

Natura Impact Statement

Proposed Cashen Estuary
Pump Infrastructure, Co.
Kerry





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Appendix 2 EcoEireann (2020) Water Framework Directive Screening Assessment
Appendix 3 Construction Environmental Management Plan (CEMP)
Appendix 4 Design Drawings

1. INTRODUCTION

1.1 Background

McCarthy Keville O’Sullivan Ltd. (MKO) has been appointed to provide the information necessary to allow the competent authority to conduct an Article 6(3) Appropriate Assessment of the proposed construction of No. 16 pumping stations (7 electric and 9 wind driven), within each of the existing polders along the River Feale, Co. Kerry. An Appropriate Assessment Screening Report has been prepared and is provided in Appendix 1. This Article 6(3) Appropriate Assessment Screening Report has identified the European Sites upon which the proposed development has the potential to result in significant effects and the pathways by which those effects may occur. It has also identified those qualifying interests/special conservation interests that have the potential to be affected by the proposed development.

This report has been prepared in accordance with the European Commission guidance document Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2001), European Communities (2018) Managing Natura 2000 Sites: the provisions of Article 6 of the ‘Habitats’ Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission and the Department of the Environment’s Guidance on the Appropriate Assessment of Plans and Projects in Ireland (December 2009, amended February 2010).

In addition to the guidelines referenced above, the following relevant guidance was considered in preparation of this report:

1. *European Communities (2000) Managing Natura 2000 Sites: the provisions of Article 6 of the ‘Habitats’ Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,*
2. *Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,*
3. *EC (2007) 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.*

1.2 Statement of Authority

Baseline ecological surveys were undertaken on the 8th of October 2019 by Pat Roberts (B.Sc., MCIEEM) and David McNicholas (B.Sc., M.Sc., MCIEEM). This report has been prepared by David McNicholas and Pat Roberts. David is an experienced ecologist with over 10 years professional consultancy experience. Pat has over 15 years’ experience in ecological consultancy and management.

1.3 Structure and Format of this NIS

This NIS firstly provides a summary of the findings of the Article 6(3) Appropriate Assessment Screening Report. This clearly identifies the European Sites that have the potential to be adversely affected by the proposed development and the pathways by which they might be affected. This sets out the scope of the NIS. Following this, all elements of the proposed project are fully described as is the baseline environment with respect to the relevant QI/SCI of the screened in European Sites.

Section 5 provides an assessment of the potential for adverse effects on the identified European Sites and prescribes mitigation to robustly block any identified pathways for impact. Section 6 provides an assessment of residual effects taking into consideration the proposed mitigation.

In Section 7, the potential in combination effects of the proposed project on European Sites, when considered in combination with other plans and projects was considered. A concluding statement is provided in Section 8.

2.

CONCLUSIONS OF ARTICLE 6(3) APPROPRIATE ASSESSMENT SCREENING REPORT

The Article 6(3) Appropriate Assessment Screening report, that is provided as Appendix 1 to this NIS, examined the potential for significant effects on European sites within a 15km radius of the proposed works and the potential for the proposed development to result in significant effects was identified on the Lower River Shannon SAC [002165].

The individual pathways for effect that were identified in Table 3.1 of the AA Screening Report (Appendix 1) and the QIs with the potential to be affected are described below.

Following a review of the detailed Conservation Objective Supporting Documents and the known location of the proposed infrastructure in relation to the SAC, potential for **direct and indirect** effects has been identified in the absence of mitigation on the following QIs associated with the construction, operational and decommissioning phases of the proposed project and therefore require further assessment:

- > [1130] Estuaries
- > [1140] Mudflats and sandflats not covered by seawater at low tide
- > [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- > [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- > [1095] Sea Lamprey (*Petromyzon marinus*)
- > [1096] Brook Lamprey (*Lampetra planeri*)
- > [1099] River Lamprey (*Lampetra fluviatilis*)
- > [1106] Atlantic Salmon (*Salmo salar*) (only in freshwater)
- > [1355] Otter (*Lutra lutra*)
- > [1160] Large shallow inlets and bays
- > [1170] Reefs
- > [1310] *Salicornia* and other annuals colonising mud and sand

Potential pathways for effect on the above Qualifying Interests (QIs) are discussed in the below subsections.

2.1

Potential for Direct Effect

In the absence of mitigation, potential for direct habitat loss/disturbance has also been identified at three locations (wind pumps 3, 4 and 14) for the following QIs, associated with the installation of the proposed discharge pipe infrastructure to be located between the existing embankment and the main river channel:

- > [1130] Estuaries
- > [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- > [1410] Mediterranean salt meadows (*Juncetalia maritimi*)

Taking a precautionary approach, potential for direct impact i.e., destruction of an otter holt/mortality, on otter during construction has been identified in the absence of mitigation.

2.2

Potential for Indirect Effects

The proposed works have the potential to cause deterioration in surface water quality during the construction phase of the development due to the release of pollutants, including suspended solids and hydrocarbons, potentially affecting the following adjacent and downstream aquatic habitats and supporting habitats for aquatic fauna:

- > [1130] Estuaries
- > [1140] Mudflats and sandflats not covered by seawater at low tide
- > [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- > [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- > [1095] Sea Lamprey (*Petromyzon marinus*)
- > [1096] Brook Lamprey (*Lampetra planeri*)
- > [1099] River Lamprey (*Lampetra fluviatilis*)
- > [1106] Atlantic Salmon (*Salmo salar*) (only in freshwater)
- > [1355] Otter (*Lutra lutra*)
- > [1160] Large shallow inlets and bays
- > [1170] Reefs
- > [1310] *Salicornia* and other annuals colonising mud and sand.

On a precautionary basis a potential pathway for indirect effects was identified in the form of disturbance/ displacement potentially affecting otter (*Lutra lutra*).

3. DESCRIPTION OF PROPOSED DEVELOPMENT

3.1 Site Location

The proposed development of pumping stations will pump water into the Rivers Brick, Galey, and Feale from adjacent lands between Ferry Bridge and Lixnaw, Co. Kerry [IG Ref: Q 89581 33860]. The Feale River forms part of the Lower River Shannon SAC [002165]. The proposed works areas are located adjacent to, or overlap with, the Lower River Shannon SAC. The Cashen estuary discharges to the 'Mouth of the Shannon' coastal waterbody, also forming part of the Lower River Shannon SAC [002165]. A site location map is provided in Figure 3.1. A map of the site location in relation to European Sites is provided in Figure 3.2.

