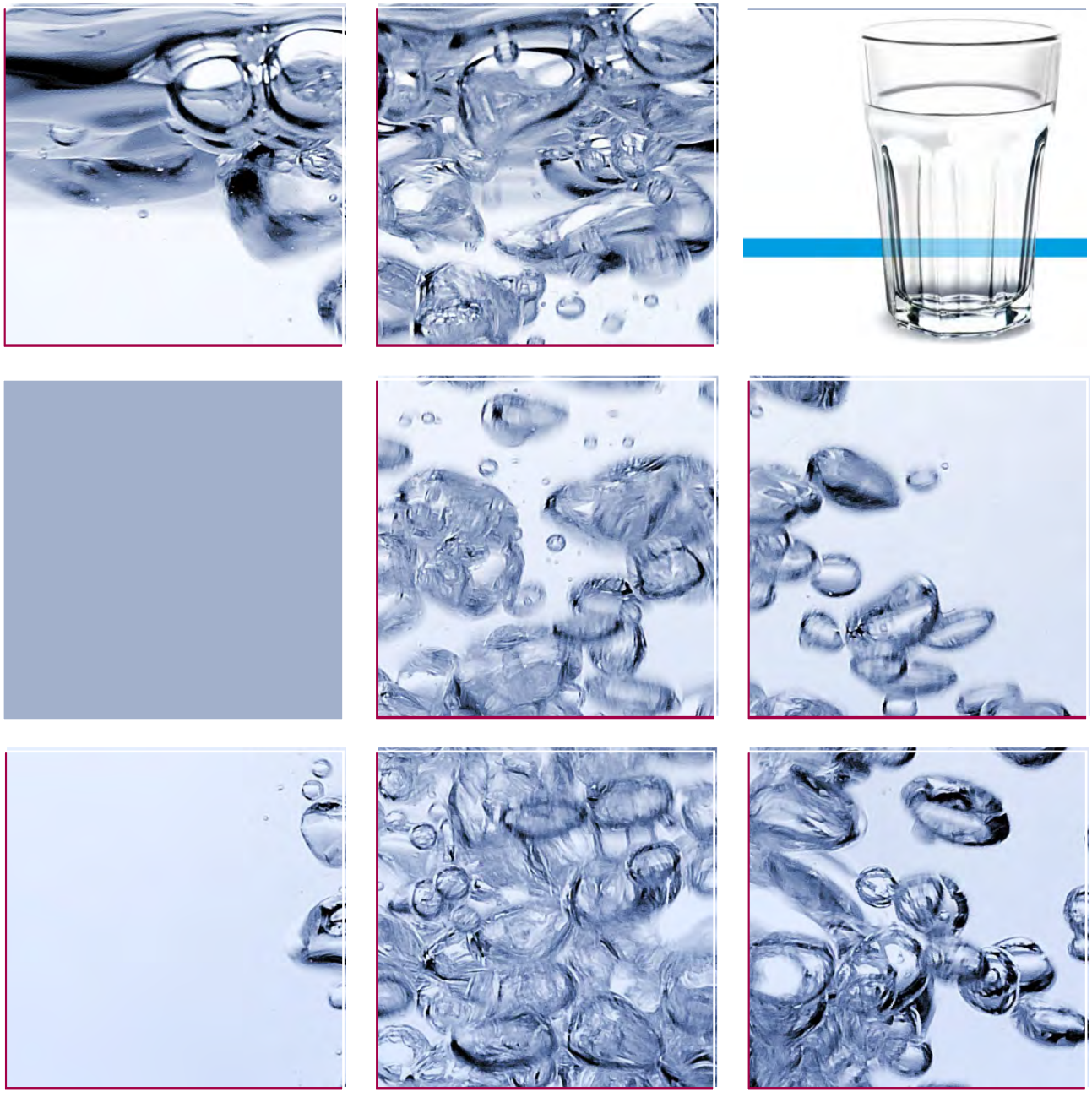
Uisce Éireann - Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment

068 Rockingham WTP - Boyle Ardcarne WSS (2600PUB1027)



Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment 068 Rockingham WTP – Boyle Ardcarne WSS (2600PUB1027)

Document Control Sheet

Client:	Uisce Éireann
Project Title:	Lead in Drinking Water Mitigation Plan
Document Title:	Screening for Appropriate Assessment 068 Rockingham WTP – Boyle Ardcarne WSS (2600PUB1027)
Document No:	MDW0766Rp_5.3_Screening_068_Rockingham_F03

Text Pages:	69	Appendices:	3

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F01	Final	21st Jan 2019	LE		LC		DC	
F02	Final	10th Jun 2023	AW	Aaron Ward	MM		MM	
F03	Final	8th Dec 2023	AW	Aaron Ward	MM		MM	

TABLE OF CONTENTS

APPENDICES

Appendix A **European Sites - Conservation Objectives**

Appendix B **Nutrient Sensitive Qualifying Interests**

Appendix C **EAM Summary Report for Rockingham WTP**

LIST OF FIGURES

LIST OF TABLES

GLOSSARY OF TERMS & ABBREVIATIONS

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

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

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

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

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

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

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

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

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

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

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

1 INTRODUCTION

RPS was commissioned by 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 Rockingham Water Treatment Plant (WTP), Co. Roscommon.

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[1] and Department of Health in June 2015.

The overall objective of the Plan is to effectively address the risk of failure to comply with the drinking water quality standard for lead due to lead pipework in as far as is practical within the areas of 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[2]). Problems can also be caused by lead leaching from domestic plumbing components made of brass and from lead-containing solder, with the most significant portion of the lead pipework lying outside of 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

[1] Now known as the Department of Housing, Planning and Local Government (DHPLG).
[2] 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 (µg/l) as per the European Union (Drinking Water) Regulations. From 2003 to 2013, the limit was 25µg/l, which was a reduction on the previous limit (i.e. pre 2003) of 50µg/l.

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

The Plan sets out the short, medium and longer term actions that 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 mg/l to 1.5 mg/l. At Rockingham WTP orthophosphate will be added at a rate of 1.0 mg/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 mg/l phosphorus, would be 4.5 milligrams.

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

1.3 PROJECT BACKGROUND

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

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

The EAM process identified 43 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Bricklieve Mountains and Keishcorran SAC, Flughany Bog SAC, Cloonakilla Lough SAC, Lough Arrow SAC, Callow Bog SAC, Tullaghanrock Bog SAC, Urlaur Lakes SAC, Derrinea Bog SAC, Errit Lough SAC, Drumalough Bog SAC, Cloonshanville Bog SAC, Mullygollan Turlough SAC, Annaghmore Lough (Roscommon) SAC, Unshin River SAC, Union Wood SAC, Clooneen Bog SAC, Lough Forbes Complex SAC, Lough Ree SAC, River Shannon Callows SAC, Pilgrim's Road Esker SAC, Lough Derg North-east Shore SAC, Lower River Shannon SAC, Ballysadare Bay SAC, Cummeen Strand / Drumcliffe Bay (Sligo Bay) SAC, Streedagh Point Dunes SAC, Bunduff Lough and Machair / Trawalua / Mullaghmore SAC; and
- SPA sites: Lough Arrow SPA, Lough Gara SPA, Ballykenny-Fishertown Bog SPA, Lough Ree SPA, Middle Shannon Callows SPA, River Little Brosna Callows SPA, Lough Derg (Shannon) SPA, River Shannon and River Fergus Estuaries SPA, Kerry Head SPA, Loop Head SPA, Balllysadare Bay SPA, Cummeen Strand SPA, Drumcliffe Bay SPA, Ballintemple and Ballygilgan SPA, Ardboline Island and Horse Island SPA, Aughris Head SPA and Inishmurray 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 and www.catchments.ie;
- Geological Survey of Ireland – Geology, Soils and Hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- National Parks and Wildlife Service – online Natura 2000 network information www.npws.ie;
- National Biodiversity Action Plan 2017 - 2021 (DCHG 2017);
- Article 17 Overview Report Volume 1 (NPWS, 2019a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2019b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2019c);
- EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);
- River Basin Management Plan for Ireland 2018 - 2021 - www.housing.gov.ie;
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie;
- National Summary for Article 12 (Cummins et al., 2019); and
- Format for a Prioritised Action Framework (PAF) for Natura 2000 (2014) www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf.

2.5 EVALUATION OF THE RECEIVING ENVIRONMENT

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

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

In relation to protected water-dependent habitats and species under the Birds and Habitats Directive, the river basin management planning process contributes towards achieving water related environmental supporting conditions that support Favourable Conservation Status. In preparing the RBMP (2018-2021) (DHPLG, 2018[3]) the characterisation assessment carried out by the EPA for these water dependent European Site protected areas has focussed on looking at the risks to the water standards/objectives established for the purpose of supporting Good Ecological Status (GES), or High Ecological Status (HES) where required. GES, which is the default objective of the WFD, is considered adequate for supporting many water dependent European Site protected areas where site specific environmental supporting conditions have not been defined within SSCOs by the NPWS. A number of lake habitats (e.g. oligotrophic lakes) and species (e.g. the freshwater pearl mussel) will require a more stringent environmental objective i.e. high status. Where this applies, this has been taken into account in the EAM and evaluated within the context of this Screening report.

2.5.1 Identification of European Sites

Current guidance (DEHLG, 2010) on the ZoI to be considered during the Screening for AA states the following:

"A distance of 15km is currently recommended in the case of plans, and derives from UK guidance (Scott Wilson et al., 2006). For projects, the distance could be much less than 15km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in-combination effects".

As stated above, a buffer of 15km is typically taken as the initial ZoI extending beyond the reach of the footprint of a plan or project, although there may be scientifically appropriate reasons for extending this ZoI further depending on pathways for potential impacts. With regard to the current project, the 15km distance is considered inadequate to screen all likely significant effects that might impact upon European Sites. This is primarily due to the need to consider the potential for likely significant effects

[3] DHPLG (2018) The River Basin Management Plan for Ireland (2018-2021). Available at: http://www.housing.gov.ie/sites/default/files/publications/files/rbmp_reportbodyenglish_web_version_final_0.pdf

on European Sites with regard to aquatic and water dependent receptors. Therefore, the ZoI for this project includes all of the hydrologically connected surface water sub catchments and groundwater bodies (**Figure 4-2**).

2.5.2 Conservation Objectives

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

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

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

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

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

For SACs:

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

For SPAs:

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

Favourable Conservation status of a habitat is achieved when:

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

Favourable Conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis.

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

2.5.3 Existing Threats and Pressures to EU Protected Habitats and Species

Given the nature of the proposed project, a review has been undertaken of those QIs/SCIs which have been identified as having sensitivity to orthophosphate loading. Information has been extracted primarily from a number of NPWS authored reports, including recently available statutory assessments on the conservation status of habitats and species in Ireland namely; *The Status of EU Protected Habitats and Species in Ireland* (NPWS 2013 a, 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

Rockingham WTP supplies a large area in the north of Co. Roscommon covering a total area of over 130km² predominantly serving the rural areas in the north of the county spanning from Lough Gara in the west to the outskirts of Carrick-on-Shannon to the east, with the town of Boyle the main urban area within the water supply system. Rockingham WTP supplies all the distribution input to both Boyle Ardcarne WSS (2600PUB1027) and Killaraght Public Water Supply (2700PUB2714).

The distribution input for Boyle Ardcarne WSS is 2,802 m^3/day (56% of which is accounted for) serving a population in excess of 5,511. The non-domestic demand is 13.6% of the distribution input. The distribution input for Killaraght PWS is only 30 m^3/day (77% of which is accounted for). The non-domestic demand is 22.7% of the distribution input. This equates to a combined distribution input for the two water supplies of 2,832 m^3/day (57.5% of which is accounted for) serving a population in excess of 5,511. The non-domestic demand is 13.7% of the distribution input.

The area is served by Boyle (D0121), Carrick-on-Shannon (D0154) and Leitrim Village (D0278) WWTPs which are 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 is a smaller agglomeration with a population equivalent of <500, i.e. Milltow Cootehall (A0280) and the estimated additional load from these plants from the orthophosphate dosing is considered at the water body level via the surface water pathways. It is estimated that there are 1,313 properties across the WSZ that are serviced by a DWWTS (see **Appendix C**).

Rockingham WTP lies just south of Lough Key on the river water body Demesne_010 (IE_SE_26D090760) in the Upper Shannon catchment (HA26). The EAM process identified 43 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Bricklieve Mountains and Keishcorran SAC, Flughany Bog SAC, Cloonakilla Lough SAC, Lough Arrow SAC, Callow Bog SAC, Tullaghanrock Bog SAC, Urlaur Lakes SAC, Derrinea Bog SAC, Errit Lough SAC, Drumalough Bog SAC, Cloonshanville Bog SAC, Mullygollan Turlough SAC, Annaghmore Lough (Roscommon) SAC, Unshin River SAC, Union Wood SAC, Clooneen Bog SAC, Lough Forbes Complex SAC, Lough Ree SAC, River Shannon Callows SAC, Pilgrim's Road Esker SAC, Lough Derg North-east Shore SAC, Lower River Shannon SAC, Ballysadare Bay SAC, Cummeen Strand / Drumcliffe Bay (Sligo Bay) SAC, Streedagh Point Dunes SAC, Bunduff Lough and Machair / Trawalua / Mullaghmore SAC; and
- SPA sites: Lough Arrow SPA, Lough Gara SPA, Ballykenny-Fishertown Bog SPA, Lough Ree SPA, Middle Shannon Callows SPA, River Little Brosna Callows SPA, Lough Derg (Shannon) SPA, River Shannon and River Fergus Estuaries SPA, Kerry Head SPA, Loop Head SPA, Balllysadare Bay SPA, Cummeen Strand SPA, Drumcliffe Bay SPA, Ballintemple and Ballygilgan SPA, Ardboline Island and Horse Island SPA, Aughris Head SPA and Inishmurray SPA.

3.2 CONSTRUCTION OF CORRECTIVE WATER TREATMENT WORKS

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

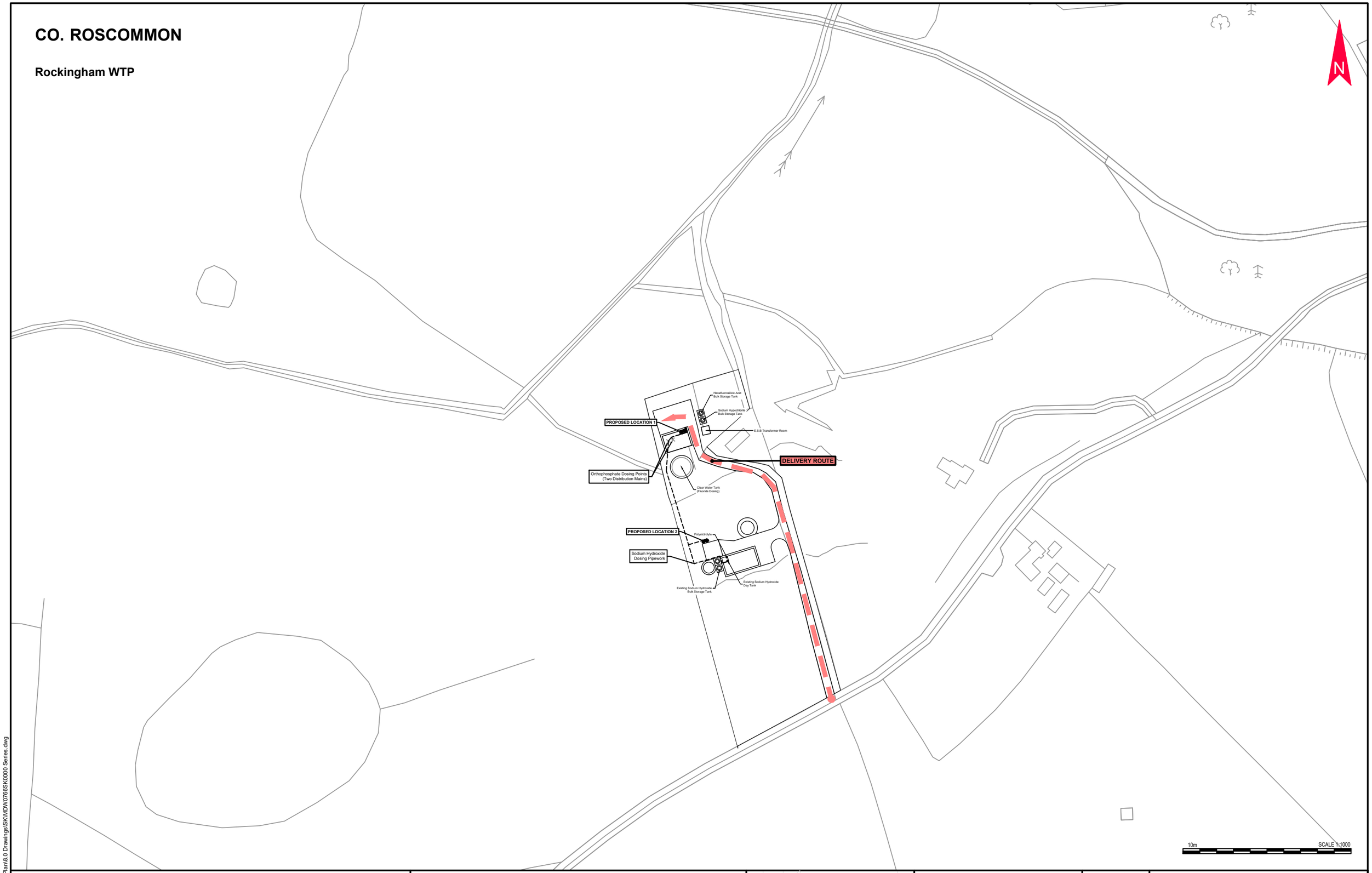
There are three possible locations for the orthophosphate dosing system at Rockingham WTP all of which will be located within the confines of the existing WTP boundary. The surrounding landscape is dominated by agricultural grassland and forestry. The location of the works is shown on **Figure 3-1**.

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

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

CO. ROSCOMMON

Rockingham WTP



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

Client

Uisce Éireann Irish Water

No.	Date	Drg. Chk.	Amendment / Issue	App
F01	Jan'19	BL BR	Issue For Information	DC

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

Drawn	BL
Checked	BR
Approved	DC
Date	28/01/2018
Scale	1:1,000 @ A1 1:2,000 @ A3
Job No.	MDW0766
File Ref.	
Drg. No.	SK0068 WTP
Rev.	F01

Project

LEAD MITIGATION PLAN

ROCKINGHAM WATER TREATMENT PLANT - SITE LAYOUT

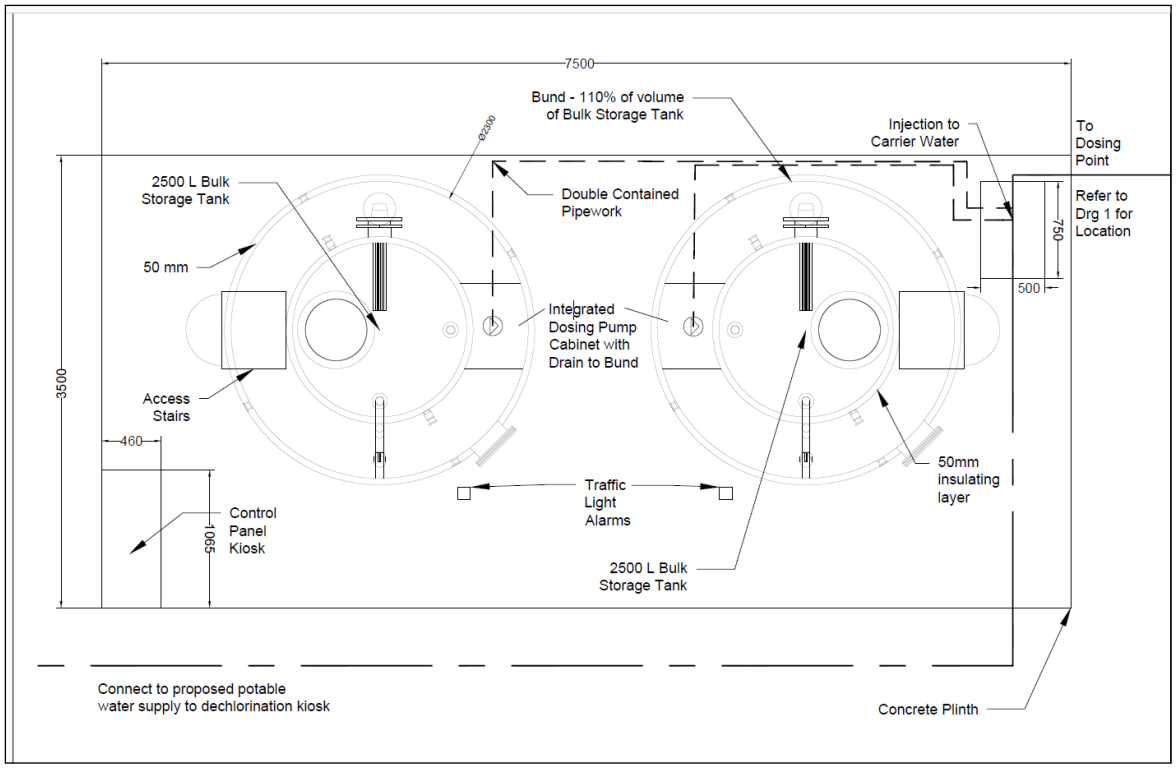
The bulk storage tanks (2 no. tanks, each with a working volume of 500 l) will sit upon an above ground reinforced concrete plinth, designed to support the combined weight of the storage tanks, equipment and total volume of chemical to be stored (**Figure 3-4**).

