Irish Water-Leadin Drinking Water MitigationPlan

Screening for Appropriate Assessment

054 Mallow WTP - Zone 4 Mallow WSZ (0500PUB1313)

Lead in Drinking Water Mitigation Plan

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054 Zone 4 Mallow WSZ - Mallow WTP

Document Control Sheet

Client:	Irish Water
Project Title:	Lead in Drinking Water Mitigation Plan
Document Title:	Screening for Appropriate Assessment 054 Zone 4 Mallow WSZ ((0500PUB1313) – Mallow WTP
Document No:	MDW0766Rp_5.3_Screening_054_Mallow WSZ_F05

Text Pages:	71	Appendices:	3

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
A02	Client Approval	18th July 2018	CH		LC		PK	
F01	Final	5th Nov 2018	LE		LC		DC	
F02	Final	14th Nov 2018	LC		LE		DC	
F03	Final	28th Nov 2018	LC		LE		DC	
F04	Final	30th May 2019	KWB		LC		GJG	
F05	Final	5th May 2023	KWB		MM		MM	

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GLOSSARY OF TERMS & ABBREVIATIONS

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

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

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

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

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

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

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

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

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

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

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

1 INTRODUCTION

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

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

1.1 PURPOSE OF THIS REPORT

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

1.2 THE PLAN

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

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

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

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

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

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

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

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

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

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

Orthophosphate is added in the form of Phosphoric acid, which is approved for use as a food additive (E338) in dairy, cereals, soft drinks, meat and cheese. The average adult person consumes between 1,000 and 1,500 milligrams (mg) of phosphorus every day as part of the normal diet. The quantity of orthophosphate that IW will be required to add to treated water is between 0.5 mg/l to 1.5 mg/l. At Mallow WTP orthophosphate will be added at a rate of 0.6 mg/l, with seasonal variation in the proposed dose, as set out within the Preliminary Design Report for the proposed dosing.

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

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

1.3 PROJECT BACKGROUND

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

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

The EAM process identified 16 European Sites with hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Ballymacoda (Clonpriest and Pillmore), Lough Hyne Nature Reserve and Environs, Roaringwater Bay and Islands, Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment, Barley Cove to Ballyrisode Point, Great Island Channel, Ardmore Head and Blackwater River (Cork/Waterford); and
- SPA sites: Ballymacoda Bay, Blackwater Callows, Blackwater Estuary, Cork Harbour, Stack's to Mullaghareirk Mountains, West Limerick Hills and Mountains, Mullaghanish to Musheramore Mountains, Kilcoman Bog and Sovereign Islands.

Each of these European Sites includes habitats and/or species identified as nutrient sensitive. Following the precautionary principle the potential for likely significant effects arising from the proposed project requires assessment, due to connectivity to each of the identified European Sites, in light of their nutrient sensitive Qualifying Interests.

2 APPROPRIATE ASSESSMENT METHODOLOGY

2.1 LEGISLATIVE CONTEXT

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora better known as the "Habitats Directive" provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of sites known as Natura 2000. These are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/ECC) as codified by Directive 2009/147/EC.

The obligation to undertake appropriate assessment derives from Articles 6(3) and 6(4) of the Habitats Directive and both involve a number of steps and tests that need to be applied in sequential order. Article 6(3), which is concerned with the strict protection of sites, establishes the requirement for AA:

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

Article 6(4) states:

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

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

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

2.2 GUIDANCE FOR THE APPROPRIATE ASSESSMENT PROCESS

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

European and National Legislation:

- Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (also known as the 'Habitats Directive');
- Council Directive 2009/147/EC on the conservation of wild birds, codified version, (also known as the 'Birds Directive');
- European Communities (Birds and Natural Habitats) Regulations 2011 to 2015; and
- Planning and Development Act 2000 (as amended).

Guidance / Case Law:

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

Departmental/NPWS Circulars:

- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities.* Circular NPWS 1/10 and PSSP 2/10. (DEHLG, 2010);
- *Appropriate Assessment of Land Use Plans*. Circular Letter SEA 1/08 & NPWS 1/08;
- *Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments*. Circular L8/08;
- *Guidance on Compliance with Regulation 23 of the Habitats Directive.* Circular Letter NPWS 2/07; and

- *Compliance Conditions in respect of Developments requiring (1) Environmental Impact Assessment (EIA); or (2) having potential impacts on Natura 2000 sites*. Circular Letter PD 2/07 and NPWS 1/07.

2.3 STAGES OF THE APPROPRIATE ASSESSMENT PROCESS

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

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

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

Stage 1: Screening for a likely significant effect

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

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

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

Stage 3: Assessment of Alternative Solutions

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

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

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

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

2.4 INFORMATION SOURCES CONSULTED

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

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

2.5 EVALUATION OF THE RECEIVING ENVIRONMENT

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

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

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

2.5.1 Identification of European Sites

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

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

As stated above, a buffer of 15km is typically taken as the initial ZoI extending beyond the reach of the footprint of a plan or project, although there may be scientifically appropriate reasons for extending this ZoI further depending on pathways for potential impacts. With regard to the current project, the 15km distance is considered inadequate to screen all likely significant effects that might impact upon European Sites. This is primarily due to the need to consider the potential for likely significant effects on European Sites with regard to aquatic and water dependent receptors. Therefore, the ZoI for this project includes all of the hydrologically connected surface water sub catchments and groundwater bodies (**Figure 4-2**).

2.5.2 Conservation Objectives

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

Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects,

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

shall be subject to appropriate assessment of its implications of the site in view of the site's ***conservation objectives****.*

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

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

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

For SACs:

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

For SPAs:

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

Favourable Conservation status of a habitat is achieved when:

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

Favourable Conservation status of a species is achieved when:

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

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

2.5.3 Existing Threats and Pressures to EU Protected Habitats and Species

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

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

3 DESCRIPTION OF THE PROJECT

3.1 OVERVIEW OF THE PROPOSAL

Mallow (Ballyellis) WTP supplies Mallow/Ballyvintner environs in County Cork. The distribution input for Zone 4 Mallow is 5,065 m^3/day (38% of which is accounted for) serving a population of about 8,030. The non-domestic demand is 10% of the distribution input. The area is served by Mallow WWTP (D0052-01) which is licensed in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended, and the potential impact of the orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There are no other WWTPs within this WSZ. There are an estimated 513 properties across the WSZ that are serviced by a DWWTS (see **Appendix C**).

Mallow WTP lies in the vicinity of the Munster Blackwater River, in the Blackwater [Munster]_SC_080, Blackwater [Munster]_SC_090 and Blackwater [Munster]_SC_110 sub-catchments of the Blackwater catchment. The EAM process identified 16 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Ballymacoda (Clonpriest and Pillmore), Lough Hyne Nature Reserve and Environs, Roaringwater Bay and Islands, Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment, Barley Cove To Ballyrisode Point, Great Island Channel, Ardmore Head and Blackwater River (Cork/Waterford); and
- SPA sites: Ballymacoda Bay, Blackwater Callows, Blackwater Estuary, Cork Harbour, Stack's to Mullaghareirk Mountains, West Limerick Hills and Mountains, Mullaghanish to Musheramore Mountains, Kilcoman Bog and Sovereign Islands.

3.2 CONSTRUCTION OF CORRECTIVE WATER TREATMENT WORKS

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

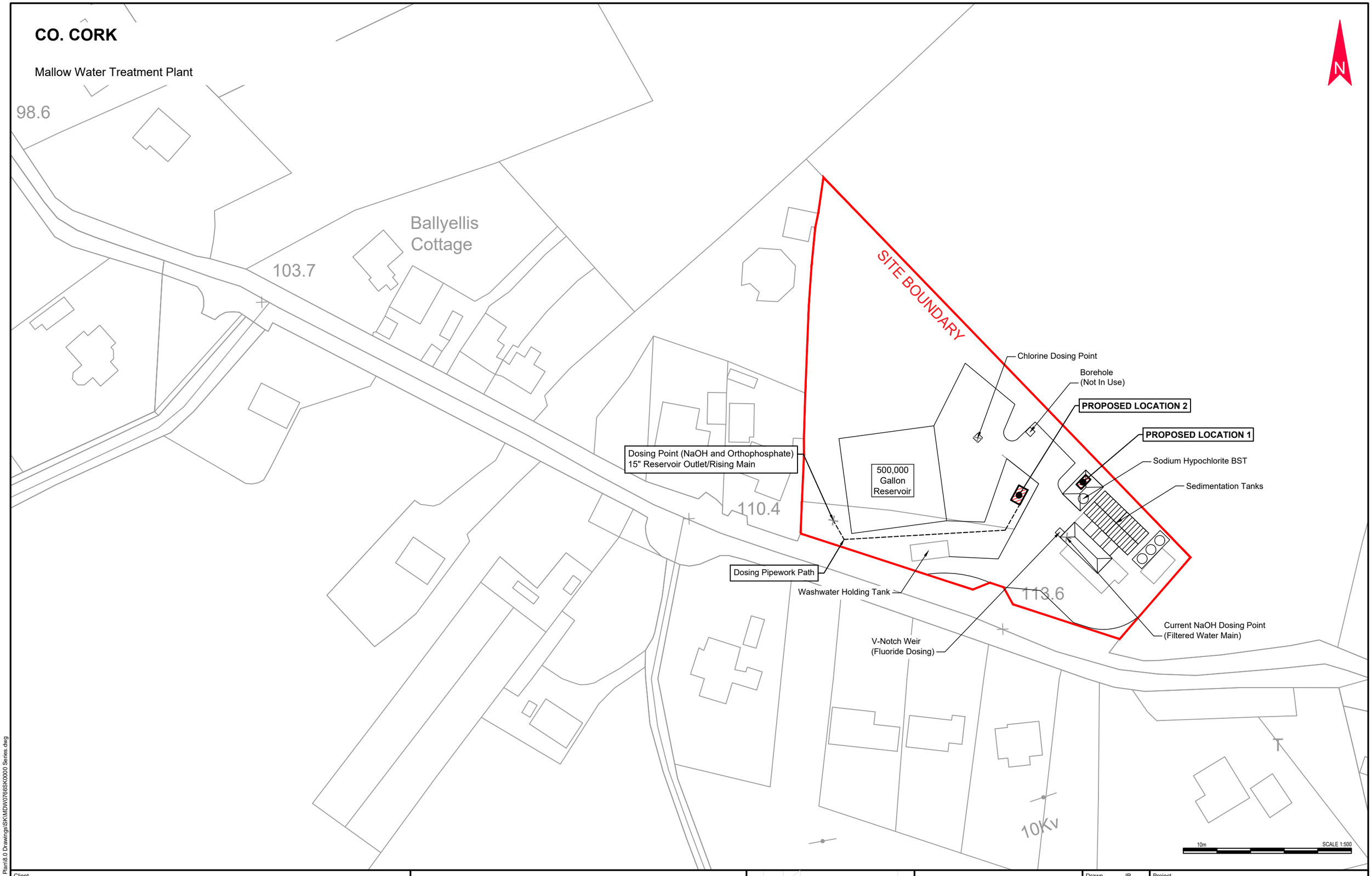
There are two possible locations for the orthophosphate dosing system at Mallow WTP both of which will be located within the confines of the existing WTP boundary. The surrounding landscape is dominated by agricultural grassland and bordered by linear treeline screening and residential dwellings. The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

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

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

CO. CORK

Mallow Water Treatment Plant



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Client

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No.	Date	Drn. Chk.	Amendment / Issue	App
F01	MAR 19	BL BR	ISSUE FOR CLIENT APPROVAL	GJG
D01	NOV 18	JR BL	DRAFT	DC

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Date	14/03/2019
Scale	1:500 @ A1 1:1,000 @ A3
Job No.	MDW0766

Project

LEAD MITIGATION PLAN

Figure 3.1

MALLOW WATER WATER TREATMENT PLANT - SITE LAYOUT

File Ref. MDW0766SK0000 Series.dwg

Drg. No. SK0054 WTP

Rev. F01

The bulk storage tanks (2 no. tanks, each with a working volume of 400l) will sit upon an above ground reinforced concrete plinth, designed to support the combined weight of the storage tanks, equipment and total volume of chemical to be stored (**Figure 3-2**).

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

A stable pH is critical to facilitate effective plumbosolvency control. With implementation of orthophosphate dosing it is necessary to ensure a stable pH of the final water. There is an existing pH correction system at the Mallow WTP, It is proposed to relocate the dosing point of final water pH correction to the outlet of the treated water storage reservoir at the Mallow WTP.

Dosing pipelines, carrier water pipework and electrical cables shall be installed within 100mm diameter ducts, placed in trenches constructed within existing made ground at the Mallow 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.

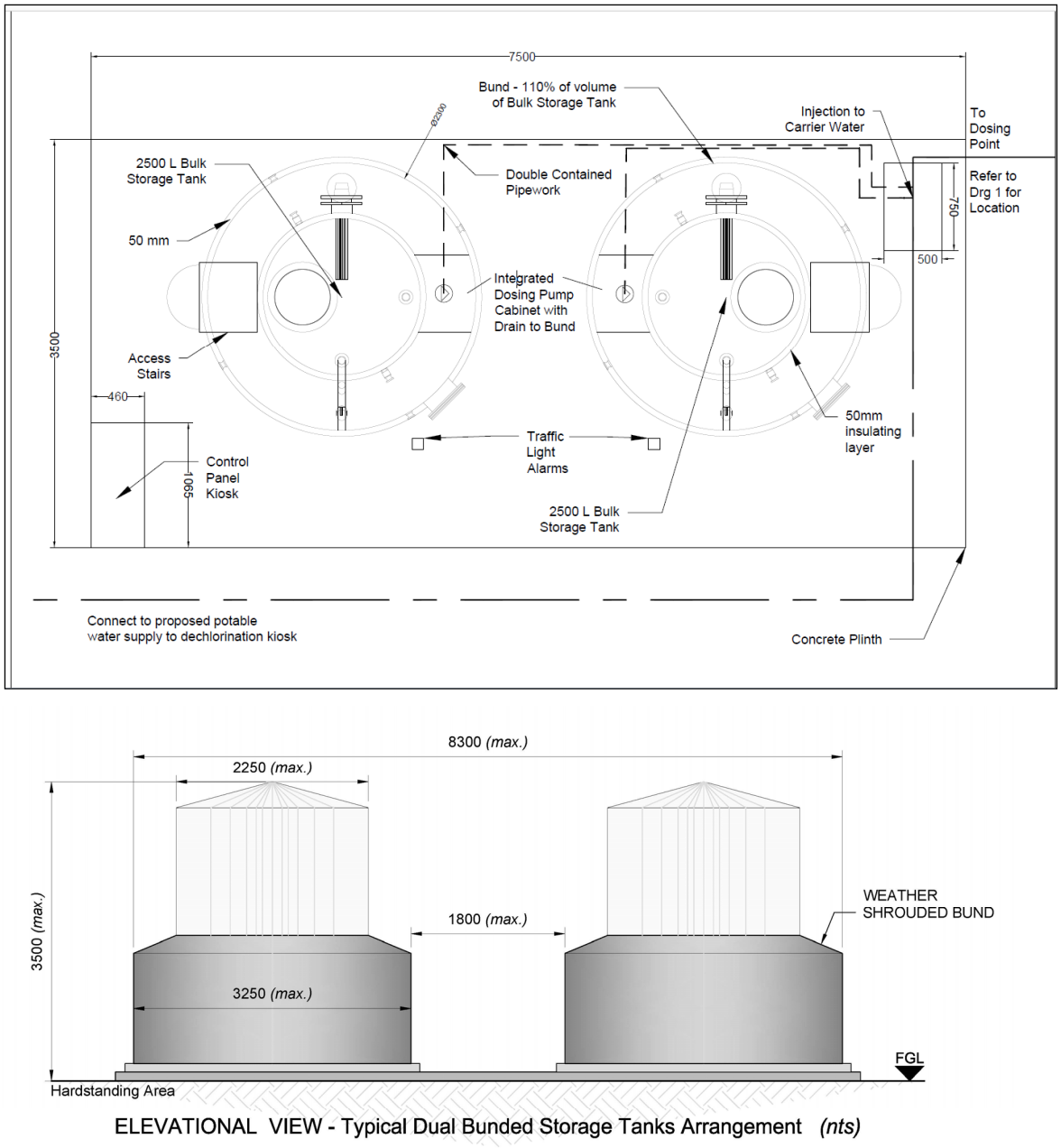


Figure 3-2: Plan and Elevation Drawings of a typical Orthophosphate Dosing Unit

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

3.5 LDWMP APPROACH TO ASSESSMENT

3.5.1 Work Flow Process

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

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

Depending on the potential impacts identified, appropriate measures may be built into the project proposal, as part of an iterative process to avoid / reduce those potential impacts for the orthophosphate treatment being proposed. Project measures adopted within the overall design proposal may include selected placement of the orthophosphate treatment point within the WSZ; enhanced wastewater treatment (to potentially remove equivalent phosphorus levels related to the orthophosphate treatment at the WTP); reduced treatment rate; and water network leakage control. The EAM will be the basis of the decision support matrix to inform any programmes developed as part of the LDWMP. Further detail on the model is presented in **Section 3.5.1** below.