3.2 Characteristics of the Proposed Development

3.2.1 Background to the Project

The River Feale Certified Drainage Scheme was constructed by the Commissioners of Public Works between 1951 and 1957. The Scheme included the dredging of the Cashen Estuary and comprises of 295km of river channel, 144 km of Flood Defence Embankments, 338 Bridges/Culverts, 193 Sluice Structures and one pumping station on the River Brick. The objective was to protect agricultural land from inundation by high tides. The Office of Public Works (OPW) is required, under the 1945 Arterial Drainage Act, to maintain the scheme in an effective condition, and to improve drainage to assist farming activities to continue uninterrupted.

Local stakeholders and landowners reported to the OPW that 'higher and more prolonged flooding has been occurring in the low-lying polders that are drained by the OPW's sluiced back drain systems and that this is having a significant impact upon land drainage adjacent to the estuary. Subsequent consideration of the problem has identified that the bed levels at the estuary mouth have risen significantly in the intervening years since the River Feale Certified Drainage Scheme due to the progressive natural deposition of sand within the unmaintained wide section of the estuary, where tidal flows from the Atlantic Ocean meet the fluvial flows of the Feale catchment. This has resulted in reduced flow capacity through the estuary mouth on ebb tides, causing higher water levels in the main channel which in turn has reduced the discharge capability of existing sluices through the embankments and back-drain systems at certain times within the tidal cycle' (EcoEireann, 2020). As a result, fields flood more regularly, and the existing drainage channels and sluice system is less effective at draining the land.

The proposed development which will be carried out under Section 38 of the Arterial Drainage Act 1945, will pump water into the Rivers Brick, Galey, and Feale. The pumping stations within the catchment will pump water from the polders into the adjacent watercourse; however, as water is already discharged via gravity from existing drainage ditches there is no new hydrological connection or pathway for pollutants. The operation of the pumping stations will assist with the drainage of 3,651ha of agricultural land. The confluence of the Rivers Brick, Galey, and Feale forms the Cashen River which flows into the Atlantic Ocean via the Cashen Estuary, all of which comprises part of the Lower River Shannon SAC.

Following a detailed options appraisal process, a preferred option to provide pumping in each polder was selected. A pumping station or a number of pumping stations will be installed into each polder (with the exceptions of 12A and 12B which already have a pumping station), augmenting the existing gravity drainage, pumping water from existing drainage ditches on the defended side of the embankment into the river side regardless of the water level in the river.



Map Legend

 Study Area Boundary



Drawing Title

Site Location Map

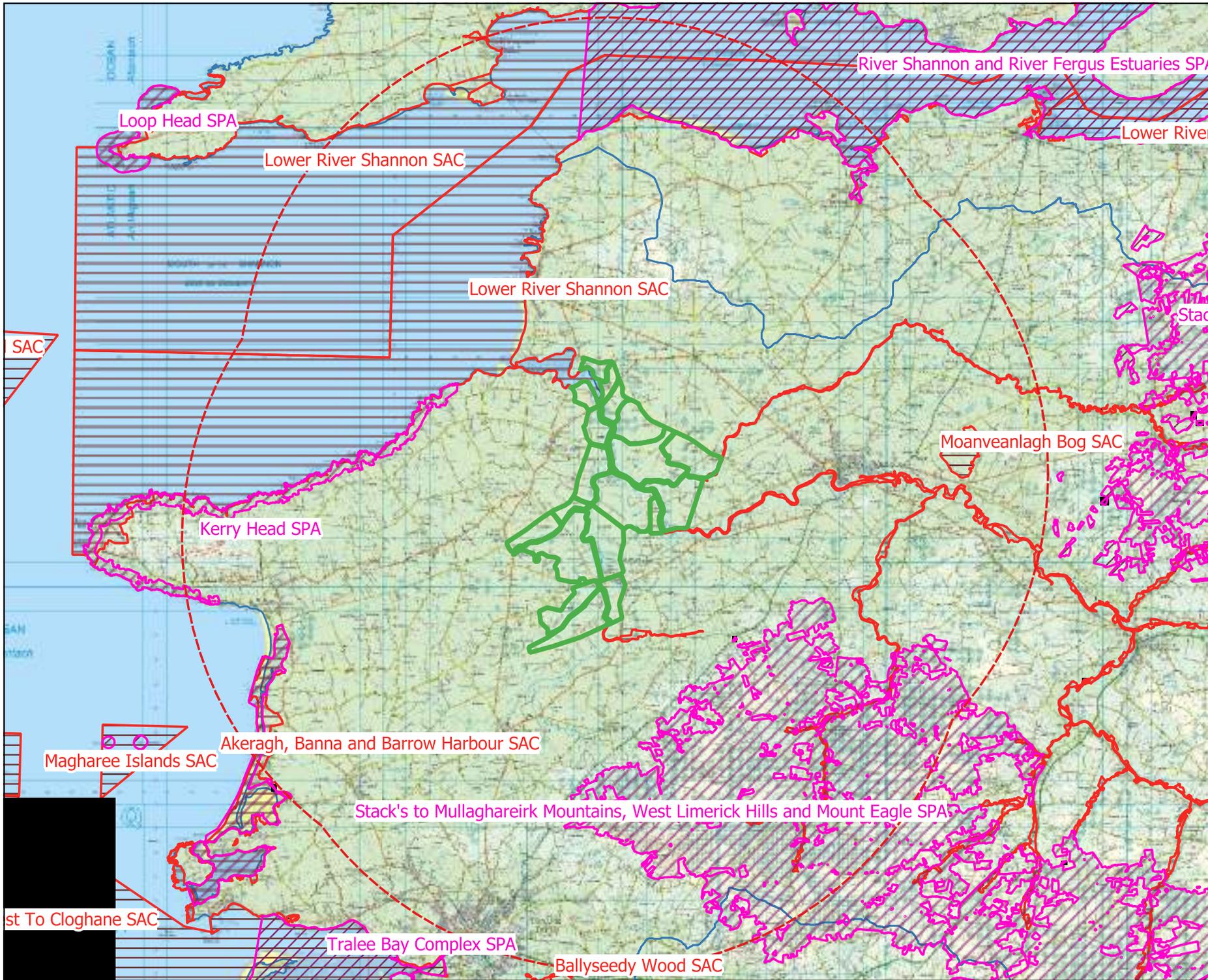
Project Title

Cashen Estuary Drainage

Drawn By	Checked By
OOG	JH
Project No.	Drawing No.
190937	Figure 3.1
Scale	Date
1:67537	2021-07-13



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Map Legend

-  Study Area Boundary
-  15km Buffer
-  Special Area of Conservation (SAC)
-  Special Area of Protection (SPA)
-  Hydrological Catchment Boundary

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Drawing Title
EU designated sites within 15km buffer zone

Project Title
Cashen Estuary Drainage

Drawn By OOG	Checked By JH
Project No. 190937	Drawing No. Figure 3.2
Scale 1:205000	Date 2021-07-13



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A total of 16 pumping stations (7 electric and 9 wind driven) are proposed. The pumps will augment existing gravity drainage to reproduce drainage conditions when the scheme was first constructed (prior to sea level rise and sediment deposition in the main channel). The proposed site infrastructure layout is provided in Drawing no. 20649-NOD-00-XX-DR-C-03101. All 9 wind pump locations, i.e., sites No. 1, 3, 4, 11A, 11B, 14, 15, 17 & 18, and 7 electric powered pumps i.e., locations at sites No. 6, 7, 9, 10, 12, 13 and 16, are shown in this drawing. No works are proposed at point number No. 2 or No. 5, and site location No. 8 on the drawing is a link culvert.