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

A stable pH is critical to facilitate effective plumbosolvency control. With implementation of orthophosphate dosing it is necessary to provide a back-up system to ensure a stable pH of the final water. There is an existing pH correction system at the Rockingham WTP, comprising caustic dosing (pre conditioning and final) which is not currently in use. No additional pH works are required.

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 Rockingham WTP. The ducts will be installed at approximately 700mm below ground level and following installation the trench will be backfilled and the surface reinstated to match the existing surface. Where pipework and cables are routed through existing structures, they shall be surface mounted within trunking.

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



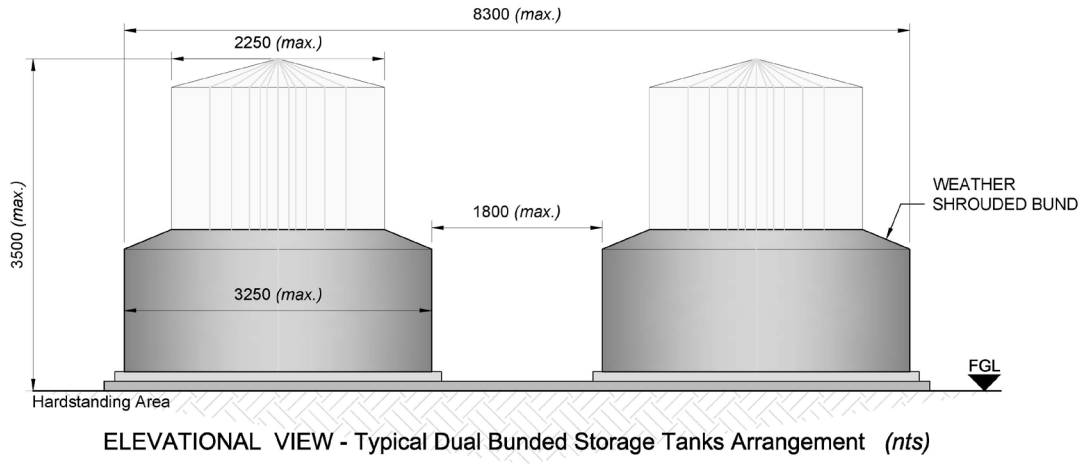


Figure 3-2: Plan and Elevation Drawings of a typical Orthophosphate Dosing Unit

3.3 CONSTRUCTION METHODOLOGY

The proposed works will be carried out by suitably qualified contractors. The proposed dosing unit will be located within the bounds of the existing Rockingham 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 Rockingham 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 potential 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 (DWWTS).

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 phosphorus (P) transfer (see **Figure 3-3)** based on the source-pathway-receptor model, from the water distribution and wastewater collection systems.

- The source of phosphorus is defined as the orthophosphate dosing at the water treatment plant which will be dependent on the water chemistry of the raw water quality, the integrity of the distribution network and the extent of lead piping.
- Pathways include discharges from the wastewater collection system (WWTP discharges and intermittent discharges – Storm Water Overflows (SWOs)), leakage from the distribution system and small point source discharges from DWWTSs.
- Receptors refer to SACs and SPAs which may receive orthophosphate dosed water via the pathway examples outlined above. Receptors and their sensitivity, is of key consideration in the EAM. A water body may be more sensitive to additional phosphorus loadings where it has a low capacity for assimilating the load e.g. high status sites, such as the habitat of the freshwater pearl mussel or oligotrophic lakes. Where a SAC/SPA could receive orthophosphate dosing inputs at more than one WSZ, the cumulative effects are considered in the EAM.

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

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

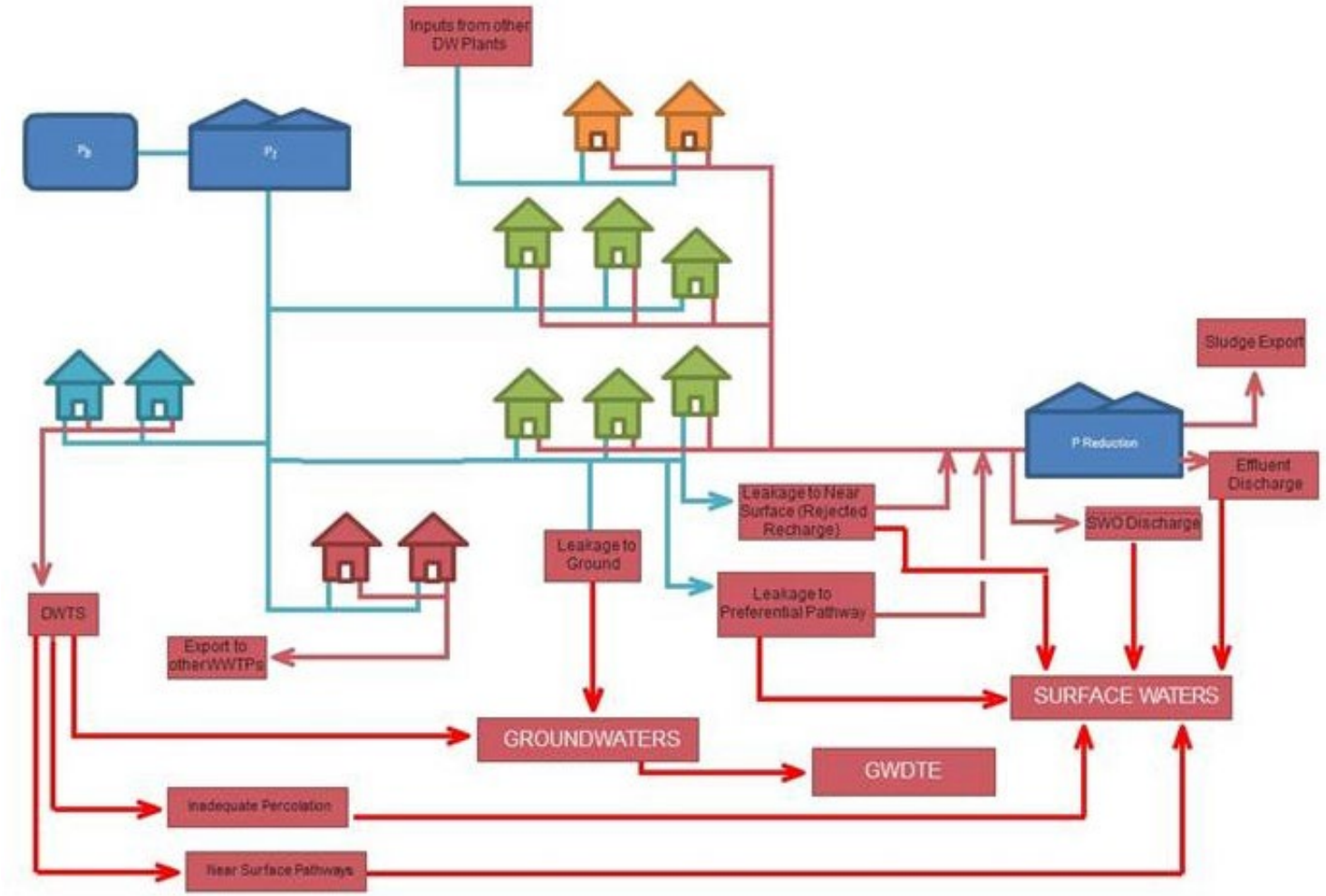


Figure 3-3: Conceptual Model of P Transfer

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

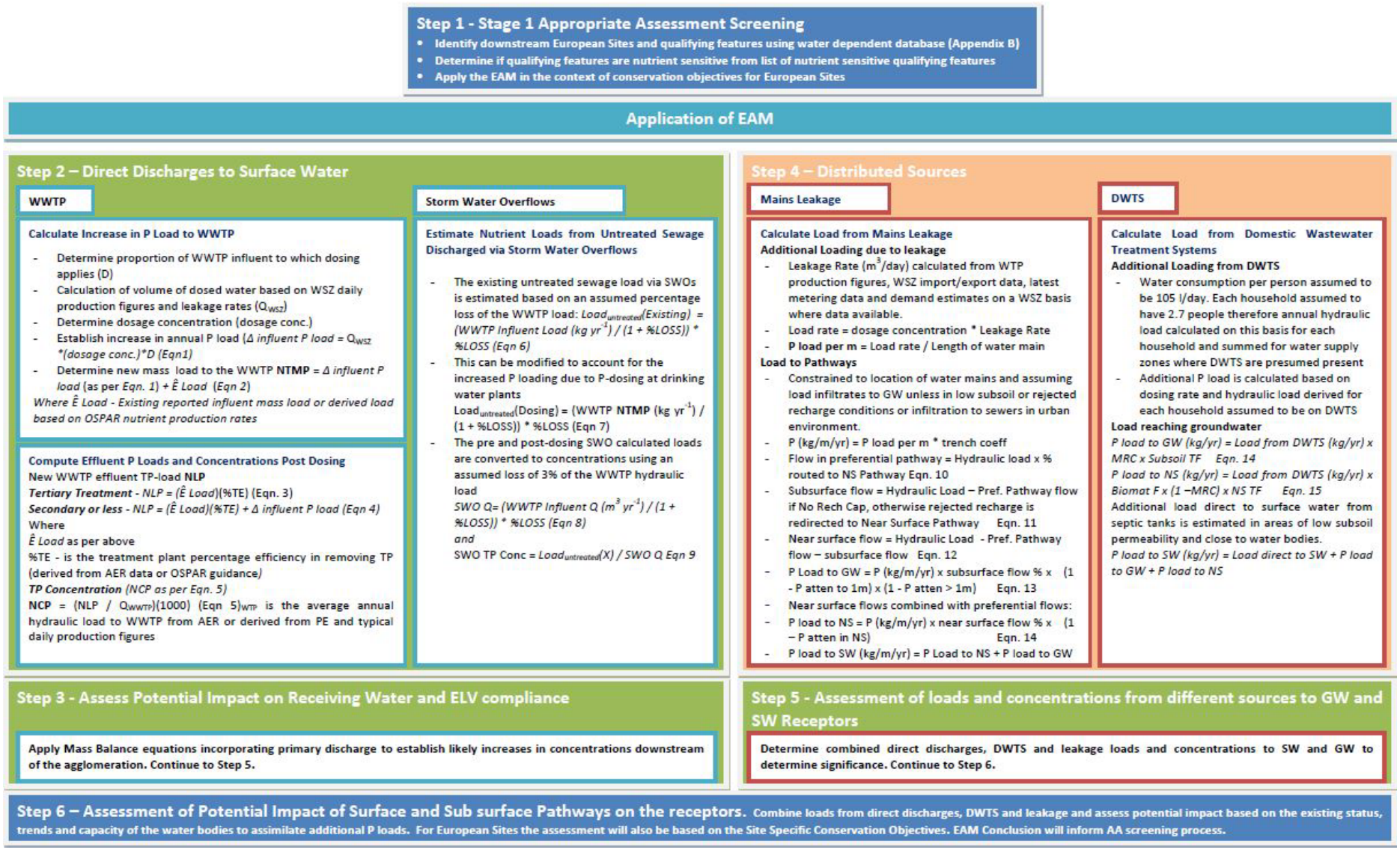


Figure 3-4: Stepwise Approach to the Environmental Assessment Methodology

4 PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

The construction phase of the proposed project will take place within the confines of the existing Rockingham WTP. The WTP is not located within or directly adjacent to the boundary of any European Site. Given the small-scale nature of construction works, the ZoI was considered to include the footprint of the existing Rockingham WTP followed by a review of hydrological and hydrogeological connectivity between the proposed development site and European Sites. The European Sites within ZoI for the construction phase of the project are listed in **Table 4-1** and displayed in **Figure 4-1.**

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

	Site Name	SAC / SPA Code	Direct Impact	Water Dependent Species / Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
1	Annaghmore Lough (Roscommon)	SAC 001626	No	Yes	No	Yes (Carrick-on-Shannon)	Yes
2	Callow Bog	SAC 000595	No	Yes	No	Yes (Carrick-on-Shannon)	Yes
3	Cloonshanville Bog	SAC 000614	No	Yes	No	Yes (Carrick-on-Shannon)	Yes
4	Derrinea Bog	SAC 000604	No	Yes	No	Yes (Carrick-on-Shannon)	Yes
5	Urlaur Lakes	SAC 001571	No	Yes	No	Yes (Carrick-on-Shannon)	Yes
6	Errit Lough	SAC 000607	No	Yes	No	Yes (Carrick-on-Shannon)	Yes
7	Drumalough Bog	SAC 002338	No	Yes	No	Yes (Carrick-on-Shannon)	Yes
8	Mullygollan Turlough	SAC 000612	No	Yes	No	Yes (Carrick-on-Shannon)	Yes
9	Lough Forbes Complex	SAC 001818	No	Yes	Yes - RWBs [Demesne, Boyle, Shannon (Upper)], LWBs (Key, Oakport, Eidin, Corry, Tap North, Tap South, Boderg, Bofin, Forbes)	No	No
10	Lough Gara	SPA 004048	No	Yes	No	Yes (Carrick-on-Shannon)	Yes
11	Ballykenny-Fishertown Bog	SPA 004101	No	Yes	Yes - RWBs [Demesne, Boyle, Shannon (Upper)], LWBs (Key, Oakport, Eidin, Corry, Tap North, Tap South, Boderg, Bofin, Forbes)	No	No

4.1.2 Operational Phase

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

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

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

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive Species / Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
1	Bricklieve Mountains & Keishcorran	SAC 001656	Yes	Yes	Yes (Unshin)	Yes (Gorteen)	Yes
2	Flughany Bog	SAC 000497	Yes	Yes	No	Yes (Gorteen)	Yes
3	Cloonakillina Lough	SAC 001899	Yes	Yes	No	Yes (Gorteen)	Yes
4	Lough Arrow	SAC 001673	Yes	Yes	Yes (Unshin, L. Arrow)	Yes (Gorteen)	Yes
5	Callow Bog	SAC 000595	Yes	Yes	Yes (Boyle)	Yes (Curlew Mountains, Carrick-on-Shannon)	Yes
6	Tullaghanrock Bog	SAC 002354	Yes	Yes	No	Yes (Curlew Mountains)	Yes
7	Urlaur Lakes	SAC 001571	Yes	Yes	No	Yes (Carrick-on-Shannon)	Yes
8	Derrinea Bog	SAC 000604	Yes	Yes	No	Yes (Carrick-on-Shannon)	Yes
9	Errit Lough	SAC 000607	Yes	Yes	No	Yes (Carrick-on-Shannon)	Yes
10	Drumalough Bog	SAC 002338	Yes	Yes	No	Yes (Carrick-on-Shannon)	Yes
11	Cloonshanville Bog	SAC 000614	Yes	Yes	No	Yes (Carrick-on-Shannon)	Yes
12	Mullygollan Turlough	SAC 000612	Yes	Yes	No	Yes (Carrick-on-Shannon)	Yes
13	Annaghmore Lough (Roscommon)	SAC 001626	Yes	Yes	No	Yes (Carrick-on-Shannon)	Yes
14	Unshin River	SAC 001898	Yes	Yes	Yes (Unshin, L. Arrow)	No	Yes
15	Union Wood	SAC 000638	Yes	Yes	Yes (Ballysodare)	No	Yes
16	Clooneen Bog	SAC 002348	Yes	Yes	Yes [Shannon Upper)]	No	Yes
17	Lough Forbes Complex	SAC 001818	Yes	Yes	Yes [Shannon Upper)]	No	Yes
18	Lough Ree	SAC 000440	Yes	Yes	Yes [Shannon Upper), L. Ree]	No	Yes

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive Species / Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
19	River Shannon Callows	SAC 000216	Yes	Yes	Yes [Shannon Upper), L. Ree]	No	Yes
20	Pilgrim's Road Esker	SAC 001776	Yes	Yes	Yes [Shannon Upper)] *Flood plains	No	Yes
21	Lough Derg North-east Shore	SAC 002241	Yes	Yes	Yes [Shannon (Lower)]	No	Yes
22	Lower River Shannon SAC	SAC 002165	Yes	Yes	Yes [Shannon (Lower), Limerick Dock]	No	Yes
23	Ballysadare Bay	SAC 000622	Yes	Yes	Yes (Ballysadare Estuary, Sligo Bay)	No	Yes
24	Cummeen Strand / Drumcliffe Bay (Sligo Bay)	SAC 000627	Yes	Yes	Yes (Ballysadare Estuary, Sligo Bay)	No	Yes
25	Streedagh Point Dunes	SAC 001680	Yes	Yes	Yes (Ballysadare Estuary, Sligo Bay)	No	Yes
26	Bunduff Lough and Machair / Trawalua / Mullaghmore	SAC 000625	Yes	Yes	Yes (Ballysadare Estuary, Sligo Bay)	No	Yes
27	Lough Arrow	SPA 004050	Yes	Yes	Yes (Unshin, L. Arrow)	Yes (Gorteen)	Yes
28	Lough Gara	SPA 004048	Yes	Yes	Yes (Boyle, Derrymaquirk, L. Gara)	Yes (Curlew Mountains, Carrick-on-Shannon)	Yes
29	Ballykenny – Fishertown Bog	SPA 004101	Yes	Yes	Yes [Shannon (Upper), L. Forbes]	No	Yes
30	Lough Ree	SPA 004064	Yes	Yes	Yes [Shannon (Upper), L. Ree]	No	Yes
31	Middle Shannon Callows	SPA 004096	Yes	Yes	Yes [Shannon (Upper)]	No	Yes
32	River Little Brosna Callows	SPA 004086	Yes	Yes	Yes [Shannon (Lower), Incherky *Flood plains]	No	Yes
33	Lough Derg (Shannon)	SPA 004058	Yes	Yes	Yes [Shannon (Lower), Derg]	No	Yes
34	River Shannon & River Fergus Estuaries	SPA 004077	Yes	Yes	Yes [Shannon (Lower), Limerick Dock]	No	Yes
35	Kerry Head	SPA 004189	Yes	Yes	Yes (Mouth of the Shannon)	No	Yes
36	Loop Head SPA	SPA 004119	Yes	Yes	Yes (Mouth of the Shannon)	No	Yes
37	Ballysadare Bay	SPA 004129	Yes	Yes	Yes (Ballysodare, Ballysadare Estuary, Sligo Bay)	No	Yes
38	Cummeen Strand	SPA 004035	Yes	Yes	Yes (Ballysadare Estuary, Sligo Bay)	No	Yes
39	Drumcliffe Bay	SPA 004013	Yes	Yes	Yes (Ballysadare Estuary, Sligo Bay)	No	Yes
40	Ballintemple & Ballygilgan	SPA 004234	Yes	Yes	Yes (Ballysadare Estuary, Sligo Bay)	No	Yes
41	Ardboline Island & Horse Island	SPA 004135	Yes	Yes	Yes (Ballysadare Estuary, Sligo Bay)	No	Yes