3.5.2 Environmental Assessment Methodology

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

- The source of phosphorus is defined as the orthophosphate dosing at the water treatment plant which will be dependent on the water chemistry of the raw water quality, the integrity of the distribution network and the extent of lead piping.
- Pathways include discharges from the wastewater collection system (WWTP discharges and intermittent discharges – Storm Water Overflows (SWOs)), leakage from the distribution system and small point source discharges from DWWTSs.
- Receptors refer to SACs and SPAs which may receive orthophosphate dosed water via the pathway examples outlined above. Receptors and their sensitivity is of key consideration in the

EAM. A water body may be more sensitive to additional phosphorus loadings where it has a low capacity for assimilating the load e.g. high status sites, such as the habitat of the freshwater pearl mussel or oligotrophic lakes. Where a SAC/SPA could receive orthophosphate dosing inputs at more than one WSZ, the cumulative effects are considered in the EAM.

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

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

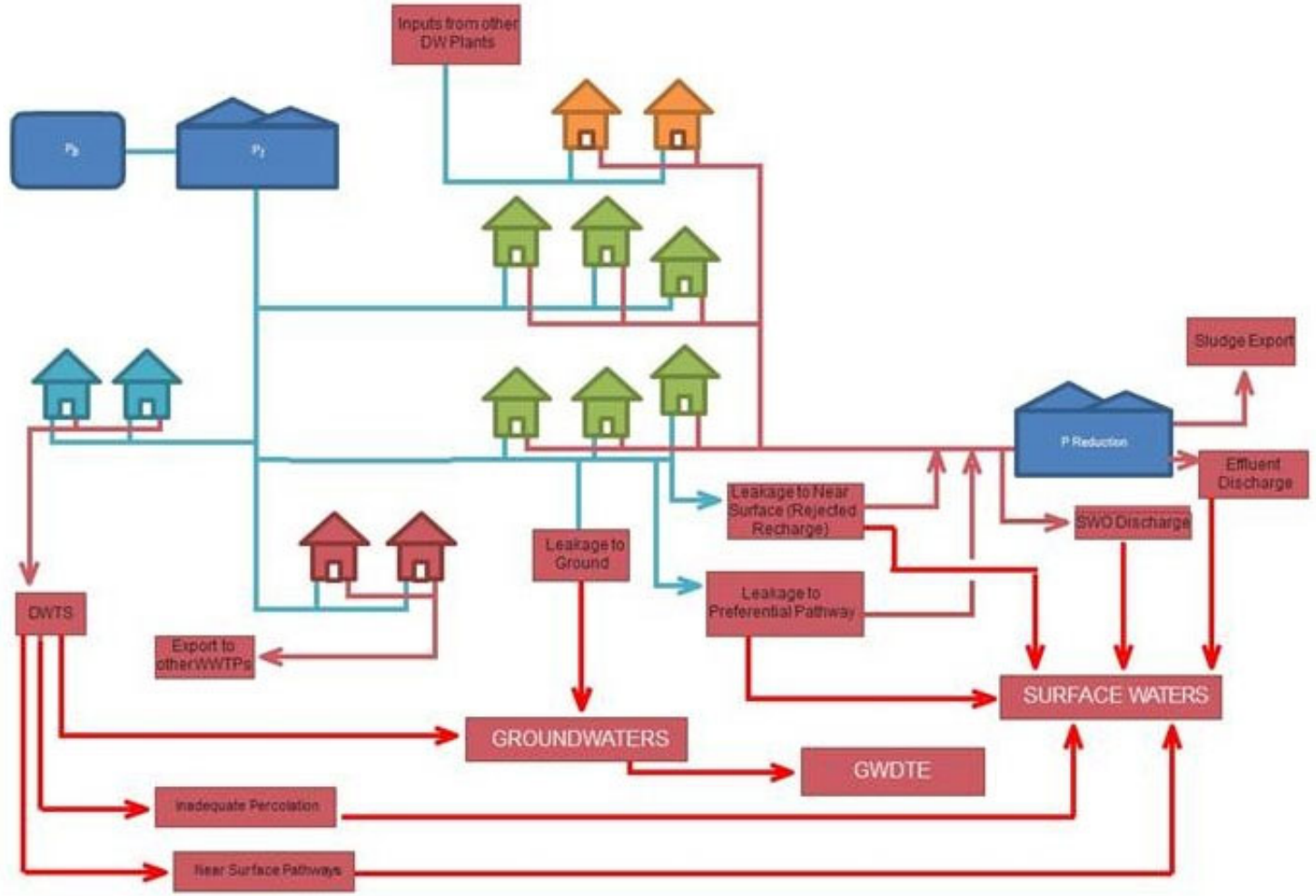


Figure 3-3: Conceptual Model of P Transfer

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

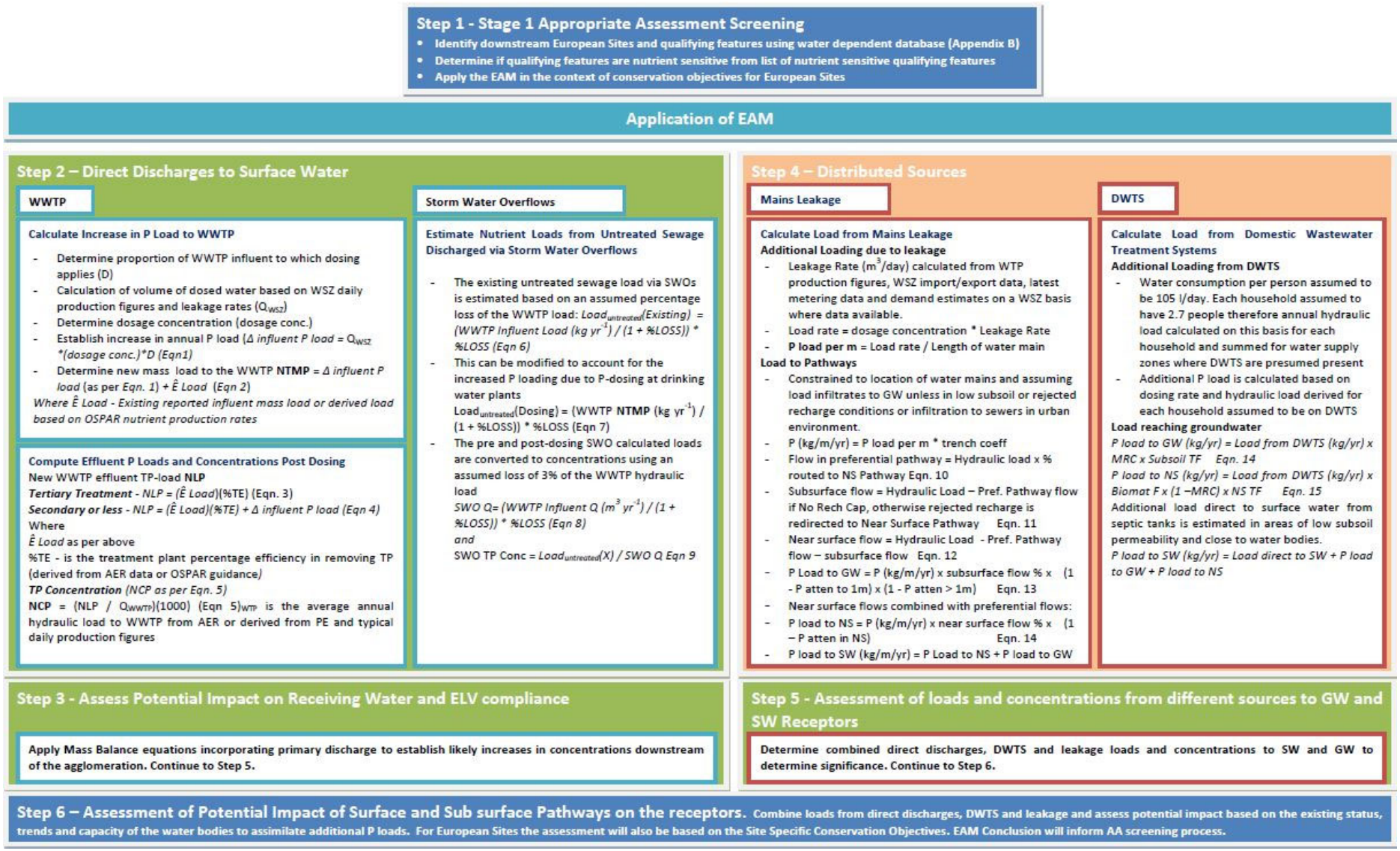


Figure 3-4: Stepwise Approach to the Environmental Assessment Methodology

4 PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

The construction phase of the proposed project will take place within the confines of the existing Mallow WTP. The WTP is not located within or directly adjacent to the boundary of any European Site. The Muster Blackwater (IE_SW_18B021800_Blackwater (Munster)_150) watercourse, which feeds into the main Muster Blackwater River, is located approximately 248m south-east of the Mallow WTP and is buffered by several agricultural grassland field parcels and residential houses. The ZoI for the construction phase of the project is given in **Table 4-1.** There are no surface water bodies connecting the Mallow WTP to the surrounding watercourses and therefore no risk of negative impacts to the surrounding environment within the ZoI via hydrological pathways. Hydrogeological pathways to European Sites are discussed below and also excluded. Therefore there is no risk of likely significant effects to the European site network as a result of the construction phase.

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

	Site Name	SAC / SPA Code	Direct Impact	Water Dependent Species / Habitats	Surface Water Connectivity	Groundwater Connectivity[4,5]	Potential Source Pathway Receptor
1	Blackwater River (Cork/Waterford) SAC	SAC 002170	No	Yes	No	Yes (Glenville)	No
2	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC	SAC 000365	No	Yes	No	Yes (Glenville)	No
3	Mullaghanish to Musheramore Mountains SPA	SPA 004162	No	Yes	No	Yes (Glenville)	No
4	Blackwater Estuary SPA	SPA 004028	No	Yes	No	Yes (Glenville)	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 Mallow WTP and associated

[4] Mallow WTP overlies the Glenville (IE_SW_G_037) GWB. All European Sites overlying or supporting connectivity to this groundwater body have been assessed to determine potential source pathway receptors. This is a poorly productive bedrock aquifer and flow is generally unconfined. Most groundwater flow likely occurs in an upper shallow weathered zone. Below this in the deeper zones water-bearing fractures and fissures are less frequent and less well connected. The water table is generally within 10 m of the surface. Local groundwater flow is towards the rivers and streams, and flow path will not usually exceed a few hundred metres in length. Site 2, 3 and 4 are all located >25 km from the WTP, Site 1 is located >1 km for the WTP and there are no surface water connections to all four sites, therefore there is no potential for source impact pathways via this GWB.

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

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- Operational Phase

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive Species / Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
1	Ballymacoda (Clonpriest & Pillmore)	SAC 000077	Yes	Yes	Yes – (Munster Blackwater River & Youghal Bay)	No	Yes
2	Lough Hyne Nature Reserve & Environs	SAC 000097	Yes	Yes	Yes – (Munster Blackwater River, Youghal Bay & Western Celtic Sea)	No	Yes
3	Roaringwater Bay and Islands	SAC 000101	Yes	Yes	Yes – (Munster Blackwater River, Youghal Bay & Western Celtic Sea)	No	Yes
4	Killarney National Park, Macgillycuddy's Reeks & Caragh River Catchment	SAC 000365	Yes	Yes	No – (upstream of WSZ)	Yes – (Glenville)	Yes
5	Barley Cove To Ballyrisode Point	SAC 001040	Yes	**Yes**	Yes – (Munster Blackwater River, Youghal Bay & Western Celtic Sea)	No	Yes
6	Great Island Channel	SAC 001058	Yes	Yes	Yes – (Munster Blackwater River, Youghal Bay & Western Celtic Sea)	No	Yes
7	Ardmore Head	SAC 002123	Yes	Yes	Yes – (Munster Blackwater River, Youghal Bay & Western Celtic Sea)	No	Yes
8	Blackwater River (Cork/Waterford)	SAC 002170	Yes	Yes	Yes – (intersects WSZ, Munster Blackwater River)	Yes – (Glenville, Mitchelstown)	Yes
9	Ballymacoda Bay	SPA 004023	Yes	Yes	Yes – (Munster Blackwater River & Youghal Bay)	No	Yes
10	Blackwater Callows	SPA 004094	Yes	Yes	Yes – (Munster Blackwater River)	Yes – (Mitchel stown)	Yes
11	Blackwater Estuary	SPA 004028	Yes	Yes	Yes – (Munster Blackwater River)	Yes – (Glenville)	Yes
12	Cork Harbour	SPA 004030	Yes	Yes	Yes – (Munster Blackwater River, Youghal Bay & Western Celtic Sea)	No	Yes

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive Species / Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
13	Kilcoman Bog SPA	SPA 004095	Yes	Yes	No – (upstream of WSZ)	Yes – (Mitchel stown)	Yes
14	Sovereign Islands SPA	SPA 004124	Yes	Yes	Yes – (Munster Blackwater River, Youghal Bay & Western Celtic Sea)	No	Yes
15	Stack's to Mullaghareirk Mountains, West Limerick Hills & Mount Eagle	SPA 004161	Yes	Yes	No – (upstream of WSZ)	Yes – (Rathmore West)	Yes
16	Mullaghanish to Musheramore Mountains	SPA 004162	Yes	Yes	No – (upstream of WSZ)	Yes – (Glenville)	Yes

Zone of Influence (ZoI) for Operational Phase

Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)

Kilcolman Bog SPA (004095)

Blackwater River (Cork/Waterford) SAC (002170)

Zone4 Knoppogue

Zone4 Mallow

Zone4 Gortnagraiga

Blackwater Callows SPA (004094)

Blackwater Estuary SPA (004028)

Zone3 Youghal Regional

Mullaghanish to Musheramore Mountains SPA (004162)

Cork City Water Supply

Zone3 Glashaboy

Zone2 Cork Harbour and City

Cork Harbour SPA (004030)

Ballymacoda Bay SPA (004023)

Ardmore Head SAC (002123)

Zone2 Innishannon

Great Island Channel SAC (001058)

Ballymacoda (Clonpriest and Pillmore) SAC (000077)

Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment SAC (000365)

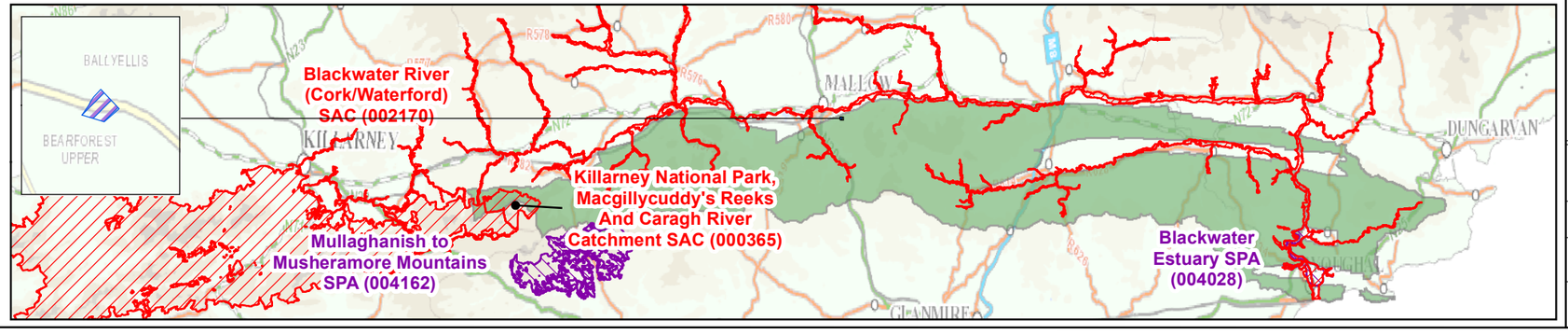
Roaringwater Bay And Islands SAC (000101)

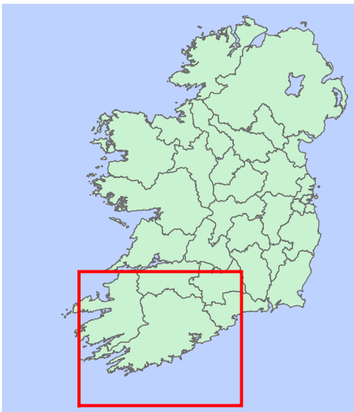
Sovereign Islands SPA (004124)

Barley Cove to Ballyrisode Point SAC (001040)

Lough Hyne Nature Reserve And Environs SAC (000097)

Zone of Influence (ZoI) for Construction Phase





Legend

LEMA Emission Type

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

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

N

0 5 10 20 Kilometres

Client: UISCE ÉIREANN : IRISH WATER

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Zone 4 Mallow

European Sites within the ZoI of the Proposed Project

RPS

Scale: 1:600,000 @ A3	Date: 07/06/2019
File Ref: MDW0766Arc0016aF01	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.** One site is included for further assessment for the operational phase, with justification provided below, and is included into the Section 5 and Section 6 assessment.