As described above, increased sediment loading in the estuary has resulted in the non-return valves functioning for a shorter period of time than originally envisaged. This has been compounded by sea level rise. The proposed installation of the pumping infrastructure within the catchment therefore aims to augment the current discharge in order to compensate for the amount of water that would have originally drained via gravity when water levels in the estuary were lower. The pumps will be carefully managed, by OPW personnel, to improve the existing drainage as per the original scheme; electric pumps will only be in operation from March to October when the polders are actively grazed. The pumps will only be used periodically, during the grazing period (March-October), when existing gravity discharge requires supplementation such as periods of high rainfall or tidal inundation (EcoEireann, 2020).

The selection of electric versus wind driven pump solutions and prioritisation of interventions was derived based on size and quality of the land protected and the associated cost. Along with these measures, the OPW will continue to maintain the existing embankments, forming part of the River Feale Certified Drainage Scheme. There will be no change to the current ongoing maintenance programme. Such maintenance is assessed in the cumulative assessment in Section 7 of this NIS.

The proposed pumping infrastructure has been assessed as the least invasive option comprising of a number of small-scale pump infrastructure, associated access tracks and power supply.

3.2.2 Modelled pump rates

As described in the accompanying ‘Water Framework Directive Screening Assessment’ report (EcoEireann, 2020), modelled pump rates for the proposed development have been prepared and are shown in this NIS in Table 3.1 for ease of reference. This report states that as ‘water is already discharged from the polders to the rivers via gravity discharge from ditches, so a new hydrological connection is not being made. The method of discharge will be controlled to reduce the potential for ‘pulses’ of potentially nutrient rich, anoxic water entering the watercourse’.

Table 3.1: Cashen Estuary Modelled Pump Rates

Pump Station	Design type	Polder(s)	Peak Flow Through Existing Sluices	Max. Pump Rate - 6 Hrs	Max. Pump Rate - 24 Hrs	Max. Pump Rate - 48 Hrs	Max. Ave. Flow Rate - 30 day
1	Wind	1	3622	493	138	71	0.9
2	N/A						
3	Wind	3	17626	1358	483	255	3.6
4	Wind	4	14335	2162	795	462	19.2
5	N/A						
6	Electric	½ of 05	28550	5315	2104	1431	30.0
7	Electric	½ of 05 + 06	35447	5700	2198	1500	32.2
8	N/A						
9	Wind	½ of 07	12002	3081	1386	1147	52.2
10	Electric	½ of 07 + 08	38340	10957	4883	4039	174.7

11A	Wind	9	6848	828	303	196	4.9
11B	Wind	10	3738	452	193	170	10.7
12	Electric	11	46404	6395	2850	2229	53.8
13	Electric	13	16024	3596	1482	899	13.5
14	Wind	14	11401	1342	374	198	4.0
15	Wind	12C	2106	637	493	442	14.8
16	Electric	15	24372	3071	1230	926	25.3
17	Wind	16	9295	1234	375	220	3.7
18	Wind	17	5094	721	295	144	1.3

3.2.3 Proposed Works

As described above, a total of 16 pumping stations (7 electric and 9 wind driven) are proposed. Each pumping station will require approximately 10m x 10m, plus the embankment outside that, and the inlet and outlets beyond. The proposed development will consist of the construction of the following pumping stations along the banks of the River Feale polders:

- 9 No. Windmill powered pumping solutions at Sites No. 1, 3, 4, 11A, 11B, 14, 15, 17 & 18 and 7.
- 7 No. Electrically powered pumping stations at Sites No. 6, 7, 9, 10, 12, 13 and 16.

The typical site plan for the electric powered pump chambers is provided in Drawing no. 20649-NOD-XX-XX-DR-C-03400 (*Typical Site Plan Standard Pump Chamber 400mm Outfall*). The typical site plan for the wind powered pump chambers is provided in Drawing no. 20649-NOD-XX-XX-DR-C-03410 (*Typical 7m High Windmill Pump Plans*).

In addition, 2 No. Link Culverts; one each between Polders 5 & 6, and Polders 7 & 8 are also proposed, see Drawing no. 20649-NOD-00-XX-DR-C-03101. The Proposed Development culvert infrastructure is illustrated in drawings 20649-NOD-00-XX-DR-C-03208 (*Culvert No. 8 - Plan & Section*) and 20649-NOD-00-XX-DR-C-03211 (*Culvert No. 10A - Plan & Section*).

The electric pumping stations will typically be used to drain larger polder areas and pump large volumes of water (>100 l/s). The wind driven pumps will have a slower response with a lower discharge capacity (typically <5 l/s) compared to the electric pumps, though they operate throughout the year, gradually reducing water levels and on average maintaining them at levels equivalent to the original scheme design.

It is proposed that pumping stations are sited near existing outfalls on the basis that this will be the low point in the existing drainage system and cause less disruption by minimising the need for re-grading the existing back drains. Each pumping station will require the following associated infrastructure:

- Access track – approximately 3-4km of access track will be required in total. Where possible, the access track will follow the edge of a field to avoid breaking up of land parcels;
- Fencing and security set up – each pumping station will be surrounded by palisade fencing for safety reasons;
- Sump (depth to be determined following ground investigations);
- Possible intake weir (where required) set at a level sufficiently below surrounding ground level to enable drainage, but high enough to prevent drying out of drains – potentially stop log adjustable;
- Outlet pipe/channel through or over embankment with access (path and railing); and
- Outfall potentially including flap gate/valve, depending on outlet pipe/channel arrangement, including scour protection features downstream as required.

The below subsections provided a description of each element of the proposed works.

3.2.3.1 Electric pumping station

In addition to the above infrastructure, electric pumping station would also require:

- Pumps (submersible, cannister or other) with lifting davit(s), kiosk, etc., as required;
- Power supply and other electrical infrastructure such as transformers, MCC, electrical control panels and HV and LV Switchgear and variable-speed drives (VSD); and
- Sensors and telemetry system for pump controls.