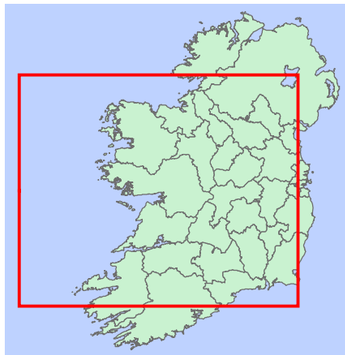
	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive Species / Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
42	Aughris Head	SPA 004068	Yes	Yes	Yes (Ballysadare Estuary, Sligo Bay, Donegal Bay Southern)	No	Yes
43	Inishmurray	SPA 004133	Yes	Yes	Yes (Ballysadare Estuary, Sligo Bay, Donegal Bay Southern)	No	Yes

Zone of Influence (ZoI) for Construction Phase

Callow Bog SAC (000595)
Lough Gara SPA (004048)
Cloonshanville Bog SAC (000614)
Lough Forbes Complex SAC (001818)
Derrinea Bog SAC (000604)
Ballykenny-Fisherstown Bog SPA (004101)
Urlaur Lakes SAC (001571)
Mullygollan Turlough SAC (000612)
Errit Lough SAC (000607)
Annaghmore Lough (Roscommon) SAC (001626)

Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (000627)
Drumcliff Bay SPA (004013)
Ballintemple and Ballygilgan SPA (004234)
Streedagh Point Dunes SAC (001680)
Ardboline Island and Horse Island SPA (004135)
Bricklieve Mountains and Keishcorran SAC (001656)
Cloonakillina Lough SAC (001899)
Bunduff Lough And Trawalua/Mullaghmore SAC (000625)
Cummeen Strand SPA (004035)
Unshin River SAC (001898)
Ballysadare Bay SPA (004129)
Union Wood SAC (000638)
Errit Lough SAC (000607)
Lough Arrow SAC (001673)
Flughany Bog SAC (000497)
Urlaur Lakes SAC (001571)
Lough Arrow SPA (004050)
Ballysadare Bay SAC (000622)
Lough Gara SPA (004048)
Ballykenny-Fisherstown Bog SPA (004101)
Mullygollan Turlough SAC (000612)
Annaghmore Lough (Roscommon) SAC (001626)
Carrowbehy/Caher Bog SAC (000597)
Tullaghanrock Bog SAC (002354)
Lough Ree SPA (004064)
Lough Forbes Complex SAC (001818)
Ree SAC (000440)
Callow Bog SAC (000595)
Clooneen Bog SAC (002348)
Cloonshanville Bog SAC (000614)
Derrinea Bog SAC (000604)
Pilgrim's Road Esker SAC (001776)
Drumalough Bog SAC (002338)
Roscommon Central Water Supply Scheme
Tuam RWSS
Ahascragh P.S.
SRRWSS - Lisbrock
Athlone WSS
Ballinasloe Public Supply
Middle Shannon Callows SPA (004096)
Crosswood Bog SAC (002337)
River Shannon Callows SAC (000216)
Lough Derg, North-east Shore SAC (002241)
River Little Brosna Callows SPA (004086)
Borrisokane
Lough Derg (Shannon) SPA (004058)
Lower River Shannon SAC (002165)
Shannon/Sixmilebridge RWSS
W. Clare RWS (New WTP)
Ennis PWS
Cloughjordan
Nenagh RWSS
Kiladysart PWS
River Shannon and River Fergus Estuaries SPA (004077)
CappamoreFoileen Water Supply
Limerick City Water Supply
Ballingarry Water Supply
Rathkeale Water Supply
Croom Water Supply
IRONMILLS
Galtee Regional
Kerry Head SPA (004189)
Loop Head SPA (004119)
Zone4 Allow Regional

Zone of Influence (ZoI) for Operational Phase



Legend

LEMA Emission Type

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

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

N

0 10 20 40 Kilometres

Client: Uisce Éireann Irish Water

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Boyle Ardcarne WSS

European Sites within the ZoI of the Proposed Project

RPS

Scale: 1:1,100,000 @ A3	Date: 30/01/2019
File Ref: MDW0766Arc0047aF01	Map Projection: Irish National Grid (TM65)

4.2 IDENTIFICATION OF RELEVANT EUROPEAN SITES

For the construction and operational phase of the project each European Site was assessed for the presence of water dependent habitats and species, their associated nutrient sensitivity, together with the hydrological/hydrogeological connectivity of each site to the proposed project. A number of sites are excluded from further assessment in Section 6. Those included, are detailed in **Table 4-3** and are displayed in **Figure 4-2.** Thirteen sites are included for further assessment, with justification provided below i.e. Callow Bog SAC, Cloonshanville Bog SAC, Lough Gara SPA, Annaghmore Lough (Roscommon) SAC, Urlaur Lakes SAC, Derrinea Bog SAC, Drumalough Bog SAC, Mullygollan Turlough SAC, Errit Lough SAC, Lough Arrow SAC, Tullaghanrock Bog SAC, Lough Arrow SPA and Lough Gara SPA.

The construction phase of the proposed project will take place within the confines of the existing Rockingham WTP. The potential for likely significant effects as a result of hydrological connectivity has been excluded, as outlined in **Table 4-1**. The WTP is located within the Carrick-on-Shannon (IE_SH_G_048) groundwater body, with potential hydrogeological connectivity between the development site and the following nine European Sites: Annaghmore Lough (Roscommon) SAC, Callow Bog SAC, Derrinea Bog SAC, Cloonshanville Bog SAC, Urlaur Lakes SAC, Errit Lough SAC, Drumalough Bog SAC, Mullygollan Turlough SAC and Lough Gara SPA.

For the operational phase of the project, the Boyle Ardcarne WSS WSZ is located south of Lough Arrow and surrounding Lough Key, Lough Eidin, Oakport Lake and Fin Boyle Lake, terminating just above Corry Lake. As a result four European Sites are intersected via river pathways, i.e. Lough Arrow SAC, Callow Bog SAC, Lough Arrow SPA and Lough Gara SPA and are included in Section 5 and Section 6 for further assessment.

A fifth site, Bricklieve Mountains and Keishcorran SAC is also intersected by a river pathway (Unshin_010; IE_WE_35U010100) as it flows from the WSZ, however the site is located upstream of the main channel on a tributary and therefore there will be no interaction between the site and surface water from the WSZ. This SAC is also hydrogeologically connected to the WSZ via Gorteen (IE_SH_G_0028) groundwater body which will be discussed below.

The WSZ also intersects three groundwater bodies – Gorteen (IE_WE_G_0028), Curlew Mountains (IE_SH_G_073) and Carrick-on-Shannon (IE_SH_G_048) (**Table 3, Appendix C**). The WSZ is primarily intersected by Carrick-on-Shannon and Curlew Mountains groundwater bodies, with a very small portion of the WSZ being intersected by Gorteen (IE_WE_G_0028). The following 19 European Sites overlay or intersect these groundwater bodies. Callow Bog SAC and Lough Gara SPA are hydrogeologically conneted via the Curlew Mountains and Carrick-on-Shannon GWBs. Groundwater from the Curlew Mountains GWB discharges locally to Lough Gara[4]. Lough Arrow SPA is hydrogeologically connected via the Gorteen GWB. These sites have already been included for further assessment for hydrological connections. For European Sites which have only hydrogeological connections an assessment was made of the direction of flow in the groundwater body forming the connection i.e. Bricklieve Mountains and Keishcorran SAC, Flughany Bog SAC, Cloonakilla Bog SAC, Tullaghanrock Bog SAC, Urlaur Lakes SAC, Derrinea Bog SAC, Errit Lough SAC, Carrowbehy/Caher Bog SAC, Drumalough Bog SAC, Cloonshanville Bog SAC, Mullygollan Turlough SAC, Annaghmore Lough (Roscommon) SAC and Unshin River SAC

[4] GSI - Curlew GWB: Summary of Initial Characterisation

Groundwater flows through voids such as connected pore spaces in sand and gravel aquifers and through fissures, faults, joints and bedding planes in bedrock aquifers. Regional groundwater flows tend to follow the regional topography and generally discharge towards main surface water bodies including rivers, lakes and coastal water bodies. In areas of karstified limestones, high permeability zones give rise to rapid groundwater velocities with more complex flow directions, which may vary seasonally and are difficult to predict with certainty. In this case, the assumption is that groundwater flow direction is from areas of higher elevations to lower elevations, unless groundwater specific information indicates otherwise. Groundwater body specific information relating to flow and discharge is available from the GSI[5] and was consulted in making the assessment.

Carrick-on-Shannon groundwater body (IE_SH_G_048) is a regionally important karstified aquifer dominated by conduit flow[6]. There is a high degree of interconnection between groundwater and surface water in this groundwater body. There are numerous karst features and surface streams sink frequently, draining through karst features into the groundwater system, providing rapid recharge to groundwater. Streams re-emerge as springs after flowing as groundwater for some distance, to once again form significant surface streams. Flow paths can be several kilometres in length. Groundwater discharges to the streams and rivers crossing the body and to the large, high-yielding springs, many of which are used for water supply. The groundwater flow direction is influenced by a topographic high in the centre of the body. Locally groundwater flow directions can be highly variable due to the highly karstified nature of the bedrock. Low permeability rocks of adjoining groundwater bodies can act as barriers to flow from the karstified pure bedded limestone of this body. There has been some tracing carried out within this groundwater body which supports the theory that groundwater flows to surface waters across the body.

The following nine European Sites are underlain or intersected by Carrick-on-Shannon groundwater body (approximate distance from WSZ):), Cloonshanville Bog SAC (8km),), Annaghmore Lough (Roscommon) SAC (>20km), Urlaur Lakes SAC (>30km), Derrinea Bog SAC (>30km), Drumalough Bog SAC (>30km), Mullygollan Turlough SAC (>30km) and finally Errit Lough SAC (>35km). Though the groundwater body is karst and flow paths can be several kilometres in length, the majority of sites are located >20km from the WSZ. Due to the unknown nature of the flow paths within the groundwater body and limited tracing, all of these hydrogeologically connected sites have been included for further assessment.

The Gorteen (IE_WE_G_0028) groundwater body intersects a very small portion of the WSZ to the north, just below Lough Arrow. The aquifer categories include locally important aquifer, moderately productive only in local zones, Poor aquifer, generally unproductive except for local zones and an area (7km^2) of regionally important karstified aquifer[7]. Flow paths are expected to be short, up to 300m, with groundwater discharging rapidly to nearby streams and small springs. Flow directions are expected to follow topography, generally to the north. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater – surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low. There are five European Sites intersected by this groundwater body: Bricklieve Mountains and Keishcorran SAC, Flughany Bog SAC, Cloonakillina Bog SAC, Lough Arrow SAC and Lough Arrow SPA. Lough Arrow SAC and Lough Arrow SPA have already been included for further assessment in Section 6 due to proximity to the WSZ and both hydrological and hydrogeological connectivity. Both Cloonakillina Bog SAC and Flughany Bog SAC can be excluded from further assessment due to the nature of the Gorteen groundwater body, as discussed, in addition

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

to both being located >20 km from the WSZ, with flow paths expected to be up to 300 m in length. Finally Bricklieve Mountains and Keishcorran SAC has been excluded from further assessment due to distance from the WSZ (approximately 6.8 km) and although there is a hydrological connection to the WSZ via Unshin_010, the site is located upstream on a tributary that will not receive any water from the WSZ.

Surface water flow from the WSZ is for the most part, in two separate directions. The Unshin River leaves the WSZ from the north and the Boyle River traverses the WSZ from west to east before joining the Shannon and flowing south.

The ZoI for surface water has been terminated to the north of the WSZ after the Unshin_010 (IE_WE_35U010100), where the modelled post-dosing concentration is not detectable (0.0000 mg/l). This pathway ultimately flows to the coast via the remainder of the Unshin River (Unshin_020 – Unshin_050), where it meets Ballysodare_010 (IE_WE_35B050100) and discharges at the coast. The sites that are hydrologically connected to the WSZ but are located downstream of Unshin_010 (IE_WE_35U010100) (where ZoI has terminated) include the following ten European Sites: Unshin River SAC, Union Wood SAC, Ballysadare Bay SAC, Cummeen Strand/Drumcliffe Bay (Sligo Bay) SAC, Streedagh Point Dunes SAC, Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, Ballysadare Bay SPA, Cummeen Strand SPA, Drumcliffe Bay SPA, Ballintemple and Ballygilgan SPA and Ardboline Island and Horse Island SPA.

The ZoI for surface water has been terminated to the south of the WSZ after the Shannon (Upper)_060 where the flow finally leaves the WSZ. The modelled post-dosing concentration for this river which receives the majority of the surface water that intersects the WSZ is not detectable (0.0000 mg/l). The European Sites downstream of this point include: Clooneen Bog SAC, Lough Forbes Complex SAC, Lough Ree SAC, River Shannon Callows SAC, Pilgrim's Road Esker SAC, Crosswood Bog SAC, Lough Derg North-eat Shore SAC, Lower River Shannon SAC, Ballykenny-Fishertown Bog SPA, Lough Ree SPA, Middle Shannon Callows SPA, River Little Brosna Callows SPA, Lough Derg (Shannon) SPA, River Shannon and River Fergus Estuaries SPA, Kerry Head SPA and Loop Head SPA.

On this basis, nine 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. Callow Bog SAC, Cloonshanville Bog SAC, Lough Gara SPA, Annaghmore Lough (Roscommon) SAC, Urlaur Lakes SAC, Derrinea Bog SAC, Drumalough Bog SAC, Mullygollan Turlough SAC and finally Errit Lough SAC. Five sites has been included for further assessment for the operational phase in Sections 5 and 6 below i.e. Lough Arrow SAC, Callow Bog SAC, Tullaghanrock Bog SAC, Lough Arrow SPA and Lough Gara SPA.

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

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species/ Habitats	Nutrient Sensitive Species / Habitats	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
Construction Phase Only								
Annaghmore Lough (Roscommon)	**SAC 001626**	21st February 2018 Version 6.0	7230	Alkaline fens*	Yes	Yes	Yes	Yes
			1013	Geyer's Whorl Snail (*Vertigo geyeri*)	Yes	Yes		
Mullygollan Turlough	**SAC 000612**	29th January 2018 Version 1.0	3180	Turloughs*	Yes	Yes	Yes	Yes
Cloonshanville Bog	**SAC 000614**	21st January 2016 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		
			91D0	Bog woodland*	Yes	Yes		
Drumalough Bog	**SAC 002338**	3rd August 2016 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		
Errit Lough	**SAC 000607**	18th December 2017 Version 1.0	3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara*	Yes	Yes	Yes	Yes
Derrinea Bog	**SAC 000604**	2nd November 2015 Version 1.0	7110	Active raised bogs*	Yes	Yes	Yes	Yes
			7120	Degraded raised bogs still capable of natural regeneration	Yes	Yes		

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species/ Habitats	Nutrient Sensitive Species / Habitats	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
			7150	Depressions on peat substrates of the *Rhynchosporion*	Yes	Yes		
Urlaur Lakes	**SAC 001571**	15th December 2017 Version 1.0	3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara*	Yes	Yes	Yes	Yes
Operational Phase Only								
Lough Arrow	**SAC 001673**	21st Feb 2018 Generic Version 6.0	3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara*	Yes	Yes	Yes	Yes
Tullaghanrock Bog	**SAC 002354**	15th Dec 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		
Lough Arrow	**SPA 0040502**	1st Feb 2018 Generic Version 6.0	A004	Little Grebe (*Tachybaptus ruficollis*)	Yes	Yes	Yes	Yes
			A061	Tufted Duck (*Aythya fuligula*)	Yes	Yes		
			A999	Wetlands	Yes	Yes		
Construction and Operational Phases								
Callow Bog	**SAC 000595**	19th Jan 2016 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		

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species/ Habitats	Nutrient Sensitive Species / Habitats	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
Lough Gara	**SPA 004048**	21st Feb 2018 Generic Version 6.0	A038	Whooper Swan (*Cygnus cygnus*)	Yes	Yes	Yes	Yes
			A395	Greenland White-fronted Goose (*Anser albifrons flavirostris*)	Yes	Yes		

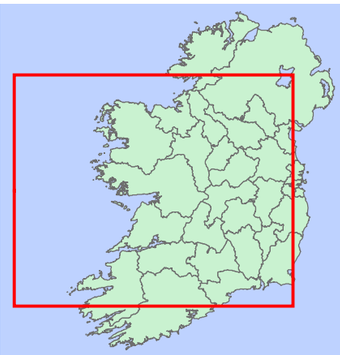
**Indicates a priority habitat under the Habitats Directive.

Zone of Influence (ZoI) for Construction Phase

Urlaur Lakes SAC (001571)
Lough Gara SPA (004048)
Callow Bog SAC (000595)
Mullygollan Turlough SAC (000612)
Annaghmore Lough (Roscommon) SAC (001626)
Drumalough Bog SAC (002338)
Derrinea Bog SAC (000604)
Errit Lough SAC (000607)
Cloonshanville Bog SAC (000614)

Callow Bog SAC (000595)
Lough Arrow SAC (001673)
Tullaghanrock Bog SAC (002354)
Lough Arrow SPA (004050)
Lough Gara SPA (004048)
Boyle Ardcarne WSS
Castlerea WSS
Williamstown PS
Ballinlough/Loughglynn
Roscommon Central Water Supply Scheme
Longford Central
Ballany High Level Reservoir
Kells-Oldcastle
Ardonagh Reservoir
SRRWSS - Lisbrock
Athlone WSS
Ahascragh P.S.
Tuam RWSS
Ballinasloe Public Supply
Borrisokane
Nenagh RWSS
Cloughjordan
Ennis PWS
Shannon/Sixmilebridge RWSS
W. Clare RWS (New WTP)
Kiladysart PWS
Limerick City Water Supply
CappamoreFoileen Water Supply
IRONMILLS
Galtee Regional
Rathkeale Water Supply
Ballingarry Water Supply
Croom Water Supply
Zone4 Allow Regional

Zone of Influence (ZoI) for Operational Phase



Legend

LEMA Emission Type

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

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

N

0 10 20 40 Kilometres

Client: Uisce Éireann Irish Water

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Boyle Ardcarne WSS

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

RPS

Scale: 1:1,100,000 @ A3	Date: 30/01/2019
File Ref: MDW0766Arc0047bF01	Map Projection: Irish National Grid (TM65)

5 EVALUATION OF POTENTIAL IMPACTS

5.1 CONTEXT FOR IMPACT PREDICTION

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

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

5.2 IMPACT IDENTIFICATION

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

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

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

5.2.1 Construction Phase

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

5.3.1 Construction Phase

There are two possible locations for the orthophosphate dosing system both of which will be located within the confines of the existing WTP boundary. The assessment of potential significant effects associated with construction of the corrective water treatment works was conducted taking the whole Rockingham WTP into account and therefore included both possible locations. The assessment of impacts associated with the construction of the corrective water treatment works at Rockingham WTP is presented in **Section 5.3.1** and is based on a desktop study using the following information:

- Design descriptions and drawings for the proposed corrective water treatment works at Rockingham WTP;
- A review of hydrological connectivity between the proposed works and European Sites using the EPA Mapping Resources: http://gis.epa.ie/; www.Catchments.ie;
- Ordnance Survey Ireland Map viewer: http://maps.osi.ie/publicviewer/#V1,591271,743300,0,10
- Site synopses, conservation objectives and qualifying interest data for European Sites.