The construction phase of the proposed project will take place within the confines of the existing Mallow WTP. The WTP is not located within or directly adjacent to the boundary of any European Site. The Blackwater (Munster)_150 (IE_SW_18B021800) watercourse, which feeds into the main Munster Blackwater River, is located approximately 248m south-east of the Mallow WTP and is buffered by several agricultural grasslands and residential houses. There are no surface water bodies connecting the Mallow WTP to the surrounding watercourses. Mallow WTP lies on the Glenville groundwater body. Potential source pathways (via groundwater) to European Sites within the ZoI have been ruled out. Therefore, there is no risk of likely significant effects to any European Site within the ZoI as a result of the construction phase.

The WSZ for the operational phase in Zone 4 Mallow supplies Mallow and Ballyviniter environs. The WSZ and WTP are located adjacent to the Munster Blackwater River. The following WFD sub-catchments are intersected by the WSZ: Blackwater [Munster]_SC_080, Blackwater [Munster]_SC_090 and Blackwater [Munster]_SC_110. The EAM assessment has determined that the river water body downstream of the WSZ, i.e. Blackwater [Munster]_150 (IE_SW_18B021800) has a modelled increase loading of 35.5 kg/yr total orthophosphate in this receiving water body, and a modelled additional orthophosphate concentration of 0.0001 mg/l. On this basis, it has been determined that the Zone of Influence for the operational phase of the project terminates in the river water body downstream of the WSZ Blackwater [Munster]_150 (IE_SW_18B021800), and there will be no impact to any European Site downstream of this river water body as a result of the proposed dosing at Mallow WTP. On this basis, the following European Sites have been excluded from further assessment: Ballymacoda (Clonpriest and Pillmore) SAC, Lough Hyne Nature Reserve and Environs SAC, Roaringwater Bay SAC, Barley Cove to Ballyriosde Point SAC, Great Island Channel SAC, Ardmore Head SAC, Ballymacoda Bay SPA, Blackwater Callows SPA, Blackwater Estuary SPA, Cork Harbour SPA and Sovereign Islands SPA.

A number of European Sites also lie upstream of the WSZ and therefore will not be impacted via surface water pathways. They are however connected via groundwater body pathways. These sites are: Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, Kilcoman Bog SPA, Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle and Mullaghanish to Musheramore Mountains SPA. Groundwater flows through voids such as connected pore spaces in sand and gravel aquifers and through fissures, faults, joints and bedding planes in bedrock aquifers. Regional groundwater flows tend to follow the regional topography and generally discharge towards main surface water bodies including rivers, lakes and coastal water bodies. In areas of karstified limestones, high permeability zones give rise to rapid groundwater velocities with more complex flow directions, which may vary seasonally and are difficult to predict with certainty. In this case, the assumption is that groundwater flow direction is from areas of higher elevations to lower elevations,

unless groundwater specific information indicates otherwise. Groundwater body specific information relating to flow and discharge is available from the GSI[6], and was consulted in making the assessment.

Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, and Mullaghanish to Musheramore Mountains SPA both intersect the Glenville GWB[7] which is a poorly productive bedrock aquifer. The WSZ intersects this GWB in Mallow only, at the southern boundary of the WSZ. There is no direct overlap between the WSZ and either SPA. Groundwater discharges to springs within the GWB and to the rivers and streams crossing the GWB. Groundwater flow occurs in faults and joints. Most groundwater flow likely occurs in an upper shallow weathered zone. Below this in the deeper zones water-bearing fractures and fissures are less frequent and less well connected. The water table is generally within 10m of the surface. Groundwater in this GWB is generally unconfined. Local groundwater flow is towards the rivers and streams, and flow path will not usually exceed a few hundred metres in length. On this basis, and given the distance between the WSZ and these two European sites, there is no risk of impact to these sites from proposed dosing at Mallow WTP, and they are excluded from further assessment.

Kilcoman Bog SPA does not intersect the Mallow WSZ directly, but is indirectly connected via the Mitchelstown GWB[8]. Groundwater discharges to large springs within the GWB and to the rivers and streams crossing the GWB. Because of the high frequency of fissures in this water body, overall groundwater flow is thought to be of a diffuse nature, although solutionally enlarged conduits and cave systems do occur. The highly permeable aquifer supports a regional scale flow system. At a local scale groundwater flow direction may not follow local topography due to flow in karstified conduit systems. Groundwater flow paths can be up to several kilometres long, but may be significantly shorter in areas where the water table is close to the surface. Regional groundwater flow will be away from the surrounding uplands towards the main rivers draining the valleys. Kilcoman Bog SPA lies adjacent to the Awbeg River which is a tributary of the Munster Blackwater River, and to Lougheagle Stream, which is a tributary of the Awbeg River. Groundwater flow is therefore likely to be in the direction of the Awbeg River, which lies upstream of the WSZ and is not intersected by the WSZ. On this basis, Kilcoman Boy SPA is excluded from further assessment, as there is no risk of impact to this European Site.

Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA does not intersect the Mallow WSZ directly, but is indirectly connected via the Rathmore West GWB[9]. Due to the generally low permeability of the aquifers within this GWB and the high slopes, a high proportion of the recharge will discharge rapidly to surface watercourses via the upper layers of the aquifer, effectively reducing further the available groundwater resource in the aquifer. Groundwater levels are about 1.5 – 15m below ground level, and will generally follow the topography. Close to the rivers and streams, water levels will be near ground level. Surface water features are considered to be in hydraulic continuity with the water table. Groundwater flow will be local, and flow paths are generally short, typically 30 – 300m with ground water discharging to small springs, or to the streams and rivers that traverse the aquifer. Flow directions are expected to approximately follow the local surface water catchments. On this basis, the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA is excluded from further assessment given it is a significant distance upstream of the Mallow WSZ (approximately 30 km), and therefore is no risk to this European Site.

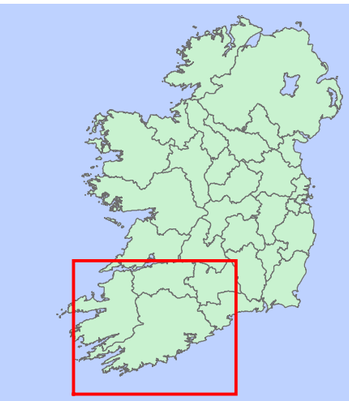
[6] https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx
[7] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/GlenvilleGWB.pdf
[8] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/MitchelstownGWB.pdf
[9] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/RathmoreGWB.pdf

On this basis, no sites are required to be included for further assessment in relation to the construction phase. One site has been included for further assessment in order to evaluate the significance of potential effects arising during the operational phase in Sections 5 and 6 below i.e. Blackwater River (Cork/Waterford) SAC.

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
Operation Phase Only								
Blackwater River (Cork / Waterford) SAC	SAC 002170	31 July 2012 Version 1.0	1029	Freshwater pearl mussel (*Margaritifera margaritifera*)	Yes	Yes	Yes	Yes
			1092	White-clawed Crayfish (*Austropotamobius pallipes*)	Yes	Yes		
			1095	Sea lamprey (*Petromyzon marinus*)	Yes	Yes		
			1096	Brook lamprey (*Lampetra planeri*)	Yes	Yes		
			1099	River lamprey (*Lampetra fluviatilis*)	Yes	Yes		
			1103	Twaite shad (*Alosa fallax*)	Yes	Yes		
			1106	Atlantic salmon (*Salmo salar*) (only in fresh water)	Yes	Yes		
			1130	Estuaries	Yes	Yes		
			1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes		
			1220	Perennial vegetation of stony banks	Yes	No		
			1310	Salicornia and other annuals colonising mud and sand Spartina swards (*Spartinion maritimae*)	Yes	Yes		
			1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	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
			1355	Otter (*Lutra lutra*)	Yes	Yes		
			1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes		
			1421	Killarney fern (*Trichomanes speciosum*)	Yes	Yes		
			3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	Yes	Yes		
			91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	No	Yes		
			91E0	* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Yes	Yes		
			91J0	* Taxus baccata woods of the British Isles	No	No		



Legend

LEMA Emission Type

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

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

N

0 5 10 20 Kilometres

Client: UISCE ÉIREANN : IRISH WATER

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Zone 4 Mallow

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

RPS

Scale: 1:600,000 @ A3	**Date:** 07/06/2019
File Ref: MDW0766Arc0016bF01	**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

There source-pathway-receptor approach has identified a number of potential impact pathways associated with the construction of the orthophosphate treatment works at Mallow 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. These potential pathways have been ruled out in **Section 4.1.1** above.

- 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 Mallow 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 Mallow 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 Mallow WTP into account and therefore included both possible locations. The assessment of impacts associated with the construction of the corrective water treatment works at Mallow WTP is based on a desktop study using the following information:

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

Following the assessment of impacts associated with the construction phase of the corrective water treatment works at Mallow WTP, the Mallow WTP is not located within or directly adjacent to the boundary of any European Site. The Munster Blackwater Blackwater (Munster)_150 (IE_SW_18B021800) watercourse, which feeds into the main Blackwater River, is located approximately 248m south-east of the Mallow WTP and is buffered by several agricultural grasslands and residential houses. There are no surface water bodies connecting the Mallow WTP to the surrounding watercourses and therefore no risk of negative impacts to the surrounding environment within the ZoI. Hydrogeological pathways to European Sites were also excluded. Therefore there is no risk of likely significant effects to the European Site network as a result of the construction phase.

5.3.2 Operational Phase

In the case of the additional orthophosphate load due to dosing at Mallow 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 5-1.** 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. Where a water body does not have monitored orthophosphate concentrations, a conservative approach is used whereby the surrogate indicative quality is calculated based on the ecological status assigned to that water body by the EPA.

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 the ecological status assigned to that water body by the EPA but using the more conservative freshwater orthophosphate limits for the different indicative quality bands are applied[10].

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

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

[10] The conservative thresholds in transitional and coastal water bodies for orthophosphate indicative quality in unassigned water bodies i.e. upper limits are: High 0.025 mg/l; Good 0.04 mg/l; Moderate 0.06 mg/l; Poor 0.09 mg/l; Bad – N/A. The higher range for transitional and coastal water bodies with a median salinity ≤ 17mg/l are: High 0.03 mg/l; Good 0.06 mg/l; Moderate 0.1 mg/l; Poor 0.2 mg/l; Bad N/A.

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

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

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

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

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

Table 5-1: Surface and Groundwater Bodies within the WSZ with a Hydrological or Hydrogeological Connection to European Sites

Site Name (Code)	Contributing WB Code_Name	WB Type[11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline[14] Ortho P Conc.[15] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[16] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
Blackwater River (Cork / Waterford) SAC (002170)	IE_SW_18B021510 Blackwater (Munster)_120	RWB	High Downwards Near	0.024	0.019	35.5	0.0000	0.024	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_18B021600 Blackwater (Munster)_130	RWB	High Downwards Near	0.021	0.019	62.1	0.0001	0.021	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_18B021720 Blackwater (Munster)_140	RWB	High Upwards Far	0.015	0.019	96.7	0.0001	0.015	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_18B021800 Blackwater (Munster)_150	RWB	*Good*	0.*030*	0.033	96.7	0.0001	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_18C020300 Clyda_030	RWB	High None Near	0.022	0.019	0.1	0.0000	0.022	The baseline indicative orthophosphate concentration exceeds 75% of the indicative quality upper threshold, however there is an undetectable increase (0.0000 mg/l) in the concentration as a result of the dosing. Therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

[11] Monitoring period is annual unless specified.
[12] Surrogate Indicative Quality in *italic*.
[13] Distance to threshold.
[14] Baseline year is 2014 for surface water bodies and 2012 for groundwater bodies.
[15] Surrogate concentration is given in *italic* mg/l
[16] Values above 5% of Good / High indicative quality boundary (0.00125 mg/l) for SW or 5% of Good / Fail indicative quality boundary (0.00175 mg/l) for GW highlighted in yellow.
[17] Green cells signify that there is no risk of deterioration in status of the water body following dosing at the WTP.

Site Name (Code)	Contributing WB Code_Name	WB Type[11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline[14] Ortho P Conc.[15] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[16] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
			High None Near	0.021	0.019			0.021	The baseline indicative orthophosphate concentration exceeds 75% of the indicative quality upper threshold, however there is an undetectable increase (0.000 mg/l) in the concentration as a result of the dosing. Therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_037 Glenville	GWB	Good None Far	0.006	0.026	0.3	0.0000	0.006	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.009	0.026			0.009	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_070 Rathmore West	GWB	Good Upwards Far	0.012	0.026	1.8	0.0000	0.012	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.013	0.026			0.013	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.009	0.026			0.009	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_082 Mitchelstown	GWB	Good Upwards Far	0.008	0.026	43.6	0.0004	0.008	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Failing to achieve good Upwards Far	0.041	-			0.042	The post-dosing Ortho P potential baseline exceeds 75% of the indicative quality upper threshold due to the baseline Ortho P conc. The modelled conc. is low and will not result in deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives. In addition this monitoring

Site Name (Code)	Contributing WB Code_Name	WB Type[11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline[14] Ortho P Conc.[15] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[16] (mg/l)	Post-Dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
									site is remote from the WSZ and is not considered characteristic of quality in the GWB, which is otherwise Good.
			Good Upwards Far	0.007	0.026			0.007	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.010	0.026			0.010	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.009	0.026			0.009	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.008	0.026			0.008	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.010	0.026			0.010	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

‡ Load from WWTP / SWO following treatment added

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

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

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

For the purposes of assessing the potential impact on the receiving environment a number of scenarios have been assessed at the agglomerations which receive water from the WSZ (**Table 5-2**). 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 5-2 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 5-3**, 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 5-2: Increased loading / concentration due to Orthophosphate Dosing – Dosing rate = 0.6 mg/l

Agglom. and Discharge Type	ELV from WWDL	Scenario	TP Load Kg/Yr	Ortho P Concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	*0.4*	*0.68*
Mallow Primary Discharge	1.5 mg/l Ortho P Compliant with ELV within the 2017 AER	**Existing**	385.1	0.082	0.065	0.111
		Post Dosing	385.1	0.082	0.065	0.111
Mallow SWOs (8 no.)	n/a	**Existing**	186.9	1.361	1.089	1.851
		Post Dosing	201.5	1.468	1.174	1.996

Table 5-3: Mass balance assessment based on 0.6 mg/l dosing using available background concentrations and mean flow information from Hydrotool or gauged catchments.

Agglom.	RWB Name / Code for Primary Discharge	Background Conc. (mg/l)[18]	Modelled Conc. Existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc
Mallow (D0052)	Blackwater (Munster)_140 IE_SW_18B021720	0.0213	0.0223	0.0223	0.0

Mallow Agglomeration

The Mallow agglomeration discharges into Blackwater (Munster)_140 (IE_SW_18B021720) which is contained within the Blackwater River (Cork/Waterford) SAC. Tertiary treatment is operational at this plant i.e. chemical dosing for orthophosphate removal. The modelled concentrations for both existing and post dosing scenarios are compliant with total phosphorus ELVs set in WWDL. As the plant is compliant with its current ELVs, the EAM assumes the plant can remove any additional orthophosphate load from the effluent due to dosing. When mean flows are taken into account, there is no detectable increase in the receiving water (0.0%) (**Table 5-3**). Therefore, there is no risk of failing to achieve the WFD objectives of the Blackwater (Munster)_140 (IE_SW_18B021720) or its hydrologically connected European Sites as a result of dosing at Mallow WTP.

