers. The plan also outlines the importance of compliance with the River Basin Management Plan (now replaced by the RBMP 2018-2021), emphasising compliance with environmental objectives. There is no potential for cumulative impacts with these plans.</p>

<sup>47</sup> [http://cdp.kerrycoco.ie/wordpress/wp-content/uploads/2015/12/chptr\\_7.pdf](http://cdp.kerrycoco.ie/wordpress/wp-content/uploads/2015/12/chptr_7.pdf)

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
<p>i) WS-9: Protect the County’s waters from pollution by nitrates and phosphates from agricultural sources by facilitating changes in agricultural practices.</p> <p>j) WS-10: Ensure that all wastewater treatment systems for single houses are designed, constructed, installed and maintained in accordance with the manufacturers guidelines and the E.P.A. Publication ‘Code of Practice – Wastewater Treatment and Disposal Systems Serving Single Houses’ or any amending/replacement guidance or standards.</p> <p>k) WS-11: Protect, enhance and support the restoration of 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.</p>		
<p>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).</p> <p>The document (Chapter 3) sets out the condition of Waters in Ireland and a summary of status for all monitored waters in the 2013 – 2018 period, including a description of the changes since 2007 – 2009 and 2010-2015. A large number of river waterbodies are still declining and unless this is addressed, sustained and progressive improvements in water quality will be difficult to achieve. Overall, 53% of surface waters are in good or high ecological status while the remaining 47% are in unsatisfactory ecological status. For groundwater bodies, 92% are in good chemical and quantitative status.</p> <p>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</p>	<ul style="list-style-type: none"> <li>▪ N/A</li> </ul>	<p>The objectives of the RBMP are to</p> <ul style="list-style-type: none"> <li>• Prevent deterioration;</li> <li>• Restore good status;</li> <li>• Reduce chemical pollution; and</li> <li>• Achieve water related protected areas objectives</li> </ul> <p>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.</p>

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
<p>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.</p>		
<p><b>Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive</b> 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.</p>	<ul style="list-style-type: none"> <li>▪ Habitat loss or destruction;</li> <li>▪ Habitat fragmentation or degradation;</li> <li>▪ Alterations to water quality and/or water movement;</li> <li>▪ Disturbance;</li> <li>▪ In-combination impacts within the same scheme.</li> </ul>	<p>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.</p>
<p><b>Foodwise 2025</b> 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.</p>	<ul style="list-style-type: none"> <li>▪ Land use change or intensification;</li> <li>▪ Water pollution;</li> <li>▪ Nitrogen deposition;</li> <li>▪ Disturbance to habitats / species.</li> </ul>	<p>Foodwise 2025 was subject to its own AA<sup>48</sup>. 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</p>

<sup>48</sup><http://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/environmentalanalysis/AgriFoodStrategy2025NIDRAFT300615.pdf>

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
		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.
<p><b>Rural Development Programme 2014 – 2020</b></p> <p>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.</p> <p>The achievement of the objectives outlined within GLAS, to improve water quality, mitigate against climate change and promote biodiversity will be of direct positive benefit in achieving the measures within the RBMP and the goals of the Natura Directives. The scheme has an expected participation for 2014-2020 of 50,000 farmers which have to engage in specific training and tasks in order to receive full payment. Farmers within the scheme must have a nutrient management plan which is a strategy for maximising the return from on and off-farm chemical and organic fertilizer resources. This has a direct positive contribution towards protecting water bodies from pollution through limiting the amount of fertiliser that is placed on the land. The scheme prioritises farms in vulnerable catchments with ‘high status’ water bodies and</p>	<ul style="list-style-type: none"> <li>▪ Overgrazing;</li> <li>▪ Land use change or intensification;</li> <li>▪ Water pollution;</li> <li>▪ Nitrogen deposition;</li> <li>▪ Disturbance to habitats / species.</li> </ul>	<p>The RDP for 2014 – 2020 has been subject to SEA<sup>49</sup>, and AA<sup>50</sup>. 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.</p>

<sup>49</sup><https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf>

<sup>50</sup><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
<p>also focuses on educating farmers on best practices to try and improve efficiency along with environmental outcomes.</p> <p>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.</p>		
<p><b>National Nitrates Action Programme</b></p> <p>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.</p>	<ul style="list-style-type: none"> <li>▪ Land use change or intensification;</li> <li>▪ Water pollution;</li> <li>▪ Nitrogen deposition;</li> <li>▪ Disturbance to habitats / species.</li> </ul>	<p>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<sup>51</sup>. 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.</p>
<p><b>Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) / Forestry Programme 2014 - 2020</b></p> <p>Ireland's forestry sector is striving to increase forestry cover and one of the recommended policy actions in the Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) is to increase the level of afforestation annually over time and support afforestation and mobilisation measures under the Forestry Programme 2014-2020. Two key objectives within the Forestry Programme 2014-2020 that will influence the RBMP are to increase Ireland's forest cover to 18% and to establish 10,000 ha of new forests and woodlands per annum. As part of this programme there</p>	<ul style="list-style-type: none"> <li>▪ Habitat loss or destruction;</li> <li>▪ Habitat fragmentation or degradation;</li> <li>▪ Water quality changes;</li> </ul>	<p>Ireland's Forestry Programme 2014 – 2020 has undergone AA<sup>52</sup>. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts and the proximity of Natura 2000 habitats and species should be taken into account when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there</p>

<sup>51</sup> <http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownload,35218,en.PDF>

<sup>52</sup> <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
<p>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.</p>	<ul style="list-style-type: none"> <li>▪ Disturbance to species.</li> </ul>	<p>is no potential for cumulative impacts with the proposed project.</p>
<p><b>Water Services Strategic Plan (WSSP, 2015)</b></p> <p>Uisce Éireann 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 Uisce Éireann 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 Uisce Éireann'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 Uisce Éireann Capital Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Uisce Éireann owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.</p>	<ul style="list-style-type: none"> <li>▪ Habitat loss and disturbance from new / upgraded infrastructure;</li> <li>▪ Species disturbance;</li> <li>▪ Changes to water quality or quantity;</li> <li>▪ Nutrient enrichment /eutrophication.</li> </ul>	<p>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.</p>
<p><b>National Wastewater Sludge Management Plan (2016)</b></p> <p>The National Wastewater Sludge Management Plan was prepared in 2015, outlining the measures needed to improve the management of wastewater sludge.</p>	<ul style="list-style-type: none"> <li>▪ Habitat loss and disturbance from new / upgraded infrastructure;</li> </ul>	<p>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</p>