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

Site Name (Code)	Contributing WB Code_Name	WB Type[8]	Evaluation of Potential Significant Effects
Callow Bog SAC (000595)	Carrick-on-Shannon (IE_SH_G_048)	GWB	The construction works will be located within the confines of the existing Rockingham WTP. Rockingham WTP is not located within or directly adjoining a European Site. **Surface Water** There are no surface water bodies within the confines of the WTP. The Demesne_010 is located approximately 70m northwest of the WTP. An unmapped river which joins Demesne_010 also runs approx. 50m west of the WTP. There is no direct connectivity between the WTP site and the Demesne River, and the potential for likely significant effects due to the proposed development via overland flow has been discussed in **Table 4-1** and excluded from further assessment. The proposed construction works are small scale in nature and will be undertaken within the confines of the Rockingham WTP site. There will be no aspects of the proposed works that will result in the release of potential impacts sources identified in **Section 5.3.1.** The works will be localised and contained to the immediate development area which supports / buildings and artificial surfaces and is bounded by a narrow strip of mown lawn, hedgerows and mature trees to the northeast of the WTP. 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. The required works practices to deliver the construction elements will retain all potential construction-related pollutants at source. Owing to the small scale nature of the proposed works, absence of hydrological connections, significant distance
Annaghmore Lough (Roscommon) SAC (001626)	Carrick-on-Shannon (IE_SH_G_048)	GWB	
Mullygollan Turlough SAC (000612)	Carrick-on-Shannon (IE_SH_G_048)	GWB	
Cloonshanville Bog SAC (000614)	Carrick-on-Shannon (IE_SH_G_048)	GWB	
Drumalough Bog SAC (002338)	Carrick-on-Shannon (IE_SH_G_048)	GWB	
Errit Lough SAC (000607)	Carrick-on-Shannon (IE_SH_G_048)	GWB	
Derrinea Bog SAC (000604)	Carrick-on-Shannon (IE_SH_G_048)	GWB	
Urlaur Lakes SAC (001571)	Carrick-on-Shannon (IE_SH_G_048)	GWB	
Lough Gara SPA (004048)	Carrick-on-Shannon (IE_SH_G_048)	GWB	

[8] Monitoring period is annual unless specified.

			between the WTP and the European Sites as well as natural and built barriers there is no potential for likely significant effects on these sites through sediment laden run-off, dust emissions or environmental incidents. Therefore, there is no potential for likely significant effects to these European Sites. **Groundwater** The WTP overlies the Carrick-on-Shannon (IE_SH_G_048) groundwater body which is intersects the following European Sites: Callow Bog SAC (000595), Annaghmore Lough (Roscommon) SAC (001626), Mullygollan Turlough SAC (000612), Cloonshanville Bog SAC (000614), Drumalough Bog SAC (002338), Errit Lough SAC (000607), Derrinea Bog SAC (000604), Urlaur Lakes SAC (001571) and Lough Gara SPA (004048). The excavation of trenches to install dosing pipelines, carrier water pipework and electrical cables to 700mm below ground level has the potential to interfere with the water table potentially causing groundwater drawdown. Carrick-on-Shannon GWB (IE_SH_G_048) is a regionally important karstified aquifer dominated by conduit flow. There is a high degree of interconnection between groundwater and surface water. There are numerous karst features and surface streams sink frequently, draining through karst features into the GW system, providing rapid recharge to GW. Streams re-emerge as springs after flowing as GW for some distance, to once again form significant surface streams. Flow paths can be several kms in length. The GW flow direction is influenced by a topographic high in the centre of the body. Locally GW flow directions can be highly variable due to the highly karstified nature of the bedrock. Low permeability rocks of adjoining GW bodies can act as barriers to flow from the karstified pure bedded limestone of this body. There has been some tracing carried out within this groundwater body which supports the theory that GW flows to surface waters across the body and at the WTP groundwater has been traced to flow towards the unmapped tributary of the Demesne River. The hydrogeologically connected European Sites are located at the following approximate distances from the proposed development site: Cloonshanville Bog SAC (>20km), Callow Bog SAC (>25km), Annaghmore Lough (Roscommon) SAC (>30km), Mullygollan Turlough SAC (>35km), Drumalough Bog SAC (>50km), Errit Lough SAC (>50km), Derrinea Bog SAC (>50km), Urlaur Lakes SAC (>50km) and Lough Gara SPA (>15km). As the excavation works will not be extensive (up to c. 75m for pipework and to an approximate depth of 700mm) and upon made ground, interference with water table will be unlikely to occur. Any interference would be localised, minor and temporary. Therefore, there is no potential for likely significant effects to the underlying groundwater body, the receiving surface water feature and subsequently those European Sites included for further assessment, as a result of the construction of the corrective water treatment works at Rockingham WTP.

5.3.2 Operational Phase

In the case of the additional orthophosphate load due to dosing at Rockingham 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.

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.

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 1.2 mg/l.

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

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

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

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
Lough Arrow SAC (001673)	IE_WE_35U010100 Unshin_010	RWB	High	*0.007*	*0.019*	0.7	0.0000	*0.007*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_WE_G_028 Gorteen	GWB	*Good*	*0.018*	*0.026*	0.3	0.0000	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Callow Bog SAC (000595)	IE_SH_26B080100 Boyle_010	RWB	*Moderate*	*0.046*	*0.051*	5.8	0.0000	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_048 Carrick-on-Shannon	GWB	Good Upwards Far	0.018	0.026	29.6	0.0002	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.027	0.026			0.027	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled conc. is 0.0002mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

[9] Monitoring period is annual unless specified.
[10] Surrogate indicative quality in italic.
[11] Distance to threshold
[12] Baseline year is 2014 for surface water bodies and 2012 for groundwater bodies.
[13] Surrogate concentration is given in italic mg/l
[14] 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.
[15] 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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
	IE_SH_G_073 Curlew Mountains	GWB	*Good*	*0.018*	*0.026*	17.2	0.0006	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Tullaghanrock Bog SAC (002354)	IE_SH_G_073 Curlew Mountains	GWB	*Good*	*0.018*	*0.026*	17.2	0.0006	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Lough Arrow SPA (004050)	IE_WE_35U010100 Unshin_010	RWB	High	*0.007*	*0.019*	0.7	0.0000	*0.007*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_WE_G_028 Gorteen	GWB	*Good*	*0.018*	*0.026*	0.3	0.0000	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Lough Gara SPA	IE_SH_26B080100 Boyle_010	RWB	*Moderate*	*0.046*	*0.051*	5.8	0.0000	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26D110290 Derrymaquirk_010	RWB	*Moderate*	*0.046*	*0.051*	0.6	0.0001	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_048 Carrick-on-Shannon	GWB	Good Upwards Far	0.018	0.026	29.6	0.0002	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.027	0.026			0.027	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled conc. is 0.0002mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled increase in Conc.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
	IE_SH_G_073 Curlew Mountains	GWB	*Good*	*0.018*	*0.026*	17.2	0.0006	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

* Trends are Statistically Significant.
‡ Load from WWTP / SWO following treatment added.

The assessment of discharges from the wastewater collection system and WWTPs and the loading from leakage and DWWTSs to lakes is based on the Vollenweider equation. This is an empirical equation which aims to predict the critical total P loading to a lake where eutrophic conditions can occur. It is calculated based on area, mean depth, and hydraulic outflow of lake (Vollenweider, 1968[16]) (see **Table 5-3**).

Table 5-3: Vollenweider Assessment of Lakes within the WSZs

Site Name (Code)	ContributingWB Code_Name	Parameter	TP Indicative Quality and Trends[17]	Baseline[18] Ortho P Conc.[19] (mg/l)	TP Total Dosing Load (kg/yr)	Est. Existing Areal Loading Based on Vollenweider (mg/m²/yr)	Est. Post Dosing Areal Loading Based on Vollenweider (mg/m²/yr)	Lc – Critical Load (mg/m²/yr)	% Increase
Lough Gara SPA (004048)	IE_SH_26_728 Lough Gara	TP	Good Upwards Near	0.021	6.5	880	881	519	0.1%
Lough Arrow SPA (004050)	IE_WE_35_159 Lough Arrow	TP	Good Upwards Far	0.012	0.7	67	67.1	134	0.1%
All located within WSZ, with a hydrological connection upstream of European Sites	IE_SH_26_576 Fin Boyle	TP	*Moderate*	*0.048*	7.6	2027	2040	562	0.6%
	IE_SH_26_724 Lough Key	TP	Good Downwards Far	0.019	6.5	1171	1172	785	0.1%
	IE_SH_26_721 Lough Oakport	TP	*Poor*	0.085	43.9	91,359	91,445	11,379	0.1%
	IE_SH_26_711 Meelagh	TP	Good *Upwards Far*	0.030	1.9	64	66	119	2.5%
	IE_SH_26_722 Lough Eidin	TP	*Poor*	0.085	62.5	19,315	19,338	2,529	0.1%

[16] Vollenweider, R. A. (1968) *Scientific fundamentals of stream and lake eutrophication with particular reference to nitrogen and phosphorus*. OECD Technical Report DAF/DST/88. Organisation of Economic Cooperation and Development, Paris.
[17] Distance to Threshold. Surrogate indicative quality in *italic*
[18] Baseline year is 2014.
[19] Surrogate indicative quality given in italic

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 5-4**). 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 5-4 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 5-5**, 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 5-4: Increased loading/concentration due to Orthophosphate Dosing – Dosing rate = 1.0 mg/l

Agglom. and Discharge Type	ELV from WWDL (Ortho P mg/l)	Scenario	TP Load Kg/Yr	Ortho P Concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	*0.4*	*0.68*
Boyle Primary Discharge	0.5	**Existing**	729.9	0.289	0.232	0.394
		Post Dosing	729.9	0.289	0.232	0.394
Boyle SWOs (3 no.)	n/a	**Existing**	132.9	1.809	1.447	2.461
		Post Dosing	139.8	1.904	1.523	2.590
Carrick-on-Shannon Primary Discharge	0.92 (Total P ELV)	**Existing**	140.9	0.058	0.047	0.079
		Post Dosing	140.9	0.058	0.047	0.079
Carrick-on-Shannon SWOs (11 no.)	n/a	**Existing**	102.6	1.454	1.163	1.978
		Post Dosing	104.7	1.484	1.187	2.018

Agglom. and Discharge Type	ELV from WWDL (Ortho P mg/l)	Scenario	TP Load Kg/Yr	Ortho P Concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	***0.4***	***0.68***
Leitrim Village Primary Discharge	1	**Existing**	91.3	0.380	0.304	0.517
		Post Dosing	91.3	0.380	0.304	0.517
Leitrim Village SWOs (3 no.)	n/a	**Existing**	10.2	1.461	1.169	1.988
		Post Dosing	10.2	1.464	1.171	1.990

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

Agglom.	RWB Name / Code for Primary Discharge	Background Conc.[20] (mg/l)	Modelled Conc. Existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc
Boyle (D0121)	IE_SH_26B080400 Boyle_030	0.0242	0.0250	0.0250	0.0
Carrick-on-Shannon (D0154)	IE_SH_26S021010 Shannon (Upper)_060	0.0087	0.0088	0.0088	0.0
Leitrim Village (D0278)	IE_SH_26S020550 Shannon (Upper)_050	0.0067	0.0067	0.0067	0.0

Boyle Agglomeration

The WWTP that serves the Boyle agglomeration (D0121) receives tertiary treatment (chemical dosing for phosphorus removal) and therefore it can be assumed that the entire additional load from orthophosphate dosing will be removed by the plant prior to discharge. The AER for the WWTP indicates the plant was compliant with ELV for orthophosphate in 2017. The final effluent is discharged to the river water body Boyle_030 (IE_SH_26B080400), which is hydrologically connected to Clooneen Bog SAC, Lough Forbes Complex SAC and Ballykenny-Fishertown Bog SPA through a series of rivers and lakes >30km downstream. When mean flows are taken into account the increase in the receiving water is not detectable (0.0%) (**Table 5-5**). Therefore, there is no risk of failing to achieve WFD objectives for Boyle_030 (IE_SH_26B080400) and its hydrologically connected European Sites as a result of dosing at Rockingham WTP.

Carrick-on-Shannon Agglomeration

The WWTP that serves the Carrick-on-Shannon agglomeration (D0154) receives tertiary treatment (nutrient removal – ferric dosing) and therefore it can be assumed that the entire additional load from orthophosphate dosing will be removed by the plant prior to discharge. The AER for the WWTP indicates the plant was compliant with ELV for orthophosphate in 2017. The final effluent is discharged to the Shannon (Upper)_060 (IE_SH_26S021010), which is hydrologically connected to Clooneen Bog SAC, Lough Forbes Complex SAC and Ballykenny-Fishertown Bog SPA. When mean flows are taken into account the increase in the receiving water is not detectable (0.0%) (**Table 5-5**). Therefore, there is no risk of failing to achieve WFD objectives for Shannon (Upper)_060 (IE_SH_26S021010) and its hydrologically connected European Sites as a result of dosing at Rockingham WTP.

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

Leitrim Village Agglomeration

The WWTP that serves the Leitrim Village agglomeration (D0278) receives tertiary treatment (nutrient removal – ferric dosing) and therefore it can be assumed that the entire additional load from orthophosphate dosing will be removed by the plant prior to discharge. The AER for the WWTP indicates the plant was compliant with ELV for orthophosphate in 2017. The final effluent is discharged to the Shannon (Upper)_050 (IE_SH_26S020550), which is hydrologically connected to Clooneen Bog SAC, Lough Forbes Complex SAC and Ballykenny-Fishertown Bog SPA. When mean flows are taken into account the increase in the receiving water is not detectable (0.0%) (**Table 5-5**). Therefore, there is no risk of failing to achieve WFD objectives for Shannon (Upper)_050 (IE_SH_26S020550) and its hydrologically connected European Sites as a result of dosing at Rockingham WTP.

5.3.4 Assessment of Indirect Impact from Subsurface Flow

5.3.4.1 Sub surface flows from leakage and DWWTP

Step 4 of the EAM model assesses the distributed inputs to river water bodies from subsurface pathways (**Appendix C**). The modelled increases in concentration due to subsurface pathways are insignificant in all water bodies, i.e. < 0.00125 mg/l (5% of the High / Good indicative quality boundary for surface water bodies). The groundwater waterbody Carrick-on-Shannon exhibits a baseline concentration (at one monitoring point) which exceeds the 75% of indicative quality upper threshold. Whilst the post dosing concentration also exceeds the 75% upper indicative quality threshold this is due to the baseline ortho P conc. The modelled conc. is only 0.0002mg/l which is not significant therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

The highest potential increase in concentration modelled for receiving water bodies is 0.0006 mg/l to Curlew Mountains (IE_SH_G_073) however this does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk to deterioration in the indicative quality of the water body as a result of dosing at Rockingham WTP.

There are no transitional or coastal water bodies directly affected by this WTP. Therefore, there will be no risk of deterioration in the ortho P indicative quality or of preventing the achievement of WFD objectives within hydrologically/ hydrogeologically connected surface water bodies due to orthophosphate dosing.

5.3.4.2 Groundwater assessment

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

The groundwater waterbody Carrick-on-Shannon exhibits a baseline concentration (at one monitoring point) which exceeds the 75% of indicative quality upper threshold. Whilst the post dosing concentration also exceeds the 75% upper indicative quality threshold this is due to the baseline ortho P conc. The modelled conc. is only 0.0002mg/l which is not significant therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

The groundwater body with the highest potential increase in orthophosphate concentration due to dosing is Curlew Mountains (IE_SG_G_073). In this case the potential increase is 0.0006 mg/l which does not exceed the 5% Good / Fail indicative quality boundary (0.00175 mg/l).

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

5.3.5 Combined Assessment

Table 4A of Appendix C provides details of the combined orthophosphate inputs to river water bodies from direct discharges, DWWTSs and leakage loads. The increased loads due to orthophosphate dosing are not predicted to be significant i.e. are <0.0125 mg/l (5% of High / Good indicative quality boundary). The dosing therefore poses no risk of deterioration in the indicative quality of the river water bodies identified in **Table 5-2**, or of preventing the achievement of WFD objectives.

As demonstrated by **Table 4B of Appendix C**, for those lake water bodies that are currently at good indicative quality (Lough Meelagh, Lough Key, Lough Arrow and Lough Gara), at moderate indicative quality (Fin Boyle), and poor indicative quality (Lough Oakport and Lough Eidin) the critical loading for oligotrophic conditions have already been exceeded except for Lough Meelagh. However, the additional loading as a result of the orthophosphate dosing will not result in a significant increase. For Lough Key (IE_SH_26_724), Lough Gara (IE_SH_26_721), Meelagh (IE_SH_26_711), Lough Oakport (IE_SH_26_721), Lough Eidin (IE_SH_26_722) and Arrow (IE_WE_35_159) the increases range from 0.1% to 2.5% and therefore the increase in orthophosphate will not significantly impact on the trophic status of these lakes. With regard to Meelagh (IE_SH_26_711), the percentage increase has been determined as 2.5%, however as stated above, the additional loading will not result in the critical loading for this lake being exceeded and it will therefore remain oligotrophic. An assessment of the trophic status, based on the OECD methodology, supports this with these lakes classified at the lower end of the mesotrophic range. The orthophosphate dosing will not result in any significant increase in the TP loading or alteration to trophic status.

Lough Arkedy (IE_WE_35_120) is also within the WSZ, however as it is upstream of any of the pathways for orthophosphate dosing load it will not be impacted and will not receive any additional load.

There are no transitional or coastal water bodies directly affected by this WTP.

5.3.6 Assessment of Cumulative Impacts from other WSZs

The cumulative impacts on the Shannon Catchments (HAs 24, 25, 26, 27), associated with the corrective water treatment at the additional WTPs listed below have been assessed in combination with Rockingham WTP. The common water bodies evaluated within the WSZs supplied by these WTPs have been summarised in

Table 5-6 and **Table 5-7** below:

- 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
- 021 Rossadrehid WTP – Galtee Regional
- 027 Athlone WTP – Athlone WSS
- 034 Lough Forbes WTP – Longford Central
- 040 Coolbawn WTP – Nenagh RWSS
- 049 Ballany WTP – Ballany High Level Reservoir
- 058 Ballinasloe Town WTP - Ballinasloe Public Supply
- 081 Ballinagard Springs WTP - Roscommon Central Water Supply Scheme
- 128 Longford Springs WTP Future Supply - Castlerea WSS
- 140 Lisbrock WTP - SRRWSS Lisbrock
- 161 Freemount WTP – Zone 4 Allow Regional
- 178 Clavin's Bridge WTP – Kells / Oldcastle WS
- 184 Foileen WTP – Cappamore Foileen Water Supply
- 185 Ballinlough / Loughglynn (Ballybane Springs) – Ballinlough / Loughglynn
- 190 Ironmils Pump Station - Ironmills
- 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.
- 355 Croom Bypass Pump Station - Croom Water Supply

The cumulative loads to common water bodies that are hydrologically connected to the WSZs supplied by these WTPs have been summarised in Table 5.A and Table 5.B of Appendix C and below in **Table 5-6** and **Table 5-7**. The modelled cumulative increases in orthophosphate concentration due to dosing will be insignificant, i.e. will not exceed 5% of the Good / High indicative quality boundary (0.00125 mg/l).

However the pre-dosing baseline concentration for Boyle_030 (IE_SH_26B080400), Fergus Estuary (IE_SH_060_1100) in summer and Upper Shannon Estuary (IE_SH_060_0800) in summer, exceed 75% of the orthophosphate indicative quality upper threshold. However the post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary for Boyle_030. The post dosing conc. exceeds the 75% upper indicative quality threshold for Upper Shannon Estuary (Summer) and Fergus Estuary (Summer); however this is due to the baseline ortho P conc. The modelled conc. is 0.0010mg/l and 0.0001mg/l respectively which is not significant therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

For those lake water bodies that are currently at high orthophosphate indicative quality or assumed to be at high indicative quality (**Table 5-7**), the additional loading will not result in the critical loading for these lakes to be exceeded and they will remain oligotrophic. For the remaining lakes that are currently at good, moderate or poor indicative quality, the critical loading for oligotrophic conditions has already been exceeded (with the exception of Meelagh); however the additional loading as a result of the orthophosphate dosing will not result in a significant increase to the loading. For Ross WH (IE_SH_26_498), Corry (IE_SH_26_710), Forbes (IE_SH_26_723), Key (IE_SH_26_724), Gara (IE_SH_26_728), Bofin LM (IE_SH_26_747a, Boderg (IE_SH_26_747b), Ree (IE_SH_26_750), Derg TN

(including HMWB section) (IE_SH_25_191), Oakport (IE_SH_26_721) and Eidin (IE_SH_26_722) the percentage increases in concentration range from 0.3-3.0%. Therefore, the increase in orthophosphate will not significantly impact on the orthophosphate indicative quality of these lakes. An assessment of the trophic status, based on the OECD methodology, supports this with these lakes classified at the upper end of the oligotrophic range or lower end of the mesotrophic range. The orthophosphate dosing will not result in any significant increase in the TP loading or alteration to trophic status.

