Shannon Technology and Energy Park (STEP) Power Plant

Appendix A6.4: WFD Assessment

Shannon LNG Limited

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Water Framework Directive Assessment
Ralappane Stream, Ralappane, Tarbert, Co. Kerry

Produced by

AQUAFACT International Services Ltd

On behalf of

Shannon LNG Limited
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1. Introduction

1.1 Background

AQUAFACT International Services Ltd. have been commissioned by Shannon LNG Limited to prepare a Water Framework Directive (WFD) Assessment in relation to the proposed development of a Combined Cycle Gas Turbine (CCGT) gas-powered power plant capable of 600 MW of electricity generation, 120 MWh (1-hr) Battery Energy Storage System (BESS), Above Ground Installation (AGI), and associated plant, equipment and infrastructure on the Shannon Estuary and the potential impact of this proposed development on the Ralappane stream, an identified WFD river water body. It will be known collectively as the Shannon Technology and Energy Park (STEP) Power Plant, hereafter referred to as the 'Proposed Development'). It will be located adjacent to the Shannon Estuary between Tarbert and Ballylongford in Co. Kerry.

1.2 Legislative Context

The EU Water Framework Directive (Directive 2000/60/EC) establishes a framework for the protection of inland surface waters, transitional waters, coastal waters, and groundwater. It aims to prevent and reduce pollution, promote sustainable water use, protect and improve the aquatic environment and mitigate the effects of floods and droughts.

In Ireland, the WFD is transposed by the following national regulations:

- European Communities (Water Policy) Regulations (2003 and 2014) and;
- European Union Environmental Objectives (Surface Waters) Regulations (2009, 2012, 2015 and 2019)

Under the WFD, a water body is the basic management unit used to assess if the environmental objectives for that water body have been met.

River water bodies are defined as all or part of a river system within operational subcatchments which are located in larger catchments within river basin districts. Relevant examples for this study would include:

- Water body: Ralappane river water body;
- Subcatchment: Astee West;
- Catchment: Shannon Estuary South;
- River Basin Districts (RBD): Ireland's national River Basin District.

The Irish River Basin District (RBD) covers an area of 70,273km2, with 46 catchment management units — consisting of 583 sub-catchments, with 4,829 water bodies (DHLGH, 2018).

The key environmental objectives of the WFD are set out in Article 4 of the Directive. It requires member states to use their River Basin Management Plans (RBMPs) and Programme of Measures (PoMs) to protect and, where necessary, restore water bodies in order to reach good status, and to prevent deterioration. Good status means both good chemical and good ecological status. RBMPs are

key tools for implementing the WFD and are drawn up every six-years following extensive public consultation.

In Ireland, the Department of Housing, Local Government and Heritage leads the development and implementation of Ireland's river basin management plans. To date, there have been two cycles of river basin management planning in Ireland: the first cycle covered the period 2010-2015 and the second cycle the period 2018-2021. Ireland's third cycle RBMP for the period 2022-2027 is expected to be published shortly.

Under the requirements of the WFD member states must ensure that the requirements of Article 4 are met. Specifically, the relevant competent authorities of a member state must consider whether proposals for new schemes/development have the potential to:

1. Cause a deterioration of a water body from its current status or potential, and or,
2. Jeopardise attainment of good status or potential where not already achieved.

As a result, new schemes/developments that have the potential to impact on current or predicted WFD status are required to assess their compliance against the WFD objectives of the potentially affected water bodies.

1.3 Report Structure

This report is structured as follows:

- Section 1 provides the context and legal requirements for undertaking a Water Framework Directive Assessment as well as a description of the Project and the water body being assessed;
- Section 2 provides a description of water body status and its components;
- Section 3 provides a description of the methodology of a Water Framework Directive Assessment;
- Section 4 provides a description of the results of the Water Framework Directive Assessment;
- Section 5 provides conclusions of the findings of the Water Framework Directive Assessment.

1.4 Project Overview

The Proposed Development will be comprised of three main components:

1. A Power Plant;
2. Above Ground Installation (AGI); and
3. A Battery Energy Storage System

The Proposed Development would occupy approximately 100 acres on the eastern side of the 600 acre landbank. The area to be developed is characterised by predominantly improved grassland in an agricultural setting. Field boundaries predominantly comprise hedgerows with small drainage ditches. A small section of the Ralappane Stream, an identified WFD water body (IE_SH_24R300270), is located in the southernmost part of the Proposed Development site. The EPA code for this water body is Ralappane_010.

The Power Plant would comprise up to 3 highly flexible Combined Cycle Gas Turbine generation blocks, with a total capacity of up to 600MW, and an integrated Battery Storage Facility with a 120MW 1-hour Ultra-Fast Response capability.

The Proposed Development will connect to the Gas Networks Ireland gas grid at the location near Foynes through the approved 26-kilometre gas pipeline route[1].

The Proposed Development site is drained by several short streams or drainage channels which either discharge to the main Ralappane Stream or directly north to the Shannon Estuary. The Ralappane Stream drains directly to the Shannon Estuary via a tidal wetland area to the west of the Proposed Development site.

Further information on the Proposed Development can be found in the Environmental Impact Assessment Report (EIAR) which has been submitted as part of the planning application to ABP. All details of the EIAR and drawings for the Power Plant and BESS are located on the project website https://stepplanning.com/

1.5 Water body Overview

The Ralappane Stream (Ralappane_010) is located in the Astee West subcatchment within the Shannon Estuary South catchment (Figure 1.1). Additional details on this river water body are shown in Table 1.