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
	<ul style="list-style-type: none"> <li>▪ Species disturbance;</li> <li>▪ Changes to water quality or quantity;</li> <li>▪ Nutrient enrichment /eutrophication.</li> </ul>	<p>requirements. This plan does not specifically address domestic wastewater loads, only those relating to Uisce Éireann facilities. In relation to the plan as it stands, no in-combination effects are expected with the implementation of proposed mitigation measures.</p>
<p><b>National Water Resources Plan (in prep.)</b> 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 Uisce Éireann include those for urban wastewater and urban runoff and also as part of other measures in relation to the lead in drinking water.</p>	<ul style="list-style-type: none"> <li>▪ Increased abstractions leading to changes / pressure on existing hydrology / hydrogeological regimes.</li> </ul>	<p>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.</p>
<p><b>Planning Applications</b> There are a large number of planning applications approved, pending or recently approved within the Dromin: Listowel/Moyvane 601E WSZ, particularly within the Listowel town, just south of the Dromin WTP. The applications are predominantly for the construction of new infrastructure or renovations to existing infrastructure. These include recently for housing, schools, industrial buildings, and farm works (i.e. slurry tanks).</p>	<ul style="list-style-type: none"> <li>▪ Habitat loss and disturbance from new / upgraded infrastructure;</li> <li>▪ Species disturbance;</li> <li>▪ Changes to water quality or quantity;</li> <li>▪ Nutrient enrichment /eutrophication.</li> </ul>	<p>Adherence to the overarching policies and objectives of the Cork County Development Plan 2014 will ensure that local planning applications and subsequent grant of planning will comply with the requirements of relevant environmental legislation including the WFD and Habitats Directive.</p>
<p><b>Integrated Pollution Control (IPC) Licensing</b> The Dromin: Listowel/Moyvane 601E WSZ has one Industrial IPC licensed facility, Kerry Ingredients (Ireland) Limited. Under the Industrial Emissions Directive 2010/75/EU and Environmental Protection Agency Act, 1992 (as amended) industrial activities (e.g. pharmaceutical) 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.</p>	<ul style="list-style-type: none"> <li>▪ Changes to water quality or quantity;</li> <li>▪ Nutrient enrichment /eutrophication.</li> </ul>	<p>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.</p>

## 7 SCREENING CONCLUSION STATEMENT

This Screening to inform the AA process has considered whether the proposed construction works and orthophosphate dosing at the Dromin WTP, within the Listowel/Moyvane 601E\* WSZ, in combination with other plans or projects, is likely to have a significant effect on European Sites.

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

During the construction phase of the corrective water treatment works at Dromin WTP the potential for direct, indirect and cumulative impacts affecting European Sites within the ZoI (i.e. Lower River Shannon SAC and Moanveanlagh Bog SAC) has been assessed. There will be no significant direct, indirect or cumulative impacts that will result in likely significant effects to the qualifying interests/special conservation interests of the European Sites within the ZoI.

During the operational phase the potential for direct, indirect and cumulative impacts affecting Lower River Shannon SAC, Moanveanlagh Bog SAC, Akeragh, Banna and Barrow Harbour SAC, , River Shannon and River Fergus Estuaries SPA, Kerry Head SPA, and Tralee Bay Complex SPA, have been assessed. Due to the low orthophosphate inputs following dosing at Dromin WTP and no risk of deterioration in the orthophosphate indicative quality of the receiving water bodies or of preventing the achievement of WFD objectives, there will be no significant direct, indirect or cumulative impacts that will result in likely significant effects to the qualifying interests/special conservation interests of the European Sites within the ZoI. This is concluded with regard to the range, population densities and overall conservation status of the habitats and species for which these sites are designated (i.e. Conservation Objectives).

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

## 8 REFERENCES

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

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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](http://www.npws.ie). Links to the COs for the European Sites relevant to this Screening for AA are provided below.

Site Name (Code)	Conservation Objectives Source
Lower River Shannon SAC (002165)	<a href="https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002165.pdf">https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002165.pdf</a>
Moanveanlagh Bog SAC (002351)	<a href="https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002351.pdf">https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002351.pdf</a>
Akeragh, Banna and Barrow Harbour SAC (000332)	<a href="https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000332.pdf">https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000332.pdf</a>
Tralee Bay and Magharees Peninsula, West to Cloghane SAC (002070)	<a href="https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002070.pdf">https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002070.pdf</a>
Magharees Islands SAC (002261)	<a href="https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002261.pdf">https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002261.pdf</a>
River Shannon and River Fergus Estuaries SPA (004077)	<a href="https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004077.pdf">https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004077.pdf</a>
Kerry Head SPA (004189)	<a href="https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004189.pdf">https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004189.pdf</a>
Loop Head SPA (004119)	<a href="https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004119.pdf">https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004119.pdf</a>
Tralee Bay Complex SPA (004188)	<a href="https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004188.pdf">https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004188.pdf</a>
Magharee Island SPA (004125)	<a href="https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004125.pdf">https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004125.pdf</a>
Dingle Peninsula SPA (004153)	<a href="https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004153.pdf">https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004153.pdf</a>





## **APPENDIX B**

### **Nutrient Sensitive Qualifying Interests**

### Water dependant and nutrient sensitive SAC species

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

### Water dependant and nutrient sensitive SAC habitats

Code	Qualifying Interest	Water dependant	GWDE	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 ( <i>Spartinion maritimae</i> )	No		No
1330	Atlantic salt meadows ( <i>Glauco-Puccinellietalia maritimae</i> )	Yes	Yes	Yes
1410	Mediterranean salt meadows ( <i>Juncetalia maritimi</i> )	Yes	Yes	Yes
1420	Mediterranean and thermo-Atlantic halophilous scrubs ( <i>Sarcocornetea fruticosi</i> )	Yes		Yes
2110	Embryonic shifting dunes	Yes		Yes
2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)	Yes		Yes
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)	Yes		Yes
2140	Decalcified fixed dunes with <i>Empetrum nigrum</i>	Yes		Yes
2150	Atlantic decalcified fixed dunes ( <i>Calluno-Ulicetea</i> )	Yes		Yes
2170	Dunes with <i>Salix repens</i> ssp. <i>argentea</i> ( <i>Salicion arenariae</i> )	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 ( <i>Littorelletalia uniflorae</i> )	Yes		Yes
3130	Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i>	Yes		Yes
3140	Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.	Yes		Yes
3150	Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> - type vegetation	Yes		Yes
3160	Natural dystrophic lakes and ponds	Yes		Yes
3180	Turloughs	Yes	Yes	Yes
3260	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation	Yes		Yes
3270	Rivers with muddy banks with <i>Chenopodion rubri</i> p.p. and <i>Bidention</i> p.p. vegetation	Yes	Yes	Yes
4010	Northern Atlantic wet heaths with <i>Erica tetralix</i> (Flushes only)	Yes	Yes	Yes
4030	European dry heaths	No		Yes
4060	Alpine and Boreal heaths	No		No
5130	<i>Juniperus communis</i> formations on heaths or calcareous grasslands	No		No

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
6130	Calaminarian grasslands of the <i>Violetalia calaminariae</i>	No (flood risk)*		Yes
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites)	No (flood risk)*		Yes
6230	Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)	No		No
6410	<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils ( <i>Molinion caeruleae</i> )	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 ( <i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i> )	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 <i>Rhynchosporion</i>	Yes	Yes	Yes
7210	Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>	Yes	Yes	Yes
7220	Petrifying springs with tufa formation ( <i>Cratoneurion</i> )	Yes	Yes	Yes
7230	Alkaline fens	Yes	Yes	Yes
8110	Siliceous scree of the montane to snow levels ( <i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i> )	No		No
8120	Calcareous and calcshist screes of the montane to alpine levels ( <i>Thlaspietea rotundifolii</i> )	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
8330	Submerged or partially submerged sea caves	Yes		Yes
91A0	Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	No		Yes
91D0	Bog woodland	Yes	Yes	Yes
91E0	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> ( <i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i> )	Yes	Yes	Yes
91J0	<i>Taxus baccata</i> woods of the British Isles	No		No