The impact to the remaining receiving waters is also not significant as outlined in **Table 5, Appendix C** and **Table 5-6** below given that predicted increased in orthophosphate as a result of dosing are all <5% of the Good / High indicative quality boundary i.e. 0.00125mg/l and will not cause a deterioration in the orthophosphate indicative quality or prevent the achievement of the WFD objectives of the water bodies.

Table 5-6 Cumulative assessment of the increased loading and concentrations to receiving water bodies from Rockingham WTP and other WSZs proposed for corrective water treatment in the upstream catchments

EU Code_Name	Period	Ortho P Indicative Quality[21] and Trends[22]	Baseline Year 2014 and Conc.[23] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Conc. using 30%ile Flows (mg/l)	PO_4 Potential Baseline Conc. Following Dosing (mg/l)
IE_SH_26B080100 Boyle_010	n/a	*Moderate*	*0.046*	*0.051*	*202.4*	*0.0004*	*0.046*
IE_SH_26B080200 Boyle_020	n/a	High Downwards Far	0.017	0.019	206.9	0.0004	0.018
IE_SH_26B080400 Boyle_030	n/a	High Upwards Near	0.020	0.019	220.9	0.0004	0.021
IE_SH_26B080600 Boyle_040	n/a	High Downwards Far	0.010	0.019	243.9	0.0004	0.010
IE_SH_26W010200 Boyle_050	n/a	*Good*	*0.030*	*0.033*	*258.9*	*0.0004*	*0.030*
IE_SH_26S021010 Shannon (Upper)_060	n/a	High Far	0.009	0.019	280.2	0.0003	0.009
	n/a	High Far	0.010	0.019			0.010
IE_SH_26S021800 Shannon (Upper)_120	n/a	High	0.013	0.019	611.7	0.0002	0.013
		High	0.016	0.019			0.016
		High	0.012	0.019			0.012
		High	0.012	0.019			0.012

[21] Surrogate indicative quality in *italic*
[22] Distance to threshold
[23] Surrogate concentration indicated in *italic*

IE_SH_25S012000 Shannon (Lower)_010	n/a	High	0.011	0.019	1021.2	0.0002	0.011
IE_SH_060_0900 Limerick Dock	Summer	High (S)	0.007	0.019	7516.7	0.0010	0.008
	Winter	High (W)	0.012	0.019			0.013
IE_SH_060_0800 Upper Shannon Estuary	Summer	High (S)	0.020	0.019	8848.1	0.0010	0.021
	Winter	Good (W)	0.031	0.037			0.032
IE_SH_060_1100 Fergus Estuary	Summer	Good (S) None Far	0.032	0.030	1333.5	0.0001	0.032
	Winter	Good (W) Downwards Near	0.037	0.042			0.037
IE_SH_060_0300 Lower Shannon Estuary	Summer	High (S) Far	0.012	0.020	12412.9	0.0002	0.012
	Winter	Good (W) Far	0.025	0.036			0.025
IE_SH_060_0000 Mouth of the Shannon (HAs 23;27)	Summer	High (S)	*0.008*	0.019	13317.6	0.0001	0.008
	Winter	*Good (W)*	*0.033*	*0.040*			0.033

‡ Load from WWTP / SWO following treatment added.

* Trends are Statistically Significant.

** 2014 Baseline is inconsistent with Upper and Lower Thresholds for the given Ortho P indicative quality as reported in the WFD App

Table 5-7 Cumulative assessment of the increased loading and concentrations to lake water bodies from Rockingham WTP and other WSZs proposed for corrective water treatment in the upstream catchments

EU Code_Name Lakes	TP Indicative Quality[24] and Trends[25] (Distance to Threshold. Surrogate indicative quality in *italic*	Baseline Year 2014 and Conc.[26] (mg/l)	TP Total Dosing Load kg/yr	Estimated Areal Existing loading based on Vollenweider mg/m²/yr)	Estimated Areal Post dosing loading based on Vollenweider(mg/m²/yr)	Lc (mg/m²/yr)	% Increase
Ross WH IE_SH_26_498	*High*	*0.005*	0.1	95.3	95.8	236	0.5
Corry IE_SH_26_710	*High*	*0.005*	108.1	3509.0	3579.3	7,411	2.0
Forbes IE_SH_26_723	Moderate Downwards Far	0.0317	0.0525	14,250.6	14,294.4	4,941	0.3
	Moderate Downwards Far	0.0317	0.0525				
Key IE_SH_26_724	Good Downwards Far	0.019	0.021	1,224.7	1,233.6	785	0.7
Gara IE_SH_26_728	Good Upwards Near	0.021	0.021	753.4	756.3	519	0.4
Bofin LM IE_SH_26_747a	Good Downwards Near	0.0225	0.019	5,331.3	5,399.9	2,796	1.3
Boderg IE_SH_26_747b	Moderate Upwards Far	0.0258	0.0525	6,996.1	7,051.7	3,376	0.8
Ree IE_SH_26_750	Good Upwards Far	0.0206	0.019	475.7	479.1	405	0.7
	Good Upwards Far	0.0114	0.019				
	High Upwards Near	0.008	0.0075				
	Good Upwards Far	0.0158	0.019				
Derg TN (including HMWB section) IE_SH_25_191	Good Upwards Far	0.0199	0.019	803.1	810.4	735	0.9
	Good Upwards Far	0.0163	0.019				
Oakport IE_SH_26_721	Good	0.030	0.033	5,374.1	5,515.0	11,379	2.6
Eidin IE_SH_26_722	Good	0.030	0.033	1,136.2	1,170.0	2,534	3.0

[24] Surrogate indicative quality in *italic*
[25] Distance to threshold
[26] Surrogate concentration indicated in *italic*

5.3.7 Conclusions

The modelled increased orthophosphate dosing concentrations due to subsurface pathways are insignificant in all river water bodies, i.e. < 0.00125 mg/l (5% of the High / Good indicative quality boundary for surface water bodies) 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. The highest concentration modelled for receiving water bodies is 0.0006 mg/l to Curlew Mountains (IE_SH_G_073) groundwater body which is below the 5% Good/Fail indicative quality boundary (0.0175 mg/l). While Carrick-on-Shannon (IE_SH_G_048) groundwater body exhibits a post-dosing concentration exceeding 75% of indicative quality upper threshold, this is due to the baseline ortho P concentration. The modelled increase in concentration is 0.0002 mg/l which is not significant and therefore poses no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

The modelled concentrations for receiving lake water bodies indicate a 2.5% increase for Meelagh (IE_SH_26_711). However, the additional loading will not result in the critical loading for the lake to be exceeded and it will remain as oligotrophic. The remaining lake water bodies all had a percentage increase of ≤1%. It was concluded that orthophosphate dosing will not result in any significant increase in TP loading or trophic status.

The predicted loads to groundwater bodies range from not detectable (0.0000 mg/l) to low (0.0006 mg/l), however all groundwater bodies were < 0.00175 mg/l = 5% of the Good / Fail boundary. The Carrick-on-Shannon groundwater body has been referenced in the text above with regards to its post dosing concentration exceeding 75% of indicative quality upper threshold.

Increases in concentration for all remaining river water bodies are within the 5% Good / High indicative quality boundary threshold following dosing. Increases in all remaining groundwaters are within 5% if of the Good / Fail indicative quality boundary. There are no transitional or coastal water bodies directly affected by the Rockingham WTP.

The cumulative assessment of dosing at Rockingham WTP together with other WTPs which may be subject to dosing in the same catchments, has demonstrated that there will not be a significant effect on receiving water bodies. The pre-dosing baseline concentration for Boyle_030 (IE_SH_26B080400), Fergus Estuary (IE_SH_060_1100) in summer and Upper Shannon Estuary (IE_SH_060_0800) in summer, exceed 75% of the orthophosphate indicative quality upper threshold. However, the post-dosing increases in concentration do not exceed 5% of the High / Good indicative quality boundary for Boyle_030. The post dosing conc. exceeds the 75% upper indicative quality threshold for Upper Shannon Estuary (Summer) and Fergus Estuary (Summer); however, this is due to the baseline ortho P conc. The modelled conc. is 0.0010mg/l and 0.0001mg/l respectively which is not significant therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives. 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

Rockingham WTP is not located within or directly adjacent to the boundary of any European Site. The closest sites with potential to support hydrological connectivity to the proposed works are Lough Forbes Complex SAC and Ballykenny-Fishertown Bog SPA located approximately 45km downstream of the proposed works connected via the following water bodies: Demesne_010, Lough Key, Boyle_040, Oakport (lake), Boyle_050, Eidin (lake), Shannon (Upper)_060, Corry (lake), Shannon (Upper)_070, Tap North (lake), Tap South (lake), Boderg (lake), Bofin LM (lake) and Shannon (Upper)_080. Therefore, there is no potential for direct effects to the European Sites as a result of the construction of the corrective water treatment works at Rockingham WTP.

The site boundary for Rockingham WTP lies approximately 70m south of the Demense_010 (IE_SH_26D090760) river water body. Potential hydrological connectivity to European Sites has been excluded from further assessment, as discussed in **Table 4-1**. A treeline/hedgerow surrounds the WTP site, with the remaining distance comprising agricultural grassland, both of which will act as a buffer to limit surface run-off from the works area to the river. In addition, the nearest European Sites are significantly downstream of this point, as discussed in **Table 4-1**.

In addition, Rockingham WTP overlies the Carrick-on-Shannon (IE_SH_G_048) groundwater body. This is a large groundwater body that intersects nine European Sites: Callow Bog SAC, Cloonshanville Bog SAC, Lough Gara SPA, Annaghmore Lough (Roscommon) SAC, Urlaur Lakes SAC, Derrinea Bog SAC, Drumalough Bog SAC, Mullygollan Turlough SAC and finally Errit Lough SAC. Interference with the underlying water table is unlikely to occur owing to the nature of the construction works. The proposed construction works will be localised and contained within the WTP development boundary which comprises of made ground and scrub surrounded by a treeline/hedgerow. Any interference would be localised, minor and temporary. Therefore, there is no potential for likely significant effects on the receiving ground or surface water bodies and by extension those European Sites as a result of the construction of the corrective water treatment works at Rockingham WTP.

Therefore, it can be concluded on the basis of objective scientific information that the construction of the corrective water treatment works at Rockingham WTP, individually or in combination with other plans or projects, will not to have a likely 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 and the potential to impact upon the qualifying interests (habitats and species) identified in **Table 4-3** that are both water dependent and nutrient sensitive (**Appendix B**). The likelihood of significant effects on these habitats and species, in view of their Conservation Objectives, are assessed in detail below.

6.2.1 Lough Arrow SAC 001673

6.2.1.1 (3140) Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

Lough Arrow, located in Counties Sligo and Roscommon, is a large limestone lake that conforms to a type listed on Annex I of the E.U. Habitats Directive. The lake is sheltered on three sides by hills and is the source of the Unshin River. Lough Arrow is unusual in being a mesotrophic natural lake which has changed little in the last 40 years. It is largely spring-fed and very sheltered for its size and as such, is hydrologically different from most other lakes (NPWS, 2013)[27].

There are no nutrient specific targets in the SSCO for this habitat (NPWS, 2018[28]), the generic conservation objectives for Lough Arrow SAC is to maintain favourable conservation condition of the Annex I habitat for which the SAC has been selected.

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

- The river water body that is hydrologically connected to the site is Unshin_010 (IE_WE_35U010100);
- The lake water body connected to the site is Lough Arrow (IE_WE_35_159);
- The groundwater body hydrogeologically connected to the site is Gorteen (IE_WE_G_0028).

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**.

A small portion of the SAC is located within the WSZ, including Arkedy Lake which feeds into Lough Arrow. However Arkedy Lake will not receive any additional loading as a result of dosing at Rockingham WTP.

For Unshin_010 (IE_WE_35U010100) which connects the WSZ to the lake, the modelled post-dosing increase in orthophosphate concentration is not detectable (0.0000 mg/l) whilst the post-dosing concentration does not exceed 75% of indicative quality upper threshold. Therefore, there is no risk of deterioration in the orthophosphate indicative quality for the river, or of preventing the achievement of WFD objectives as a result of dosing at Rockingham WTP.

The modelled post-dosing increase in Lough Arrow (IE_WE_35_159) is 0.1% which will not result in a significant increase in concentration in the lake. Therefore, there is no risk of deterioration in the high (surrogate) orthophosphate indicative quality of the lake and there will be no alteration to the trophic status as a result of dosing.

The modelled post-dosing increase in concentration in the groundwater body Gorteen (IE_WE_G_0028) is not detectable (0.0000 mg/l) whilst the post-dosing concentration does not exceed 75% of indicative quality upper threshold. Therefore there is no risk of deterioration in the

[27] NPWS 2013 Lough Arrow SAC (001673) Site Synopsis
[28] NPWS 2018 Lough Arrow SAC 001673 Conservation Objectives

orthophosphate indicative quality for the groundwater body, or of preventing the achievement of WFD objectives as a result of dosing at Rockingham WTP.

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

6.2.2 Callow Bog SAC 000595

6.2.2.1 (7110) Active Raised Bogs, (7120) Degraded raised bogs still capable of natural regeneration, (7150) Depressions on peat substrates of the *Rhynchosporion*

Callow Bog is located approximately 7 km north-west of Frenchpark, Co. Roscommon, in the townlands of Callow or Runnawillin, Cloonmagunnaun, Keelbanada, Creggan and Ratra. It is situated on the south-western shore of Lough Gara. The site includes both areas of high bog and cutover. The high bog consists of five lobes dissected by roads and a stream. Overall the high bog is relatively flat with slight slopes north to Lough Gara. The high bog also supports a very large central flush. The River Lung flows near the north-western boundary of the site and there is a low-relief drumlin to the northwest of the bog. To the south, the raised bog is surrounded by agricultural land (NPWS, 2015[29]).

The SSCO identifies targets with regards to water quality, to ensure that water quality on high bog and transitional area remains close to natural reference conditions. Water chemistry within raised bogs is influenced by atmospheric inputs (rainwater). However, within soak systems, water chemistry is influenced by other inputs such as focused flow or interaction with underlying substrates. Water chemistry in marginal areas and lagg zone surrounding the high bog varies due to influences of different water types (bog water, regional groundwater, and runoff from surrounding mineral lands) (NPWS, 2016[30]).

Ombrotrophic peat waters found on the surface of raised bogs are characterised by low pH values (pH < 4.5) and also have low values of electrical conductivity. This is due to the fact that the raised bog system derives its mineral supply from precipitation, which is usually acidic and low in nutrients. Raised bog vegetation exchanges cations with protons to further reduce the pH. Hydrochemistry varies in the areas surrounding a raised bog. Locally, conditions may be similar to the high bog due to a dominance of water originating from the bog. However, elsewhere in the marginal areas, there may be increased mineral and nutrient content of the water due to regional groundwater influences, run-off from surrounding mineral soils, and the release of nutrients through oxidation of peat resulting from reduced water levels.

Based on the close ecological relationship between these three habitats types, it is not necessary to set SSCOs for all three habitats individually. 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 the other two habitats would also be achieved (NPWS, 2016)[30].

[29] NPWS 2015 Callow Bog SAC 000595 Site Synopsis
[30] NPWS 2016 Callow Bog SAC 000595 Conservation Objectives

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

- The river water body connected to the site is Boyle_010 (IE_SH_26B080100); and
- The groundwater bodies connected to the site include Curlew Mountains (IE_SH_G_073) and Carrick-on-Shannon (IE_SH_G_048).

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**.

Active raised bog habitat was mapped at 11.4 ha, while degraded raised bog on the high bog has been modelled as 48.4 ha[30]. It is estimated that only 33.9 ha is potentially restorable to active raised bog by drain blocking. The *Rhychosporion* habitat occurs in wet depressions, pool edges and erosion channels 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 panacea*).

The site is located on Boyle_010 (IE_SH_26B080100), however this is upstream of the WSZ and therefore there the SAC will not receive water from the WSZ that has been subject to dosing.

For groundwater bodies, the potential increase in orthophosphate concentration is 0.0006 mg/l for Curlew Mountains (IE_SH_G_073) and 0.0002 mg/l Carrick-on-Shannon (IE_SH_G_048). Neither water body exceeds the 5% Good / Fail indicative quality boundary, i.e. <0.00175 mg/l. The post dosing concentration for Carrick-on-Shannon exceeds 75% of indicative quality upper threshold but this is due to the baseline Ortho P concentration. As stated, the modelled increase in Ortho P concentration for Carrick-on-Shannon does not exceed 5% Good / Fail indicative quality boundary hence there is no risk of deterioration in the indicative quality of the groundwater bodies as a result of dosing at Rockingham WTP, or of preventing the achievement of WFD objectives.

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

6.2.3 Tullaghanrock Bog SAC 002354

6.2.3.1 (7110) Active Raised Bogs, (7120) Degraded raised bogs still capable of natural regeneration, (7150) Depressions on peat substrates of the *Rhynchosporion*

Tullaghanrock Bog is situated approximately 5 km east of Ballaghaderreen, Co. Roscommon, and is located in the townlands of Tullaghan Rock and Creggan. The site comprises a raised bog that includes both areas of high bog and cutover bog. The southern and eastern margins are bounded by the River Lung and the old Ballaghaderreen railway line adjoins the north-west margin (NPWS, 2014[31]).

[31] NPWS 2014 Tullaghanrock Bog SAC 002354 Site Synopsis

The SSCO identifies targets with regards to water quality, to ensure that water quality on high bog and transitional area remains close to natural reference conditions. Water chemistry within raised bogs is influenced by atmospheric inputs (rainwater). However, within soak systems, water chemistry is influenced by other inputs such as focused flow or interaction with underlying substrates. Water chemistry in marginal areas and lagg zone surrounding the high bog varies due to influences of different water types (bog water, regional groundwater, and runoff from surrounding mineral lands) (NPWS, 2015[32]).

Based on the close ecological relationship between these three habitats types, it is not necessary to set SSCOs for all three habitats individually. 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 the other two habitats would also be achieved (NPWS, 2015)[32].

Ombrotrophic peat waters found on the surface of raised bogs are characterised by low pH values (pH < 4.5) and also have low values of electrical conductivity. This is due to the fact that the raised bog system derives its mineral supply from precipitation, which is usually acidic and low in nutrients. Raised bog vegetation exchanges cations with protons to further reduce the pH. Hydrochemistry varies in the areas surrounding a raised bog. Locally, conditions may be similar to the high bog due to a dominance of water originating from the bog. However, elsewhere in the marginal areas, there may be increased mineral and nutrient content of the water due to regional groundwater influences, run-off from surrounding mineral soils, and the release of nutrients through oxidation of peat resulting from reduced water levels.

Table 5-2 identifies the groundwater body which is hydrogeologically connected to Tullaghanrock Bog SAC and will receive inputs from the proposed orthophosphate dosing at Rockingham WTP:

- The groundwater body connected to the site is Curlew Mountains (IE_SH_G_073).

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**.

Active raised bog habitat was mapped at 11.0 ha while the area of degraded raised bog on the high bog was modelled at 3.9 ha. It is considered that the full 3.9 ha is potentially restorable to active raised bog by drain blocking[32]. The *Rhychosporion* habitat occurs in wet depressions, pool edges and erosion channels 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 panacea*)[31].

For the groundwater body, the potential increase in orthophosphate concentration is 0.0006 mg/l for Curlew Mountains (IE_SH_G_073). This does not exceed 5% Good / Fail indicative quality boundary, i.e. <0.00175 mg/l whilst the post-dosing concentration does not exceed 75% of indicative quality upper threshold. Therefore, there is no risk of deterioration in the orthophosphate indicative quality of the groundwater body as a result of dosing at Rockingham WTP, or of preventing the achievement of WFD objectives.