The Ralappane Stream passes through the southern end of the Proposed Development but is largely outside the Proposed Development. A secondary stream/field drain (referred to as D2) enters the Proposed Development site from the east and flows towards the northwest through the Proposed Development site before turning southwest and flowing offsite to join the Ralappane Stream to the west of the site; a tertiary stream/field drain (referred to as D3) enters the Proposed Development from the east and flows across the access road area and then offsite to the southwest to join the Ralappane Stream to the west of the site. Nutrient and sediments may be entering the river from agricultural sources. When the site transitions to an industrial development this agricultural nutrient supply is likely to reduce.

[1] An Bord Pleanála Reference Number: 08.GA0003

Table 1. (Source: www. Catchments.ie)

Attribute	Value
Name	RALAPPANE_010
Code	IE_SH_24R300270
Subcatchment	24_9 ASTEE_WEST_SC_010
Catchment	24 Shannon Estuary South
Latitude	52.5754427
Longitude	-9.4338586
Local Authority	Kerry County Council
Water body Category	River
Ecological Status	Moderate
WFD Risk	Review
Protected Area	Yes
High Status Objective	No
Heavily Modified	Unknown
Artificial	Unknown
Length (Km)	5.98

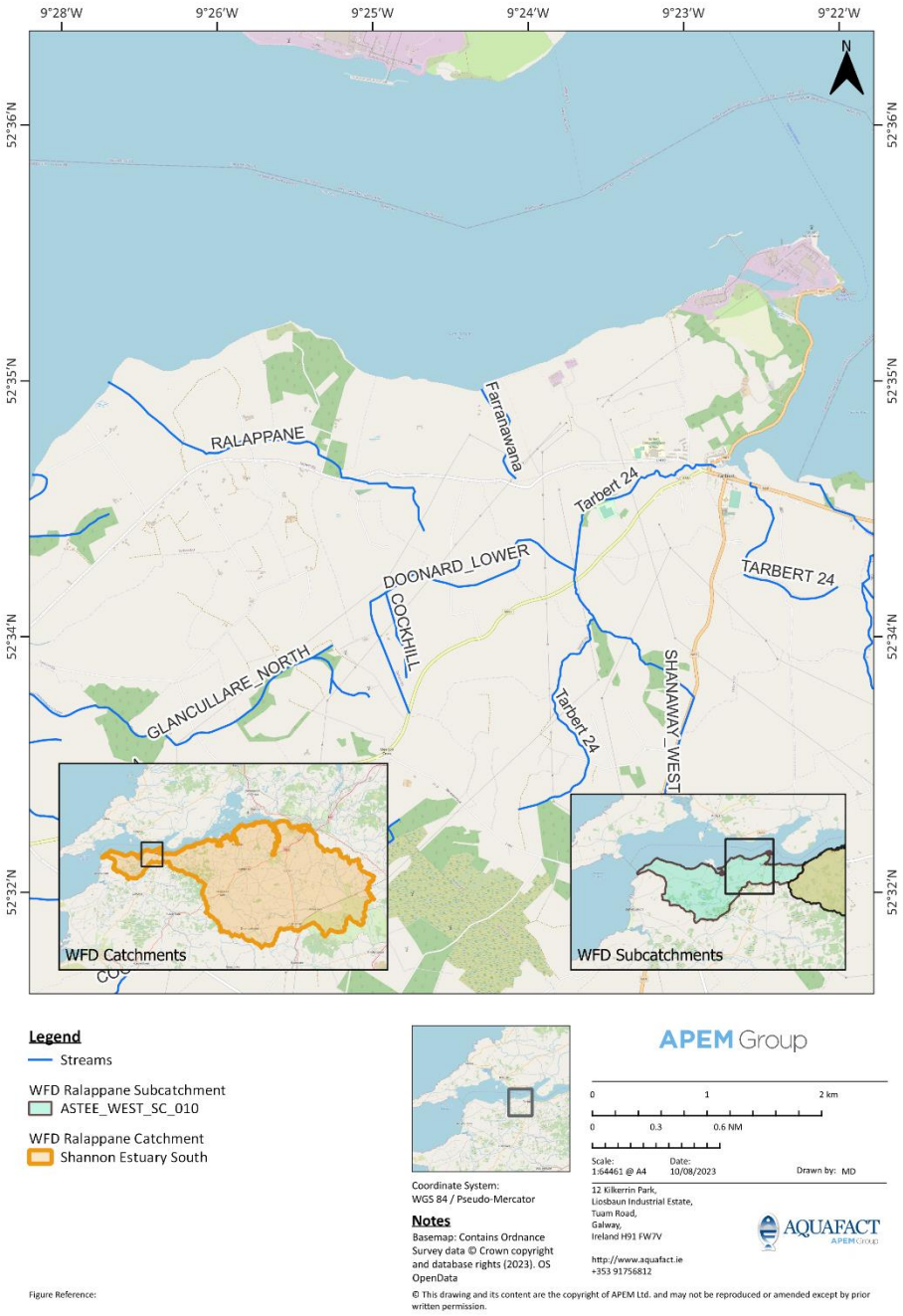

Figure 1: Location of the Ralappane Stream.

2. Water Body Status

2.1 Definition of Water Body Status

Surface waters are classified by their ecological status (biology, water quality and hydromorphology combined) and chemical status (level of harmful chemicals in the water). Groundwaters are classified

according to their chemical status and quantitative status (the amount of water present). The way this information is combined to provide an overall status of surface waters and groundwaters is illustrated in Figure 2. The element with the lowest status in each step of the process determines the overall classification. This is called the 'one out, all out' principle.

The quality elements used to determine water status are detailed in Annex V of the Directive.