\*While this habitat is determined to be non-water dependent, it is included 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 ( <i>Gavia stellata</i> )	Yes	Yes
A003	Great Northern Diver ( <i>Gavia immer</i> )	Yes	Yes
A004	Little Grebe ( <i>Tachybaptus ruficollis</i> )	Yes	Yes
A005	Great Crested Grebe ( <i>Podiceps cristatus</i> )	Yes	Yes
A009	Fulmar ( <i>Fulmarus glacialis</i> )	Yes	Yes
A013	Manx Shearwater ( <i>Puffinus puffinus</i> )	Yes	Yes
A014	Storm Petrel ( <i>Hydrobates pelagicus</i> )	Yes	Yes
A015	Leach's Storm-petrel ( <i>Oceanodroma leucorhoa</i> )	Yes	Yes
A016	Gannet ( <i>Morus bassanus</i> )	Yes	Yes
A017	Cormorant ( <i>Phalacrocorax carbo</i> )	Yes	Yes
A018	Shag ( <i>Phalacrocorax aristotelis</i> )	Yes	Yes
A028	Grey Heron ( <i>Ardea cinerea</i> )	Yes	Yes
A037	Bewick's Swan ( <i>Cygnus columbianus bewickii</i> )	Yes	Yes
A038	Whooper Swan ( <i>Cygnus cygnus</i> )	Yes	Yes
A043	Greylag Goose ( <i>Anser anser</i> )	Yes	Yes
A045	Barnacle Goose ( <i>Branta leucopsis</i> )	Yes	Yes
A046	Light-bellied Brent Goose ( <i>Branta bernicla hrota</i> )	Yes	Yes
A048	Shelduck ( <i>Tadorna tadorna</i> )	Yes	Yes
A050	Wigeon ( <i>Anas penelope</i> )	Yes	Yes
A051	Gadwall ( <i>Anas strepera</i> )	Yes	Yes
A052	Teal ( <i>Anas crecca</i> )	Yes	Yes
A053	Mallard ( <i>Anas platyrhynchos</i> )	Yes	Yes
A054	Pintail ( <i>Anas acuta</i> )	Yes	Yes
A056	Shoveler ( <i>Anas clypeata</i> )	Yes	Yes
A059	Pochard ( <i>Aythya ferina</i> )	Yes	Yes
A061	Tufted Duck ( <i>Aythya fuligula</i> )	Yes	Yes
A062	Scaup ( <i>Aythya marila</i> )	Yes	Yes
A063	Eider ( <i>Somateria mollissima</i> )	Yes	Yes
A065	Common Scoter ( <i>Melanitta nigra</i> )	Yes	Yes
A067	Goldeneye ( <i>Bucephala clangula</i> )	Yes	Yes
A069	Red-breasted Merganser ( <i>Mergus serrator</i> )	Yes	Yes
A082	Hen Harrier ( <i>Circus cyaneus</i> )	Yes	Yes
A098	Merlin ( <i>Falco columbarius</i> )	Yes	Yes
A103	Peregrine ( <i>Falco peregrinus</i> )	Yes	Yes
A122	Corncrake ( <i>Crex crex</i> )	Yes	Yes
A125	Coot ( <i>Fulica atra</i> )	Yes	Yes
A130	Oystercatcher ( <i>Haematopus ostralegus</i> )	Yes	Yes
A137	Ringed Plover ( <i>Charadrius hiaticula</i> )	Yes	Yes
A140	Golden Plover ( <i>Pluvialis apricaria</i> )	Yes	Yes
A141	Grey Plover ( <i>Pluvialis squatarola</i> )	Yes	Yes

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

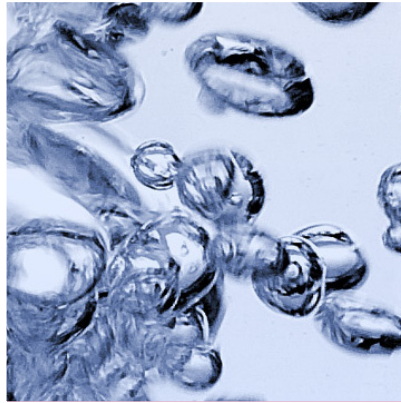
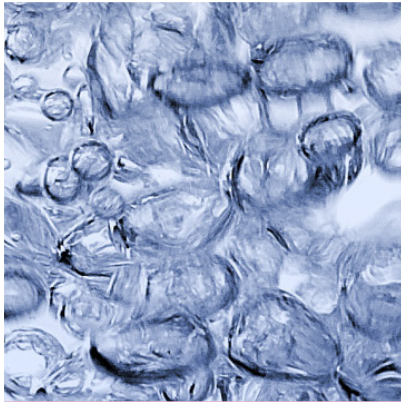
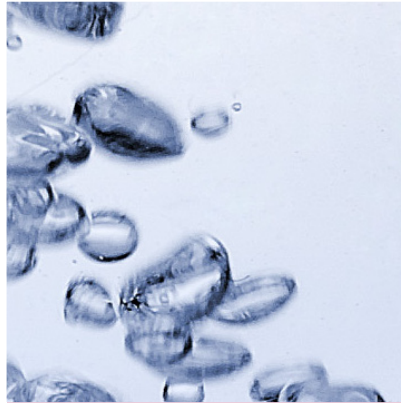
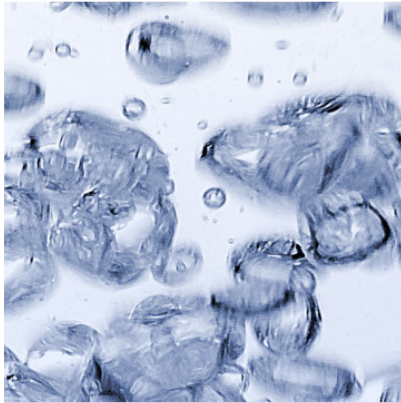
**APPENDIX C**  
**EAM Summary Report**



# Uisce Éireann - Lead in Drinking Water Mitigation Plan

Environmental Assessment Methodology (EAM) Summary Report

032 Dromin WTP – Listowel/Moyvane 601E\* (1300PUB1204)







# National Lead in Water Mitigation Strategy

## Environmental Assessment Methodology

### Report – 032 Dromin WTP (Dromin: Listowel/Moyvane 601E\*)

## Document Control Sheet

Client:	Uisce Éireann
Project Title:	National Lead in Water Mitigation Strategy
Document Title:	Environmental Assessment Methodology Report: 032 Dromin WTP – Dromin: Listowel/Moyvane 601E* (1300PUB1204)
Document No:	MDW0766RP_5.1_EAM_032_Dromin_F05

Text Pages:	14	Appendices:	-
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Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
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F03	Final	31 <sup>st</sup> Jan 2019	YE		IP/MM		DC	
F04	Final	15 <sup>th</sup> Aug 2019	IP		MM		GJG	
F05	Final	13 <sup>th</sup> Mar 2023	YE		IP		MM	

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## 032 Dromin WTP – Dromin : Listowel/Moyvane 601E\* (1300PUB1204)

### Supporting spreadsheet: 032 Dromin WTP – Dromin Listowel Moyvane 601E V25

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

Dromin WTP supplies Listowel area in County Kerry. The distribution input for Dromin: Listowel/Moyvane 601E\* is 6,639 m<sup>3</sup>/day (41% of which is accounted for, with the remainder assumed to be lost through leakage) serving a population of approximately 18,000. The non-domestic demand is 18% of the distribution input. A number of Group Water Schemes have been connected to the Dromin WTP supply, the full extent of the area supplied is shown in Figure 3.