5.3.4 Assessment of Potential Indirect Impact from Subsurface Flow

5.3.4.1 Sub surface flows from leakage and DWWTP

The modelled increases in concentrations in the subsurface pathways are insignificant for all river water bodies (less than 0.00125 mg/l, which is 5% of the orthophosphate Good / High indicative quality boundary for surface water bodies), with the highest increases equal to 0.0001 mg/l, predicted for: Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720) and Blackwater (Munster)_150 (IE_SW_18B021800).

Therefore, there is no risk of deterioration in the orthophosphate indicative quality or of preventing the achievement of WFD objectives within water bodies or hydrologically / hydrogeologically connected to European Sites as a result of dosing at Mallow WTP.

There are no lake, transitional or coastal water bodies directly affected by the WSZ.

5.3.4.2 Groundwater Assessment

Table 3 Appendix C detailed the loads and modelled concentrations for the assessment of groundwater bodies. The predicted loads to groundwater bodies are very low or undetectable i.e. 0.0000 mg/l for Glenville (IW_SW_G_037) and Rathmore West (IE_SW_G_070) GWBs, and 0.0004 mg/l for Mitchelstown (IE_SW_G_082). One of the seven monitoring points for Mitchelstown (IE_SW_G_082) is failing to achieve good indicative quality, however as the post-dosing increase is < 5% of the Good / Fail indicative quality boundary (0.00175 mg/l), there is no risk of deterioration in orthophosphate indicative quality as a result of dosing.

[18] Annual mean from AER u/s monitoring point.

The subsurface assessment takes into account the groundwater / surface water interaction and as the potential for impact on surface water is not significant, similarly, there is no risk of failing to achieve WFD objectives for groundwater receptors due to orthophosphate dosing.

As all potential increases in orthophosphate concentrations due to dosing are < 5% of the Good / Fail indicative quality boundary (0.00175 mg/l). Therefore, there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives within the hydrogeologically connected groundwater bodies due to orthophosphate dosing as indicated in **Table 3, Appendix C**.

5.3.5 Combined Assessment

Table 4 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 range from undetectable for Blackwater (Munster)_120 (IE_SW_18B021510) and Clyda_030 (IE_SW_18C020300), to 0.0001 mg/l for Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720) and Blackwater (Munster)_150 (IE_SW_18B021800). The dosing therefore poses no risk of deterioration in orthophosphate indicative quality of the river water bodies identified in **Table 5-1**, or preventing the achievement of WFD objectives.

For the Blackwater (Munster)_120 (IE_SW_18B021510), Blackwater (Munster)_130 (IE_SW_18B021600) and Clyda_030 (IE_SW_18C020300), the baseline concentrations are greater than the 75% upper threshold for orthophosphate indicative quality, but as the potential increase due to dosing is undetectable (0.0000 mg/l) in the case of the Blackwater (Munster)_120 (IE_SW_18B021510) and Clyda_030 (IE_SW_18C020300), and negligible (0.0001 mg/l) in the Blackwater (Munster)_130 (IE_SW_18B021600) there is no risk of deterioration in the orthophosphate indicative quality or of preventing to achieve the WFD objectives for these river water bodies. There will be no significant effect on the receiving water bodies as a result of dosing at Mallow WTP.

5.3.6 Assessment of Cumulative Impacts from other WSZs Assessment

In order to assess cumulative impacts based on corrective water treatment which is proposed for WTPs in the same catchment as the Zone 4 Mallow WSZ, the cumulative impact from the combined loads to downstream water bodies has been assessed. An assessment of these cumulative loads has been undertaken and is detailed in **Table 5-4** below. The cumulative loads to the Blackwater (Munster) (HA18) catchment associated with the orthophosphate dosing at the following plants has been undertaken:

- 4 Lee Road WTP - Cork City Water Supply
- 6 Inniscarra WTP – Zone 2 Cork City and Harbour
- 26 Glashaboy WTP – Zone 3 Glashaboy
- 30 Innishannon WTP – Zone 2 Innishannon
- 36 Clonakilty RWSS WTP (Jones Bridge WTP) - Zone 1 Clonakilty
- 59 Glendine WTP - Zone3 Youghal Regional
- 60 Ballyhilty WTP - Zone 1 Skibbereen Ballyhilty
- 72 Kilva Reservoir Site – Zone 3 Whitegate Regional
- 78 Midleton WTP – Zone 3 Midleton
- 83 Tibbetstown WTP - Tibbotstown
- 118 Macroom WTP – Zone 2 Macroom
- 157 Carriglusky Reservoir Site, Cloyne - Zone3 Cloyne

- 161 Freemount WTP – Zone 4 Allow Regional
- 165 Knockraha WTP -Zone3 Glanmire
- 180 Mitchelstown South WTP – Zone 4 Mitchelstown South
- 192 Michelstown Galtee WTP - Cappamore Foileen Water Supply
- 236 Mountnorth Reservoir – Zone 4 Mount North
- 324 Killdorrery WTP – Zone 4 Kildorrery
- 333 Shrone WTP - Shrone PWSS 078A
- 359 Ballymacoda Road Borehole – Zone 3 Killeagh
- 363 Hammond Place Pump Station - Zone 4 Dromahane
- 370 LCB Cappoquin Pump Station - LCB Cappoquin
- 371 LCB Lismore WTP – LCB Lismore
- 376 Tallow WTP - Tallow
- 386 Drimoleague WTP, Deelish - Zone1 Drimoleague
- 400 Bweeng WTP – Zone4 Bweeng

There are three monitoring points on the Blackwater (Munster)_200 (IE_SW_18B022450). Two of the three monitoring points are located on a tributary of the main Blackwater channel, Careysville Stream and one is currently at Bad orthoP indicative quality. Clondulane WWTP discharges to this stream and is noted within the 2021 AER as having an impact on the stream, because the dilution is low and therefore there is no assimilative capacity. Upstream of the WWTP, the monitoring point is at Poor indicative quality. Downstream of the WWTP, this deteriorates to Bad indicative quality.

The Careysville Stream will not receive any dosed water from the WSZ, either alone or in-combination. Using WFD delineation it is encompassed in the Blackwater (Munster)_200, however it is upstream of the main channel and not connected to the WSZ. The representative monitoring station for the main channel (RS18B022450) shows that the indicative quality is high. Sufficient dilution has taken place to between the tributary stream, which is not located within the SAC but discharges directly to it, and the Blackwater main channel. The modelled increase on the Blackwater (Munster)_200 cumulatively is insignificant (0.0002 mg/l), which does not exceed 5% of the High / Good indicative quality boundary. Therefore, there is no risk of deterioration in the indicative quality of the water body as a result of dosing, or of preventing the achievement of WFD objectives.

The baseline orthoP concentration for the following river water bodies; Blackwater (Munster)_120 (IE_SW_18B021510), Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_180 (IE_SW_18B022100), Blackwater (Munster)_190 (IE_SW_18B022300), Blackwater (Munster)_200 (IE_SW_18B022450), and Clyda_030 (IE_SW_18C020300); and coastal water body Youghal Bay (winter) exceed the 75% upper indicative quality threshold. The EAM modelled additional load as a result of dosing is either undetectable (0.0000mg/l) Youghal Bay or insignificant (0.0001mg/l to 0.0002mg/l) for the other water bodies listed and will not cause a deterioration in the orthophosphate indicative quality of the water bodies or prevent their achievement of WFD objectives.

The impact to the remaining receiving waters is also not significant 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 5-4: Cumulative assessment of the increased loading and concentrations to water bodies impacted by Zone 4 Mallow WSZ and other WSZs proposed for corrective water treatment in the upstream catchments

NAME / EU_CD	WB Type/ Period	Ortho P Indicative Quality and Trends[19]	Baseline Year 2014 and Conc.[20] (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 flows mg/l	PO4 Potential Baseline Conc. following dosing mg/l
IE_SW_18C020300 CLYDA_030	RWB	High None Near	0.022	0.019	3.5	0.0000	0.022‡
		High None Near	0.021	0.019			0.021‡
IE_SW_18B021510 Blackwater (Munster)_120	RWB	High Downwards Near	0.024	0.019	135.2	0.0001	0.024‡
IE_SW_18B021600 Blackwater (Munster)_130	RWB	High Downwards Near	0.021	0.019	166.1	0.0001	0.021‡
IE_SW_18B021720 Blackwater (Munster)_140	RWB	High Upwards Far	0.015	0.019	200.7	0.0002	0.015‡
IE_SW_18B021800 Blackwater (Munster)_150	RWB	*Good*	*0.030*	*0.033*	*200.8*	*0.0002*	*0.030‡*
IE_SW_18B021900 BLACKWATER (MUNSTER)_160	RWB	Good Upwards Far	0.027	0.033	200.8	0.0002	0.027‡
IE_SW_18B022000 BLACKWATER (MUNSTER)_170	RWB	*High*	*0.022*	*0.019*	*303.0*	*0.0002*	*0.022‡*
IE_SW_18B022100 BLACKWATER (MUNSTER)_180	RWB	High Upwards Near	0.024	0.019	303.0	0.0002	0.024‡
IE_SW_18B022300 BLACKWATER (MUNSTER)_190	RWB	Good Upwards Far	0.030	0.033	303.0	0.0002	0.030‡
		High Downwards Near	0.025	0.019			0.025‡
IE_SW_18B022450 Blackwater (Munster)_200	RWB	Bad None Far	0.208	-	335.3	0.0002	0.208‡
		Moderate Downwards Near	0.054	0.051			0.054‡

[19] Distance to threshold
[20] Surrogate concentration indicated in *italic*

NAME / EU_CD	WB Type/ Period	Ortho P Indicative Quality and Trends[19]	Baseline Year 2014 and Conc.[20] (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 flows mg/l	PO4 Potential Baseline Conc. following dosing mg/l
		Good Upwards Far	0.028	0.026			0.028‡
IE_SW_18B022700 Blackwater (Munster)_220	RWB	Good	0.033	0.033	338.3	0.0002	0.033‡
		Moderate	0.037	0.056			0.037‡
		Moderate	0.044	0.056			0.044‡
		Moderate	0.050	0.056			0.050‡
IE_SW_020_0500 Upper Blackwater M Estuary	TWB Summer	High	0.019	0.023	380.9	0.0002	0.019‡
	TWB Winter	Good	0.031	0.053			0.031‡
IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour	TWB Summer	High	0.021	0.023	506.3	0.0001	0.021‡
	TWB Winter	Good	0.034	0.053			0.034‡
IE_SW_020_0000 Youghal Bay	CWB Summer	High	0.008	0.019	517.9	0.0000	0.008‡
	CWB Winter	High	0.022	0.019			0.022‡
IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20)	CWB	*High*	*0.013*	*0.019*	9601.2	0.0001	*0.013*‡

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

5.3.7 Conclusions

The increased orthophosphate dosing concentrations from direct discharges to surface water do not result in a noticeable impact with an increase in the orthophosphate concentrations in the receiving Blackwater (Munster)_140 (IE_SW_18B021720) at 0%, as shown by the mass balance assessment in **Table 2 Appendix C**.

The modelled increases in concentrations in the subsurface pathways are insignificant for all river water bodies (less than 0.00125 mg/l, which is <5% of the orthophosphate Good / High indicative quality boundary for surface water bodies), with the highest increase equal to 0.0001 mg/l, taking place in Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720) and Blackwater (Munster)_150 (IE_SW_18B021800).

For groundwater bodies connected to the WSZs, all potential increases in orthophosphate concentrations due to dosing were low or undetectable i.e. 0.0000 mg/l for Glenville (IW_SW_G_037) and Rathmore West (IE_SW_G_070) and 0.0004 mg/l for Mitchelstown (IE_SW_G_082) and within the 5% of the Good / Fail boundary (i.e. < 0.00175 mg/l)

Modelled post-dosing concentrations to all remaining river and ground water bodies are below 5% of the Good / High orthophosphate indicative quality boundary and therefore there is no risk of deterioration in the orthophosphate indicative quality of the water bodies as a result of the proposed project, or of preventing the achievement of WFD objectives.

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

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

6 EVALUATION OF LIKELY SIGNIFICANT EFFECTS

6.1 CONSTRUCTION PHASE

Mallow WTP is not located within or directly adjacent to the boundary of any European site. The WTP is located approximately 248 m south-east of the Munster Blackwater (IE_SW_18B021800 Blackwater (Munster)_150) watercourse, which feeds into the main Munster Blackwater River and is buffered by several agricultural grassland parcels and residential houses. There are no surface water bodies connecting the Mallow WTP to the surrounding watercourses, in addition groundwater connections have been ruled out. In the absence of pathways for potential impacts there is no risk of negative impacts to the surrounding environment within the ZoI.

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

6.2 OPERATIONAL PHASE

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

6.2.1 Blackwater River (Cork/Waterford) SAC 002170

6.2.1.1 (1029) Freshwater Pearl Mussel

Conservation objectives for the species in the Blackwater River SAC have been set; however an orthophosphate specific level is not defined. In addition, the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations S.I. No. 296 of 2009, as amended in 2018[21], set ecological quality objectives for the Freshwater pearl mussel habitat, which are the equivalent of high ecological status. The European Communities Environmental Objectives (Surface Water) Regulations S.I. No. 272 of 2009 (as amended) set a limit of ≤0.025 (mean) or ≤0.045 (95%ile) mg/l for Molybdate Reactive Phosphorus (MRP) (mg P/l) for high ecological status waters, however the level required is likely to be even lower than this standard. These objectives have framed the impact assessment for this species within this SAC for this proposed project.

Table 5-1 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River (Cork/Waterford) SAC and will receive inputs from the proposed orthophosphate dosing at Mallow WTP:

- The river water bodies that are hydrologically connected include: Blackwater (Munster)_120 (IE_SW_18B021510), Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater

[21] http://www.irishstatutebook.ie/eli/2018/si/355/made/en/pdf

(Munster)_140 (IE_SW_18B021720), Blackwater (Munster)_150 (IE_SW_18B021800) and Clyda_030 (IW_SW_18C020300); and

- The groundwater bodies connected to the site include: Glenville (IE_SW_G_037), Rathmore West (IE_SW_G_070) and Mitchelstown (IE_SW_G_082).

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

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

The Allow population lies upstream of Kanturk in North Cork which is upstream of the Mallow WSZ and therefore will not be impacted by the project. The Licky population lies on the eastern side of the Munster Blackwater Estuary and is not hydrologically connected to the Mallow WSZ and therefore will not be impacted by the project.

The distribution of the Freshwater pearl mussel in the Munster Blackwater catchment is presented in **Figure 6-1** below[22]. The largest known habitat reach is upstream and downstream of Mallow, within the WSZ. **Figure 6-2** shows the distribution and suitable habitat of Freshwater pearl mussel within the designated catchment from the Blackwater River (Cork/Waterford) SAC Conservation Objectives.

[22] Munster Blackwater Freshwater Pearl Mussel Sub-basin Management Plan 2009 – 2015. Final. August 2010.