[32] NPWS 2015 Tullaghanrock Bog SAC 002354 Conservation Objectives

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

6.2.4 Lough Arrow SPA 004050

Lough Arrow is a large limestone lake situated almost entirely within Co. Sligo with a small section extending into Co. Roscommon (NPWS, 2014)[33]. It is sheltered on three sides by hills and is the source of the Unshin River which flows north-westwards from its northern end. It has a relatively small catchment and is largely spring-fed. The average depth of water is 9 m (max. 33 m) and the lake is classified as a mesotrophic system. There is a well-developed submerged aquatic flora, with a notable *charophyte* community.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe and Tufted Duck. 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 and Waterbirds[33].

Lough Arrow supports nationally important populations of Little Grebe and Tufted Duck. Other species include Whooper Swan, Goldeneye, Great Crested Grebe and Coot. It is a breeding site for a number of species including Great Crested Grebe, Common Scoter, Tufted Duck and Red-breasted Merganser. Common Gull and Lesser Black-backed Gull also breed on islands in the lake.

In relation to protected water-dependent habitats and species under the Birds and Habitats Directive, the river basin management planning process contributes towards achieving water conditions that support Favourable Conservation Status. In preparing the RBMP (2018-2021) (DHPLG, 2018[34]) 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.

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

- The river water body that is hydrologically connected to the site is Unshin_010 (IE_WE_35U010100);
- The lake water body connected to the site is Lough Arrow (IE_WE_35_159);
- The groundwater body hydrogeologically connected to the site is Gorteen (IE_WE_G_0028).

[33] NPWS 2014 Lough Arrow SPA 004050 Site Synopsis
[34] DHPLG (2017) Public consultation on The River Basin Management Plan for Ireland (2018-2021). Available at: http://www.housing.gov.ie/sites/default/files/public-consultation/files/draft_river_basin_management_plan_1.pdf

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**.

For Unshin_010 (IE_WE_35U010100) which connects the WSZ to the lake, the modelled post-dosing increase in orthophosphate concentration is not detectable (0.0000 mg/l) and the post-dosing concentration does not exceed 75% of indicative quality upper threshold. Therefore, there is no risk of deterioration in the orthophosphate indicative quality for the river, or of preventing the achievement of WFD objectives as a result of dosing at Rockingham WTP.

The modelled post-dosing increase in Lough Arrow (IE_WE_35_159) is 0.1% which will not result in a significant increase in concentration in the lake. Therefore, there is no risk of deterioration in the high (surrogate) orthophosphate indicative quality of the lake and there will be no alteration to the trophic status as a result of dosing.

The modelled post-dosing increase in concentration in the groundwater body Gorteen (IE_WE_G_0028) is not detectable (0.0000 mg/l) whilst the post-dosing concentration does not exceed 75% of indicative quality upper threshold. Therefore, there is no risk of deterioration in the orthophosphate indicative quality for the groundwater body, or of preventing the achievement of WFD objectives as a result of dosing at Rockingham WTP.

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

6.2.5 Lough Gara SPA 004048

Lough Gara is located on the Co. Sligo/Roscommon border south-west of the Curlew Mountains and between the towns of Boyle and Ballaghaderreen. Most of the lake is in Co. Sligo, but two sections in the south and north-east lie within Co. Roscommon. It is a shallow (maximum depth 16 m), medium-sized lake, which overlies Carboniferous limestones and shales, and Devonian sandstone. The main inflowing river is the River Lung while the main outflow is the Boyle River (NPWS, 2014[35]). The site is a SPA under the E.U. Birds Directive, of special conservation interest for the following species: Whooper swan (*Cygnus cygnus*) and Greenland white fronted goose (*Anser albifrons flavirostris*)

In relation to protected water-dependent habitats and species under the Birds and Habitats Directive, the river basin management planning process contributes towards achieving water conditions that support Favourable Conservation Status. In preparing the RBMP (2018-2021) (DHPLG, 2018[36]) 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

[35] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004048.pdf
[36] DHPLG (2017) Public consultation on The River Basin Management Plan for Ireland (2018-2021). Available at: http://www.housing.gov.ie/sites/default/files/public-consultation/files/draft_river_basin_management_plan_1.pdf

environmental supporting conditions have not been defined within SSCOs by the NPWS. This is the case for SPA birds and wetlands.

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

- The river water bodies connected to the site include: Boyle_010 (IE_SH_26B080100) and Derrymaquirk_010 (IE_SH_26D110290);
- The lake water body connected to the site is Lough Gara (IE_SH_26_728); and
- The groundwater bodies connected to the site include Curlew Mountains (IE_SH_G_073) and Carrick-on-Shannon (IE_SH_G_048).

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**.

Boyle_010 (IE_SH_26B080100) comprises a number of small streams that form the inflow and outflow of Lough Gara. Several of these small streams originate within the WSZ. The modelled post-dosing increase in concentration for this river is not detectable (0.0000 mg/l). Derrymaquirk_010 (IE_SH_26D110290) also flows directly from the WSZ to the outflow of the lake and the modelled post-dosing increase in concentration is negligible (0.0001 mg/l). Neither of the river water bodies have modelled increases in concentration that exceed 5% of the High / Good indicative quality boundary whilst the post-dosing concentration of both river waterbodies does not exceed 75% of indicative quality upper threshold. Therefore, there is no risk of deterioration in the indicative quality of the river water bodies as a result of dosing at Rockingham WTP, or of preventing the achievement of WFD objectives.

Lough Gara is at good indicative quality; however the critical loading for oligotrophic conditions has already been exceeded. The additional loading as a result of orthophosphate dosing will not result in a significant increase (0.1%) and therefore will not impact the trophic status of the lake.

For groundwater bodies, the potential increase in orthophosphate concentration is 0.0006 mg/l for Curlew Mountains (IE_SH_G_073) and 0.0002 mg/l Carrick-on-Shannon (IE_SH_G_048). Neither of the groundwater bodies exceed 5% of the Good / Fail indicative quality boundary, i.e. <0.00175 mg/l. The post dosing concentration for Carrick-on-Shannon exceeds 75% of indicative quality upper threshold but this is due to the baseline Ortho P concentration. As stated, the modelled increase in Ortho P concentration for Carrick-on-Shannon does not exceed 5% Good / Fail indicative quality boundary. Therefore there is no risk of deterioration in the orthophosphate indicative quality of the groundwater bodies as a result of dosing at Rockingham WTP, 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 orthophosphate indicative quality of the water bodies that support the structure and function of the SPA; the additional loading from the orthophosphate dosing will therefore not result in any likely significant effect on the maintenance or restoration of favourable conservation status of its SCIs, either in terms of individual bird species or wetland habitats.

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

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

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

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

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

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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Roscommon County Development Plan 2022 - 2028 The plan outlines under Water Services 7.8 the following objectives: ▪ ITC 7.34: Support Irish Water [Uisce Éireann] in the implementation of their capital investment programme to ensure the timely delivery of water and waste-water infrastructure for the county. ▪ ITC 7.35: Collaborate with Irish Water [Uisce Éireann] in relation to the preparation of their Investment Plans in order to accommodate the target population and employment potential of the county in accordance with the statutory obligations set out in EU and national policy and in line with the Core Strategy and Settlement Hierarchy set out in this Plan. ▪ ITC 7.36: Protect both ground and surface water resources including taking account of the impacts of climate change, support the implementation of the Rural Water Programme and to support Irish Water [Uisce Éireann] in the development and implementation of Drinking Water Safety Plans and the National Water Resources Plan ▪ ITC 7.37: Ensure the efficient and sustainable use and development of water resources and water services infrastructure, in order to manage and conserve water resources in a manner that supports a healthy society, economic development requirements and a cleaner environment. ▪ ITC 7.38: Work with all stakeholders to promote water conservation and sustainable water usage. ▪ ITC 7.39: Ensure that new development proposals connect into the existing public water mains, where available. These will be subject to a connection agreement with Irish Water [Uisce Éireann]. ▪ Ob 4.41: Control development within the existing source protection areas in accordance with the recommendations in existing source protection plans and only allow development in these areas where no reasonable alternative exists.	▪ N/A	The County Development Plan emphasis the objectives for water services in the county which include the enhancement and improved quality of the service to its consumers. The plan also outlines the importance of compliance with the River Basin Management Plan (now replaced by the RBMP 2018-2021), and emphasises compliance with environmental objectives. There is no potential for cumulative impacts with these plans.
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.	▪ N/A	The objectives of the RBMP are to • Prevent deterioration; • Restore good status;

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
The 3rd cycle of River Basin Management Plan (RBMP) for the period of 2022-2027 is currently being prepared by Department of Housing, Local Government and Heritage (DHLGH) in line with the EU Water Framework Directive (WFD) (2000/60/EC). The document (Chapter 3) sets out the condition of 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. Chapter 3 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each water body that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2027. This work was presented in the RBMP for 4,842 water bodies nationally. 1,603 water bodies were classed *At Risk* or 33%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 1,000 water bodies that are *At Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.		• Reduce chemical pollution; and • Achieve water related protected areas objectives The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each water body. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of this plan will have a positive impact on biodiversity and the Project will not affect the achievement of the RBMP objectives given the detailed assessment of the effects of dosing on water body environmental objectives under the EAM.
Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive The Office of Public Works (OPW) is responsible for the implementation of the Floods Directive 2007/60/EC which is being carried out through a Catchment based Flood Risk Assessment and Management (CFRAM) Programme. As part of the directive Ireland is required to undertake a Preliminary Flood Risk Assessment, to identify areas of existing or potentially significant future flood risk and to prepare flood hazard and risk maps for these areas. Following this, flood risk management plans are developed for these areas setting objectives for managing the flood risk and setting out a prioritised set of measures to achieve the objectives. The CFRAM programme is currently being rolled out and Draft Flood Risk Management Plans have been prepared. These plans have been subject AA.	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Alterations to water quality and/or water movement; ▪ Disturbance; ▪ In-combination impacts within the same scheme.	CFRAM Studies and their product Flood Risk Management Plans, will each undergo appropriate assessment. Any future flood plans will have to take into account the design and implementation of water management infrastructure as it has the potential to impact on hydromorphology and potentially on the ecological status and favourable conservation status of water bodies. The establishment of how flooding may be contributing to deterioration in water quality in areas where other relevant pressures are absent is a significant consideration in terms of achieving the objectives of the WFD. The AA of the plans will need to consider the potential for impacts from hard engineering solutions and

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
		how they might affect hydrological connectivity and hydromorphological supporting conditions for protected habitats and species. There is no potential for cumulative impacts with the CFRAMS programme as no infrastructure is proposed as part of this project.
Foodwise 2025 Foodwise 2025 strategy identifies significant growth opportunities across all subsectors of the Irish agri-food industry. Growth Projection includes increasing the value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	Foodwise 2025 was subject to its own AA[37]. Growth is to be achieved through sustainable intensification to maximise production efficiency whilst minimising the effects on the environment however there is increased risk of nutrient discharge to receiving waters and in turn a potential risk to biodiversity and Europe Sites if not controlled. With the required mitigation in the Food Wise Plan, no significant in-combination impacts are predicted. Mitigation measures included cross compliance with 13 Statutory Management Requirements, EIA Agricultural Regulations 2011, GLAS, and AA Screening of licencing and permitting in the forestry and seafood sectors.
Rural Development Programme 2014 – 2020 The agricultural sector is actively enhancing competitiveness whilst trying to achieve more sustainable management of natural resources. The common set of objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2020 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while improvements are sought in relation to water management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and	▪ Overgrazing; ▪ Land use change or ▪ intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	The RDP for 2014 – 2020 has been subject to SEA[38], and AA[39]. 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,

[37] http://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/environmentalanalysis/AgriFoodStrategy2025NISDRAFT300615.pdf
[38] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf
[39] https://www.agriculture.gov.ie/media/migration/agarchive/ruralenvironment/preparatoryworkfortherdp2014-2020/RDP20142020DraftAppropriateAssessmentReport160514.pdf

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Targeted Agriculture Modernisation Scheme (TAMS). They provide the role of a supportive measure to improve water quality and thus provide direct benefits in achieving the measures within the RBMP. The achievement of the objectives outlined within GLAS, to improve water quality, mitigate against climate change and promote biodiversity will be of direct positive benefit in achieving the measures within the RBMP and the goals of the Natura Directives. The scheme has an expected participation for 2014-2020 of 50,000 farmers which have to engage in specific training and tasks in order to receive full payment. Farmers within the scheme must have a nutrient management plan which is a strategy for maximising the return from on and off-farm chemical and organic fertilizer resources. This has a direct positive contribution towards protecting water bodies from pollution through limiting the amount of fertiliser that is placed on the land. The scheme prioritises farms in vulnerable catchments with 'high status' water bodies and also focuses on educating farmers on best practices to try and improve efficiency along with environmental outcomes. The TAMS scheme is open to all farmers and is focused on supporting productive investment for modernisation. This financial grant for farmers is focused on the pig and poultry sectors, dairy equipment and the storage of slurry and other 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.		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.
National Nitrates Action Programme Ireland is obliged under the Nitrates Directive 91/676/EEC to prepare a National Nitrates Action Programme which is designed to prevent pollution of surface and ground waters from agricultural sources. This will directly contribute to the improvement of water quality and thus the objectives within the RBMP. Ireland's third Nitrates Action Programme came into operation in 2014 and has a timescale up to 2017. The Agricultural Catchments Programme is an ongoing programme that monitors the efficiency of various measures within the nitrate regulations. It is spread across six catchments and encompasses approximately 300 farmers.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	This programme has been subject to a Screening for Appropriate Assessment and it concluded that the NAP will not have a significant effect on the Natura 2000 network and a Stage 2 AA was not required[40]. 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

[40] http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad,35218,en.PDF

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
		strategy would have to operate within the constraints of the NAP.
Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) / Forestry Programme 2014 - 2020 Ireland's forestry sector is striving to increase forestry cover and one of the recommended policy actions in the Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) is to increase the level of afforestation annually over time and support afforestation and mobilisation measures under the Forestry Programme 2014-2020. Two key objectives within the Forestry Programme 2014-2020 that will influence the RBMP are to increase Ireland's forest cover to 18% and to establish 10,000 ha of new forests and woodlands per annum. As part of this programme there are a number of schemes that promote sustainable forest management and they include the Afforestation Scheme, the Woodland Improvement Scheme, the Forest Road Scheme and the Native Woodland Conservation Scheme. Under the Native Woodland Conservation Scheme funding is provided to restore existing native woodland which promotes Ireland's native woodland resource and associated biodiversity. Native woodlands provide wider ecosystem functions and services which once restored can contribute to the protection and enhancement of water quality and aquatic habitats. New guidance and plans are also being developed to address forestry adjacent to water bodies, Freshwater Pearl Mussel Plans for 8 priority catchments and a Hen Harrier Threat Response Plan (NPWS). The mitigation measures within these plans will be particularly important in terms of protecting sensitive habitats and species from such forestry increases.	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Water quality changes; ▪ Disturbance to species.	Ireland's Forestry Programme 2014 – 2020 has undergone AA[41]. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts and the proximity of Natura 2000 habitats and species should be taken into account when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there is no potential for cumulative impacts with the proposed project.
Water Services Strategic Plan (WSSP, 2015) 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	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity;	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.

[41] https://www.agriculture.gov.ie/media/migration/forestry/publicconsultation/newforestryprogramme2014-2020/nis/ForestryProgrammeNaturalImpactStatement290914.pdf

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
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.	▪ Nutrient enrichment /eutrophication.	
National Wastewater Sludge Management Plan (2016) The National Wastewater Sludge Management Plan was prepared in 2015, outlining the measures needed to improve the management of wastewater sludge.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	The plan was subject to both AA and SEA and includes a number of mitigation measures which were identified in relation to transport of materials, land spreading of sludge and additional education and research requirements. This plan does not specifically address domestic wastewater loads, only those relating to Uisce Éireann facilities. In relation to the plan as it stands, no in-combination effects are expected with the implementation of proposed mitigation measures.
National Water Resources Plan (in prep.) This Framework will deliver a sustainable water supply on a catchment and water resource zone basis, meeting growth and demand requirements through drought and critical periods. The resources plan will need to take account of WFD objectives and the programme of measures proposed in the relevant catchments and water resource zones. Specific measures in the plan with relevance to 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.	▪ Increased abstractions leading to changes / pressure on existing hydrology / hydrogeological regimes.	The plan will seek to develop sustainable water supplies but must consider particularly critical drought periods when assimilation capacity for diffuse runoff may be reduced. The potential for in-combination impacts are unclear as the plan is not sufficiently developed at this stage.
Planning Applications There are a large number of planning applications approved, pending or recently approved within the Boyle Ardcarne WSZ, particularly within the vicinity of Boyle town and its surrounding townlands. The applications are predominantly for the construction of new infrastructure or renovations to existing infrastructure. These include for housing, retention or demolition of buildings and the construction of agricultural buildings.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity;	Adherence to the overarching policies and objectives of the Roscommon County Development Plan 2014-2020 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.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
	▪ Nutrient enrichment /eutrophication.	
Integrated Pollution Control (IPC) Licensing There are no IPC licensed facilities within the Boyle Ardcarne WSS.	▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	The EPA is responsible for monitoring emissions and dealing with any infringements on IPC licences. All emissions must be within set limits which must not be contravened. Limits are set for phosphorus where relevant. Compliance with the limits set for phosphorus will ensure that there will be no significant in-combination impacts on Natura 2000 sites.

7 SCREENING CONCLUSION STATEMENT

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

The appraisal undertaken in this Screening assessment has been informed by an EAM (see **Appendix C**) with reference to the ecological communities and habitats potentially affected by the proposed project, in order to provide a scientific basis for the evaluations.

During the construction phase of the corrective water treatment works at Rockingham WTP, the potential for direct, indirect and cumulative impacts affecting European Sites within the ZoI (i.e. Callow Bog SAC, Annaghmore Lough (Roscommon) SAC, Mullygollan Turlough SAC, Cloonshanville Bog SAC, Drumalough Bog SAC, Errit Lough SAC, Derrinea Bog SAC, Urlaur Lakes SAC and Lough Gara SPA) has been assessed. There will be no significant direct, indirect or cumulative impacts that will result in likely significant effects to the qualifying interests/special conservation interests of the European Sites within the ZoI.

During the operational phase, the potential for direct, indirect and cumulative impacts affecting European Sites within the ZoI including; Lough Arrow SAC, Callow Bog SAC, Tullaghanrock Bog SAC, Lough Arrow SPA and Lough Gara SPA have been assessed. Due to the low orthophosphate inputs following dosing at Rockingham WTP and no risk of deterioration in the status of the receiving water bodies, 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 Rockingham 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.

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora.

DEHLG (2010). Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning *Authorities.* Produced by the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Environment Agency (2006). Use and design of oil separators in surface water drainage systems: PPG 3.https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290142/pmho0406biyl-e-e.pdf.

EPA (2010) Methodology for establishing groundwater threshold values and the assessment of chemical and quantitative status of groundwater, including an assessment of pollution trends and trend reversal. 57 pp.
http://www.epa.ie/pubs/reports/water/ground/Methodology%20for%20Groundwater%20Chemical%20&%20Quantitative%20Status%20Methology,%20TVs%20and%20Trends.pdf

European Commission (2000a) Communication from the Commission on the Precautionary Principle, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2000b). *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. Office for Official Publications of the European Communities, Luxembourg.

European Commission (2002). *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*. Office for Official Publications of the European Communities, Luxembourg.

European Commission (2011). *Guidelines on the Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones, with particular attention to port development and dredging*. European Communities (Natural Habitats) Regulations (S.I. No. 477 of 2011)

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). *Red Lists Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

NPWS (2009). *Threat response plan: otter (2009 - 2011).* National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

NPWS (2013a) Article 17 Overview Report (Vol. 1) The Status of EU Protected Habitats and Species in Ireland.

NPWS (2013b) Article 17 Habitat Conservation Assessments (Vol. 2) Version 1.1. The Status of EU Protected Habitats and Species in Ireland.