The area within the extended Dromin/Listowel Water Supply Zone (WSZ) outlined by the red boundary in Figure 3 is served by WWTPs in Ballybunion (D0183), Listowel (D0179 -01), Ballyheigue (D0186), Ballylongford (D0459) and Tarbert (D0283), which are all licenced in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended. The impact of the orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There are also smaller agglomerations with a population equivalent of less than 500, i.e. Ballyduff (D0418), Causeway (A0098), Lixnaw (D0462), and Moyvane (A0026). The estimated additional load from these plants from the orthophosphate dosing is considered at the water body level via the surface water pathways. There are an estimated 4,698 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 Tralee Bay-Feale catchment (HAs 23) and the Shannon Catchments (HAs 24, 25, 26, 27). An assessment of these cumulative loads has been undertaken and is detailed in the summary and mitigation section.

<b>Water Treatment Plant</b>	<b>Dromin WTP</b>	
<b>Water Supply Zone</b>	<b>Dromin : Listowel/Moyvane 601E* (1300PUB1204)</b> <b>Additional WSZ used to calculate Distribution Input:</b> <b>Dromin: Scartleigh(H) 600E (1300PUB1200)</b> <b>Dromin: Ballybunion 605E* (1300PUB1201)</b> <b>Dromin: Ballyduff 602E* (1300PUB1202)</b> <b>Dromin: Ballylongford 603E* (1300PUB1203)</b> <b>Dromin: Tarmons 604E* (1300PUB1205)</b> <b>See Figure 4.1 / 4.2 of the AA Screening for a map of the WSZ and ZoI</b>	
<b>Step 1 Appropriate Assessment Screening</b>	<b>European Sites within Zone of Influence</b>	
	<b>SACs</b>	
	<ul style="list-style-type: none"> <li>• Akeragh, Banna and Barrow Harbour</li> <li>• Mount Brandon</li> <li>• Tralee Bay and Magharees Peninsula, West to Cloghane</li> </ul>	<ul style="list-style-type: none"> <li>• Blasket Islands</li> <li>• Magharee Islands</li> <li>• Kerry Head Shoal</li> </ul>

	<ul style="list-style-type: none"> <li>Lower River Shannon</li> </ul>	<ul style="list-style-type: none"> <li>Moanveanlugh Bog</li> </ul>																																																																																																																																						
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	<ul style="list-style-type: none"> <li>Akeragh, Banna and Barrow Harbour</li> <li>Loop Head</li> </ul>	<ul style="list-style-type: none"> <li>Magharee Islands</li> <li>River Shannon and River Fergus Estuary</li> </ul>																																																																																																																																						
	<b>Appropriate Assessment Screening Required – Yes see AA screening report for details</b>																																																																																																																																							
<b>Step 2 –Direct Inputs to Surface Water</b>	<b>Table 1: Increased loading/concentration to agglomerations due to Orthophosphate Dosing – Dosing rate = 1.0 mg/l</b>																																																																																																																																							
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	<p><i>Note: Listowel, Ballylongford and Tarbert both have ELVs set within the WWDL for orthophosphate and all agglomerations are modelled as being compliant with the ELVs set in their discharge licences. Both WWTPs were monitored to be compliant in the 2021 AERs so are operating efficiently in terms of the orthophosphate treatment.</i></p> <p><i>Ballybunion and Ballyheigue do not have set ELVs for Total P or Ortho-P.</i></p> <p><i>For all WWTPs listed above secondary treatment only is available; it is assumed that the additional load from orthophosphate dosing is not removed in the treatment process but rather is added to the existing effluent loads.</i></p>																																																																																																																																							

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 mean flow information**

Agglom.	WB Name / Code for Primary Discharge	Background Conc. (mg/l) (annual mean from AER u/s monitoring point)	Modelled Conc. existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc.
Ballybunion	Cashen Estuary IE_SH_060_0100	0.0370	0.0378	0.0378	0.2
Listowel	Feale_090 IE_SH_23F010800	0.0232	0.0246	0.0248	0.9
Ballyheigue	Outer Tralee Bay IE_SH_040_0000	0.0193	0.0194	0.0194	0.0
Ballylongford	Ballylongford_030 IE_SH_24B030860	0.0822	0.0838	0.0843	0.6
Tarbert	Lower Shannon Estuary IE_SH_060_0300	0.0245	0.0245	0.0245	0.0

#### Surface Assessment

**Cashen Estuary (IE\_SH\_060\_0100)** – The effluent load from Ballybunion WWTP will increase as it has been assumed that the additional load is not removed during the secondary treatment process, however the increase in concentrations in the receiving waters following orthophosphate dosing will not be significant, representing an undetectable increase in concentration, due the assimilative capacity available.

**Feale\_090 (IE\_SH\_23F010800)** – The effluent concentrations from Listowel WWTP are compliant with ELVs. Secondary treatment is available at this agglomeration, and it has been assumed that the additional load is not removed during the treatment process and is added to the existing effluent loads. The mass balance assessment in Table 2 demonstrates that the impact on the receiving water body will be insignificant.

**Outer Tralee Bay (IE\_SH\_040\_0000)** - Secondary treatment is available at Ballyheigue and it has been assumed that the additional load is not removed during the treatment process and is added to the existing effluent loads. The mass balance assessment in Table 2 demonstrates that the impact on the receiving water body will be undetectable.

**Ballylongford\_030 (IE\_SH\_24B030860)** – Secondary treatment is available at Ballylongford WWTP, which is currently compliant with the orthophosphate ELVs set in the license and there will be no impact from the orthophosphate dosing on the WDDL ELVs or the receiving water body.

**Lower Shannon Estuary (IE\_SH\_060\_0300)** - Secondary treatment is available at Tarbert WWTP which is currently compliant with the orthophosphate ELVs set in the license. The mass balance assessment in Table 2 demonstrates that the impact on the receiving water body will be undetectable.