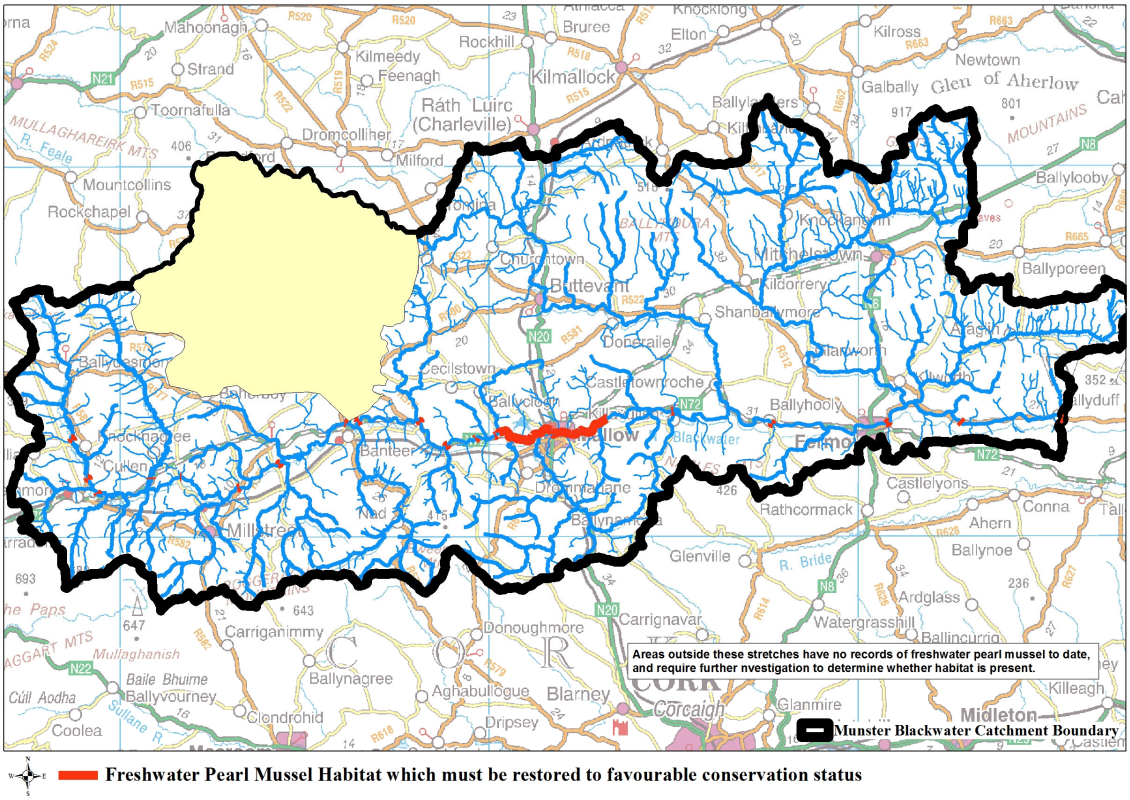


Figure 6-1: Freshwater pearl mussel habitat within the Munster Blackwater Catchment (not yet updated since S.I. No. 355 of 2018)

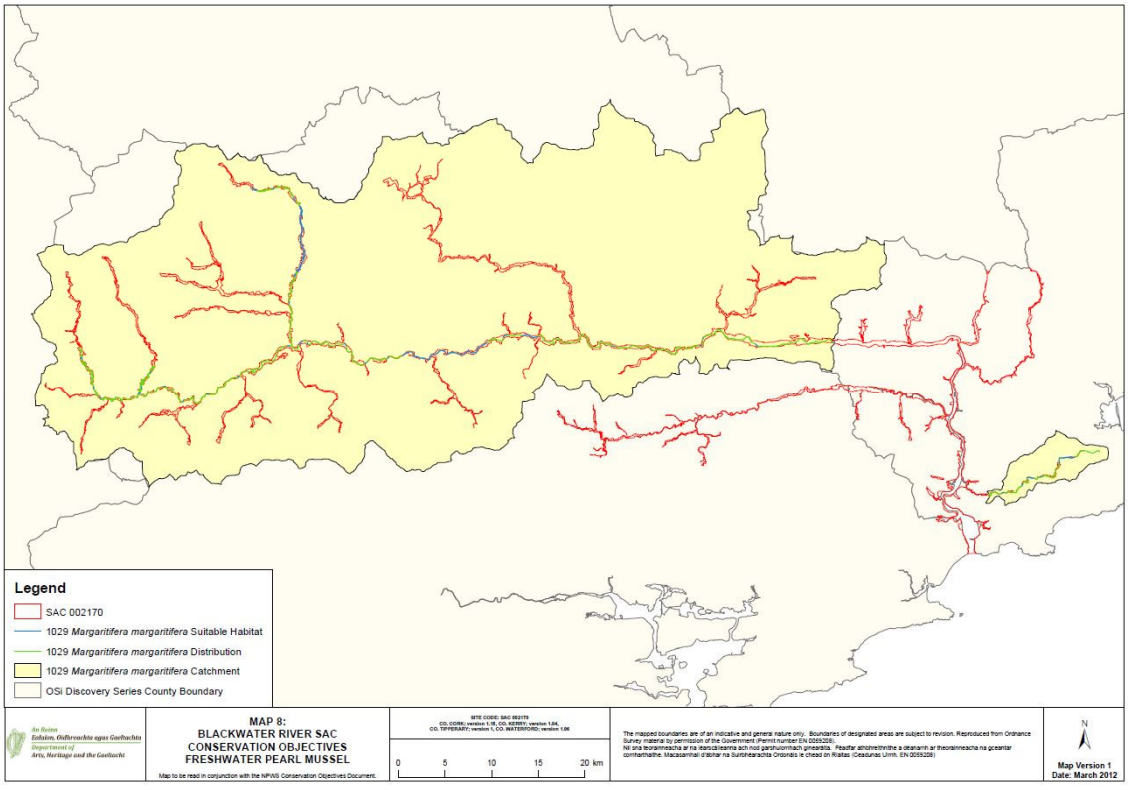


Figure 6-2: Blackwater River SAC Conservation Objectives for Freshwater pearl mussel[23]

[23] NPWS 2012 Blackwater River (Cork/Waterford) SAC 002170 Conservation Objectives

The EAM has assessed the potential for impact on water quality and nutrient conditions and has based this assessment on a conservative basis using all available riverine flows. Full details of the assessment are provided in **Appendix C**.

As described above, five river water bodies are connected to the WSZ and to the Blackwater River (Cork / Waterford) SAC. The modelled increases in concentrations in the subsurface pathways are insignificant for all river water bodies (less than 0.00125 mg/l, which is 5% of the Good / High orthophosphate indicative quality boundary for surface water bodies), with the highest increases equal to 0.0001 mg/l, taking place in Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720) and Blackwater (Munster)_150 (IE_SW_18B021800).

One of these three water bodies are currently not meeting the high ecological status requirement for Freshwater pearl mussel catchments, or ≤0.025 mg/l (mean) or ≤0.045 mg/l (95%ile) orthophosphate as per the European Communities Environmental Objectives (Surface Water) Regulations S.I. No. 272 of 2009 (as amended). The Blackwater (Munster)_150 (IE_SW_18B021800) is currently at Good indicative quality. Given predicted increases of orthophosphate as a result a result of dosing at Mallow WTP are all 0.0001 mg/l, it is concluded that there is no risk of deterioration in orthophosphate indicative quality for these three river water bodies. Modelled increases are low and will not compromise the achievement of a high ecological status objective or the ability to maintain the objective.

Clyda_030 (IW_SW_18C020300) is also currently meeting the high ecological status requirement for Freshwater pearl mussel catchments at both monitoring locations. The modelled increase in concentration for this water body is 0.0000 mg/l; therefore there will be no deterioration in the orthophosphate indicative quality of this water body as a result of the project. The proposed works will not impact on the restoration of the habitat for this species as there will be no change in the indicative quality classification of the water bodies as a result of dosing.

At present, Blackwater (Munster)_120 (IE_SW_18B021510) is at high indicative quality, with an downward trend (trend not significant) and a baseline concentration of 0.024 mg/l for orthophosphate in 2020. This water body is meeting the high status environmental quality standard; and with a predicted undetectable increase in orthophosphate concentration for this water body as a result of proposed dosing (0.0000 mg/l), the proposed works will not impact on the current orthophosphate indicative quality of this river water body or prevent.

For groundwater bodies, the predicted loads to groundwater bodies are very low and undetectable i.e. 0.0000 mg/l for Glenville (IW_SW_G_037) and Rathmore West (IE_SW_G_070) and 0.0004 mg/l for Mitchelstown (IE_SW_G_082). One of the seven monitoring points for Mitchelstown (IE_SW_G_082) is failing to achieve good orthophosphate indicative quality, however as the modelled post-dosing increase is less than 5% of the Good / Fail indicative quality boundary, it is not considered to be significant. In addition this monitoring site is remote from the WSZ and is not considered characteristic of quality in the GWB, which is otherwise Good. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, similarly, there is no risk of failing WFD objectives for groundwater receptors due to orthophosphate dosing.

There are no transitional or coastal water bodies directly affected by this WSZ. There will be no potential for indirect impact to the species via these pathways e.g. via Atlantic salmon as a host to Freshwater pearl mussel larval glochidia. The assessment of potential for impacts to Atlantic salmon (freshwater only) is provided below under **Section 6.2.1.3**.

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

6.2.1.2 (1092) White-clawed crayfish

A review of the targets and measures for the White-clawed crayfish found no nutrient specific targets for the species (NPWS, 2012[23]). However, white-clawed crayfish have a general water quality requirement for moderate to good water quality (i.e. Q3-4 or higher; NPWS, 2013[24]), therefore any reduction in water quality as a result of orthophosphate loading would be contrary to the conservation objectives for this species.

Table 5-1 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River (Cork/Waterford) SAC and will receive inputs from the proposed orthophosphate dosing at Mallow WTP. The White-clawed crayfish is a river species only; therefore the relevant waters for assessment are river water bodies and groundwater bodies:

- The river water bodies that are hydrologically connected include: Blackwater (Munster)_120 (IE_SW_18B021510), Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720), Blackwater (Munster)_150 (IE_SW_18B021800) and Clyda_030 (IW_SW_18C020300); and
- The groundwater bodies connected to the site include: Glenville (IE_SW_G_037), Rathmore West (IE_SW_G_070) and Mitchelstown (IE_SW_G_082).

Within the Munster Blackwater River system, White-clawed crayfish is present only in the Awbeg River. The main Munster Blackwater River is considered chemically unsuitable for the White-clawed crayfish, however, there have been some records from other parts of the river system e.g. downstream of the confluence of the Awbeg and Munster Blackwater Rivers which may represent a specimen moving out of the Awbeg, and the second was upstream of Mallow (NPWS, 2012[23]) and this may represent a new population or an introduction. On a precautionary basis, this assessment has been undertaken on the basis that the species may be present in the main Munster Blackwater River, notwithstanding the lack of suitable chemical conditions i.e. lack of limestone geology.

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

All river water bodies intersected by the WSZ have modelled concentrations for orthophosphate which are below the 5% Good / High indicative quality boundary (0.00125 mg/l) following dosing at Mallow WTP. The highest increases in modelled orthophosphate concentrations was 0.0001 mg/l for Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720) and Blackwater (Munster)_150 (IE_SW_18B021800).

The Blackwater (Munster)_120 (IE_SW_18B021510) and Clyda_030 (IE_SW_18C020300) are currently at high indicative quality, and the predicted modelled increase in concentration in these water bodies

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

is undetectable (0.0000 mg/l). Therefore, there will be no impact to the indicative quality classifications of these river water bodies as a result of the project (see **Table 5-1**).

For groundwater bodies, the predicted loads to groundwater bodies are very low and undetectable i.e. 0.0000 mg/l for Glenville (IW_SW_G_037) and Rathmore West (IE_SW_G_070) and 0.0004 mg/l for Mitchelstown (IE_SW_G_082). One of the seven monitoring points for Mitchelstown (IE_SW_G_082) is failing to achieve good orthophosphate indicative quality, however as the modelled post-dosing increase is less than 5% of the Good / Fail indicative quality boundary, it is not considered to be significant. In addition this monitoring site is remote from the WSZ and is not considered characteristic of quality in the GWB, which is otherwise Good. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, similarly, there is no risk of failing WFD objectives for groundwater receptors due to orthophosphate dosing.

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

6.2.1.3 (1095) Sea lamprey, (1096) Brook lamprey, (1099) River lamprey, (1103) Twaite shad and (1106) Atlantic salmon (freshwater only)

Water quality is a particular threat to all fish fauna listed as qualifying interests. The latest Red List of Irish amphibians, reptiles and freshwater fish (King *et al*., 2011[25]) highlights the deterioration in water quality and ongoing point and diffuse sources of pollution as a key threat to these species and includes the potential effects from municipal discharges. The SSCOs (NPWS, 2012[23]) for these fish species requires that the spawning habitat should not be reduced. Deterioration in water quality has the potential for a detrimental effect on spawning habitats, particularly where nutrient conditions result in excessive algal growth and macrophyte abundance, leading to smothering, shading effects, alteration of macroinvertebrate communities and silt deposition. The SSCOs for salmon also requires a Q-value of at least 4, which equates to good ecological status.

Sea lamprey, river lamprey and brook lamprey have a mapped distribution throughout the SAC, including some tributaries (as per Map 10, NPWS, 2012[23]). The distribution of Atlantic salmon is not provided in the SSCO report. The Munster Blackwater River and its tributaries are surveyed for fish as part of the WFD surveillance monitoring programme in rivers. The most recent fish survey of the Munster Blackwater was carried out in 2013 at Lismore Bridge (0km), Killavullen Br. (46km upstream of WSZ) and Nohaval Bridge (100km upstream of WSZ). At Lismore Bridge, salmon was the most abundant fish species recorded during the survey. No lamprey species were recorded. Salmon and lamprey were both previously recorded during a 2010 survey of the site. At Killavullen Bridge, lamprey species and salmon were among the fish species recorded. Salmon were also observed during a 2009 survey of the site. At the Nohaval Bridge, salmon was the most abundant fish species recorded during the 2013 surveys. Lamprey species were also recorded. Salmon were also observed during a 2010 and

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

2009 survey of the site. While lamprey species were observed during the 2010 survey only (Kelly *et al*., 2014[26]).

A WFD fish survey of the Finisk River (tributary of the Munster Blackwater) was carried out in 2014. The survey site was located downstream of Modelligo Bridge, approximately 4km of the Cappoquin WSZ. Salmon was the most abundant fish species recorded at this site. Lamprey species were not recorded during the 2014 survey however both lamprey and salmon were previously recorded at this location in 2010 (Kelly *et al*., 2015[27]).

IFI also surveyed two sites on the River Funshion, one at Brackbaun Bridge and another at Kilbeheny Bridge, in 2014. The Funshion is a tributary of the Munster Blackwater and confluences with the Munster Blackwater approximately 20km upstream of the Cappoquin WSZ. Salmon was observed at both survey sites and it was one of the most abundant fish species recorded at the Kilbeheny Bridge. Lamprey species were not recorded at either survey site (Kelly et al., 2015[27]). The River Funshion was also surveyed in 2013 upstream of Ballyfean Bridge, approximately 1km upstream of the River Munster Blackwater River confluence. Salmon was the most common species recorded. Lamprey species were also recorded. Salmon and lamprey were previously observed during the 2010 survey of the site (Kelly et al., 2014[26]).

It is noted that large weirs on the Munster Blackwater may delay salmon upstream migration in certain water conditions but do not generally prevent access to spawning areas. For twaite shad, there is no distribution provided in the SSCO for the site and the species is also impacted by large weirs on the Munster Blackwater which prevents potential exploitation of adult spawning grounds (NPWS, 2012[23]). It is assumed for the purposes of this assessment, that all species have access to the water bodies which may potentially be impacted by the proposed dosing at LCB Cappoquin PS, thereby providing a conservative assessment of impacts.

Table 5-1 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River (Cork/Waterford) SAC and will receive inputs from the proposed orthophosphate dosing at Mallow WTP:

- The river water bodies that are hydrologically connected include: Blackwater (Munster)_120 (IE_SW_18B021510), Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720), Blackwater (Munster)_150 (IE_SW_18B021800) and Clyda_030 (IW_SW_18C020300); and
- The groundwater bodies connected to the site include: Glenville (IE_SW_G_037), Rathmore West (IE_SW_G_070) and Mitchelstown (IE_SW_G_082).

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**.

[26] Kelly, F.L., Matson, R., Connor, L., Feeney, R., Morrissey, E., Coyne, J. and Rocks, K. (2014) Water Framework Directive Fish Stock Survey of Rivers in the South Western River Basin District. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland. http://wfdfish.ie/wp-content/uploads/2011/11/SWRBD_rivers_report_2013.pdf

[27] Kelly, F.L., Connor, L., Matson, R., Feeney, R., Morrissey, E., Coyne, J. and Rocks, K. (2015) Sampling Fish for the Water Framework Directive, Rivers 2014. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland. http://wfdfish.ie/wp-content/uploads/2011/11/Rivers_report_2014.pdf

All river water bodies intersected by the WSZ have modelled concentrations for orthophosphate which are below the 5% Good / High indicative quality boundary (0.00125 mg/l) following dosing at Mallow WTP. The highest increases in modelled orthophosphate concentrations was 0.0001 mg/l for Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720) and Blackwater (Munster)_150 (IE_SW_18B021800).