An example of an existing electric pump systems is shown in Plate 3.1 with a detailed design drawing provided in 20649-NOD-XX-XX-DR-C-03400 (*Typical Site Plan Standard Pump Chamber 400mm Outfall*) as described above. The pump infrastructure will be constructed from precast concrete and pipework will be sized based on the required pumping capacity at each location.



Plate 3.1 Example of existing electric pumping station within back drain, with flood defence embankment in the background.

The proposed foundation solution for the Pump Chambers will comprise of the following:

- 6 no. 200m² precast concrete piles (6 no. are required to allow for ground beams spans)
- Precast concrete pile caps.
- Precast concrete ground beams – L shaped to allow bearing of slabs.
- 150mm thick prestressed concrete Wide Slabs will bear onto the ground beams to form a formation for the Chamber.

An example of the proposed Pump Chambers design is shown in Plates 3-2 and 3-3 below.

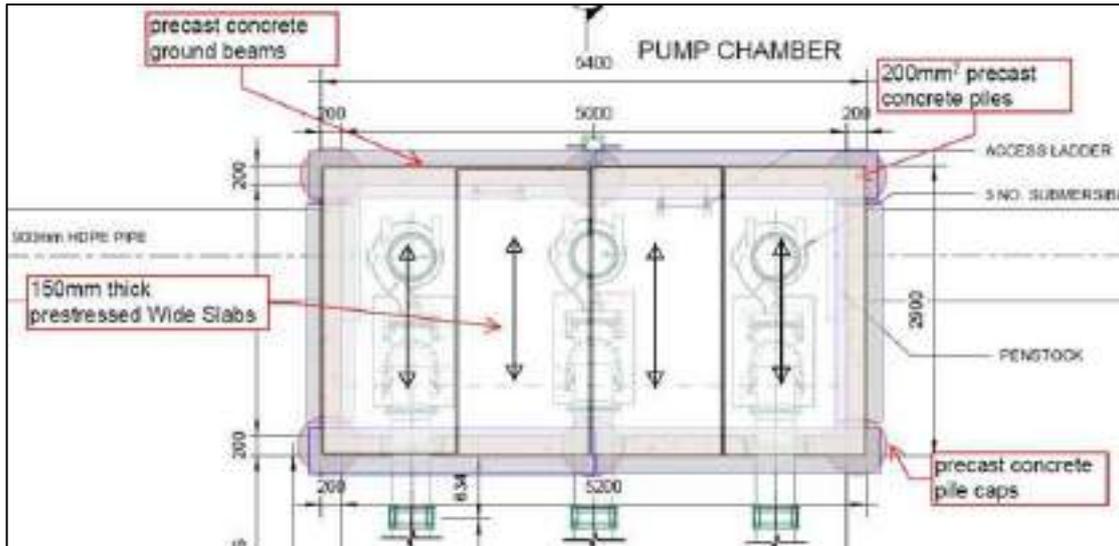


Plate 3-2 – Example (Plan view) of the proposed Pump Chambers at electricity driven pumps.

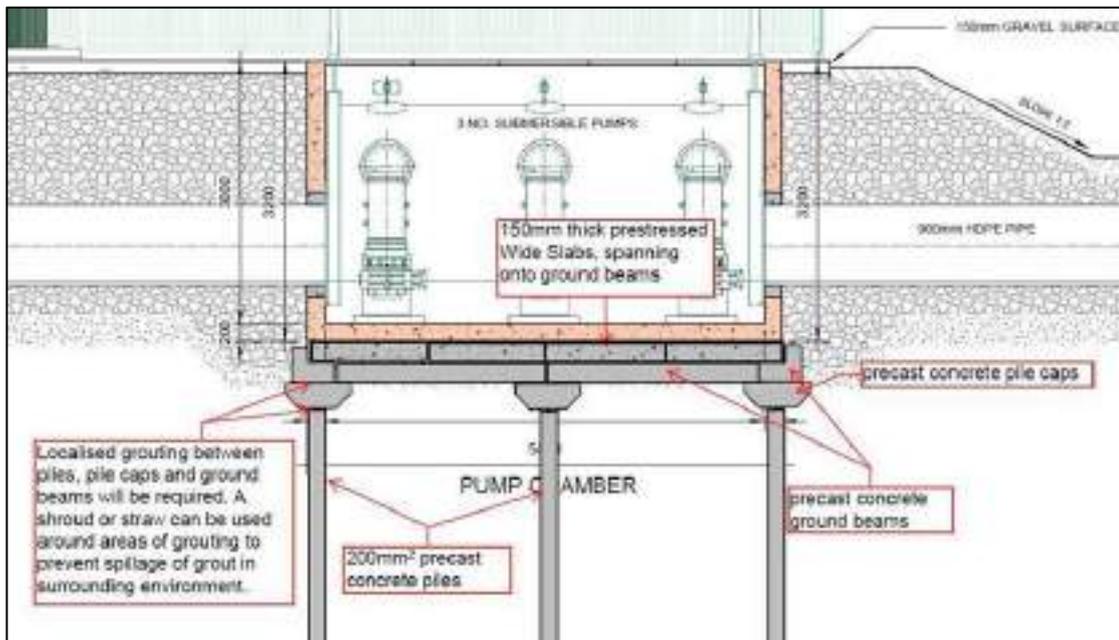


Plate 3-3 - Example (cross section view) of the proposed Pump Chambers at electricity driven pumps.

3.2.3.2 Wind driven pumps

Wind driven installations would also require:

- Mechanical gear, steel tower and anchoring system.

An example of a wind driven pump systems is provided in Drawings no. 20649-NOD-XX-XX-DR-C-03410 ‘Typical 7m High Windmill Pump Plans’ and 20649-NOD-00-XX-DR-C-03202 ‘Pumping Station No. 1 Plan & Section’. The discharge to the main river channel will be the same as that used in the electric pump system above, as shown in Plate 3.2. An example of the proposed Pump Chambers design for the wind driven pumps is shown in Plate 3-4 below.