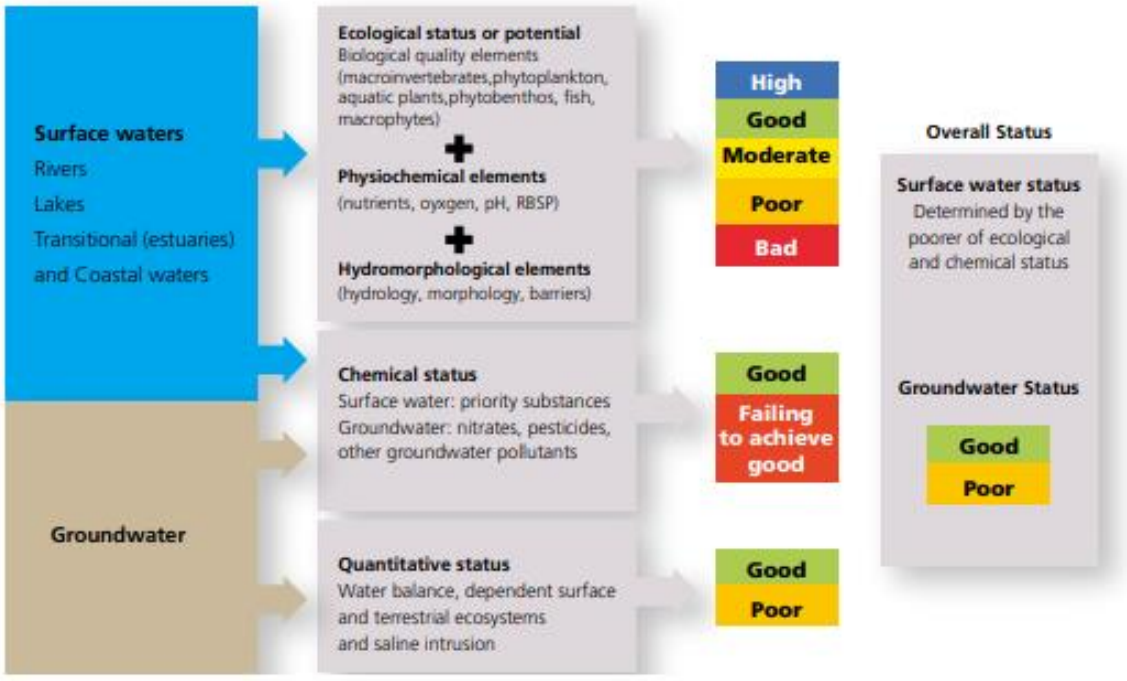

Figure 2. Schema detailing how the status of a water body is derived (EPA, 2022).

2.1.1 Ecological Status or Potential

Ecological status is assessed for natural water bodies whereas ecological potential is assessed for water bodies which are artificial (i.e. created by humans) and for heavily modified water bodies (HMWBs) whose natural state has been profoundly changed in character for important specific purposes (e.g. drinking water reservoirs). The objective for natural water bodies is good ecological status whereas the objective for artificial or heavily modified water bodies is good ecological potential which is the best status they can achieve whilst also taking their modified nature into account.

The components which are used to assess the ecological status or potential of a WFD water body are described in further detail below.

Biology: The biological status of a WFD water body is assessed by looking at individual biological elements such as the abundance and composition of fish, macroinvertebrates, phytoplankton[2],

[2] The biological element 'phytoplankton' is not used in the assessment of the ecological status of river water bodies in Ireland. Phytoplankton are considered a poor indicator of nutrient enrichment in rivers due to the short residence times of most Irish rivers.

phytobenthos and aquatic plants. The biological quality elements can influence an overall water body status from bad through to high.

In Ireland, the biological element used most widely to determine the biological status of rivers is based on the relative abundance and composition of benthic macroinvertebrates. Fish and the presence of benthic diatoms (phytobenthos) are also used but at fewer sites.

Physico-chemical: The physico-chemical status of a WFD water body is assessed by looking at the compliance of physico-chemical supporting elements such as dissolved oxygen, nutrients and pH. The compliance of these parameters is checked against the values represented by environmental quality standards (EQSs)[3]. The compliance of certain substance known as river basin specific pollutants (RSPB) which may be of particular concern within member state river basin districts is also assessed by checking the concentration of these substances against their respective EQSs.

The physico-chemical elements can only influence the classification of a water body from high to good and moderate but not below moderate.

Hydromorphology: The hydromorphological status of a water body is assessed by looking at elements such as water flow, morphology and continuity. Information on the hydromorphological condition of a water body is only used when the biological and physico elements are in high status.

If the hydromorphological elements do not support high status, then the status of the water body is classified as being in good status.

2.1.2 Chemical Status

The chemical status of a water body is assessed by comparing the concentration of certain substances known as priority substances and or priority hazardous substances, against the value of their respective Environmental Quality Standards which have been established at member state level. These standards have been set at levels to protect the most sensitive aquatic organisms and to protect those higher up the food chain (predators and humans) from their damaging effects. Waters which have concentrations below the EQS for these substances are defined as being in good chemical status.

2.2 Relevant Water Body Status

The Ralappane river water body (Ralappane_010) has been assigned a moderate ecological status by the Environmental Protection Agency, the competent authority responsible for assigning water status in Ireland. According to the EPA's website the status of the Ralappane was assigned by modelling and not by monitoring (www.epa.ie). This information is also available through the EPA's GeoPortal site https://gis.epa.ie/GetData/Download as the following dataset - WFD Status Geodatabase (All Water Bodies) – May 2023).

[3] The values of the environmental quality standards are presented in Table 9 of the amended European Union Environmental Objective (Surface Water) Regulations. https://www.irishstatutebook.ie/eli/2019/si/77/

The modelling exercise undertaken by the EPA used modelled river phosphorus concentration and other factors such as dissolved oxygen saturation, river flow, river slope, soil type and geographic location to predict the likely status of the Ralappane river water body. River phosphorus concentration and the role it plays in increasing the growth of filamentous algae and aquatic plants and impacts on dissolved oxygen concentration is one of the main environmental pressures impacting ecological status in Irish rivers (EPA, 2023).