The Blackwater (Munster)_120 (IE_SW_18B021510) and Clyda_030 (IE_SW_18C020300) are currently at high indicative quality, and the predicted modelled increase in concentration in these water bodies is undetectable (0.0000 mg/l). Therefore, there will be no impact to the indicative quality classifications of these river water bodies as a result of the project (see **Table 5-1**).

For groundwater bodies, the predicted loads to groundwater bodies are very low and undetectable i.e. 0.0000 mg/l for Glenville (IW_SW_G_037) and Rathmore West (IE_SW_G_070) and 0.0004 mg/l for Mitchelstown (IE_SW_G_082). One of the seven monitoring points for Mitchelstown (IE_SW_G_082) is failing to achieve good orthophosphate indicative quality, however as the modelled post-dosing increase is less than 5% of the Good / Fail indicative quality boundary, it is not considered to be significant. In addition this monitoring site is remote from the WSZ and is not considered characteristic of quality in the GWB, which is otherwise Good. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, similarly, there is no risk of failing WFD objectives for groundwater receptors due to orthophosphate dosing.

In light of the EAM assessment result, which evaluates the additional orthophosphate loading from dosing at Mallow WTP, it has been demonstrated that likely significant effects on these Annex II species. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of Sea lamprey, Twaite shad and maintenance of the favourable conservation condition of Brook lamprey, River lamprey and Atlantic salmon.

6.2.1.4 (1130) Estuaries

The attributes and targets that will maintain the favourable conservation condition of this habitat in the Blackwater River SAC do not make specific reference to water quality and nutrient conditions; however, there is a requirement to conserve community types in their natural conditions (NPWS, 2012[23]). The COs supporting document for Marine habitats (NPWS, 2012[28]) does require that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

There are no transitional or coastal water bodies directly affected by this WSZ. The EAM assessment has determined that the river water body downstream of the WSZ, i.e. Blackwater [Munster]_150 (IE_SW_18B021800) has a modelled increase loading of 96.7 kg/yr total orthophosphate in this receiving water body, and a modelled orthophosphate concentration of 0.0001 mg/l. On this basis, it has been determined that the zone of influence for this WSZ terminates in the river water body downstream of the WSZ - Blackwater [Munster]_150 (IE_SW_18B021800), and there will be no impact to any European Site downstream of this river water body as a result of the proposed dosing at Mallow

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

WTP, and therefore there will be no impact on any coastal or marine habitat within the Blackwater River (Cork / Waterford) SAC.

6.2.1.5 (1140) Mudflats and sandflats not covered by seawater at low tide

The attributes and targets that will maintain the favourable conservation condition of this habitat in the Blackwater River SAC do not make specific reference to water quality and nutrient conditions however there is a requirement to conserve community types in their natural conditions (NPWS, 2012[23]). The COs supporting document for Marine habitats (NPWS, 2012[28]) does require that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

There are no transitional or coastal water bodies directly affected by this WSZ. The EAM assessment has determined that the river water body downstream of the WSZ, i.e. Blackwater [Munster]_150 (IE_SW_18B021800) has a modelled increase loading of 96.7 kg/yr total orthophosphate in this receiving water body, and a modelled orthophosphate concentration of 0.0001 mg/l. On this basis, it has been determined that the zone of influence for this WSZ terminates in the river water body downstream of the WSZ - Blackwater [Munster]_150 (IE_SW_18B021800), and there will be no impact to any European Site downstream of this river water body as a result of the proposed dosing at Mallow WTP, and therefore there will be no impact on any coastal or marine habitat within the Blackwater River (Cork / Waterford) SAC.

6.2.1.6 (1310) Salicornia and other annuals colonising mud and sand, (1330) Atlantic salt meadows and (1410) Mediterranean salt meadows

There are no nutrient specific targets in the SSCOs for these saltmarsh habitats (NPWS, 2012[23]); however there is a target relevant to all three habitats to maintain the natural tidal regime i.e. regular tidal inundation. The CO supporting document on coastal habitats (NPWS, 2012[29]) for the Blackwater River SAC was reviewed, and discusses the flooding regime attribute and associated target in further detail. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

Salicornia habitat was not recorded by McCorry and Ryle (2009) during the Saltmarsh Monitoring Project at Kinsalebeg estuary, but is known to occur at Foxhole (above Youghal), Blackbog, and Tourig estuary (Curtis and Sheehy-Skeffington, 1998)[23]. However, the full extent is un-mapped and further surveyed areas maybe present within the site. It is estimated that the Kinsalebeg sub-site represents less than 10% of the total area of saltmarsh within this SAC (NPWS, 2012[29]).

For Atlantic salt meadows, and based on the Saltmarsh Monitoring Project, one sub-site that supports the habitat was mapped (Kinsalebeg) (2.77ha) and additional areas of potential saltmarsh (28.13ha) were identified from an examination of aerial photographs. The habitat also occurs at Tourig Hall and

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

Ballintray House (Curtis and Sheehy-Skeffington, 1998). As with *Salicornia* habitat, further unsurveyed areas maybe present within the site.

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

On the basis of the information above, and using a precautionary approach, it was determined that the three habitat types have the potential to occur along any part of the coastline that is covered by the tide (following McCorry and Ryle, 2009[30]).

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

There are no transitional or coastal water bodies directly affected by this WSZ. The EAM assessment has determined that the river water body downstream of the WSZ, i.e. Blackwater [Munster]_150 (IE_SW_18B021800) has a modelled increase loading of 96.7 kg/yr total orthophosphate in this receiving water body, and a modelled orthophosphate concentration of 0.0001 mg/l. On this basis, it has been determined that the zone of influence for this WSZ terminates in the river water body downstream of the WSZ - Blackwater [Munster]_150 (IE_SW_18B021800), and there will be no impact to any European Site downstream of this river water body as a result of the proposed dosing at Mallow WTP, and therefore there will be no impact on any coastal or marine habitat within the Blackwater River (Cork / Waterford) SAC.

In light of the EAM assessment result, which evaluates the additional orthophosphate loading from dosing at Mallow WTP, it has been demonstrated that likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of Salicornia and Mediterranean saltmarsh habitats and restoration of the favourable conservation condition for Atlantic salt meadow.

6.2.1.7 (1355) Otter

A review of the SSCOs (NPWS, 2012[31]) found no specific attributes or targets relating to water quality however the National Parks and Wildlife Service's Threat Response Plan for the Otter (NPWS, 2009[32]), review of and response to the pressures and threats to otters in Ireland, categorized three principal risks to otters: i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution.

The extent of terrestrial, marine and freshwater (river) habitat within the site includes all areas within a 10m terrestrial buffer along the shoreline (above the high water mark and along river banks) identified as critical for otters; areas within 80m of the shoreline (high water mark) and river length

30 https://www.npws.ie/sites/default/files/publications/pdf/McCorry_%26_Ryle_2009_Saltmarsh_survey_V1.pdf

31 https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf

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

calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (NPWS, 2012[23]). The diet of the species varies locally and seasonally; however, it is dominated by fish, in particular salmonids, eels and sticklebacks in freshwater.

Table 5-1 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River (Cork/Waterford) SAC and will receive inputs from the proposed orthophosphate dosing at Mallow WTP:

- The river water bodies that are hydrologically connected include: Blackwater (Munster)_120 (IE_SW_18B021510), Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720), Blackwater (Munster)_150 (IE_SW_18B021800) and Clyda_030 (IW_SW_18C020300); and
- The groundwater bodies connected to the site include: Glenville (IE_SW_G_037), Rathmore West (IE_SW_G_070) and Mitchelstown (IE_SW_G_082).

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

All river water bodies intersected by the WSZ have modelled concentrations for orthophosphate which are below the 5% Good / High indicative quality boundary (0.00125 mg/l) following dosing at Mallow WTP. The highest increases in modelled orthophosphate concentrations was 0.0001 mg/l for Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720) and Blackwater (Munster)_150 (IE_SW_18B021800).

The Blackwater (Munster)_120 (IE_SW_18B021510) and Clyda_030 (IE_SW_18C020300) are currently at high indicative quality, and the predicted modelled increase in concentration in these water bodies is undetectable (0.0000 mg/l). Therefore, there will be no impact to the indicative quality classifications of these river water bodies as a result of the project (see Table 5 1).

For groundwater bodies, the predicted loads to groundwater bodies are very low and undetectable i.e. 0.0000 mg/l for Glenville (IW_SW_G_037) and Rathmore West (IE_SW_G_070) and 0.0004 mg/l for Mitchelstown (IE_SW_G_082). One of the seven monitoring points for Mitchelstown (IE_SW_G_082) is failing to achieve good orthophosphate indicative quality, however as the modelled post-dosing increase is less than 5% of the Good / Fail indicative quality boundary, it is not considered to be significant. In addition this monitoring site is remote from the WSZ and is not considered characteristic of quality in the GWB, which is otherwise Good. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, similarly, there is no risk of failing WFD objectives for groundwater receptors due to orthophosphate dosing.

In light of the EAM assessment result, which evaluates the additional orthophosphate loading from dosing at Mallow WTP, it has been demonstrated that likely significant effects can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of otter.

6.2.1.8 (1421) Killarney fern

Killarney fern is a type of filmy fern. It grows in deeply shaded, humid situations such as dripping caves, crevices and overhangs on cliffs and rocky slopes, in stream gullies, by waterfalls and in woodlands, and occasionally occurs under fallen trees and on the floor of damp woodlands[33]. There are currently two locations known within the SAC where this species occurs: one near Glendine, adjacent to Lackaroe (Glendine Estuary) (IE_SW_020_0400), and the second site at Glengarra, north of Lismore. Both are therefore downstream of the Mallow WSZ.

A review of the SSCOs for Killarney fern (NPWS, 2012[23]) found no specific attributes or targets relating to nutrients or water quality; however it is threatened by a variety of activities and impacts, including indirectly by water pollution.

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

The EAM assessment has determined that the river water body downstream of the WSZ, i.e. Blackwater [Munster]_150 (IE_SW_18B021800) has a modelled increase loading of 96.7 kg/yr total orthophosphate in this receiving water body, and a modelled orthophosphate concentration of 0.0001 mg/l. On this basis, it has been determined that the zone of influence for this WSZ terminates in the river water body downstream of the WSZ - Blackwater [Munster]_150 (IE_SW_18B021800), and there will be no impact to any European Site downstream of this river water body as a result of the proposed dosing at Mallow WTP. The Blackwater River (Cork / Waterford) SAC extends from upstream of the Mallow WSZ to the Munster Blackwater estuary, and therefore extends beyond Blackwater [Munster]_150 (IE_SW_18B021800). As the known locations of Killarney fern are downstream of this river water body, it has been determined that there will be no likely significant effect to this species, as there will be no effect on any water body downstream of Blackwater [Munster]_150 (IE_SW_18B021800).

In light of the EAM assessment result, which evaluates the additional orthophosphate loading from dosing at Mallow WTP, it has been demonstrated that likely significant effects can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of Killarney fern.

6.2.1.9 (3260) Watercourses of plain to montane levels

The full distribution of this habitat and its sub-types in this site are currently unknown. The basis of the selection of the SAC for the habitat was the presence of plant species listed in the Interpretation Manual (European Commission, 2007), recorded during the Natural Heritage Area (NHA) survey of the river (internal NPWS files)[23]. The dominant floating-leaved species appears to be the common and widespread stream water-crowfoot (*Rannunculus penicillatus* subsp. *Penicillatus*) (Green, 2008; O'Mahoney, 2009)[23]. No high conservation value sub-types are known to occur in the SAC and further survey is required to determine whether any such are present. Only one rare / threatened vascular plant species is known to occur in the SAC, the protected opposite-leaved pondweed (*Groenlandia densa*), which is abundant in the tidal stretches around Cappoquin (Green, 2008)[23], which is downstream of the Mallow WTP. However, given the distance between Mallow and Cappoquin and

[33] https://www.npws.ie/sites/default/files/publications/pdf/Art17-Vol1-web.pdf

the concentration of additional orthophosphate loading from dosing at Mallow WTP it is not expected for likely significant effects to occur to the species.

The SSCOs (NPWS, 2012[23]) for this site include a target that the concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition. Water quality should reach a minimum of WFD 'good status', in terms of nutrient and oxygenation standards and ecological quality ratios (EQRs) for macroinvertebrates and phytobenthos.

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

Table 5-1 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River (Cork/Waterford) SAC and will receive inputs from the proposed orthophosphate dosing at Mallow WTP:

- The river water bodies that are hydrologically connected include: Blackwater (Munster)_120 (IE_SW_18B021510), Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720), Blackwater (Munster)_150 (IE_SW_18B021800) and Clyda_030 (IW_SW_18C020300); and
- The groundwater bodies connected to the site include: Glenville (IE_SW_G_037), Rathmore West (IE_SW_G_070) and Mitchelstown (IE_SW_G_082).

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

All river water bodies intersected by the WSZ have modelled concentrations for orthophosphate which are below the 5% Good / High indicative quality boundary (0.00125 mg/l) following dosing at Mallow WTP. The highest increases in modelled orthophosphate concentrations was 0.0001 mg/l for Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720) and Blackwater (Munster)_150 (IE_SW_18B021800).

The Blackwater (Munster)_120 (IE_SW_18B021510) and Clyda_030 (IE_SW_18C020300) are currently at high indicative quality, and the predicted modelled increase in concentration in these water bodies is undetectable (0.0000 mg/l). Therefore, there will be no impact to the indicative quality classifications of these river water bodies as a result of the project (see Table 5 1).

For groundwater bodies, the predicted loads to groundwater bodies are very low and undetectable i.e. 0.0000 mg/l for Glenville (IW_SW_G_037) and Rathmore West (IE_SW_G_070) and 0.0004 mg/l for Mitchelstown (IE_SW_G_082). One of the seven monitoring points for Mitchelstown (IE_SW_G_082) is failing to achieve good orthophosphate indicative quality, however as the modelled post-dosing increase is less than 5% of the Good / Fail indicative quality boundary, it is not considered to be significant. In addition this monitoring site is remote from the WSZ and is not considered characteristic of quality in the GWB, which is otherwise Good. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, similarly, there is no risk of failing WFD objectives for groundwater receptors due to orthophosphate dosing.

In light of the EAM assessment result, which evaluates the additional orthophosphate loading from dosing at Mallow WTP, it has been demonstrated that likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat.

6.2.1.10 (91E0) * Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

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

There are six known sites within the SAC with a minimum area of 19.2ha, although there are likely to be further unsurveyed areas present (NPWS, 2012[23]). A target within the SSCOs (NPWS, 2012[23]) for this habitat is to maintain the appropriate hydrological regime necessary for maintenance of alluvial vegetation. The woodlands supporting document for this site lists fertiliser drift and water pollution as indirect threats to the habitat, which may increase trophic status of the wood leading to the stronger growth of nitrophilous species and loss of less vigorous species. However, as these are naturally eutrophic systems the impact is likely to be minimal (NPWS, 2012[34]). On the basis of the uncertainty related to the distribution of this habitat in this SAC, it is assumed on a precautionary basis, that the habitat may occur in some or all of the river water bodies hydrologically connected to the WSZ.

Table 5-1 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River (Cork/Waterford) SAC and will receive inputs from the proposed orthophosphate dosing at Mallow WTP:

- The river water bodies that are hydrologically connected include: Blackwater (Munster)_120 (IE_SW_18B021510), Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720), Blackwater (Munster)_150 (IE_SW_18B021800) and Clyda_030 (IW_SW_18C020300); and
- The groundwater bodies connected to the site include: Glenville (IE_SW_G_037), Rathmore West (IE_SW_G_070) and Mitchelstown (IE_SW_G_082).

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

All river water bodies intersected by the WSZ have modelled concentrations for orthophosphate which are below the 5% Good / High indicative quality boundary (0.00125 mg/l) following dosing at Mallow WTP. The highest increases in modelled orthophosphate concentrations was 0.0001 mg/l for Blackwater (Munster)_130 (IE_SW_18B021600), Blackwater (Munster)_140 (IE_SW_18B021720) and Blackwater (Munster)_150 (IE_SW_18B021800).