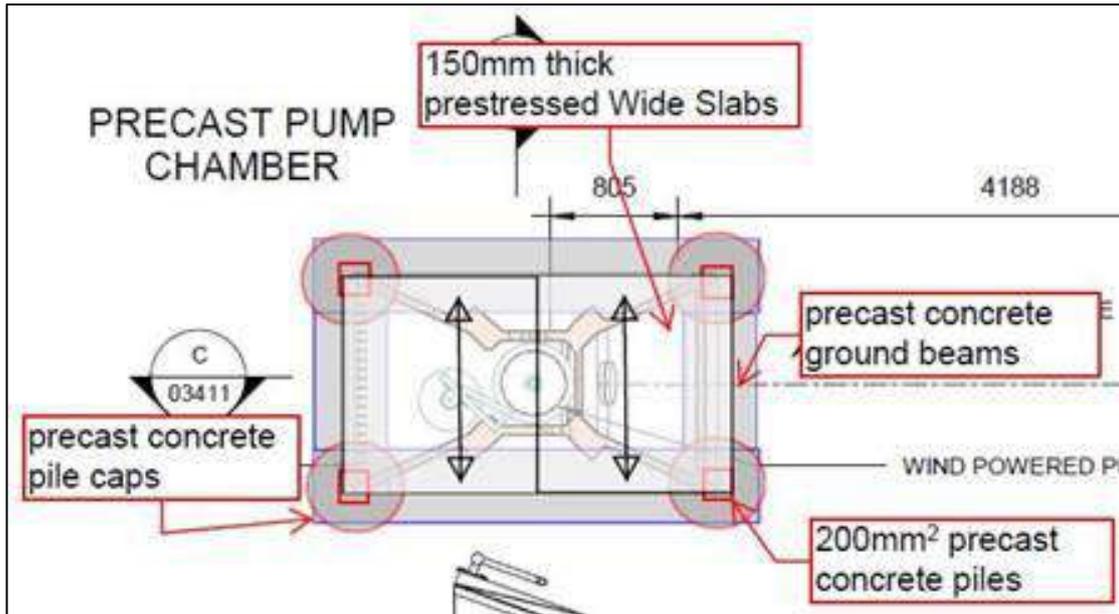


Plate 3-4 – Example (Plan view) of the proposed Pump Chambers at wind driven pumps.

3.2.3.3 Proposed outfall design

The proposed outfalls will use of standardised precast concrete elements, handrails and valves for all outlet headwalls across the project site (OPW, 2019). An example of a similar design already installed within the study area is provided in Plate 3.5.



Plate 3.5 Example of existing outfall to the River Feale from the existing pump with rock armour surrounding the discharge to prevent scouring.

3.2.3.4 Electric power supply

Based on the proposed locations of the electric pumping stations 15-20km of new electric power supply cable will be required depending on the proposed connection points. The power supply will be provided via overhead pole mounted cables.

In order to facilitate connection between the existing electricity grid network and the proposed pumping stations, it is proposed to undertake directional drilling at 3 locations, see drawings:

- > Between Pumps 6 and 13: Drawing no. 20649-NOD-00-XX-DR-C-03221
- > Between Pumps 10 & 12: Drawing no. 20649-NOD-00-XX-DR-C-03220
- > Pump 7: Drawing no. 20649-NOD-00-XX-DR-C-03222

3.2.3.5 Precast pipe culverts

In addition to the pumping stations, two short culverts are proposed between Polders 5 and 6, and Polders 7 and 8 to provide suitable connectivity. The length of these culverts is estimated at 60m and 30m respectively. The culverts have been preliminarily sized as 1.05m diameter precast pipe culverts to allow free-flow conditions between the polders. Detailed design drawings of the proposed culvert is provided in Drawing no. 20649-NOD-00-XX-DR-C-03208 ‘*Culvert No. 8 Plan & Section*’ and Drawing no. 20649-NOD-00-XX-DR-C-03211 ‘*Culvert no. 10A Plan & Section*’.

3.2.3.6 Installation/Formalisation of Access Tracks

Some of the pumping stations are located adjacent to existing access tracks, see Plate 3.6. There is existing access to all pumping stations to facilitate inspection and maintenance. Therefore, access will be formalised with the construction of stone access tracks. As described above, approximately 3-4km of access track will be required in total. The location of all existing and new site access tracks is shown in Drawing no 20649-NOD-00-XX-DR-C-03101 (*Overall Site Location Map - Key Plan of Access Roads to Pumping Stations*).

New road infrastructure will be constructed of 200mm compacted depth of clause 906 stone, as per National Roads Authority (NRA) specifications for roadworks. In addition, there will be a 150mm sub-base comprising of clause 804 stone. A typical section of proposed new road is provided in Design drawing no. 20649-NOD-XX-XX-DR-C-03415 ‘*Typical Details*’.



Plate 3.6 Example of existing site access track (right) alongside an existing embankment (left). Such existing site access tracks will be used and upgraded where available.

3.2.4

Construction Environmental Management Plan

The detailed construction methodologies for the proposed development are provided in full in Section 6 of the accompanying Construction Environmental Management Plan (CEMP) that has been prepared for the project. This is provided in full in Appendix 3 of this NIS for ease of reference.

In summary, the CEMP provides measures for:

- Refuelling on site
- Pollution Control and Spill Prevention
- Noise and Vibration

These and other measures described in the CEMP will ensure the protection of water quality adjacent to River Feale, Brick and Galey.

4. CHARACTERISTICS OF THE RECEIVING ENVIRONMENT

The ecological surveys that were undertaken to inform this NIS are fully described in this section. A general description of the ecology of the site of the proposed development is provided in the AA Screening Report in Appendix 1. The specific surveys that were undertaken to assess the potential effects on the identified European Sites are described below.

4.1 Ecological Survey Methodologies

4.1.1 Ecological Multidisciplinary Walkover Surveys and Species/Habitat Specific Surveys

Habitats were identified in accordance with the Heritage Council's 'Guide to Habitats in Ireland' (Fossitt, 2000). Plant nomenclature for vascular plants follows 'New Flora of the British Isles' (Stace, 2010), while mosses and liverworts nomenclature follows 'Mosses and Liverworts of Britain and Ireland - a field guide' (British Bryological Society, 2010).

During the site visits, habitats within and immediately adjacent to the proposed infrastructure were assessed to determine if it corresponded to those habitats listed under Annex I of the EU Habitats Directive or those for which the SAC has been designated.

The walkover surveys were also designed to detect the presence, or likely presence, of a range of protected species. The survey included a search of all potentially suitable habitat for the presence of protected species that are likely to occur in the vicinity of the Proposed Project (e.g. otter etc.).

A comprehensive search for otter was undertaken at each of the proposed pumping sites. Surveys focused on searching for sightings and signs of otter within and adjacent to the site of each pumping station and within 150m upstream and downstream as well as a 10m riparian buffer as per TII (2009)¹ guidelines, Reid, *et al* (2013) and following CIEEM best practice competencies for species surveys (CIEEM, 2013²). As well as searching for signs of otter, an assessment of the likely suitability of the nearby watercourses to support otter was also undertaken.

During the site visit, an assessment of the likely suitability of the nearby watercourses to support aquatic QI species such as lamprey and salmon was also undertaken.

The multi-disciplinary walkover surveys comprehensively covered the entire study area. The survey work was carried out in accordance with NRA *Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna* on National Road Schemes (NRA, 2009).

During the multidisciplinary surveys, a search for Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015) was conducted.