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

UKTAG (2009) Reporting confidence in groundwater status assessments. 4pp. http://www.wfduk.org/resources%20/reporting-confidence-groundwater-status-ssessments

Vollenweider, R. A. (1968) Scientific fundamentals of stream and lake eutrophication with particular reference to nitrogen and phosphorus. OECD Technical Report DAF/DST/88. Organisation of Economic Cooperation and Development, Paris.

APPENDIX A

European Sites

A full listing of the COs and QIs/ SCIs for each European Site, as well as the attributes and targets to maintain or restore the QIs/ SCIs to a favourable conservation condition, are available from the NPWS website www.npws.ie. Links to the COs for the European Sites relevant to this Screening for AA are provided below.

Site Name (Code)	Conservation Objectives Source
Lough Arrow SAC (001673)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO001673.pdf
Callow Bog SAC (000595)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000595.pdf
Tullaghanrock Bog SAC (002354)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002354.pdf
Lough Arrow SPA (004050)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004050.pdf
Lough Gara SPA (004048)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004048.pdf

APPENDIX B

Nutrient Sensitive Qualifying Interests

Water dependant and nutrient sensitive SAC species

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

Water dependant and nutrient sensitive SAC habitats

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
1110	Sandbanks which are slightly covered by sea water all the time	Yes		Yes
1130	Estuaries	Yes		Yes
1140	Mudflats and sandflats not covered by seawater at low tide	Yes		Yes
1150	Coastal lagoons	Yes		Yes
1160	Large shallow inlets and bays	Yes		Yes
1170	Reefs	Yes		Yes
1180	Submarine structures made by leaking gases	No		No
1210	Annual vegetation of drift lines	Yes		Yes
1220	Perennial vegetation of stony banks	Yes		No
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	Yes		Yes
1310	Salicornia and other annuals colonising mud and sand	Yes		Yes
1320	Spartina swards (*Spartinion maritimae*)	No		No
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes	Yes
1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes	Yes
1420	Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)	Yes		Yes
2110	Embryonic shifting dunes	Yes		Yes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	Yes		Yes
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)	Yes		Yes
2140	Decalcified fixed dunes with *Empetrum nigrum*	Yes		Yes
2150	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)	Yes		Yes
2170	Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)	Yes	Yes	Yes
2190	Humid dune slacks	Yes	Yes	Yes
21A0	Machairs (* in Ireland)	Yes	Yes	Yes
3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	Yes		Yes
3130	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*	Yes		Yes
3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.	Yes		Yes
3150	Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation	Yes		Yes
3160	Natural dystrophic lakes and ponds	Yes		Yes
3180	Turloughs	Yes	Yes	Yes
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Yes		Yes
3270	Rivers with muddy banks with *Chenopodion rubri* p.p. and Bidention p.p. vegetation	Yes	Yes	Yes
4010	Northern Atlantic wet heaths with *Erica tetralix* (Flushes only)	Yes	Yes	Yes
4030	European dry heaths	No		Yes
4060	Alpine and Boreal heaths	No		No
5130	*Juniperus communis* formations on heaths or calcareous grasslands	No		No

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
6130	Calaminarian grasslands of the *Violetalia calaminariae*	No (flood risk)*		Yes
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	No (flood risk)*		Yes
6230	Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)	No		No
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	Yes	Yes	Yes
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	Yes	Yes	Yes
6510	Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)	No (flood risk)*		Yes
7110	Active raised bogs	Yes	Yes	Yes
7120	Degraded raised bogs still capable of natural regeneration	Yes	Yes	Yes
7130	Blanket bogs (* if active bog)	Yes	Yes	Yes
7140	Transition mires and quaking bogs	Yes	Yes	Yes
7150	Depressions on peat substrates of the *Rhynchosporion*	Yes	Yes	Yes
7210	Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	Yes	Yes	Yes
7220	Petrifying springs with tufa formation (*Cratoneurion*)	Yes	Yes	Yes
7230	Alkaline fens	Yes	Yes	Yes
8110	Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)	No		No
8120	Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)	No		No
8210	Calcareous rocky slopes with chasmophytic vegetation	No		No
8220	Siliceous rocky slopes with chasmophytic vegetation	No		No
8240	Limestone pavements	No		Yes
8310	Caves not open to the public	Yes	Yes	Yes
8330	Submerged or partially submerged sea caves	Yes		Yes
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	No		Yes
91D0	Bog woodland	Yes	Yes	Yes
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Yes	Yes	Yes
91J0	Taxus baccata woods of the British Isles	No		No

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

Water dependant and nutrient sensitive SPA birds

Code	Species of special conservation interest	Water dependant	Nutrient sensitive
A001	Red-throated Diver (*Gavia stellata*)	Yes	Yes
A003	Great Northern Diver (*Gavia immer*)	Yes	Yes
A004	Little Grebe (*Tachybaptus ruficollis*)	Yes	Yes
A005	Great Crested Grebe (*Podiceps cristatus*)	Yes	Yes
A009	Fulmar (*Fulmarus glacialis*)	Yes	Yes
A013	Manx Shearwater (*Puffinus puffinus*)	Yes	Yes
A014	Storm Petrel (*Hydrobates pelagicus*)	Yes	Yes
A015	Leach's Storm-petrel (*Oceanodroma leucorhoa*)	Yes	Yes
A016	Gannet (*Morus bassanus*)	Yes	Yes
A017	Cormorant (*Phalacrocorax carbo*)	Yes	Yes
A018	Shag (*Phalacrocorax aristotelis*)	Yes	Yes
A028	Grey Heron (*Ardea cinerea*)	Yes	Yes
A037	Bewick's Swan (*Cygnus columbianus bewickii*)	Yes	Yes
A038	Whooper Swan (*Cygnus cygnus*)	Yes	Yes
A043	Greylag Goose (*Anser anser*)	Yes	Yes
A045	Barnacle Goose (*Branta leucopsis*)	Yes	Yes
A046	Light-bellied Brent Goose (*Branta bernicla hrota*)	Yes	Yes
A048	Shelduck (*Tadorna tadorna*)	Yes	Yes
A050	Wigeon (*Anas penelope*)	Yes	Yes
A051	Gadwall (*Anas strepera*)	Yes	Yes
A052	Teal (*Anas crecca*)	Yes	Yes
A053	Mallard (*Anas platyrhynchos*)	Yes	Yes
A054	Pintail (*Anas acuta*)	Yes	Yes
A056	Shoveler (*Anas clypeata*)	Yes	Yes
A059	Pochard (*Aythya ferina*)	Yes	Yes
A061	Tufted Duck (*Aythya fuligula*)	Yes	Yes
A062	Scaup (*Aythya marila*)	Yes	Yes
A063	Eider (*Somateria mollissima*)	Yes	Yes
A065	Common Scoter (*Melanitta n*igra)	Yes	Yes
A067	Goldeneye (*Bucephala clangula*)	Yes	Yes
A069	Red-breasted Merganser (*Mergus serrator*)	Yes	Yes
A082	Hen Harrier (*Circus cyaneus*)	Yes	Yes
A098	Merlin (*Falco columbarius*)	Yes	Yes
A103	Peregrine (*Falco peregrinus*)	Yes	Yes
A122	Corncrake (*Crex crex*)	Yes	Yes
A125	Coot (*Fulica atra*)	Yes	Yes
A130	Oystercatcher (*Haematopus ostralegus*)	Yes	Yes
A137	Ringed Plover (*Charadrius hiaticula*)	Yes	Yes
A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes
A141	Grey Plover (*Pluvialis squatarola*)	Yes	Yes

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

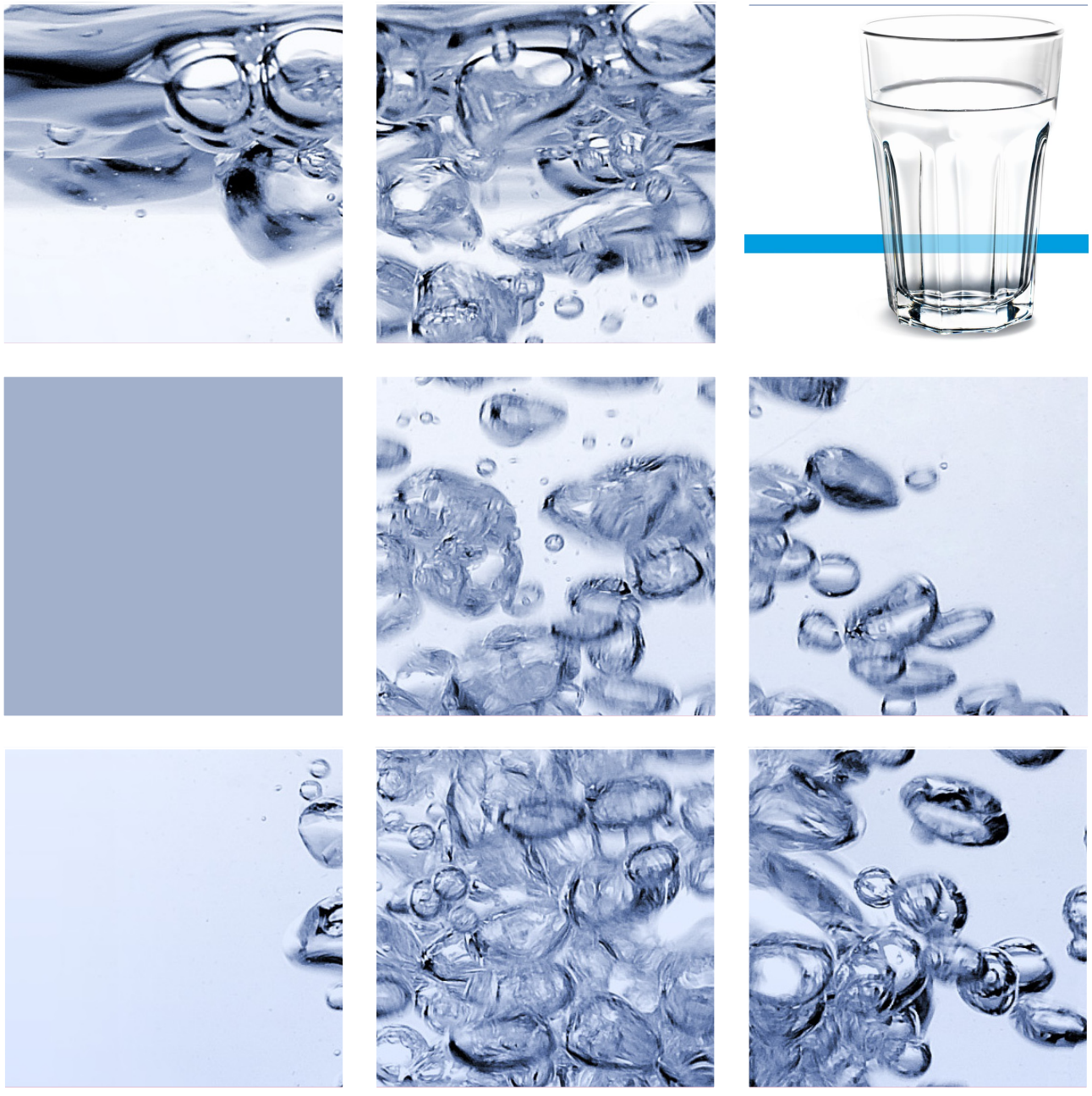
APPENDIX C

EAM Summary Report

Uisce Éireann - Lead in Drinking Water Mitigation Plan

Environmental Assessment Methodology (EAM) Summary Report

068 Rockingham WTP – Boyle Ardcarne WSS (2600PUB1027)



National Lead in Water Mitigation Strategy

Environmental Assessment Methodology Report – 068 Rockingham WTP (Boyle Ardcarne WSS)

Document Control Sheet

Client:	Uisce Éireann
Project Title:	National Lead in Water Mitigation Strategy
Document Title:	Environmental Assessment Methodology Report: 068 Rockingham WTP – Boyle Ardcarne WSS (2600PUB1027)
Document No:	MDW0766RP_5.1_EAM_068_Rockingham WTP_F06

Text Pages:	13	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
A01	Review	21st June 2018	YE		IP/MM		DC	
F01	Final	4th Oct 2018	MH		MM		DC	
F02	Final	30th Oct 2018	YE		IP		DC	
F03	Final	24th Jan 2019	IP		MM		DC	
F04	Final	16th Aug 2019	IP		MM		DC	
F05	Final	20th Jan 2023	IP		MM		JF	
F06	Final	12th Jun 2023	IP		MM		MM	

068 Rockingham WTP – Boyle Ardcarne WSS (2600PUB1027)

Supporting spreadsheet: 068_Rockingham WTP_Boyle Ardcarne WSS_V10

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

Rockingham WTP supplies a large area in the north of Co. Roscommon covering a total area of over 130km² predominantly serving the rural areas in the north of the county spanning from Lough Gara in the west to the outskirts of Carrick-on-Shannon to the east, with the town of Boyle the main urban area within the water supply zone. Rockingham WTP supplies all the distribution input to both Boyle Ardcarne WSS (2600PUB1027) and Killaraght Public Water Supply (2700PUB2714).

The distribution input for Boyle Ardcarne WSS is 2,802 m^3/day (56% of which is accounted for) serving a population of approximately 5,500. The non-domestic demand is 13.6% of the distribution input. The distribution input for Killaraght PWS is only 30 m^3/day (77% of which is accounted for). The non-domestic demand is 22.7% of the distribution input. This equates to a combined distribution input for the two water supplies of 2,832 m^3/day (57.5% of which is accounted for, with the remainder is assumed to be lost through leakage). The non-domestic demand is 13.7% of the distribution input.

The area is served by Boyle (D0121), Carrick on Shannon (D0154) and Leitrim Village (D0278) WWTPs which are 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 is also a WWTP with a population equivalent of less than 500, Cootehall (A0280), which has received a Certificate of Authorisation in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended. The impact of the orthophosphate dosing and the estimated additional load from this plant is considered at the water body level via the surface water pathways. It is estimated that there are 1,313 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 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.

Water Treatment Plant	**Rockingham WTP**	
Water Supply Zone	**Boyle Ardcarne WSS (2600PUB1027)** **Following WSZ used for Distribution Input / AFW, UFW calculations only:** **Killaraght Public Water Supply (2700PUB2714)** See Figure 4.1 and 4.2 of the AA Screening Report	
Step 1 Appropriate	**European Sites within Zone of Influence**	
	SACs	
	Annaghmore Lough (Roscommon) SAC	Lough Arrow SAC

<table>
<tr><td rowspan="4">Assessment Screening</td><td>Ballysadare Bay SAC
Bricklieve Mountains and Keishcorran SAC
Bunduff Lough and Machair/Trawalua/Mullaghmore SAC
Callow Bog SAC
Cloonakillina Lough SAC
Cloonshanville Bog SAC
Clooneen Bog SAC
Cummeen Strand/Drumcliffe Bay (Sligo Bay) SAC
Derrinea Bog SAC
Drumalough Bog SAC
Errit Lough SAC
Flughany Bog SAC</td><td>Lough Derg, North-east Shore SAC
Lough Forbes Complex SAC
Lough Ree SAC
Lower River Shannon SAC
Mullygollan Turlough SAC
Pilgrim’s Road Esker SAC
River Shannon Callows SAC
Streedagh Point Dunes SAC
Tullaghanrock Bog SAC
Unshin River SAC
Urlaur Lakes SAC
Union Wood SAC</td></tr>
<tr><td colspan="2">SPAs</td></tr>
<tr><td>Kerry Head SPA
Loop Head SPA
Arrow SPA
Lough Derg (Shannon) SPA
Lough Gara SPA
Ardboline Island and Horse Island SPA
Aughris Head SPA
Inishmurray SPA</td><td>Middle Shannon Callows SPA
River Shannon and River Fergus Estuaries SPA
Ballykenny-Fishertown Bog SPA
Lough Ree SPA
River Little Brosna Callows SPA
Ballysdare Bay SPA
Cummeen Strand SPA
Drumcliffe Bay SPA
Ballintemple and Ballygilgan SPA</td></tr>
<tr><td colspan="2">Nutrient Sensitive Qualifying Interests present – Yes
Appropriate Assessment Required – see AA screening report for details</td></tr>
</table>

Step 2 – Direct Inputs to Surface Water

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

Agglomeration and discharge type	ELV (Ortho- P unless otherwise stated) from WWDL (mg/l)	Scenario	TP Load kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	*0.4*	*0.68*
Boyle Primary Discharge	0.5	Existing	729.9	0.289	0.232	0.394
		Post Dosing	729.9	0.289	0.232	0.394
Boyle SWOs (3 no.)	n/a	Existing	132.9	1.809	1.447	2.461
		Post Dosing	139.8	1.904	1.523	2.590
Carrick on Shannon Primary Discharge	0.92 (Total P ELV)	Existing	140.9	0.058	0.047	0.079
		Post Dosing	140.9	0.058	0.047	0.079
Carrick on Shannon SWOs (11 no.)	n/a	Existing	102.6	1.454	1.163	1.978
		Post Dosing	104.7	1.484	1.187	2.018
Leitrim Village Primary Discharge	1	Existing	91.3	0.380	0.304	0.517
		Post Dosing	91.3	0.380	0.304	0.517
Leitrim Village SWOs (3 no.)	n/a	Existing	10.2	1.461	1.169	1.988
		Post Dosing	10.2	1.464	1.171	1.990

Note: The modelled effluent concentrations are compliant with ELVs. The 2020 AERs also report full compliance with the ELVs for these WWTPs.

As all three WWTPs listed above receive tertiary treatment, i.e. chemical dosing for nutrient removal, the EAM assumes that the additional P loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality.

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. (WWDL code)	RWB Name / Code for Primary Discharge	Background Conc. (mg/l) (annual mean from AER u/s monitoring point)	Modelled Conc. existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc.
Boyle (D0121)	IE_SH_26B080400	0.0242	0.0250	0.0250	0.0
Carrick on Shannon (D0154)	IE_SH_26S021010	0.0087	0.0088	0.0088	0.0
Leitrim Village (D0278)	IE_SH_26S020550	0.0067	0.0067	0.0067	0.0

	Surface Assessment ***BOYLE_030*** *(IE_SH_26B080400)* – The effluent concentration from Boyle WWTP is compliant with ELVs set in the WWDL. Tertiary treatment is assumed to remove any additional orthophosphate from the effluent due to dosing and impact due to SWOs is negligible as shown by the mass balance assessment in Table 2. ***SHANNON (Upper)_060*** *(IE_SH_26S021010)* – The effluent concentration from Carrick-on-Shannon WWTP is compliant with the ELVs set in the WWDL. Tertiary treatment is assumed to remove any additional orthophosphate from the effluent due to dosing and impact due to SWOs is negligible as shown by the mass balance assessment in Table 2. ***SHANNON (Upper)_050*** *(IE_SH_26S020550)* – The effluent concentration from Leitrim village WWTP is compliant with ELVs set in the WWDL. Tertiary treatment is assumed to remove any additional orthophosphate from the effluent due to dosing and impact due to SWOs is negligible as shown by the mass balance assessment in Table 2. The dosing will therefore have an insignificant impact on the direct discharges to surface water from agglomerations within the WSZ.

Step 4 Distributed Inputs to surface water bodies from sub surface pathways	**Subsurface Assessment** The modelled increases in concentrations in the subsurface pathways are insignificant (less than 5% of the Good / High Ortho P Indicative Quality boundary, i.e. 0.00125 mg/l) or undetectable (0.0000 mg/l) for all river water bodies. As a result there will be no risk of deterioration in orthophosphate indicative quality or to the achievement of the WFD objectives. There are a number of lakes within the WSZs supplied by Rockingham WTP. The loading to the lakes is predominantly from subsurface pathways with only a small proportion of the load from the upstream Cootehall WWTP. The potential impact of additional loading to lakes is outlined below in step 5 and 6, combined inputs to surface water bodies. There are no transitional water bodies directly affected by this WSZ.
Step 5 and 6: Combined Inputs to Groundwater Bodies	**Groundwater Bodies as receptors connected to WSZ** Table 3 gives the loads and modelled concentrations for the assessment of groundwater bodies. The predicted increase in concentrations to groundwater bodies are insignificant (below 5% of the Good / Fail boundary for Orthophosphate Good Indicative Quality, i.e. 0.00175mg/l) and the baseline concentrations are below the 75% limit of the upper threshold in each instance. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, and none of the overlying surface waterbodies are at Bad ecological status, there is no risk of impact on groundwater receptors due to orthophosphate dosing.