[34] NPWS 2012 Blackwater (Cork/Waterford) SAC (site code: 2170) Conservation Objectives Supporting Document - Woodland Habitat

The Blackwater (Munster)_120 (IE_SW_18B021510) and Clyda_030 (IE_SW_18C020300) are currently at high indicative quality, and the predicted modelled increase in concentration in these water bodies is undetectable (0.0000 mg/l). Therefore, there will be no impact to the indicative quality classifications of these river water bodies as a result of the project (see Table 5 1).

For groundwater bodies, the predicted loads to groundwater bodies are very low and undetectable i.e. 0.0000 mg/l for Glenville (IW_SW_G_037) and Rathmore West (IE_SW_G_070) and 0.0004 mg/l for Mitchelstown (IE_SW_G_082). One of the seven monitoring points for Mitchelstown (IE_SW_G_082) is failing to achieve good orthophosphate indicative quality, however as the modelled post-dosing increase is less than 5% of the Good / Fail indicative quality boundary, it is not considered to be significant. In addition this monitoring site is remote from the WSZ and is not considered characteristic of quality in the GWB, which is otherwise Good. The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, similarly, there is no risk of failing WFD objectives for groundwater receptors due to orthophosphate dosing.

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

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

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

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

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

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

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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Cork County Development Plan 2022-2028[35] The plan outlines under WS 4-1: Water Supply, the following objectives: a) Support the prioritisation of the supply of adequate sustainable drinking water for the resident population and invest and expand the water supply in line with future population targets. b) Ensure that all drinking water in the County complies with the European Union Drinking Water Directive 98/83/EC and that all surface water and groundwater supplies comply with the requirements of Surface Water Directive 75/440/EC and Groundwater Directive 80/68/EEC. c) Conserve sources of drinking water and minimise threats to either the quality or quantity of drinking water reserves that might result from different forms of development or development activity and other sources of pollution. Conserve sources of drinking water and minimise threats to either the quality or quantity of drinking water reserves that might result from difference forms of development or development activity and other sources of pollution. The plan outlines under WM 11-1: EU Water Framework Directive and the River Basin Management Plan the following objectives: a) Protect and improve the County's water resources and ensure that development permitted meets the requirements of the River Basin Management Plan and does not contravene the objectives of the EU Water Framework Directive. b) Promote compliance with the River Basin Management Plan and associated environmental standards and objectives set out in the European Communities (Environmental Objectives) Surface Water Regulations, 2009 and the European Communities (Environmental Objectives) Groundwater Regulations, 2010, to prevent deterioration; restore good status; reduce chemical pollution, and achieve water related protected areas objectives in rivers, lakes, groundwater, estuaries and coastal waters (as applicable). The plan outlines under WM 11-2: Surface Water Protection	▪ N/A	The County Development Plan emphasis the objectives for water services in the county which include the enhancement and improved quality of the service to its consumers. The plan also outlines the importance of compliance with the South Western River Basin Management Plan (now replaced by the RBMP 2018-2021), and emphasises compliance with environmental objectives. There is no potential for cumulative impacts with these plans.

[35] https://www.corkcoco.ie/en/resident/planning-and-development/cork-county-development-plan-2022-2028

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
a) Protect and improve the status and quality of all surface waters throughout the County, including transitional and coastal waters..		
River Basin Management Plan For Ireland 2022 – 2027 The Third Cycle Draft River Basin Management Plan 2022-2027 Consultation Report has been published. This report presents a summary of the issues raised in the submissions reviewed from the public consultation on the draft River Basin Management Plan for Ireland 2022-2027. The 3rd cycle of River Basin Management Plan (RBMP) for the period of 2022-2027 is currently being prepared by Department of Housing, Local Government and Heritage (DHLGH) in line with the EU Water Framework Directive (WFD) (2000/60/EC). The document (Chapter 3) sets out the condition of Irish waters and a summary of status for all monitored waters in the 2013 – 2018 period, including a description of the changes since 2007 – 2009 and 2010-2015. A large number of river waterbodies are still declining and unless this is addressed, sustained and progressive improvements in water quality will be difficult to achieve. Overall, 53% of surface waters are in good or high ecological status while the remaining 47% are in unsatisfactory ecological status. For groundwater bodies, 92% are in good chemical and quantitative status. Chapter 3 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each water body that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2027. This work was presented in the RBMP for 4,842 water bodies nationally. 1,603 water bodies were classed *At Risk* or 33%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 1,000 water bodies that are *At Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.	▪ N/A	The objectives of the RBMP are to • Prevent deterioration; • Restore good status; • Reduce chemical pollution; and • Achieve water related protected areas objectives The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each water body. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of this plan will have a positive impact on biodiversity and the Project will not affect the achievement of the RBMP objectives given the detailed assessment of the effects of dosing on water body environmental objectives under the EAM.
Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive 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	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation;	CFRAM Studies and their product Flood Risk Management Plans will each undergo AA Any future flood plans will have to take into account the design and implementation of water management infrastructure as it has the potential to impact on hydromorphology and potentially on the ecological status and favourable conservation status of water bodies. The establishment of how flooding may be

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
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.	▪ Alterations to water quality and/or water movement; ▪ Disturbance; ▪ In-combination impacts within the same scheme.	contributing to deterioration in water quality in areas where other relevant pressures are absent is a significant consideration in terms of achieving the objectives of the WFD. The AA of the plans will need to consider the potential for impacts from hard engineering solutions and how they might affect hydrological connectivity and hydromorphological supporting conditions for protected habitats and species. There is no potential for cumulative impacts with the CFRAMS programme as no infrastructure is proposed as part of this project.
Foodwise 2025 Foodwise 2025 strategy identifies significant growth opportunities across all subsectors of the Irish agri-food industry. Growth Projection includes increasing the value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.	▪ Land use change or intensification ▪ Water pollution ▪ Nitrogen deposition ▪ Disturbance to habitats / species	Foodwise 2025 was subject to its own AA[36]. 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	• Overgrazing; • Land use change or intensification; • Water pollution;	The RDP for 2014 – 2020 has been subject to SEA[37], and AA[38]. The AA assessed the potential for impacts from the RDP measures e.g. for the GLAS scheme to result in inappropriate management prescriptions; minimum

[36] http://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/environmentalanalysis/AgriFoodStrategy2025NISDRAFT300615.pdf
[37] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf
[38] 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
European agriculture is outlined in the Rural Development Programme (RDP) 2014-2020 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while improvements are sought in relation to water management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and Targeted Agriculture Modernisation Scheme (TAMS). They provide the role of a supportive measure to improve water quality and thus provide direct benefits in achieving the measures within the RBMP. The achievement of the objectives outlined within GLAS, to improve water quality, mitigate against climate change and promote biodiversity will be of direct positive benefit in achieving the measures within the RBMP and the goals of the Natura Directives. The scheme has an expected participation for 2014-2020 of 50,000 farmers which have to engage in specific training and tasks in order to receive full payment. Farmers within the scheme must have a nutrient management plan which is a strategy for maximising the return from on and off-farm chemical and organic fertilizer resources. This has a direct positive contribution towards protecting water bodies from pollution through limiting the amount of fertiliser that is placed on the land. The scheme prioritises farms in vulnerable catchments with 'high status' water bodies and also focuses on educating farmers on best practices to try and improve efficiency along with environmental outcomes. The TAMS scheme is open to all farmers and is focused on supporting productive investment for modernisation. This financial grant for farmers is focused on the pig and poultry sectors, dairy equipment and the storage of slurry and other 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.	• Nitrogen deposition; • Disturbance to habitats / species;	stocking rates under the Areas of Natural Constraints measure leading to overgrazing in sensitive habitats with dependent species, and TAMS supporting intensification. Mitigation included project specific AA for individual building, tourism or agricultural reclamation projects, consultations with key stakeholders during detailed measure development, and site-based monitoring of the effects of RDP measures. With such measures in place, it was concluded that there would be no significant in-combination impacts on Natura 2000 sites.
National Nitrates Action Programme Article 28 of the Good Agricultural Practice Regulations, in line with the Nitrates Directive (91/676/EEC), requires the Minister for Housing, Local Government and Heritage, in consultation with the Minister for Agriculture, Food and the Marine, to review the Nitrates Action Programme every four years. Ireland has	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition;	In accordance with the Directive 2001/42/EC on the assessment of effects of certain plans and programmes, as transposed into Irish law, a Strategic Environmental Assessment (SEA) is being undertaken and an Environmental Report has been prepared. Appropriate Assessment under EU Directive 92/43/EEC, as transposed

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
published the Fifth Nitrates Action Programme on the 11th March 2022. The Programme sets out new measures that have been introduced since the Fourth Programme. This iteration of the NAP is developed in the context of significantly greater environmental ambition in the Programme for Government and at EU level. The key issues considered in the fifth iteration of the NAP include: ▪ Better Policy Alignment; ▪ Compliance and Enforcement; ▪ Climate Action Measures. ▪ Biodiversity Measures; and Nitrates Derogation.	▪ Disturbance to habitats / species.	into Irish law, is also being undertaken and a Natura Impact Statement (NIS) has been prepared It concluded that the NAP was an environmental programme which imposes environmental constraints on all agricultural systems in the state. Consultation and submission on the 5th NAP have been considered in the SEA Statement and the Natura Impact Statement of the adopted fifth Nitrates Action Programme. These documents provide information on the decision-making process and documents how environmental considerations, the views of consultees/stakeholders and the recommendations of the SEA Environmental Report and the assessment carried out under Article 6 of the Habitats Directive have influenced the final adopted Plan. Adherence to the recommendations in these documents and incorporation into he Plan will ensure that there is no potential for cumulative impacts with the proposed project.
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	• Habitat loss or destruction; • Habitat fragmentation or degradation; • Water quality changes; • Disturbance to species.	Ireland's Forestry Programme 2014 – 2020 has undergone AA[39]. 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.

[39] 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
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.		
Water Services Strategic Plan (WSSP, 2015) Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and WFD requirements. The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short, medium and long term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to be used for key water service areas such as water resource management, wastewater compliance and sludge management. The WSSP also sets out the strategic objectives against which the Irish Water Capital Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Irish Water owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.	• Habitat loss and disturbance from new / upgraded infrastructure; • Species disturbance; • Changes to water quality or quantity; • Nutrient enrichment /eutrophication.	The overarching strategy was subject to AA and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.
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;	The plan was subject to both AA and SEA and includes a number of mitigation measures which were identified in relation to transport of materials, land spreading of sludge and additional education and research requirements. This plan does not specifically address domestic wastewater loads, only those relating to Irish Water facilities. In relation to the plan as it stands, no in-combination effects

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
	• Changes to water quality or quantity; • Nutrient enrichment /eutrophication.	are expected with the implementation of proposed mitigation measures.
National Water Resources Plan – Framework Plan This Framework will deliver a sustainable water supply on a catchment and water resource zone basis, meeting growth and demand requirements through drought and critical periods. The resources plan takes account of WFD objectives and the programme of measures proposed in the relevant catchments and water resource zones. Specific measures in the plan with relevance to Irish Water include those for urban wastewater and urban runoff and also as part of other measures in relation to the lead in drinking water.	▪ Increased abstractions leading to changes / pressure on existing hydrology / hydrogeological regimes.	The plan will seek to develop sustainable water supplies but must consider particularly critical drought periods when assimilation capacity for diffuse runoff may be reduced. The SEA Environmental Report for the Framework Plan has made mitigation recommendations for the implementation of the Framework Plan which are included in the Environmental Action Plan (EAP), and the EAP will provide a basis for tracking recommendations from the SEA and NIS during the Framework Plan implementation and Regional Plan development. A Monitoring Plan has also been developed which covers the integration of environmental and sustainability considerations throughout implementation of the Framework Plan and the options development methodology and provides a framework for future long-term monitoring. Therefore, no likely significant in-combination effects are envisaged.
Planning Applications There are a significant number of planning applications approved, pending or recently approved in Mallow. The applications include for housing developments (>50 houses); one off housing; Mallow Racecourse (e.g. for machinery store) etc. The proposed M20 Cork to Limerick road project will also be a major piece of infrastructure which will potentially impact on the Munster Blackwater River catchment.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; • Nutrient enrichment /eutrophication.	Adherence to the overarching policies and objectives of the Cork County Development Plan 2014 will ensure that local planning applications and subsequent grant of planning will comply with the requirements of relevant environmental legislation including the WFD and Habitats Directive. Effluent from proposed and new infrastructure connected to the city's foul and storm drainage systems will be treated prior to discharge, negating the potential for cumulative impacts in the receiving environment.
Integrated Pollution Control (IPC) Licensing Mallow has a number of industries with industrial emissions licences or integrated pollution control licences. These include: Dairygold Co-operative Society Limited;	▪ Changes to water quality or quantity;	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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Magh nAla Limited (Quarterstown) (zinc pigment manufacturer); Mr Michael Monagle (Doneraile; intensive agriculture); Irish Sugar Limited; Road Binders Limited, and Micam Limited (composite materials manufacturer). Under the Industrial Emissions Directive 2010/75/EU and Environmental Protection Agency Act, 1992 (as amended) industrial activities (e.g. pharmaceutical) are licenced by the EPA to prevent or reduce emissions to air, water and land, reduce water and use energy/resources efficiently. An IPC licence is a single integrated licence which covers all emissions from the facility and its environmental management. All related operations that the licence holder carries in connection with the activity are controlled by this licence.	▪ Nutrient enrichment /eutrophication.	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 orthophosphate dosing at the Mallow WTP, within the Zone 4 Mallow WSZ, in combination with other plans or projects, is likely to have a significant effect on European Sites.

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

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

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

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APPENDIX A

European Sites

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

Site Name (Code)	Conservation Objectives Source
Blackwater River (Cork / Waterford) SAC	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.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
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 nigra*)	Yes	Yes
A067	Goldeneye (*Bucephala clangula*)	Yes	Yes
A069	Red-breasted Merganser (*Mergus serrator*)	Yes	Yes
A082	Hen Harrier (*Circus cyaneus*)	Yes	Yes
A098	Merlin (*Falco columbarius*)	Yes	Yes
A103	Peregrine (*Falco peregrinus*)	Yes	Yes
A122	Corncrake (*Crex crex*)	Yes	Yes
A125	Coot (*Fulica atra*)	Yes	Yes
A130	Oystercatcher (*Haematopus ostralegus*)	Yes	Yes
A137	Ringed Plover (*Charadrius hiaticula*)	Yes	Yes
A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes
A141	Grey Plover (*Pluvialis squatarola*)	Yes	Yes
A142	Lapwing (*Vanellus vanellus*)	Yes	Yes

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

APPENDIX C

EAM Summary Report

RPS

Irish Water - Lead in Drinking Water Mitigation Plan

Environmental Assessment Methodology (EAM) Summary Report

054 Mallow WTP – Zone4 Mallow (0500PUB1313)

National Lead in Water Mitigation Strategy

Environmental Assessment Methodology Report: 054 Mallow WTP – Zone4 Mallow (0500PUB1313)

Document Control Sheet

Client:	Irish Water
Project Title:	National Lead in Water Mitigation Strategy
Document Title:	Environmental Assessment Methodology Report: 054 Mallow WTP – Zone4 Mallow (0500PUB1313)
Document No:	MDW0766RP_5.1_EAM_054_Mallow_F05

Text Pages:	9	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F03	Final	21st May 2019	YE		MM/IP		DC	
F04	Final	15th Aug 2019	IP		MM		**GJG**	
F05	Final	19th Apr 2023	YE		IP		MM	

054 Mallow WTP (Ballyellis WTP) – Zone4 Mallow (0500PUB1313)

Supporting spreadsheet: 054 Mallow WTP (Ballyellis WTP) - Zone4 Mallow V18

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

Mallow WTP supplies Mallow/Ballyvintner environs in County Cork. The distribution input for Zone4 Mallow is 5,065 m^3/day (38% of which is accounted for, with the remainder assumed to be lost through leakage) serving a population of approximately 8,000. The non-domestic demand is 10% of the distribution input. The area is served by Mallow WWTP (D0052-01) which is licenced in accordance with the requirements of the Wastewater Discharge (Authorisation) Regulations 2007 as amended. The impact of the orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There are no other WWTPs within this WSZ. There are an estimated 513 properties across the WSZ that are serviced by a DWWTS.