¹ TII (2009) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes Online, Available at: <https://www.tii.ie/technical-services/environment/planning/Ecological-Surveying-Techniques-for-Protected-Flora-and-Fauna-during-the-Planning-of-National-Road-Schemes.pdf>, Accessed: 06.11.2020

²CIEEM, 2013, Technical Guidance Series – Competencies for Species Survey, Online, Available at: <https://cieem.net/resource/competencies-for-species-survey-css/> Accessed: 06.11.2020

4.1.2 Desk Study

The desk study undertaken for this assessment included a thorough review of the available ecological data including the following:

- EcoEireann, 2020, *Water Framework Directive Screening Assessment*, Cashen Estuary Drainage Project.
- Review of online web-mappers: National Parks and Wildlife Service (NPWS), EPA, Geological Survey of Ireland (GSI),
- Review of the Site Specific Conservation Objectives (SSCOs) for European Sites identified within the Appropriate Assessment Screening Report (AASR, Appendix 1) as being within the Likely Zone of Impact.

4.2 Results of Desk Study

4.2.1 Description of Baseline Hydrology

The proposed development will pump water into the Rivers Brick, Galey, and Feale. The confluence of these three rivers forms the Cashen River which flows into the Atlantic Ocean via the Cashen Estuary,

As described in the EcoEireann (2020) report, the Cashen Estuary forms part of the Cashen Transitional waterbody (code: IE_SH_060_0100) and is heavily modified with poor ecological potential. It is fed by the Upper Feale Estuary transitional waterbody (code: IE_SH_060_0200) which is currently of poor ecological potential. The Cashen transitional flows into the Mouth of the Shannon coastal waterbody (code: IE_SH_060_0000) which is currently at moderate status.

The Cashen and Upper Feale Estuary transitional waterbodies are both currently classified as being ‘at risk’ of deterioration. The status of the Feale and Cashen waterbodies is thought to be largely driven by the abundance of phytoplankton, which gives an indicator of nutrient enrichment; although nitrogen and phosphorus standards in the area are not being breached these concentrations remain relatively high, probably as a result of nutrients being quickly taken up by algae.

4.2.1.1 EPA Water Quality Data

The EPA web-mapper (<https://gis.epa.ie/EPAMaps/>) was consulted on the 14th of March 2021 regarding the water quality and status of waterbodies that are located downstream of the site of the proposed development. The proposed works will occupy a wide footprint including different watercourses. The Biotic Index of Water Quality (BIWQ) was developed in Ireland by the Environmental Protection Agency (EPA). Q-values are assigned using a combination of habitat characteristics and structure of the macro-invertebrate community within the waterbody. Individual macro-invertebrate families are classified according to their sensitivity to organic pollution and the Q-value is assessed based primarily on their relative abundance within a sample. The Q-values available for the watercourses involved in the proposed works are provided in Table 4.8.

Table 4.1 Latest Q values for the rivers within the project footprint

River	Year	Q Score	Q value	Pumps within Waterbody	Downstream Pumps
Brick	2017	3	Poor	10, 11, 12, 17	3, 4, 6, 13, 14
Feale	2017	3-4	Moderate	9, 16, 18	
Galey	2017	3	Poor	7	

River	Year	Q Score	Q value	Pumps within Waterbody	Downstream Pumps
Kilmuhane	No Data Available			1	
Drommartin	No Data Available			15	

The overall status of the River Galey was regarded as ‘Poor’, with ‘Poor’ biological and invertebrate status and with ‘High’ nitrate conditions and ‘Pass’ Oxygenation conditions. The overall Status of the River Feale was regarded as ‘Moderate’, with ‘Moderate’ biological and invertebrate status and with ‘High’ nitrate conditions and ‘Pass’ Oxygenation conditions. The transitional waterbody status of the Cashen estuary was regarded as ‘Poor’, with ‘Poor’ biological and phytoplankton status, ‘Good’ nutrient conditions and ‘Moderate’ oxygenation conditions.

The Feale River, the Galey River and the Cashen transitional waterbody are all considered at risk. All other watercourses involved in the proposed development are currently under review.

4.2.1.2 Findings of the Water Framework Directive Screening Assessment Report

A *Water Framework Directive Screening Assessment* report (EcoEireann, 2020) has been prepared as part of the proposed project and is provided in Appendix 2 of this NIS.

4.2.1.2.1 Surface water

The EcoEireann (2020) report concludes that *‘there is the potential for localised temporary impacts on water quality in the adjoining surface waterbodies from the mobilisation of sediment or release of hydrocarbons, or pollutants due to the excavation works required to create the pumping stations, realigned drainage channels and outflows. This impact is not expected to increase at the waterbody scale and any impacts are likely to be minor and localised to the agricultural drains and the area of outflow’.*

‘There is potential for minor impacts on habitat, water quality and hydromorphology as a result of the realignment of the agricultural drainage channels and construction of outflows during the construction and operation phases of the project. Any impacts are likely to be localised to the agricultural drains and the area of outflow creation/upgrade and are not expected to be significant at the water body scale. Therefore overall, the project is not expected to result in significant deterioration or change in surface water body status’.

4.2.1.2.2 Groundwater quality

The EcoEireann (2020) report states that *‘it is anticipated that the project will involve some minor dewatering of pumping station excavations, although the potential to impact the WFD status of the groundwater body is very low as the impacts will be localised to the area of the pumping station and given the presence of low permeability soils and adjacent surface water flows, these will limit the potential construction impacts of the project on the groundwater waterbody’.*

The EcoEireann (2020) report concludes that *‘overall, the project is not expected to result in significant deterioration or change in the ground-waterbody status’.*

4.2.2 Lower River Shannon SAC [002165]

The AA Screening Assessment that was carried out Screened in the potential for significant effects on the Lower River Shannon SAC. As a result, the desk study reviews the details of this site to inform the

assessment carried out in the NIS. The proposed pumping stations and associated infrastructure is located both adjacent to and partially within the SAC, on the Rivers Feale, Galey and the Brick. Potential for direct and indirect impacts as a result of the construction, operation and decommissioning phases of the proposed project has been identified on the following QIs as listed in Table 2.1:

- > [1130] Estuaries
- > [1140] Mudflats and sandflats not covered by seawater at low tide
- > [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- > [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- > [1160] Large shallow inlets and bays
- > [1170] Reefs
- > [1310] *Salicornia* and other annuals colonising mud and sand
- > [1095] Sea Lamprey (*Petromyzon marinus*)
- > [1096] Brook Lamprey (*Lampetra planeri*)
- > [1099] River Lamprey (*Lampetra fluviatilis*)
- > [1106] Atlantic Salmon (*Salmo salar*) (only in freshwater)
- > [1355] Otter (*Lutra lutra*)

4.2.2.1 Review of Conservation Objectives

The Conservation Objectives document and Natura 2000 Data Form for this site as available on the NPWS website was reviewed during this assessment. The relevant QIs and the associated conservation objective of the site are presented in Table 4.3. The associated Target and Attributes for the relevant QIs as described in the Conservation Objective Document were reviewed and considered in this assessment and are provided in Section 6 of this NIS.