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

<p><b>Step 4</b> <b>Distributed Inputs to surface water bodies from sub surface pathways</b></p>	<p><b><u>Subsurface Assessment</u></b></p> <p>The modelled increases in concentrations from the distributed inputs (near surface and subsurface pathways) are insignificant for most river water bodies (less than 0.00125 mg/l, which is 5% of Orthophosphate Good/High Indicative Quality boundary for surface water bodies). The exceptions are listed below:</p> <ul style="list-style-type: none"> <li>• IE_SH_23G750710 (Glouria_010): with 0.0017 mg/l potential increase in concentration,</li> <li>• IE_SH_23K030850 (Kilconly_South_010): with 0.0018 mg/l potential increase in concentration.</li> </ul> <p>The potential increase in both of the above cases does not cause risk of failing WFD Objectives as the potential baseline after dosing would stay below 75% of the upper threshold for Orthophosphate Indicative Quality.</p> <p>For the following cases, the baseline concentration is above 75% of the upper threshold for Orthophosphate Indicative Quality, but in each case the potential increase in concentration is not significant so there is no Risk of Failing the Deterioration of Status objective.</p> <ul style="list-style-type: none"> <li>• IE_SH_23B030700 (BRICK_040) – one monitoring point</li> <li>• IE_SH_23F010550 (FEALE_070)</li> <li>• IE_SH_23F010600 (FEALE_080)</li> <li>• IE_SH_23F010800 (FEALE_090) - some monitoring points</li> </ul> <p>Transitional and Coastal water bodies directly affected by this WSZ are: Cashen (IE_SH_060_0100), Upper Feale Estuary (IE_SH_060_0200), Lower Shannon Estuary (IE_SH_060_0300), and Outer Tralee Bay (IE_SH_040_0000), and Mouth of the Shannon (HAs 23:27) (IE_SH_060_0000). The predicted increases in concentrations in these receiving waterbodies are all insignificant (below 0.00125 mg/l).</p>
<p><b>Step 5 and 6:</b> <b>Combined Impact to Groundwater Bodies</b></p>	<p><b><u>Groundwater Bodies as receptors connected to WSZ</u></b></p> <p>Table 3 gives the loads and modelled concentrations for the assessment of groundwater bodies.</p> <p>The predicted loads to groundwater bodies are insignificant, below 5% of the Good / Fail boundary (0.00175mg/l). For all groundwater bodies the potential increase does not raise the baseline to levels above 75% of the Good Ortho P Indicative Quality Upper Threshold.</p> <p>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 failing WFD objectives for groundwater receptors due to orthophosphate dosing.</p>

**Table 3: Increased loading and concentrations to groundwater bodies connected to the WSZs (note: where existing monitoring data is not available, a surrogate indicative quality is derived from the initial characterisation or chemical status of the WB, and the mid-range of that indicative quality is used as Baseline Concentration)**

NAME / EU_CD	Ortho P Indicative Quality and Trends (distance to threshold) [Surrogate indicative quality indicated in <i>italic</i> ]	Baseline Ortho P Conc. mg/l [Surrogate concentration given in <i>italic</i> ]	75% of indicative quality threshold mg/l	Total 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_SH_G_001 Abbeyfeale	<i>Good</i>	<i>0.0175</i>	<i>0.0263</i>	25.8	0.0003	<i>0.0178</i>	
IE_SH_G_027 Ballybunnion	Good Downwards Far	0.007	0.026	31.5	0.0015	<i>0.008</i>	
IE_SH_G_030 Ballylongford	Good None Far	0.019	0.026	12.9	0.0004	<i>0.019</i>	
IE_SH_G_118 Kerry Head	<i>Good</i>	<i>0.0175</i>	<i>0.0263</i>	6.3	0.0003	<i>0.0178</i>	

**Step 5 and 6:  
Combined  
Inputs to  
Surface  
Water Bodies**

**Combined Assessment**

Table 4-A gives the loads and modelled concentrations for the combined assessment of rivers.

BRICK\_040 (IE\_SH\_23B030700), KNOPPOGE\_SOUTH\_010 (IE\_SH\_23K120820), FEALE\_070 (IE\_SH\_23F010550), FEALE\_080 (IE\_SH\_23F010600), and FEALE\_090 (IE\_SH\_23F010800) – have some monitoring points with a baseline concentration above the 75% indicative quality threshold, however, the potential increase in combined inputs due to orthophosphate dosing is insignificant and so no impact is predicted.

For Glouria\_010 (IE\_SH\_23G750710) and Kilconly\_South\_010 (IE\_SH\_23K030850) the modelled increase is potentially significant; however, this will not cause risk of failing WFD Objectives as the potential baseline after dosing is below 75% of the upper threshold for the surrogate Ortho P Indicative Quality of Good.

Considering TARBERT\_010 (IE\_SH\_24T010100, there was one existing watermain with potential to contribute to orthophosphate loading in this river, however it has been established that this is a recently installed uPVC main. It can therefore be assumed not to leak. On this basis the load from leakage along this section of main has been removed and the increase in concentration is below significant levels at 0.0012 mg/l.

**Table 4-A: Increased loading and concentrations to River water bodies connected to the WSZs (note: where existing monitoring data not available, a surrogate Indicative Quality is derived from the ecological status of the WB or the Ortho P / Ecological status of neighbouring WBS, the mid-range of that Indicative Quality is used as Baseline Concentration)**

NAME / EU_CD	Ortho P Indicative Quality and Trends (distance to threshold) [Surrogate indicative quality indicated in italic]	Baseline 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	Potential Increase in Ortho P Conc. using flows (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SH_23A150660 AHALAHANA_010	<i>Moderate</i>	<i>0.046</i>	<i>0.051</i>	19.1	0.0011	<i>0.047</i>	
IE_SH_23B030500 BRICK_030	<i>Good</i>	<i>0.030</i>	<i>0.033</i>	0.2	0.0000	<i>0.030</i>	
IE_SH_23B030700 BRICK_040	Moderate Upwards Near	0.052	0.051	30.0	0.0002	<i>0.052</i>	‡
	Poor Upwards Far	0.064	0.087			<i>0.064</i>	
IE_SH_23B600860 BALLAGHADIGUE_010	<i>Poor</i>	<i>0.077</i>	<i>0.087</i>	9.0	0.0008	<i>0.077</i>	
IE_SH_23D090580 DERRA_WEST_010	<i>Moderate</i>	<i>0.046</i>	<i>0.051</i>	64.9	0.0004	<i>0.046</i>	
IE_SH_23F010550 FEALE_070	High Upwards Near	0.020	0.019	0.1	0.0000	<i>0.020</i>	
IE_SH_23F010600 FEALE_080	High Upwards Near	0.023	0.019	3.7	0.0000	<i>0.023</i>	
IE_SH_23F010800 FEALE_090	<i>Moderate</i>	<i>0.046</i>	<i>0.051</i>	185.5	0.0003	<i>0.046</i>	‡
	High None Near	0.021	0.019			<i>0.021</i>	
	High Downwards Near	0.023	0.019			<i>0.023</i>	
	High Upwards Near	0.022	0.019			<i>0.022</i>	
IE_SH_23G010300 GALEY_020	<i>Good</i>	<i>0.030</i>	<i>0.033</i>	2.1	0.0000	<i>0.030</i>	
IE_SH_23G010400 GALEY_030	<i>Moderate</i>	<i>0.046</i>	<i>0.051</i>	19.4	0.0002	<i>0.046</i>	‡
IE_SH_23G010500 GALEY_040	<i>Good</i>	<i>0.030</i>	<i>0.033</i>	38.7	0.0002	<i>0.030</i>	
IE_SH_23G010700 GALEY_050	Poor Upwards Far	0.059	0.087	54.3	0.0004	<i>0.059</i>	*
IE_SH_23G750710 GLOURIA_010	<i>Moderate</i>	<i>0.046</i>	<i>0.051</i>	8.3	<i>0.0017</i>	<i>0.047</i>	