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

Water Treatment Plant	**Mallow WTP**	
Water Supply Zone	**Zone4 Mallow (0500PUB1313)** **See Figure 4.1 / 4.2 of the AA Screening for a map of the WSZ and ZoI**	
Step 1 Appropriate Assessment Screening	**European Sites within Zone of Influence**	
	SACs	
	Ballymacoda (Clonpriest and Pillmore) Lough Hyne Nature Reserve and Environs Roaringwater Bay and Islands Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment	Barley Cove To Ballyrisode Point Great Island Channel Ardmore Head Blackwater River (Cork/Waterford)
	SPAs	
	Ballymacoda Bay Blackwater Callows Blackwater Estuary	Cork Harbour Kilcoman Bog SPA Sovereign Islands SPA
	Appropriate Assessment Required – see AA screening report for details	

Step 2 – Direct Inputs to Surface Water

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

Agglomeration and discharge type	ELV (Ortho-P unless stated otherwise) from WWDL (mg/l)	Scenario	TP Load kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, and 68%)*		
				0.5	*0.4*	*0.68*
Mallow Primary Discharge	1.5	Existing	385.1	0.082	0.065	0.111
		Post Dosing	385.1	0.082	0.065	0.111
Mallow SWOs (8 no.)	n/a	Existing	186.9	1.361	1.089	1.851
		Post Dosing	201.5	1.468	1.174	1.996

Note: The effluent concentrations from Mallow WWTP (D0052-01) are compliant with ELVs for both the pre and post dosing scenarios.

As Mallow receives 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 0.6 mg/l dosing using available background concentrations and mean flow information

Agglom.	RWB Name / Code for Primary Discharge	Background Conc. (mg/l) (Annual mean from AER u/s monitoring point)	Modelled Conc. existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc.
Mallow	Blackwater (Munster)_140 IE_SW_18B021720	0.0213	0.0223	0.0223	0.0

Surface Assessment

Blackwater (Munster)_140 *(IE_SW_18B021720)* – The effluent concentrations from Mallow WWTP are compliant with ELVs. Tertiary treatment is assumed to remove any additional orthophosphate from the effluent due to dosing therefore the impact of orthophosphate dosing on the ELVs for the agglomeration and the receiving water body are minimal.

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 increments in concentrations in the subsurface pathways are insignificant for all river water bodies (less than 0.00125 mg/l, which is 5% of the Ortho P Good/High Indicative Quality boundary for surface water bodies), with highest increase equal to 0.0001mg/l, taking place in IE_SW_18B021600 [BLACKWATER (MUNSTER)_130], IE_SW_18B021720 [BLACKWATER (MUNSTER)_140], and IE_SW_18B021800 [BLACKWATER (MUNSTER)_150].

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

Step 5 and 6: Combined Impact 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 modelled increase in concentration to groundwater bodies are very low and undetectable (0.0000 mg/l), except for Mitchelstown (IE_SW_G_082), which is insignificant (below 0.00175 mg/l, i.e. 5% of the Good / Fail Ortho P Indicative Quality boundary for groundwater bodies).

Mitchelstown (IE_SW_G_082) has seven WQ monitoring points, of which one is "Failing to achieve good". This site is remote from the WSZ and is not considered characteristic of quality in the GWB, which is otherwise Good.

The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on groundwater or surface water is not significant, there is no risk of failing WFD objectives for groundwater receptors or receiving rivers due to orthophosphate dosing.

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

EU_CD / NAME	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate Indicative Quality indicated in italic]*	Baseline Ortho P Conc. mg/l *[Surrogate Conc. given in italic]*	75% of Ortho P Indicative Quality upper threshold mg/l	Total Ortho P load to GW due to dosing kg/yr	Potential Increase in Ortho P Conc. due to Dosing mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SW_G_037 Glenville	Good None Far	0.006	0.026	0.3	0.0000	0.006	MP1
	Good Upwards Far	0.009	0.026			0.009	MP2
IE_SW_G_070 Rathmore West	Good Upwards Far	0.012	0.026	1.8	0.0000	0.012	MP1

		Good Upwards Far	0.013	0.026			0.013	MP2
		Good Upwards Far	0.009	0.026			0.009	MP3
	IE_SW_G_082 Mitchelstown	Good Upwards Far	0.008	0.026	43.6	0.0004	0.008	MP1
		Failing to achieve good Upwards Far	0.041	-			0.042	MP2
		Good Upwards Far	0.007	0.026			0.007	MP3
		Good Upwards Far	0.010	0.026			0.010	MP4
		Good Upwards Far	0.009	0.026			0.009	MP5
		Good Upwards Far	0.008	0.026			0.008	MP6
		Good Upwards Far	0.010	0.026			0.010	MP7

MP: Multiple Monitoring Points given for waterbody

Step 5 and 6: Combined Inputs to Surface Water Bodies

Combined Assessment

Table 4 gives the loads and modelled concentrations for the combined assessment to rivers. The increased loads due to orthophosphate dosing are predicted to be insignificant.

For CLYDA_030 [IE_SW_18C020300], BLACKWATER (MUNSTER)_120, [IE_SW_18B021510], and BLACKWATER (MUNSTER)_130 [IE_SW_18B021600] the baseline concentration for the/a monitoring point is above the 75% threshold of the indicative quality band. But as they are predicted to have a negligible (0.0001 mg/l) or undetectable (0.0000 mg/l) increase due to dosing, there is no risk to the achievement of WFD objectives for these rivers.

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

EU_CD / NAME	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate Indicative Quality indicated in italic]*	Baseline Conc. mg/l *[Surrogate Conc. given in italic]*	75% of Ortho P Indicative Quality upper threshold mg/l	Total Ortho P Load in receiving waters due to dosing kg/ yr	Potential increase in Ortho P Conc. using flows (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SW_18B021510 BLACKWATER (MUNSTER)_120	High Downwards Near	0.024	0.019	35.5	0.0000	0.024	
IE_SW_18B021600 BLACKWATER (MUNSTER)_130	High Downwards Near	0.021	0.019	62.1	0.0001	0.021	
IE_SW_18B021720 BLACKWATER (MUNSTER)_140	High Upwards Far	0.015	0.019	96.7	0.0001	0.015	‡
IE_SW_18B021800 BLACKWATER (MUNSTER)_150	*Good*	0.*030*	0.033	96.7	0.0001	0.030	‡
IE_SW_18C020300 CLYDA_030	High None Near	0.022	0.019	0.1	0.0000	0.022	MP1
	High None Near	0.021	0.019			0.021	MP2

‡ Load from WWTP / SWO following treatment added.

MP: Multiple Monitoring Points given for waterbody

Summary and Mitigation Proposed

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

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

The cumulative impacts on Blackwater (Munster) (HA18) catchment of the corrective water treatment at the following additional WTPs have been assessed in combination with Mallow WTP.

- 4 Lee Road WTP - Cork City Water Supply
- 6 Inniscarra WTP – Zone 2 Cork City and Harbour

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

Table 5: Cumulative assessment of the increased loading and concentrations to water bodies impacted by Zone4 Mallow WSZ and other WSZs proposed for corrective water treatment in the upstream catchments.

EU_CD / NAME	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate indicative quality given in italic]*	Baseline Conc. mg/l *[Surrogate Conc. given in italic]*	75% of indicative quality upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Potential Increase in Ortho P Conc. due to Dosing (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SW_18C020300 CLYDA_030	High None Near	0.022	0.019	3.5	0.0000	0.022	‡ MP1
	High None Near	0.021	0.019			0.021	‡ MP2
IE_SW_18B021510 BLACKWATER (MUNSTER)_120	High Downwards Near	0.024	0.019	135.2	0.0001	0.024	‡

IE_SW_18B021600 BLACKWATER (MUNSTER)_130	High Downwards Near	0.021	0.019	166.1	0.0001	0.021	‡	
IE_SW_18B021720 BLACKWATER (MUNSTER)_140	High Upwards Far	0.015	0.019	200.7	0.0002	0.015	‡	
IE_SW_18B021800 BLACKWATER (MUNSTER)_150	*Good*	*0.030*	*0.033*	*200.8*	*0.0002*	*0.030*	‡	
IE_SW_18B021900 BLACKWATER (MUNSTER)_160	Good Upwards Far	0.027	0.033	200.8	0.0002	0.027	‡	
IE_SW_18B022000 BLACKWATER (MUNSTER)_170	*High*	*0.022*	*0.019*	*303.0*	*0.0002*	*0.022*	‡	
IE_SW_18B022100 BLACKWATER (MUNSTER)_180	High Upwards Near	0.024	0.019	303.0	0.0002	0.024	‡	
IE_SW_18B022300 BLACKWATER (MUNSTER)_190	Good Upwards Far	0.030	0.033	303.0	0.0002	0.030	‡ MP1	
	High Downwards Near	0.025	0.019			0.025	‡ MP2	
IE_SW_18B022450 BLACKWATER (MUNSTER)_200	Bad None Far	0.208	-	335.3	0.0002	0.208	‡ MP1	
	Moderate Downwards Near	0.054	0.051			0.054	‡ MP2	
	Good Upwards Far	0.028	0.033			0.028	‡ MP3	
IE_SW_18B022700 BLACKWATER (MUNSTER)_220	Good	0.033	0.033	338.3	0.0002	0.033	‡ MP1	
	Moderate	0.037	0.056			0.037	‡ MP2	
	Moderate	0.044	0.056			0.044	‡ MP3	
	Moderate	0.050	0.056			0.050	‡ MP4	
IE_SW_020_0500 Upper Blackwater M Estuary	High	0.019	0.023	380.9	0.0002	0.019	‡	
	Good	0.031	0.053			0.031		
IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour	High	0.021	0.023	506.3	0.0001	0.021	‡	
	Good	0.034	0.053			0.034		

IE_SW_020_0000 Youghal Bay	High	0.008	0.019	517.9	0.0000	0.008	‡
	High	0.022	0.019			0.022	
IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20)	*High*	*0.013*	*0.019*	9601.2	0.0001	*0.013*	‡

‡ Load from WWTP / SWO following treatment added.

S = Summer monitoring period, W = Winter monitoring period

There is one monitoring point in BLACKWATER (MUNSTER)_200 (IE_SW_18B022450) with an orthophosphate indicative of Bad quality. However, the increase in concentration is well below significant levels (0.0002 mg/l), so there will be no impact on the Ecological Status of good reported for this river.

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

MITIGATION OPTION – None required

RAG STATUS – GREEN

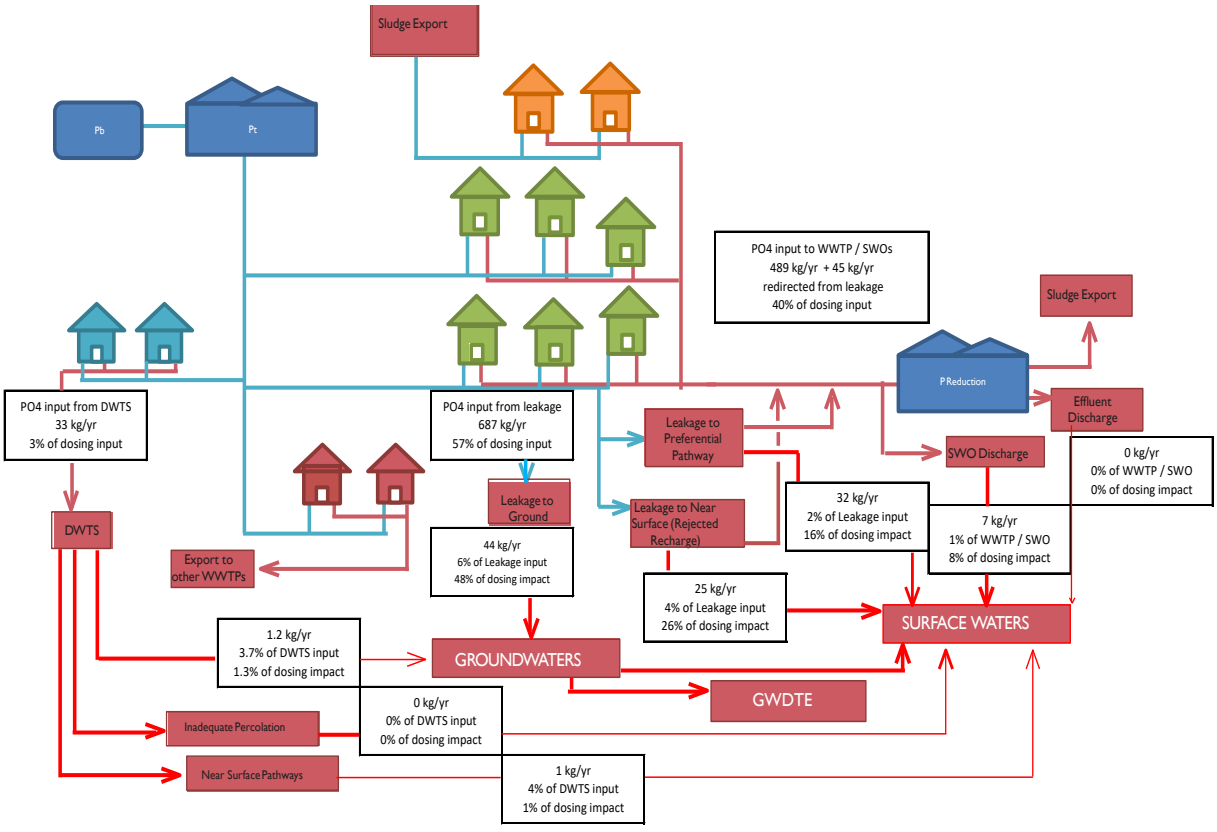
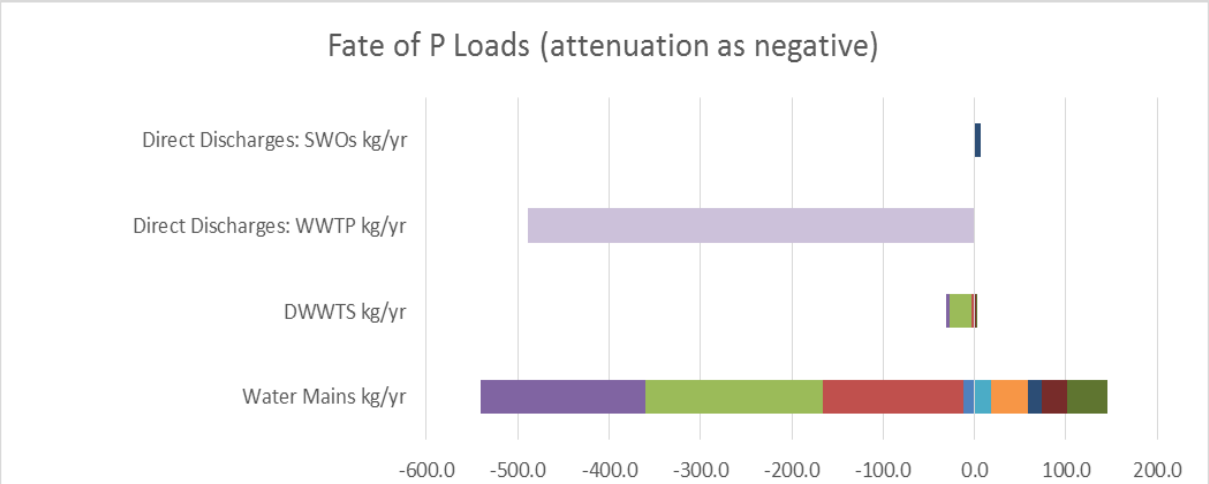


Figure 1 – Source Pathway Receptor model for Mallow WTP Regional WSZ illustrating key sources and pathways to the associated WSZs.



	Water Mains kg/yr	DWWTS kg/yr	Direct Discharges: WWTP kg/yr	Direct Discharges: SWOs kg/yr
Load attenuated in Preference (inadequate percolation) pathway	-11.6	0.0		
Load attenuated in Near Surface Pathway	-154.5	-3.2		
Load attenuated in 1m below trench	-194.6	-24.2		
Load attenuated in Subsurface Pathway	-179.9	-3.2		
Load intercepted by gravity main in Preference Pathway	17.7			
Load intercepted by gravity main in Near Surface Pathway	41.1			
Load reaching SW direct or via Preference (inadequate percolation) Pathway	14.7	0.0	0.0	7.3
Load reaching SW via Near Surface Pathway	28.0	1.2		
Load reaching SW via Subsurface Pathway	44.3	1.2		
Load treated in WWTP			-488.6	

Figure 2 – Fate of orthophosphate loads modelled for Mallow WTP impacting on Blackwater (Munster)_150 [IE_SW_18B021800] due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.