2.2.1 Supporting information

Surface water samples collected in 2020 (EIAR, Appendix A6-2[4]) generally showed elevated phosphate concentrations (which exceeded the environmental quality standard by a factor of up to two[5]).

The biological condition of the Ralappane river water body was assessed as part of the EIAR for the Proposed Development. The assessment which was based on the EPA's Q-Value macroinvertebrate system showed that the water body was in moderate status which is in agreement with the status reported by the EPA in the above modelling exercise which covered the period 2016-2021 and will be reported to the European Commission as part of Ireland's next River Basin Management Plan.

A fish stock assessment was carried out using electrofishing[6] and confirmed that fish are present within the Ralappane Stream in small numbers i.e. Stone Loach (Nemacheilus barbatus), Stickleback (Gasterosteus aculeatus) and European Eel (Anguilla Anguilla).

3. WFD Assessment Methodology

3.1 Introduction

As was set out in the introduction to this report, member states must ensure that the requirements of Article 4 of the Water Framework Directive are met. Proposed developments and schemes that have the potential to affect a WFD water body should undertake a WFD assessment to demonstrate that proposals will not result in a deterioration in status (or potential) or prevent the water body from attaining good status (or potential) in the future. Specifically, the relevant public authorities of a member state must consider whether proposals for new schemes/development have the potential to:

1. Cause a deterioration of a water body from its current status or potential, and or,
2. Jeopardise the attainment of good status or potential where not already achieved.

If the tests above cannot be satisfied, Article 4.7 of the Directive sets out conditions and specific situations that permit derogations.

[4] https://cdn.stepplanning.com/EIAR/appendices/Appendix_A6_2_Groundwater_and_Surface_Water_2020_Sampling_Report.pdf

[5] Average phosphate concentrations of less than 0.025 mg/l P and less than 0.035 mg/l P have been established in Ireland as legally binding national standards to support the achievement of high and good ecological status respectively.

[6] https://cdn.stepplanning.com/EIAR/chapters/STEP_EIAR_07B_Terrestrial_Ecology.pdf

The WFD assessment as set out below is comprised of three different stages. The stages are:

- A screening assessment which can either screen in or screen out an activity based on the available evidence;
- A no deterioration assessment which considers if the activity will result in a deterioration in the current status of a water body;
- Achievement of good status assessment which considers if the activity will jeopardise the water body from achieving good status in the future.

3.2 Screening Assessment

If the risk of the activity or the proposed development to cause deterioration or to prevent the achievement of good status, is low, the activity can be screened out. However, there needs to be a clear rational for determining that the risk is low and/or evidence that the activity will not directly impact any of the components (biological, physico-chemical, hydromorphological) of WFD status.

3.3 No Deterioration Assessment

One of the key objectives of the WFD is to prevent deterioration in the status of a water body. The assessment of water status provides an indication of how healthy, in terms of function and structure, an aquatic ecosystem is. As set out in Section 2 the assessment is based on a scientific evaluation of the key elements of a water body including biological (plant and animal species), hydromorphological and physico-chemical elements.

If a water body is not screened out during the Screening Assessment then a No Deterioration Assessment will be required.

The no deterioration clause not only applies to a deterioration from one class to the other (e.g. from good to moderate, and even high to good) it also applies to a deterioration in individual quality elements even if the fall does not result in a fall of the classification of the water body as a whole.

The no deterioration assessment as set out here will consider the risk posed by the Proposed Development and the impacts associated with it on each of these elements. It will also consider the potential impact of proposed mitigation measures and how these measures may prevent a deterioration in status or even lead to a potential improvement in status. The water status baseline used for this assessment is that reported by the EPA for the period 2016-2021 and reported in Section 2.2.

3.4 Achievement of Good Status Assessment

One of the central objectives of the WFD is to achieve good water status. The achievement of good status assessment will determine if the Proposed Development and the impacts associated with it have the potential to jeopardise the attainment of good status. The assessment may also need to consider if the Proposed Development will indirectly affect any measures as part of the Programme

of Measures, both local and further afield, put in place by competent authorities to achieve the objectives of the Directive.

This step of the assessment may not be required if the water body being assessed has already achieved the environmental objective of good status.

As the baseline used in this assessment shows that the water body is in **moderate** status (see Section 2.2) then an assessment is required.

4. WFD Assessment Results

4.1 General Approach

The WFD assessment is presented in tabular form within Section 4 which sets out in a structured way the potential effects of the Proposed Development on each of the relevant WFD elements as listed in Annex V of the Directive (set out in Section 2).

4.2 Project Characteristics and assumptions

The WFD compliance assessment uses professional judgement to assess the effects of the Proposed Development on each of the WFD elements (biological, physico-chemical and hydromorphological surface water elements).

Key activities and assumptions for the assessment are outlined in the following sections.

4.2.1 During Construction

It is envisaged that the initial construction phase for the Proposed Development will last approximately 32 months, with an additional 6-months commissioning prior to operation. During the initial phase, approximately 975 people will be employed onsite at peak.

A Construction Environmental Management Plan (CEMP) will be in place to reduce the impact of construction activities on the environment. An Outline Construction Environmental Management Plan (OCEMP) has been produced as part of the STEP EIAR[7]

A detailed CEMP will be produced by the successful Contractor prior to the main construction works and will take account of the measures included in the OCEMP and any commitments included within the statutory approvals. The CEMP is to be agreed with Kerry County Council. The CEMP will set out the necessary approach to managing the environmental aspects and impacts associated with the construction of the Proposed Development. It will also contain details of the monitoring and reporting system which will be implemented to document compliance with the following:

- Environmental commitments identified in the EIA studies; and
- The conditions of the relevant statutory consents including the planning consent and the foreshore licence associated with the Proposed Development.