IE_SH_23I100800 Island Sack Little_010	Moderate	0.046	0.051	7.0	0.0011	0.047	
IE_SH_23K030850 KILCONLY_SOUTH_010	Moderate	0.046	0.051	8.9	0.0018	0.047	
IE_SH_23K120820 KNOPPOGE_SOUTH_010	Moderate	0.046	0.051	48.7	0.0004	0.046	‡
IE_SH_23M080580 MEENOGAHANE_010	Poor	0.077	0.087	3.9	0.0009	0.077	
IE_SH_23M440980 MOUNTCOAL_010	Moderate	0.046	0.051	1.8	0.0001	0.046	
IE_SH_23T030500 TARMON STREAM_010	Poor	0.077	0.087	11.7	0.0011	0.078	
IE_SH_24B030700 BALLYLONGFORD_020	Poor Upwards Far	0.082	0.087	18.0	0.0007	0.083	
IE_SH_24B030860 BALLYLONGFORD_030	Good	0.030	0.033	44.1	0.0010	0.031	‡
IE_SH_24F320750 FARRANMILLER_010	Good	0.030	0.033	2.9	0.0003	0.030	
IE_SH_24R300270 RALAPPANE_010	Moderate	0.046	0.051	0.8	0.0001	0.046	
IE_SH_24T010100 TARBERT_010	Poor Upwards Far	0.071	0.087	8.0	0.0012	0.072	
IE_SH_23B910900 BALLYNOE_010	Moderate	0.046	0.051	12.6	0.0006	0.046	
IE_SH_23D160380 DOONAMONTANE_010	Moderate	0.046	0.051	3.0	0.0004	0.046	
IE_SH_23T120500 TIERSHANAGHAN_010	Good	0.030	0.033	2.2	0.0002	0.030	
IE_SH_24B030400 BALLYLONGFORD_010	Moderate	0.046	0.051	7.3	0.0008	0.046	
IE_SH_24A270640 ASTEE_WEST_010	Good	0.030	0.033	13.3	0.0009	0.031	

‡ Load from WWTP / SWO following treatment added.

\* Trends are Statistically Significant.

**Table 4-B** gives the loads and modelled concentrations for the combined assessment of transitional and coastal water bodies.

Upper Feale Estuary (IE\_SH\_060\_0200) has a summer baseline higher than 75% of the upper threshold for orthophosphate Indicative Quality. However, the potential increase in concentration in all cases is insignificant, i.e. below 5% of the Good / High boundary (0.00125mg/l), so there would be no risk of failing WFD objectives for these receiving waterbody.



**Table 4-B: Increased loading and concentrations to Transitional and Coastal water bodies connected to the WSZs (note: where existing monitoring data not available, a surrogate Indicative Quality is derived from the ecological status of the WB or the Ortho P / Ecological status of neighbouring WBS, the mid-range of that Indicative Quality is used as Baseline Concentration)**

NAME / EU_CD	Ortho P Indicative Quality and Trends (distance to threshold) <i>[Surrogate indicative quality indicated in italic]</i>	Baseline Conc. mg/l <i>[Surrogate Conc. given in italic]</i>	75% of indicative quality upper threshold mg/l	Total Ortho P Load in receiving waters kg/ yr	Potential Increase in Ortho P Conc. using flows (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes	
IE_SH_040_0000 Outer Tralee Bay	High (S)	0.009	0.019	17.4	0.0000	0.009	‡	
	Far							
	High (W)	0.019	0.019			0.019		
IE_SH_060_0200 Upper Feale Estuary	High (S)	0.022	0.019	180.4	0.0002	0.023	‡	
	Near							
	High (W)	0.018	0.019			0.018		
IE_SH_060_0100 Cashen	Good (S)	0.035	0.052	344.9	0.0003	0.036	‡	
	Far							
	Good (W)	0.037	0.053			0.037		
IE_SH_060_0300 Lower Shannon Estuary	High (S)	0.012	0.020	75.1	0.0000	0.012	‡	
	Far							
	Good (W)	0.025	0.036			0.025		
IE_SH_060_0000 Mouth of the Shannon (HAs 23;27)	High (S)	0.008	0.019	445.3	0.0000	0.008	‡	
	<i>Good (W)</i>	<i>0.033</i>	<i>0.040</i>			<i>0.033</i>		

‡ Load from WWTP / SWO following treatment added.

S = Summer monitoring point, W = Winter monitoring point

**Summary and Mitigation Proposed**

Considering Dromin WTP in isolation the modelled increases in load and concentrations to both groundwater and surface water receptors do not cause a risk to WFD objectives.

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

The cumulative impacts on the Tralee Bay-Feale catchment (HAs 23) and the Shannon

Catchments (HAs 24, 25, 26, 27), associated with the corrective water treatment at the following additional WTPs have been assessed in combination with the proposed dosing at Dromin WTP:

**HA 23 - Tralee Bay-Feale catchment**

- 008 Lough Guitane Headworks – Central Regional Lisloose 405F\*

**HAs 24, 25, 26, 27 - Shannon Catchment**

- 005 Clareville WTP – Limerick City Water Supply
- 012 Tuam WTP – Tuam RWSS
- 013 Portloman WTP – Ardonagh Reservoir
- 017 Drumcliffe WTP - Ennis PWS
- 019 New Doolough WTP - W.Clare RWS (New WTP)
- 020 Castle Lake WTP - Shannon/Sixmilebridge RWSS
- 027 Athlone WTP – Athlone WSS
- 034 Lough Forbes WTP – Longford Central
- 040 Coolbawn – Nenagh RWSS
- 049 Ballany WTP – Ballany High Level Reservoir
- 058 Ballinasloe Town WTP - Ballinasloe Public Supply
- 068 Rockingham WTP - Boyle Regional WSS
- 128 Longford Springs WTP Future Supply - Castlerea WSS
- 140 Lisbrock WTP - SRRWSS Lisbrock
- 178 Clavin’s Bridge WTP – Kells/Oldcastle WS
- 184 Foileen WTP - CappamoreFoileen Water Supply
- 185 Ballinlough/ Loughglynn (Ballybane Springs) - Ballinlough/Loughglynn
- 216 Kylebeg WTP – Borrisokane
- 237 Killadysert WTP - Killadysert PWS
- 238 Williamstown WTP - Williamstown PS3
- 246 Ballingarry Spring WTP - Ballingarry Water Supply
- 260 Kilcolman PS - Rathkeale Water Supply
- 267 Cloughjordan Pump Station – Cloughjordan
- 321 Ahascragh WTP - Ahascragh P.S.