Table 4.3 Qualifying Interest and Conservation Objectives (Version 01, 2012)

Qualifying Interest	Conservation Objective
[1130] Estuaries	To maintain the favourable conservation condition of Estuaries in the Lower River Shannon SAC.
[1140] Mudflats and sandflats not covered by seawater at low tide	To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Lower River Shannon SAC.
[1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)	To restore the favourable conservation condition of Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) in the Lower River Shannon SAC.
[1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>)	To restore the favourable conservation condition of Mediterranean salt meadows (<i>Juncetalia maritimi</i>) in the Lower River Shannon SAC.
[1160] Large shallow inlets and bays	To maintain the favourable conservation condition of Large shallow inlets and bays in the Lower River Shannon SAC.
[1170] Reefs	To maintain the favourable conservation condition of Reefs in the Lower River Shannon SAC
<i>Petromyzon marinus</i> (Sea Lamprey) [1095]	To restore the favourable conservation condition of <i>Petromyzon marinus</i> (Sea Lamprey) [1095] in the Lower River Shannon SAC.
<i>Lampetra planeri</i> (Brook Lamprey) [1096]	To maintain the favourable conservation condition of <i>Lampetra planeri</i> (Brook Lamprey) [1096] in the Lower River Shannon SAC.
<i>Lampetra fluviatilis</i> (River Lamprey) [1099]	To maintain the favourable conservation condition of <i>Lampetra fluviatilis</i> (River Lamprey) [1099] in the Lower River Shannon SAC.
<i>Salmo salar</i> (Salmon) [1106]	To restore the favourable conservation condition of <i>Salmo salar</i> (Salmon) [1106] in the Lower River Shannon SAC.
<i>Lutra lutra</i> (Otter) [1355]	To restore the favourable conservation condition of <i>Lutra lutra</i> (Otter) [1355] in the Lower River Shannon SAC.

4.2.2.2 Site Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to effect on the SAC were reviewed and considered in relation to the proposed project. These are provided in Table 4-5.

Table 4-5 Site specific pressures and threats

Negative Impacts			
Rank	Code	Threats and pressures	Inside/outside/both (of SAC)
L	I01	Invasive non-native species	i
M	A08	Fertilisation	o
M	E01	Urbanised areas, human habitation	o
M	H04	Air pollution, air-borne pollutants	o
M	A08	Fertilisation	i
M	E03	Discharges	o
L	D01.01	Paths, tracks, cycling tracks	i
M	K02.03	Eutrophication (natural)	o
L	G01.01	Nautical sports	i
L	B	Sylviculture, forestry	i
L	F01	Marine and Freshwater Aquaculture	i
L	F03.01	Hunting	i
L	C01.01.02	Removal of beach materials	i
M	E03	Discharges	i
L	C01.03.01	Hand cutting of peat	i
M	A04	Grazing	i
L	J02.12.01	Sea defense or coast protection works, tidal barrages	i
M	J02.01.01	Polderisation	i
L	J02.10	Management of aquatic and bank vegetation for drainage purposes	i
M	J02.01.02	Reclamation of land from sea, estuary or marsh	o

Rank: H = high, M = medium, L = low

i = inside, o = outside, b = both

4.2.2.3 Qualifying Interests

4.2.2.3.1 Habitat Specific Information

Estuaries [1130]

The extent of this habitat within the Lower River Shannon SAC is estimated as 24,273ha. This extent is illustrated on Map 4 of the site-specific conservation objective document (NPWS 2012). According to

the Site-Specific Conservation Objectives this habitat occurs adjacent to the proposed infrastructure at a number of locations.

Mudflats and sandflats not covered by seawater at low tide [1140]

The extent of this habitat within the Lower River Shannon SAC is estimated as 8808ha. This extent is illustrated on Map 5 of the site-specific conservation objective document (NPWS 2012). According to the Site-Specific Conservation Objectives Mudflats and sandflats not covered by seawater at low tide [1140] have been mapped adjacent to the works area.

Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) [1330]

This habitat has been mapped as part of the saltmarsh monitoring project (McCorry and Ryle, 2009). Ten sub sites that supported Atlantic salt meadow were mapped (119.36ha) and additional areas of potential saltmarsh (376.07ha) were identified from an examination of aerial photographs, giving a total estimated area of 495.43ha. According to the site-specific conservation objectives the extent of this habitat within the Lower River Shannon SAC is unknown and further unsurveyed areas may occur.

Mediterranean salt meadows (*Juncetalia maritimi*) [1410]

This habitat has been mapped as part of the saltmarsh monitoring project (McCorry and Ryle, 2009). Eight sub sites that support Mediterranean salt meadow were mapped (22.379ha), none of which were recorded within the Cashen estuary, and additional areas of ‘potential’ saltmarsh (25.646ha) were identified from an examination of aerial photographs, giving a total estimated area of 48.025ha. According to the site-specific conservation objectives the extent of this habitat within the Lower River Shannon SAC is unknown and further unsurveyed areas may occur. Map 12 of the detailed conservation objectives supporting document (NPWS, 2012) shows that ‘potential 1410 Mediterranean salt meadows’ are known to occur downstream of the proposed works area on the southern side of the mouth of the Cashen estuary.

Salicornia and other annuals colonising mud and sand [1310]

This habitat has been mapped as part of the saltmarsh monitoring project (McCorry and Ryle, 2009), However, according to Map 12 of the detailed conservation objectives supporting document (NPWS, 2012) none were mapped within the Cashen estuary. Habitat recorded at five of the ten sub sites surveyed and mapped, giving a total estimated area of 0.223ha. According to the site-specific conservation objectives the extent of this habitat within the Lower River Shannon SAC is unknown and further unsurveyed areas may occur.

Large shallow inlets and bays [1160]

Habitat area is estimated as covering 35,282ha as derived from intertidal and subtidal surveys in 2010 (Aquafact, 2011). The mapped distribution of this habitat is provided in Map 7 of the detailed Conservation Objectives supporting document (NPWS, 2012). This shows that the feature occurs within the bay at the mouth of the Shannon, however, does not extend upstream within the Cashen estuary.

Reefs [1170]

Distribution and area (estimated as 21,421ha) is established from intertidal and subtidal reef surveys in 2010 (Aquafact, 2011³⁴). The mapped distribution of this habitat is provided in Map 8 of the detailed Conservation Objectives supporting document (NPWS, 2012).