[7] https://stepplanning.com/

As a minimum, the CEMP will be reviewed every six months.

In addition to the CEMP, the Contractor shall prepare site specific management plans that correspond to the relevant topics and studies detailed within the EIAR. These site-specific management plans will identify the processes and procedures that the CONTRACTOR will implement to ensure compliance with all the planning and permit requirements of the Project. Site specific management plans will include (but not limited to) the following:

- Awareness & Training
- Environmental Emergency Response
- Record Keeping, Auditing and Monitoring
- Environmental Complaints Procedure
- Archaeology & Architecture (Heritage) Control Plan
- Protection of Biodiversity Control Plan
- Surface Water Management / Discharge Control Plan
- Environmental Emergency Response Plan
- Ground (Soil) Control Plan
- Waste Management Plan
- Visual (Maintenance & Housekeeping) Control Plan
- Noise and Vibration Management Plan
- Air Quality and Dust Minimisation Management Plan
- Resource Usage Plan
- Sensitive neighbours plan
- Landscape and Site Reinstatement Plan

All construction works and mitigation measures relating to ecology will be monitored by a suitably qualified ecologist.

Before construction start, cattle and other animals will be removed from the site. This may reduce nutrient sources from entering the stream.

Sewerage effluent will be collected in tanks for removal by tanker and temporary surface water drainage and silt ponds will be constructed to control runoff.

Construction materials will be sourced locally from authorised quarries, where possible to minimise the environmental impact of transportation. Due Diligence Assessments of quarry facilities will be undertaken to monitor environmental management, regulatory and legal compliance status.

Fuels, oils and other potentially hazardous chemicals will be stored in bunds in designated areas; concrete use and wash-out areas will be in designated areas, with measures to prevent alkaline wastewaters or contaminated storm water runoff to the underlying subsoil or to the surface water or marine environment.

Site access will be located off the existing L1010 (Coast Road), which is the primary access road to the townlands of Kilcolgan Lower and Ralappane from Tarbert and Ballylongford.

Three watercourse crossings are required within the Proposed Development site i.e. a bridge over the Ralappane Stream (annotated as D1) and two culverts on drainage ditches. Direct impacts on Ralappane Stream will be avoided through the use of the single span bridge for the stream crossing (Figure 3) and no instream works will be carried out. Two drainage ditches (annotated as D2 and D3), which do not have the potential to support fish, in the southwest section of the Proposed Development site, will be culverted (EIAR Section 2.4.4.2 of Chapter 02 – Project Description).

The proposed crossings of the Rallapane Stream have been adequately sized to have a minimal impact on the current hydraulic regime in the area (600 mm culvert (D3 stream), 1200 mm diameter culvert (D2 stream crossing) and 2.4 m x 3.0 m box culvert for the Ralappane (D1) stream crossing).

The culverts will provide adequate freeboard in accordance with current OPW guidelines for the 1% MRFS AEP fluvial event, which will be seen as an acceptable design flow event for culverts.

All drainage from the construction phase of the Proposed Development will be controlled and monitored as part of the discharge licence for construction surface water drainage for the Proposed Development from Kerry County Council (KCC) and associated planning conditions.

A pre-cast concrete bridge will be constructed over the Ralappane Stream. The bridge over the Rallapane Stream (Figure 3) will have a span of 22 metres and will be supported by a concrete abutment on either side of the stream. The design of the bridge will ensure that the flow and morphological characteristics of the river at this point are not significantly affected. A preliminary design drawing of the bridge is included as Appendix 1 to this report. During site enabling works a temporary portable, pre-fabricated bailey bridge will be installed over the Ralappane Stream.

The overall proposed development has been designed to avoid any impact on the Ralappane Stream. The location of the bridge crossing across the river, and its extensive 22 m span ensure river depth, width variation, dynamics of water flow, and river continuity are not impacted. No permanent watercourse diversions are proposed as part of the Proposed Development.

It is noted that Inland Fisheries Ireland (IFI) noted[8] *"IFI welcome the provision of a clear span bridging structure over the Rallappane Stream".*

[8] IFI submission to ABP on the 28th Oct 2021 for the STEP planning application. ABP Ref 311233-21

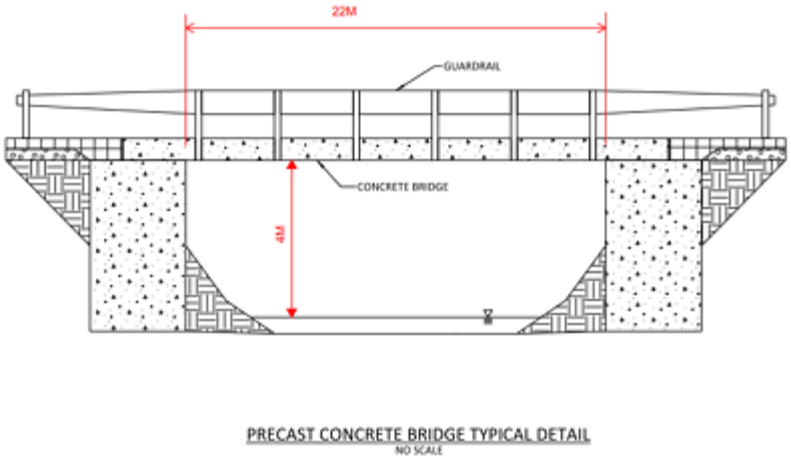

Figure 3. Design of the precast concrete bridge that will span the Ralappane Stream at the entrance to the Proposed Development

Works will comply with The IFI's Guidelines on protection of fisheries during construction works in and adjacent to waters (IFI, 2016)

4.2.2 During Operation

An Health and Safety and Environmental Management System will be will implemented for the operational phase, which will include setting of objectives and targets, measuring progress, reporting results as a commitment for continual improvement, and fostering a culture where incidents are reported and investigated and lessons learned are shared through the organisation. It will use regular audits to ensure its controls are effective. It will provide appropriate health, safety and environment training and guidelines to employees and contractors to enable them to meet the required standards of performance.