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

**Table 5: Cumulative assessment of the increased loading and concentrations to South Western Atlantic Seaboard from the Tralee Bay-Feale (HA 23) and the Shannon Catchments (Note: where existing monitoring data not available, a surrogate Indicative Quality is derived from the ecological status of the WB or the Ortho P / Ecological status of neighbouring WBS, the mid-range of that Indicative Quality is used as Baseline Concentration)**

NAME / EU_CD	Ortho P Indicative Quality and Trends (distance to threshold) [Surrogate indicative quality indicated in <i>italic</i> ]	Baseline Conc. mg/l [Surrogate Conc. given in <i>italic</i> ]	75% of indicative quality upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTs & agglomerations	Potential Increase in Ortho P Conc. due to Dosing mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SH_23B030500 BRICK_030	<i>Good</i>	<i>0.030</i>	<i>0.033</i>	75.3	0.0011	<i>0.031</i>	
IE_SH_23B030700 BRICK_040	Moderate Upwards Near	0.052	0.051	119.7	0.0009	<i>0.053</i>	‡
	Poor Upwards Far	0.064	0.087			<i>0.065</i>	
IE_SH_23D090580 DERRA_WEST_010	<i>Moderate</i>	<i>0.046</i>	<i>0.051</i>	95.4	0.0006	<i>0.046</i>	
IE_SH_23G010500 GALEY_040	<i>Good</i>	<i>0.030</i>	<i>0.033</i>	69.2	0.0004	<i>0.030</i>	
IE_SH_23G010700 GALEY_050	Poor Upwards Far	0.059	0.087	84.8	0.0006	<i>0.059</i>	*
IE_SH_23K120820 KNOPPOGE_SOUTH_010	<i>Moderate</i>	<i>0.046</i>	<i>0.051</i>	139.1	0.0012	<i>0.047</i>	‡
IE_SH_23B910900 BALLYNOE_010	<i>Moderate</i>	<i>0.046</i>	<i>0.051</i>	25.8	0.0012	<i>0.047</i>	
IE_SH_040_0000 Outer Tralee Bay	High (S) Far	0.009	0.019	244.4	0.0000	<i>0.009</i>	‡
	High (W) Far	0.019	0.019			<i>0.019</i>	
IE_SH_060_0200 Upper Feale Estuary	High (S) Near	0.022	0.019	191.0	0.0002	<i>0.023</i>	‡
	High (W) Far	0.018	0.019			<i>0.018</i>	
IE_SH_060_0100 Cashen	Good (S) Far	0.035	0.052	525.0	0.0002	<i>0.036</i>	‡
	Good (W) Near	0.037	0.053			<i>0.037</i>	

	IE_SH_060_0300 Lower Shannon Estuary	High (S) Far	0.012	0.020	12412.9	0.0002	0.012	‡
		Good (W) Far	0.025	0.036			0.025	
	IE_SH_060_0000 Mouth of the Shannon (HAs 23;27)	High (S)	0.008	0.019	13317.6	0.0001	0.008	‡
		Good (W)	0.033	0.040			0.033	
<p>‡ Load from WWTP / SWO following treatment added.                      S = Summer monitoring point, W = Winter monitoring point</p> <p>The cumulative assessment has demonstrated that there will be insignificant impact on the receiving waters or the dosing will not cause deterioration in orthophosphate indicative quality or prevent the achievement of the WFD objectives.</p> <p><b>MITIGATION OPTION - None</b></p> <p><b>RAG STATUS – GREEN</b></p>								

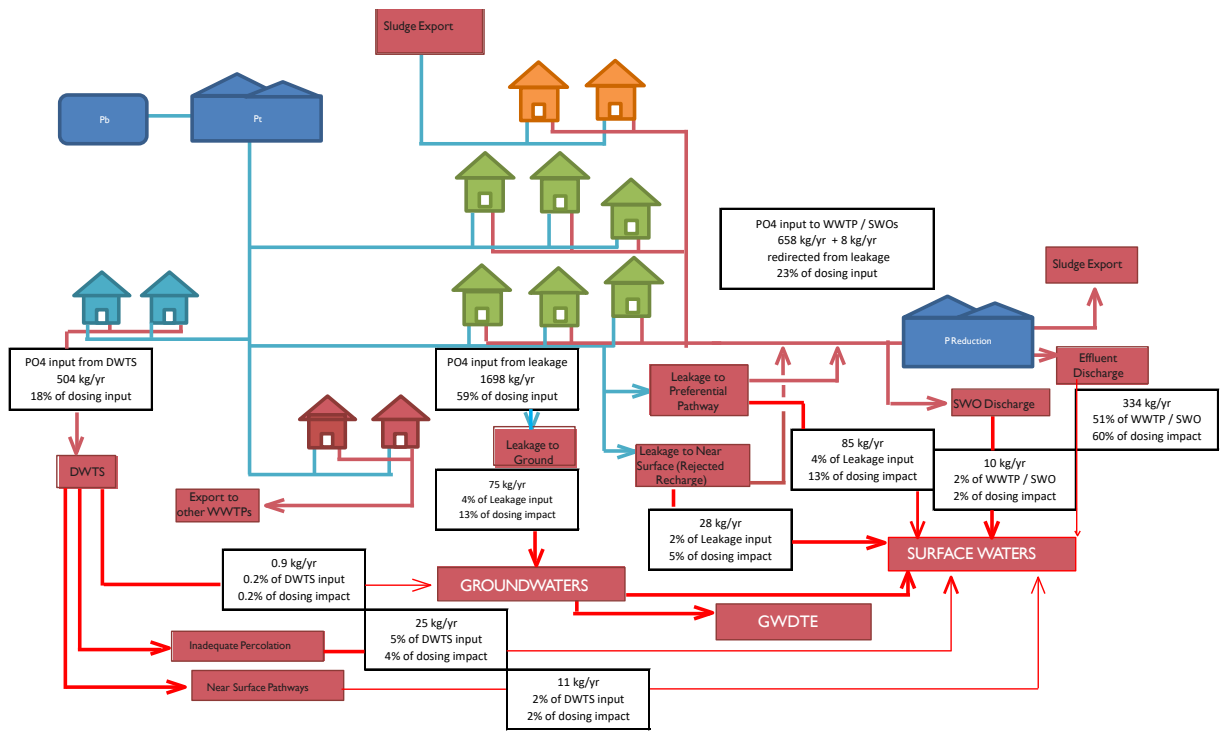
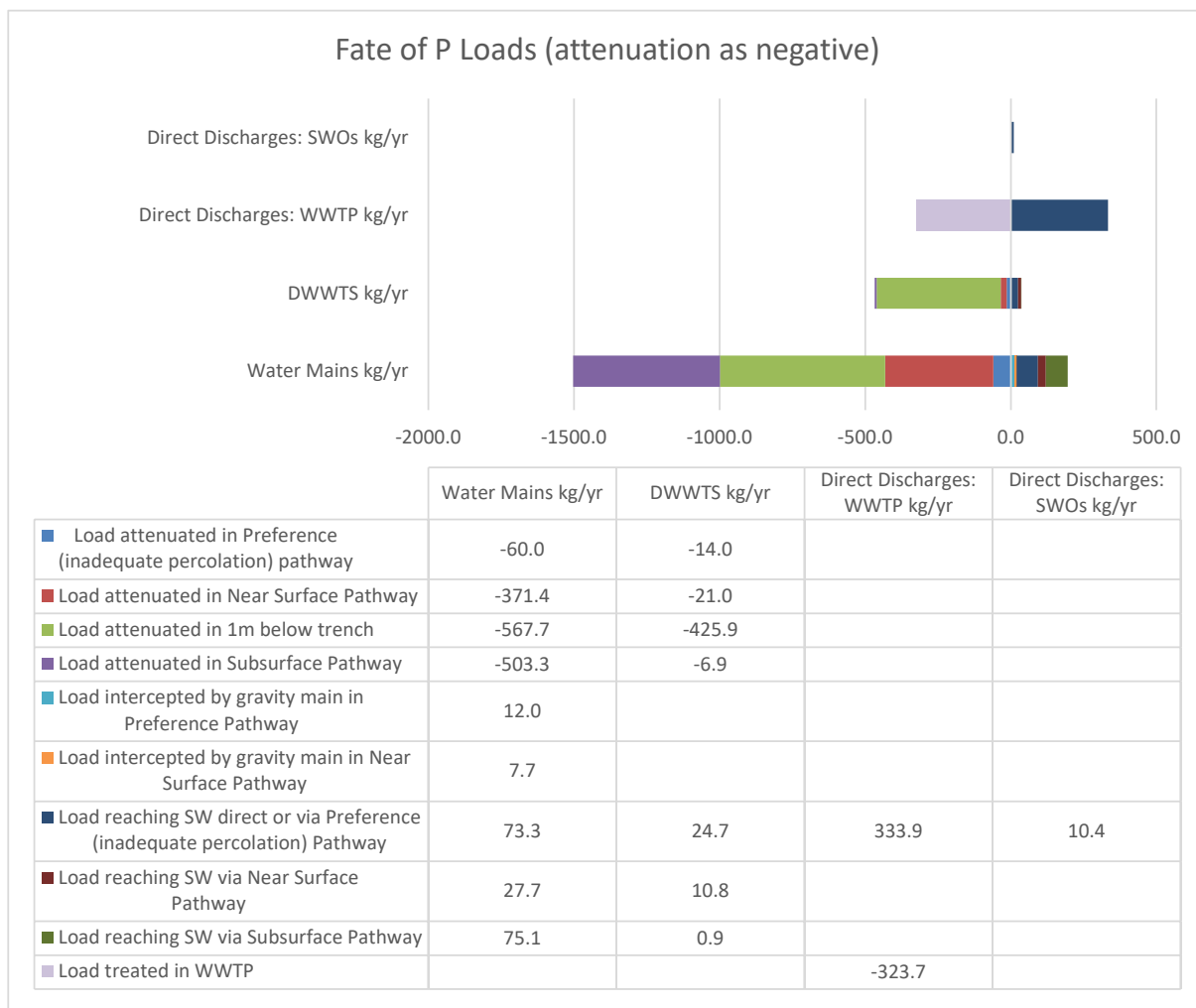