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

EU_CD/Name	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate indicative quality given in italic]*	Baseline Ortho P Conc. mg/l *[Surrogate Conc. given in italic]*	75% of indicative quality upper threshold mg/l	Ortho P load to GW kg/yr	Potential Increase in Ortho P Conc. due to Dosing mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SH_G_073 Curlew Mountains	*Good*	*0.018*	*0.026*	*17.2*	*0.0006*	*0.018*	
IE_WE_G_0028 Gorteen	*Good*	*0.018*	*0.026*	*0.3*	*0.0000*	*0.018*	
IE_SH_G_048 Carrick on Shannon	Good Upwards Far	0.018	0.026	29.6	*0.0002*	0.018	
	Good Upwards Far	0.027	0.026			0.027	

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 to rivers waterbodies. The increased concentrations due to orthophosphate dosing are predicted to be insignificant, i.e. are below 5% of the Good / High boundary for Orthophosphate Indicative Quality (0.00125mg/l), in all cases.

The baseline concentrations are all below 75% of the Orthophosphate indicative quality upper threshold, with the exception of Boyle_030 (IE_SH_26B080400) which is near the high/good indicative quality boundary however with the modelled increase in concentration having an insignificant impact there is no risk to the WFD objectives of any of the water bodies. Any increased load due to the WWTP also has an insignificant impact due to the nutrient removal included in the treatment process.

There are 6 lake water bodies directly affected by this WTP. Table 4.B summarises the impact of the orthophosphate dosing based on a Vollenweider assessment. The increase in Fin Boyle (IE_SH_26_576) is 0.6%, but this is not significant as the lake is currently assigned a moderate ecological status by the EPA based on the grouping approach, there is no monitoring information for the Lake and the contribution from dosing is very low due to limited water mains within the sub catchment of the lake. The moderate ecological status results from other pressures and the increase in TP from the limited leakage in this sub catchment will not impact on the ability of the water body to achieve its environmental objectives. Lough Meelagh (IE_SH_26_711) will not exceed its critical loading post dosing and therefore will not be significantly impacted by the dosing with a minor increase in the TP loading to the lake. For the remaining lakes that are currently at good indicative quality, the critical loading for oligotrophic conditions has already been exceeded, however the additional loading as a result of the orthophosphate dosing will not result in a significant increase (all increases being less than 1%) and therefore the orthophosphate dosing will not significantly impact on the

orthophosphate indicative quality of these lakes. An assessment of the trophic status, based on the OECD methodology, supports this; with these lakes classified at the lower end of the mesotrophic range. The orthophosphate dosing will not result in any significant increase in the TP loading or trophic status.

Lough Arkedy (IE_WE_35_120) is also within the WSZ, however as it is upstream of any of the pathways for orthophosphate dosing load it will not be impacted..

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

EU_CD/Name	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate indicative quality indicated in italic]*	Baseline Conc. mg/l *[Surrogate Conc. given in italic]*	75% of indicative quality upper threshold mg/l	Cumulative Ortho P load to SW from leakage & DWWTS kg/yr	Conc. using flows (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SH_26B080100 BOYLE_010	*Moderate*	*0.046*	*0.051*	5.8	0.0000	0.046	
IE_SH_26B080200 BOYLE_020	High Downwards Far	0.017	0.019	6.8	0.0000	0.017	
IE_SH_26B080400 BOYLE_030	High Upwards Near	0.020	0.019	20.9	0.0000	0.020	‡
IE_SH_26B080600 BOYLE_040	High Downwards Far	0.010	0.019	43.9	0.0001	0.010	‡
IE_SH_26D110290 DERRYMAQUIRK_010	*Moderate*	*0.046*	*0.051*	*0.6*	*0.0001*	*0.046*	
IE_SH_26M910890 MOCMOYNE_010	*Good*	*0.030*	*0.033*	*4.7*	*0.0005*	*0.030*	
IE_WE_35U010100 UNSHIN_010	High Far	0.007	0.019	0.7	0.0000	0.007	
IE_SH_26C180900 CLOGHER (ROSCOMMON)_020	*Poor*	*0.077*	*0.087*	*7.4*	*0.0003*	*0.077*	
IE_SH_26D090760 DEMESNE_010	*Moderate*	*0.046*	*0.051*	*6.4*	*0.0007*	*0.046*	
IE_SH_26E290990 EIDIN_010	*Moderate*	*0.046*	*0.051*	*3.7*	*0.0003*	*0.046*	
IE_SH_26F020400 FEORISH (BALLYFARNON)_030	Good Upwards Far	0.029	0.033	1.9	0.0000	0.029	*
IE_SH_26K020700 KILLUKIN_020	*Moderate*	*0.046*	*0.051*	*0.0*	*0.0000*	*0.046*	
IE_SH_26S020500 SHANNON (Upper)_040	High Upwards Far	0.007	0.019	12.7	0.0000	0.007	
IE_SH_26S020550 SHANNON (Upper)_050	Good Downwards Far	0.030	0.033	13.3	0.0000	0.030	‡ MP1

	High Downwards Far	0.007	0.019			0.007	MP2
IE_SH_26S021010 SHANNON (Upper)_060	High Far	0.009	0.019	80.1	0.0001	0.009	‡ MP1
	High Far	0.010	0.019			0.010	MP2
IE_SH_26W010200 BOYLE_050	*Good*	*0.030*	*0.033*	*58.8*	*0.0001*	*0.030*	‡

‡ Load from WWTP / SWO following treatment added.

* Trend is Statistically Significant.

MP: Multiple Monitoring Points given for waterbody.

Table 4.B: Vollenweider assessment of Lakes within the WSZ ***(note: where existing monitoring data is not available, a surrogate indicative quality is derived from ecological status of the WB or Total P indicative quality/ Ecological status of neighbouring WBS, the mid-range of that indicative quality is used as Baseline Concentration)***

EU_CD / NAME Lakes	Parameter	TP Indicative Quality and Trends (Distance to Threshold. Surrogate indicative quality in *italic*	Baseline Conc. Surrogate Conc. given in *italic* mg/l	TP Total Dosing Load kg/yr	Estimated Existing Areal loading based on Vollenweider mg/m²/yr)	Estimated Post dosing Areal loading based on Vollenweider(mg/m²/yr)	Lc (mg/m²/yr)	% Increase
IE_SH_26_576 Fin Boyle	TP	*Moderate*	*0.048*	*7.6*	2027	2040	562	0.6
IE_SH_26_724 Lough Key	TP	Good Downwards Far	0.019	6.5	1171	1172	785	0.1
IE_SH_26_728 Lough Gara	TP	Good Upwards Near	0.021	6.5	880	881	519	0.1
IE_SH_26_711 Meelagh	TP	Good Upwards Far	0.030	1.9	64	66	119	2.5
IE_SH_26_721 Lough Oakport	TP	*Poor*	*0.085*	*43.9*	91,359	91,445	11,379	0.1
IE_SH_26_722 Lough Eidin	TP	*Poor*	*0.085*	*62.5*	19,315	19,338	2,529	0.1

There are no transitional water bodies directly affected by this WTP.

Summary and Mitigation Proposed	Considering Rockingham WTP in isolation, orthophosphate dosing is predicted to have insignificant impact on all waterbodies. The modelled increase in load and concentrations to both groundwater and surface water receptors do not increase the risk of failing to achieve the WFD objectives. The breakdown from source to pathway is depicted in Figure 1 and the fate of P loads from Rockingham WTP is shown in Figure 2. The cumulative impacts on 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 Rockingham WTP. • 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 Catsle Lake WTP - Shannon/Sixmilebridge RWSS • 021 Rossadrehid WTP – Galtee Regional • 027 Athlone WTP – Athlone WSS • 034 Lough Forbes WTP – Longford Central • 040 Coolbawn WTP – Nenagh RWSS • 049 Ballany WTP – Ballany High Level Reservoir • 058 Ballinasloe Town WTP - Ballinasloe Public Supply • 081 Ballinagard Springs WTP - Roscommon Central Water Supply Scheme • 128 Longford Springs WTP Future Supply - Castlerea WSS • 140 Lisbrock WTP - SRRWSS Lisbrock • 161 Freemount WTP – Zone 4 Allow Regional • 178 Clavin's Bridge WTP – Kells/Oldcastle WS • 184 Foileen WTP - CappamoreFoileen Water Supply • 185 Ballinlough/ Loughglynn (Ballybane Springs) - Ballinlough/Loughglynn • 190 Ironmils Pump Station - Ironmills • 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. • 355 Croom Bypass Pump Station - Croom Water Supply The cumulative loads to water bodies that are impacted by the WSZs supplied by these WTPs have been summarised in Table 5.A and 5.B below. Table 5.A indicates that the increased loads due to orthophosphate dosing are predicted to be insignificant, i.e. are below 5% of the Good / High boundary for Ortho P Indicative Quality (0.00125mg/l), in all cases, indeed they are predominantly negligible (0.0001 mg/l) or lower. As demonstrated by Table 5.B For those lake water bodies that are currently at high orthophosphate indicative quality or assumed to be at high indicative quality, the additional loading will not result in the critical loading for these lakes being exceeded and they will remain as oligotrophic. For the remaining lakes that are currently at good or moderate indicative quality, the critical loading for oligotrophic conditions has already been exceeded. However, the additional loading as a result of the orthophosphate dosing will not result in a significant

increase to the loading (the majority of cases being below 1%). Therefore, the orthophosphate will not significantly impact on the Ortho phosphate indicative quality of these lakes. An assessment of the trophic status, based on the OECD methodology, supports this with these lakes classified at the upper end of the oligotrophic range or lower end of the mesotrophic range. The orthophosphate dosing will not result in any significant increase in the TP loading or trophic status.

Table 5.A: Cumulative assessment of the increased loading and concentrations to river and coastal water bodies impacted by 068 Rockingham WTP – Boyle Ardcarne WSS and other WSZs proposed for corrective water treatment in the upstream catchments ***(note: where existing monitoring data is not available, a surrogate indicative quality is derived from ecological status of the WB or Ortho P indicative quality / ecological status of upstream and downstream WBS, the mid-range of that indicative quality is used as Baseline Concentration).***

EU_CD/Name	Ortho P indicative quality and Trends (distance to threshold) *Surrogate indicative quality given in italic*	Baseline Conc. *Surrogate Conc. given in italic* mg/l	75% of indicative quality upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Conc. using 30%ile or gauged flows mg/l	PO4 Potential Baseline Conc. following dosing mg/l	Notes
IE_SH_26B080100 BOYLE_010	*Moderate*	*0.046*	*0.051*	*202.4*	*0.0004*	*0.046*	
IE_SH_26B080200 BOYLE_020	High Downwards Far	0.017	0.019	206.9	0.0004	0.018	
IE_SH_26B080400 BOYLE_030	High Upwards Near	0.020	0.019	220.9	0.0004	0.021	‡
IE_SH_26B080600 BOYLE_040	High Downwards Far	0.010	0.019	243.9	0.0004	0.010	‡
IE_SH_26W010200 BOYLE_050	*Good*	*0.030*	*0.033*	*258.9*	*0.0004*	*0.030*	‡
IE_SH_26S021010 SHANNON (Upper)_060	High Far	0.009	0.019	280.2	0.0003	0.009	‡
	High Far	0.010	0.019			0.010	
IE_SH_26S021800 SHANNON (Upper)_120	High	0.013	0.019	611.7	0.0002	0.013	‡ MP1
	High	0.016	0.019			0.016	‡ MP2
	High	0.012	0.019			0.012	‡ MP3
	High	0.012	0.019			0.012	‡ * MP4
IE_SH_25S012000 SHANNON (LOWER)_010	High	0.011	0.019	1021.2	0.0002	0.011	‡

IE_SH_060_0900 Limerick Dock	High (S)	0.007	0.019	7516.7	0.0010	0.008	‡
	High (W)	0.012	0.019			0.013	
IE_SH_060_0800 Upper Shannon Estuary	High (S)	0.020	0.0195	8848.1	0.0010	0.021	‡
	Good (W)	0.031	0.037			0.032	
IE_SH_060_1100 Fergus Estuary	Good (S) None Far	0.032	0.030	1333.5	0.0001	0.032	‡
	Good (W) Downwards Near	0.037	0.042			0.037	
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	

‡ Load from WWTP / SWO following treatment added.

* Trend is Statistically Significant.

** 2014 Baseline is inconsistent with Upper and Lower Thresholds for the given Ortho P indicative quality as reported in the WFD App

S = Summer monitoring period, W = Winter monitoring period

MP: Multiple Monitoring Points given for waterbody

Table 5.B: Cumulative assessment of the increased loading and concentrations to lake water bodies impacted by 068 Rockingham WTP – Boyle Ardcarne WSS and other WSZs proposed for corrective water treatment in the upstream catchments

NAME / EU_CD Lakes	TP Indicative Quality and Trends (Distance to Threshold. Surrogate indicative quality in *italic*	Baseline 2014 Conc. Surrogate Conc. given in *italic* mg/l	TP Total Dosing Load kg/yr	Estimated Existing Areal loading based on Vollenweider mg/m²/yr)	Estimated Post dosing Areal loading based on Vollenweider(mg/m²/yr)	Lc (mg/m²/yr)	% Increase
Ross WH IE_SH_26_498	*Good*	*0.018*	0.1	334	334	236	0.1
Corry IE_SH_26_710	*Poor*	*0.085*	280.1	59,653	59,835	7,411	0.3

Forbes IE_SH_26_723	Moderate Downwards Far	0.031	302	14,911	15,012	4,941	0.7
Key IE_SH_26_724	Good Downwards Far	0.019	250	1,171	1,200	785	2.4
Gara IE_SH_26_728	Good Upwards Near	0.021	203.1	880	897.2	519	1.9
Bofin LM IE_SH_26_747a	Good Downwards Near	0.023	284	5,862	5,920	2,796	1.0
Boderg IE_SH_26_747b	Moderate Upwards Far	0.0258	284	8,055	8,125	3,376	0.9
Ree IE_SH_26_750	Good Upwards Far	0.0206	521	576	581	405	0.9
Derg TN (including HMWB section) IE_SH_25_191	Good Upwards Far	0.021	1238	1161	1171	735	0.9
Oakport IE_SH_26_721	*Poor*	0.085	244	91,359	91,837	11,379	0.5
Eidin IE_SH_26_722	*Good*	0.085	263	19,315	19,412	2,534	0.5

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

MITIGATION OPTION – None

RAG STATUS – GREEN

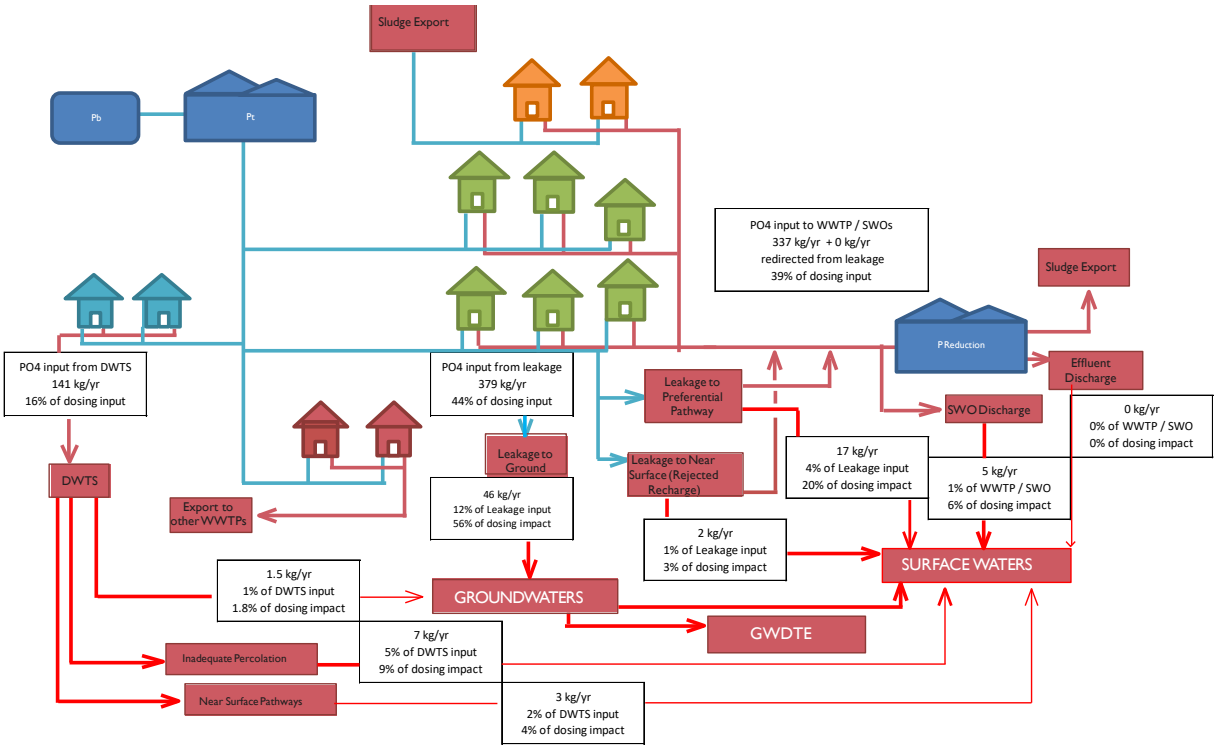
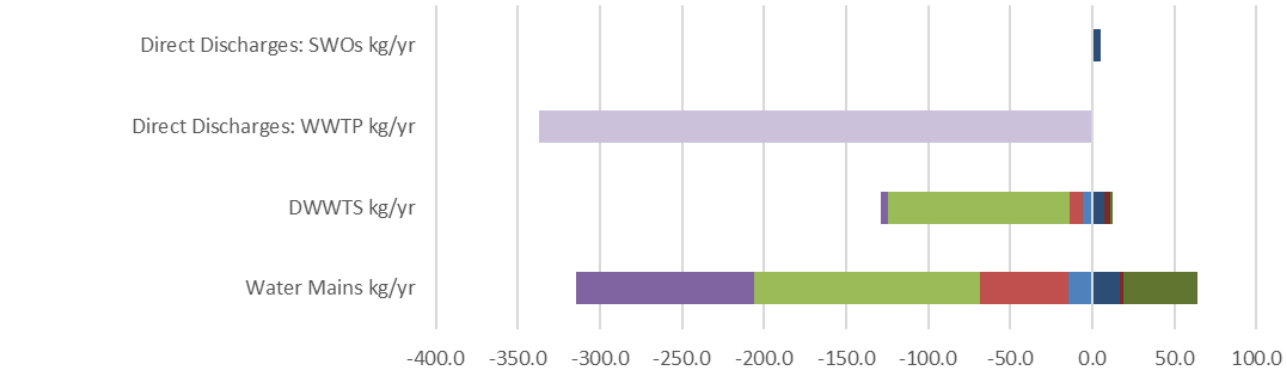


Figure 1 – Source Pathway Receptor model for Rockingham WTP illustrating key sources and pathways to the associated WSZs.



	Water Mains kg/yr	DWWTS kg/yr	Direct Discharges: WWTP kg/yr	Direct Discharges: SWOs kg/yr
Load attenuated in Preference (inadequate percolation) pathway	-14.8	-5.5		
Load attenuated in Near Surface Pathway	-53.2	-8.4		
Load attenuated in 1m below trench	-137.7	-110.8		
Load attenuated in Subsurface Pathway	-108.8	-4.1		
Load intercepted by gravity main in Preference Pathway	0.7			
Load intercepted by gravity main in Near Surface Pathway	0.0			
Load reaching SW direct or via Preference (inadequate percolation) Pathway	16.0	7.3	0.0	4.9
Load reaching SW via Near Surface Pathway	2.1	3.4		
Load reaching SW via Subsurface Pathway	45.6	1.5		
Load treated in WWTP			-336.8	

Figure 2 – Fate of orthophosphate loads modelled for Rockingham WTP impacting on SHANNON (Upper)_060 (IE_SH_26S021010) due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.