Operation of the Proposed Development will be in compliance with the requirements of the Industrial Emissions licence (IE), to be issued and enforced by the Environmental Protection Agency.

Surface water from paved and impermeable areas will be collected by an underground drainage system and will discharge to the Shannon Estuary via the drainage outfall pipe located 5 m beyond the low water mark at a water depth of approximately 2.4 m.

The Power Plant will be served by an on-site wastewater treatment plant (WWTP) and all sanitary effluent will be pumped or fall by gravity to the WWTP.

The WWTP will treat effluent to required discharge standards required by the site's Industrial Emissions licence and will be designed to cater for 67 people. An average flow of 0.4 L/s (34.5 m3 /day) is expected to be discharged from the WWTP. The stormwater discharges such as controls, proposed trigger levels, and monitoring programme will all be captured in the IE License.

All treated effluent from the WWTP will be discharged to the Shannon Estuary via the same discharge point as the stormwater.

A surface waters monitoring programme will be established as a condition of the IE licence. Monitoring points are reflected in the EIAR. Refer to fig 2-24 and section 2.4.7.2 and section 2.4.7.3 of the EIAR. The stormwater discharges such as controls, proposed trigger levels, and monitoring programme will all be captured in the IE License (Attachment 7.7), this has yet to be completed. The aim is to submit the IE License application to the EPA in Q1 2024.

Shannon LNG Limited has elected to use a cooling system for the power plant that does not require any water to be abstracted from the Ralappane Stream.

The access road levels will be profiled to drain road runoff to an engineered swale adjacent to the road, the majority of which will drain to the engineered storm drainage system at the Power Plant site and discharge to the shared constructed outfall to the Shannon Estuary.

There will also be a stormwater discharge point of road runoff at the Ralappane D1 stream crossing located 50m from the site entrance and a second stormwater discharge point will be located at the D2 stream crossing located 20m from the construction laydown area. Both will be fitted with Class 1 hydrocarbon interceptors. The use of sediment traps will also be considered during the detailed design phase.

A series of actions will be taken following decommissioning to ensure that the Proposed Development has no-lasting impact on the environment. These actions are detailed in the EIAR and include:

- All wastes at the facility at time of closure will be collected and recycled or disposed of by an authorised waste contractor, as appropriate;
- Utilities will be drained of all potential pollutants such as lubricating oils or sealed to prevent leakage if being moved offsite or reused elsewhere;
- All raw materials, oils, fuels, etc. onsite at the time of closure will be returned to the supplier, or collected and recycled or disposed of by an authorised waste contractor, as appropriate;
- All buildings and equipment will be decontaminated, decommissioned and demolished in accordance with a phased demolition plan, and either sold for reuse or recycled, or disposed of by an authorised waste contractor, as appropriate. In general, specialist equipment, pipelines and storage tanks will be sold for reuse, where possible, or disposed of offsite;
- Roadways to be broken up and removed and security fences dismantled;
- All hazardous and non-hazardous process substances to be removed;
- All roads and hardstanding areas to be removed and recycled or disposed of by an authorised waste contractor, as appropriate;
- Landscaped will be reinstated in accordance with a landscape reinstatement plan; and
- On completion of safe decommissioning of equipment, the potable water, fire water and electrical power supplies could be disconnected, and removed or abandoned in place.

When operations have ceased, and assuming confirmation from the monitoring programme that all emissions have ceased, it is expected that there would be no requirement for long-term aftercare management at the Proposed Development site.

4.3 Screening Assessment

As sections of the Ralappane river water body pass through the Proposed Development site and the main entrance to the site crosses the river water body it cannot be screened out and most move to the next stage of the assessment.

4.4 No Deterioration Assessment

Tables 4.1 to 4.3 provide an overview of the no deterioration assessment. This assessment considers the potential impact of the Proposed Development during both the construction and operation phase of the development. The assessment also highlights the measures that will be put in place to reduce the potential impacts identified. The assessment also highlights measures which may enhance existing conditions within the Ralappane water body and in the immediate riparian zone of the river.

4.5 Achievement of Good Status Assessment

This part of the assessment considers the potential of the Proposed Development to directly jeopardise the achievement of good status or to indirectly effect measures which have been, or will be, put in place by the competent authorities to achieve the WFD objective of good status.

The risk of this water body not achieving its environmental objective is currently under review by the EPA which indicates that there was insufficient data available to the EPA to categorise this water body as either being at risk or not at risk of meeting the objective of good status. Furthermore, the other six river water bodies in the Astee West subcatchment are either at risk or at review (EPA, 2019).

The Astee West subcatchment assessment undertaken by the EPA (EPA, 2019) identified intensive agriculture as the main issue impacting on water quality with specific reference to the presence of piggeries, slurry spreading, farmyards and farm effluent. It follows therefore that actions identified by the relevant authorities will focus primarily on addressing impacts from agricultural sources.