Figure 1 – Source Pathway Receptor model for Dromin WTP Regional WSZ illustrating key sources and pathways to the associated WSZs.



**Figure 2 – Fate of orthophosphate loads modelled for Dromin WTP impacting on Mouth of Shannon (HAs) (IE\_SH\_060\_000), [via Cashen (IE\_SH\_060\_0100), Upper Feale Estuary (IE\_SH\_060\_0200), and Lower Shannon Estuary (IE\_SH\_060\_0300)] due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.**

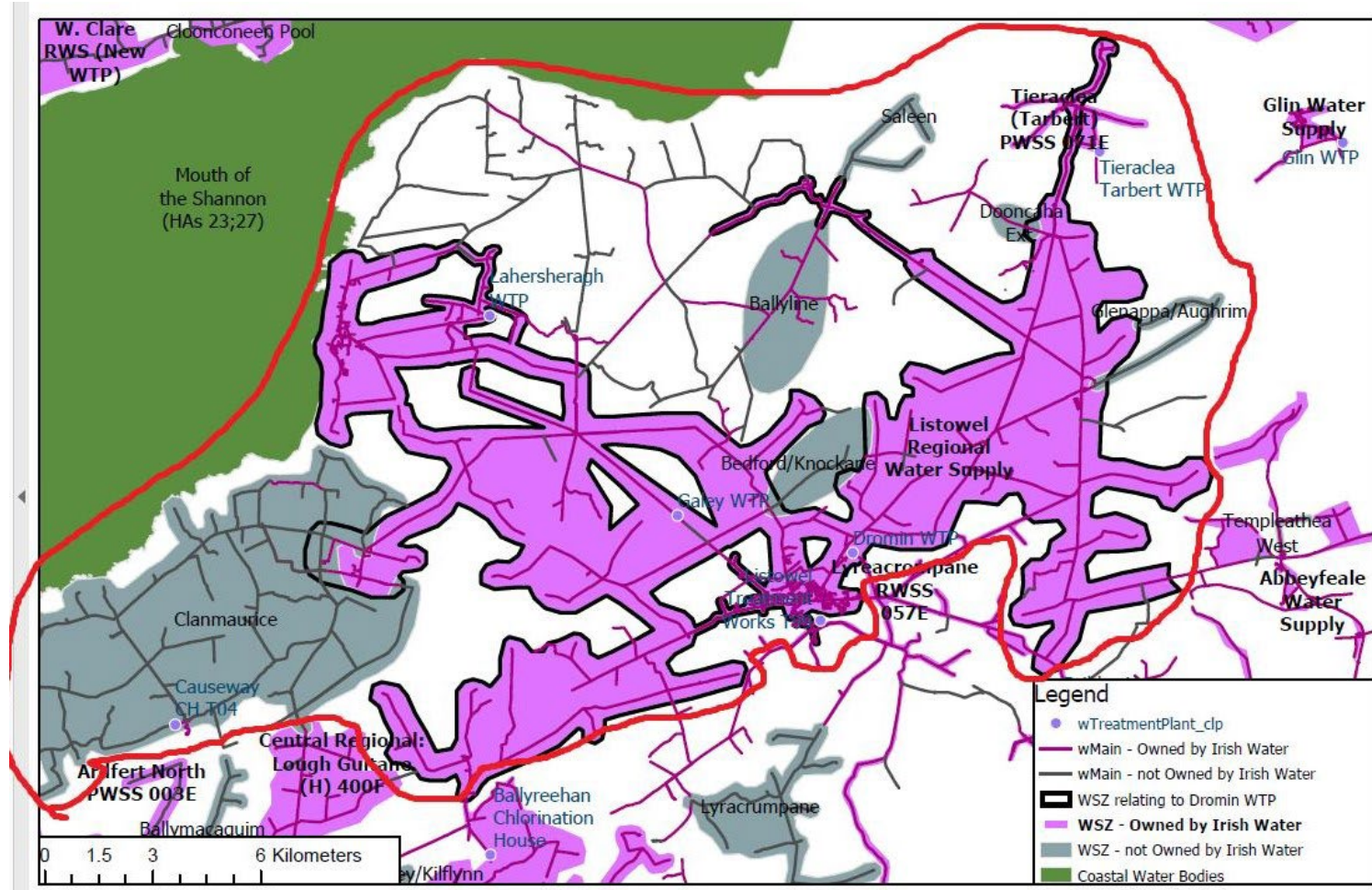


Figure 3 – Group Water Schemes analysis – all public and private watermain within the red boundary is assumed to be within the WSZ