Table 4.1 Hydromorphological assessment

Hydromorphological Quality Elements	Assessment	Possible ways to control impact
Ralappane Stream IE_SH_24R300270		
Quantity and dynamics of water flow	**Construction** No instream works will take place during construction. No change to supporting quality element status.	N/A
	Operation No permanent artificial in-channel structures to impede flow. The overall network of culverts within the site have been sized appropriately to avoid impacts to flow characteristics or wetted perimeter upstream and downstream of the site. The bridge crossing, with a span of 22 metres, has been appropriately designed to avoid impacts to flow characteristics. Water abstraction for cooling of the power plant will be from an intake located in the Shannon estuary. No water will be abstracted from the Ralappane Stream. No change to quality element status at the body scale.	The culverts will provide adequate freeboard in accordance with current OPW guidelines for the 1% MRFS AEP fluvial event, which will be seen as an acceptable design flow event for culverts.
Connection to groundwater bodies	**Construction** No change to supporting quality element status at the water body scale.	N/A
	Operation No change to supporting quality element status at the water body scale.	N/A
River Continuity	**Construction** No barriers or other structures which have the potential to impact on river continuity will be in place during the construction phase of the Proposed Development. No change to quality element status at the body scale.	N/A
	Operation No permanent barriers will be in place during the operational phase of the Proposed Development.	Culvert is sized to match upstream, limiting any

	No change to quality element status.	impact on longitudinal connectivity.
River Depth and width variation	**Construction** River depth will not be impacted during the construction phase of the Proposed Development. No change to quality element status.	N/A
	Operation River depth will not be impacted during the operation phase of the Proposed Development. Culverts will be appropriately sized to convey flow and sediment from upstream. River course will not be impacted during the operation phase of the Proposed Development. No change to quality element status at the water body scale.	Culvert is sized to match upstream, limiting any impact on longitudinal connectivity.
Structure and substrate of the riverbed	**Construction** Potential fine sediment mobilisation during construction phase with potential deterioration of downstream channel due to smothering. With mitigation in place, there is not anticipated to be any change to quality element status. Conversely, there is unlikely to be any in-channel structures that will impact on the movement of sediment in the river.	Standard construction best practice mitigation measures to prevent release of sediments, chemical and pollutants during construction. 1. Control of water pollution from construction sites. Guidance for consultants and contractors (C532). CIRIA. Masters-Williams et al (2001) 2. Control of water pollution from linear construction projects. Technical guidance (C648). CIRIA. Murnane, et al. (2006)

		Silt mitigation measures to be put in place during channel construction works. Works to be scheduled during low flow periods and in-channel plant movements minimised. Temporary surface water drainage and silt ponds will be constructed to control runoff. Regular water inspection and sampling regimes will be put in place via the OCEMP. Discharge water quality targets will be agreed with KCC and included in the OCEMP. Further in-stream measures can be considered (e.g. silt and sediment traps) in consultation with the relevant public authority.
	Operation No permanent in channel structures with the potential to impact on the movement of sediment in the river. There is not anticipated to be any change to quality element status at the water body scale.	Road runoff from the access road will be routed north to the power plant, rather than

		to natural drainage leading to the Ralappane Stream. Access road stormwater discharges to the stream will be fitted with Class 1 hydrocarbon interceptors. Consideration will be given to fitting sediment traps during the detailed design phase. Once construction begins grazing agreements currently in place will cease and land use will change from agriculture to commercial/industry. This should result in a reduction in the amount of sediment entering the waterway from reduced river bank disturbance and animal poaching.
Structure of the riparian zone	**Construction** No change to quality element status.	N/A
	Operation The percentage of artificial hard bank protection structure and other permanent artificial structures such as culverts is estimated to be low at less than 1% of the total channel length of 5.98 kms.	Fencing will be put in place to prevent cattle access and

	No change to quality element status at the body scale.	recovery of riparian zone vegetation. Riparian zone will be planted with native vegetation, suitable to the local environment. A biodiversity action plan (BAP) will be implemented for the Proposed Development. The purpose of the plan will be to enhance biodiversity across the site.

Table 4.2 Physico-chemical assessment

Physico-Chemical Quality Elements	Assessment	Possible ways to control impact
Ralappane Stream IE_SH_24R300270		
Thermal conditions (Temperature)	**Construction** No change to quality element status.	N/A
	Operation No impact on thermal conditions as the thermal discharge from the Proposed Development will be to the Shannon Estuary (The impact of the thermal discharge to the Shannon Estuary results in a minor relative change in ambient temperature and is considered to have no impact on marine habitats or fauna – see Chapter 7 of the EIAR). No change to quality element status.	Improved riparian zone vegetation and enhanced shading will help to stabilise stream temperature.

Nutrient conditions (including phosphate and ammonia)	**Construction** Potential for temporary impacts on nutrient conditions caused by mobilisation of sediment during works. No anticipated change to quality element status at water body scale.	CEMP measures to minimise sediment laden runoff will mitigate nutrient inputs. Once construction begins grazing agreements currently in place will cease and land use will change from agriculture to commercial/industry. This should result in a reduction in the amount of nutrient and coming directly from livestock during the operational phase of the project.
	Operation No impact on nutrient conditions anticipated. No direct discharges to the Ralappane stream. Surface water from paved and impermeable areas will be collected by an underground drainage system and will discharge to the Shannon Estuary via the drainage outfall pipe. Treated effluent from the WWTP will be discharged to the Shannon Estuary via the same discharge point (see section 2.4.7 of the EIAR for a full description of the drainage design). No change to quality element status.	The laydown areas will be suitably drained and any areas which will involve the storage of fuel and refuelling will be paved with bunding and hydrocarbon interceptors to ensure that no spillages percolate into the surface water or groundwater systems.
Oxygenation conditions	**Construction** Potential for some localised reduction in oxygenation conditions during the construction phase associated with fine sediment mobilisation (assuming it has an associated oxygen demand). With mitigation in place, there is not anticipated to be any change to quality element status.	Sewage effluent will be collected in tanks for removal by tanker and temporary surface water drainage and silt ponds will

		be constructed to control runoff.
	Operation No impact on oxygen conditions anticipated. No direct discharges to the Ralappane stream. Surface water from paved and impermeable areas will be collected by an underground drainage system and will discharge to the Shannon Estuary via the drainage outfall pipe. Treated effluent from the WWTP will be discharged to the Shannon Estuary via the same discharge point (see section 2.4.7 of the EIAR for a full description of the drainage design). Outfall discharges to the estuary were modelled and indicated that the treated effluent will be rapidly diluted and dispersed within a short distance of the outfall and does not compromise the water quality at the aquaculture sites in Ballylongford Bay. No change to quality element status.	N/A
Acidification status (pH)	**Construction** Potential for temporary impacts on acidification if run-off from lime and concrete construction activities occurs. No change to quality element status (concrete washout in place).	CEMP measures to minimise concrete and lime run-off will include appropriate washout of concrete transport vehicles; risk assessment to identify measures to prevent discharge of alkaline waste waters; use of filtration systems. The use of pre-cast concrete will be maximised, while the pouring of wet concrete onsite will be minimised to reduce any potential environmental impacts. Any in-situ concrete work will be staged in a

		manner to prevent concrete from entering the water. This will be achieved by installing shuttering to contain the concrete, with all concrete pours supervised by the Environmental Manager. A Concrete Washout Plan will be developed by the contractor that will detail a methodology and procedure to manage concrete washout and waste on site.
	Operation No impact on acidification status anticipated post construction phase. No change to quality element status.	N/A

Table 4.3 Biological assessment

Biological Quality Elements	Assessment	Possible ways to control impact
Ralappane Stream IE_SH_24R300270		
Benthic invertebrates	**Construction** Potential fine sediment mobilisation during construction works with potential deterioration of downstream channel substrate (at local scale) due to smothering. With mitigation in place, there is not anticipated to be any change to quality element status.	Silt mitigation measures to be put in place during construction. In channel measures such as silt fencing/ hay bales also to be used.
	Operation No material change to the hydromorphological and physico-chemical quality elements supporting the existing macroinvertebrate population No change to quality element status at the water body scale.	Access road stormwater discharges to the stream will be fitted with Class 1 hydrocarbon interceptors. Consideration will be given to fitting sediment traps during the detailed design phase.
Phytobenthos	**Construction** No change to quality element status at the water body scale.	N/A
	Operation No change to quality element status at the water body scale in the absence of any change in existing nutrient conditions (see Table 4.2)	N/A
Fish	**Construction** Potential fine sediment mobilisation during construction works with potential deterioration of downstream channel substrate due to smothering (at a local scale). With mitigation in place, there is not anticipated to be any change to quality element status.	Silt mitigation measures to be put in place during construction. In channel measures such as silt fencing/ hay bales may also used.

		Access road stormwater discharges to the stream will be fitted with Class 1 hydrocarbon interceptors.
	Operation No material change to the hydromorphological and physico-chemical quality elements supporting the existing fish population. No change to quality element status at the water body.	A biodiversity action plan (BAP) will be implemented for the Proposed Development. The purpose of the plan will be to enhance biodiversity across the site including those habitats found in the riparian zone.
Macrophytes	**Construction** No change to quality element status at the water body scale.	N/A
	Operation No material change to the hydromorphological and physico-chemical quality elements supporting the existing fish population. No change to quality element status at the water body	N/A

5. Conclusions

Based on the evaluation presented in Tables 4.1 to 4.3 the activities associated with the construction and operation of the Proposed Development will have no permanent impacts on the condition of the Ralappane river water body or indirectly affect measures put in place to achieve the environmental objectives of the WFD for this water body.

As highlighted throughout this assessment the design of the Proposed Development and proposed mitigation measures will avoid any permanent impact on the Ralappane river water body. All watercourse crossings will be planned in accordance with applicable guidelines. No permanent watercourse diversions are proposed as part of the Proposed Development. Furthermore, a Construction Environmental Management Plan (CEMP) will be developed prior to any construction activities and will outline mitigations measures to deal with surface water runoff from the site. The CEMP will include a Waste Management Plan and Surface Water Management Plan, to be prepared in accordance with Department of Environment, Community & Local Government guidelines (DoECLG, 2006) and any construction-related requirements imposed as conditions of any planning permission granted. This is outlined in Section 5.10.1.1 of the EIAR.

More specifically, the assessment has shown that the Proposed Development upon completion will have no permanent impact on the hydromorphological (i.e. flow, continuity, morphology) and physico-chemical (i.e. thermal, nutrient, oxygenation, acidification) elements of the water body and the ability of these elements to provide a supporting environment for the river's ecology. As such the assessment has demonstrated that the potential impacts associated with the Proposed Development are unlikely to cause a deterioration at the water body scale.

Some mitigation measures (e.g. fencing and planting of the riparian zone with native plants) may result in a net improvement in the local riverine environment. Furthermore, the change in land use from agriculture, to commercial and industrial, may result in a reduction in agricultural pressures such as a reduction of nutrient and sediment entering the river from agricultural sources.

It is also unlikely that the Proposed Development will impact on the measures that are required to be put in place across the Astee West subcatchment to address the main issues currently impacting on water quality which are predominantly coming from agricultural sources.

In summary the Proposed Development would not result in status deterioration of the Ralappane river water body or directly prevent the future attainment of good water status or indirectly impact measures that may be put in place by the relevant competent authorities to achieve the environmental objectives of the WFD.

6. References

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IFI, 2016. Guidelines on protection of fisheries during construction works in and adjacent to waters. Inland Fisheries Ireland.

Masters-Williams et al (2001). Control of water pollution from construction sites. Guidance for consultants and contractors (C532). CIRIA (Construction Industry Research and Information Association).

Murnane, et al. (2006) Control of water pollution from linear construction projects. Technical guidance (C648). CIRIA (Construction Industry Research and Information Association).

APPENDIX 1.

Preliminary design of the bridge crossing of the Ralappane Stream.