4.2.2.3.2 Species Specific Information

Sea Lamprey (*Petromyzon marinus*) [1095], Brook Lamprey (*Lampetra planeri*) [1096] and River Lamprey (*Lampetra fluviatilis*) [1099]

As per the detailed Site-Specific Conservation Objectives document (NPWS, 2012), lamprey species are known to occur within the aquatic habitat of the SAC. No specific map is available for this species within the SSCO. The three lampreys and Salmon have all been observed spawning in the lower Shannon or its tributaries (NPWS, 2013). According to the Natura 2000 Form, reproducing river lamprey populations are present within the SAC. Potential for indirect impacts on this QI exists as a result of potential for disturbance/displacement and deterioration in water quality associated with the installation of the proposed outfall during the construction phase of the proposal. Potential for direct impacts associated with the construction phase of the proposed project have also been identified as a result of the potential destruction of habitat during construction.

Salmon (*Salmo salar*) [1106]

As per the detailed Site-Specific Conservation Objectives document (NPWS, 2012), Atlantic salmon is known to occur within the aquatic habitat of the SAC. No specific map is available for this species within the SSCO. Salmon have been observed spawning in the lower Shannon or its tributaries. The Fergus is important in its lower reaches for spring salmon (NPWS, 2013). According to the Natura 2000 Form, reproducing salmon populations are common within the SAC. Potential for indirect impacts on this QI exists as a result of potential for disturbance/displacement and deterioration in water quality associated with the installation of the proposed outfall during the construction phase of the proposal. Potential for direct impacts associated with the construction phase of the proposed project have also been identified as a result of the potential destruction of habitat during construction.

Otter (*Lutra lutra*) [1355]

As per the detailed Site-Specific Conservation Objectives document (NPWS, 2012), otter is known to occur within the aquatic habitat of the SAC adjacent to the proposed development. The majority of the proposed pumping stations occur adjacent to the mapped commuting buffer/likely distribution for the species, as provided in Map 17 of the detailed SSCO document.

4.3

Description of the Baseline Ecological Environment

The habitats within and adjacent to the proposed pumping stations and all associated infrastructure was assessed on the 8th October 2019. The descriptions of the habitats identified at each of the proposed infrastructure locations is provided in Table 4.2 while an overview is provided in the below subsections.

³ Intertidal Hard and Soft Bottom Investigations in Lower River Shannon cSAC (Site Code: IE002165)/Shannon Fergus Estuary SPA (Site Code: IE004077),

⁴ Subtidal Benthic Investigations in Lower River Shannon cSAC (cSAC Site Code: IE002165)

4.3.1 Habitats within the Study Area

The majority of the riverbank, shoreline and channel in the estuary has been modified and manipulated over time by the OPW arterial drainage division with flood relief works. The proposed pumping stations and associated infrastructure are located on the landward side of existing flood protection embankments (see Plate 3.4) and partly overlap with existing backdrains (see Plate 4.1) in close proximity to existing outfalls. The habitats within the infrastructure footprints were largely dominated by Dry meadows and grassy verges (GS2) with some areas also comprising of Wet grassland (GS4). Much of these features are subject to regular grazing by livestock associated with ongoing agricultural activities on the adjacent lands across the study area. The back drains were identified as Drainage ditches [FW4] with the main river channels have been identified as Estuary (MW2) along with the lower sections of the Rivers Cashen Feale, Galey and Brick. The upper sections of the Rivers Feale, Brick and Galey grade into tidal influenced sections of Depositing/lowland rivers [FW2].

The vegetation within each of the habitats was assessed during the site visit. The existing embankments comprised largely of perennial ryegrass (*Lolium perenne*), tufted hair grass (*Deschampsia cespitosa*), dandelion (*Taraxacum officinalis* agg.), ragwort (*Senecio jacobaea*), broad-leaved dock (*Rumex obtusifolius*), red clover (*Trifolium pratense*) and common sorrel (*Rumex acetosa*). The back drains were largely dominated by common reed (*Phragmites australis*), soft rush (*Juncus effusus*), bramble (*Rubus fruticosus* agg) and nettle (*Urtica dioica*), see Plate 4.1. The fringe vegetation of the main River Feale channel comprised largely of common reed (*Phragmites australis*), yellow flag iris (*Iris pseudacorus*), redshank (*Persicaria maculosa*), common club-rush (*Schoenoplectus lacustris*) and sea club-rush (*Bolboschoenus maritimus*). An example of the marginal vegetation along the Rivers Feale, Galey and the Brick is shown in Plate 4.2.



Plate 4.1 Example of existing back drain located on the landward side of the embankments. The back drains will be temporarily blocked off and the works area dewatered before installation of the proposed pump stations, as shown in the plate above



Plate 4.2 Example of marginal vegetation along the River Feale.

Habitats listed as Qualifying Interests (QIs) for which the Lower River Shannon SAC has been designated were searched for in the immediate area surrounding each of the proposed pumping stations. The only QI habitats recorded within, adjacent or immediately downstream of the proposed infrastructure were:

- Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) (1330)/ Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
- Estuaries (1130), and
- Mudflats and sandflats not covered by sea water at low tide [1140].

Upper salt marsh (CM2) habitat was identified in close proximity to, pumping stations 1, 3, 4, and 14 (all of which are wind pumps), due to their proximity to this tidal influenced estuary. However, this habitat only occurs on the river side of the embankment and thus the only part of the proposed infrastructure within or adjacent to such habitats will be the proposed outfall pipe and headwall.

The QI habitat **Estuary [1130]** has been mapped in the detailed Conservation Objective Supporting Document (NPWS, 2012). Following a review of this NPWS (2012) document and associated maps, the QI habitat Estuary is located adjacent to the following pumping stations; 1W, 3W, 4W, 6E, 7E, 9E, 13E, 14W and 16E (W=Wind & E = Electric).

Although mudflats and sandflats not covered by seawater at low tide and *Salicornia* and other annuals colonising mud and sand habitats [1310] were identified in the wider area, no potential for direct effect was identified. A description of the habitats recorded at each proposed pump location is provided in Table 4.2.

Signs of faunal species for which the Lower River Shannon SAC has been designated were searched for during the site visit as well as areas of suitable supporting habitat. The only QI species recorded during the site visit was otter.

No invasive species, listed on Regulations 49 and 50 of the EC Birds and Natural Habitats Regulations 2011 (S.I. No. 477/2011), were recorded within the site of the proposed development.

Table 4.2 Baseline ecological environment at each proposed pumping station.

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
1 W	01	<p>The embankment at this location was dominated by bramble and gorse scrub. The seaward side was located close to the shore.</p> <p>The lands behind the embankment were dominated by Improved agricultural grassland with deep drains that connect to the backdrain network.</p> <p>Access to the pump will be via the Improved agricultural grassland to the north.</p> <p>No Annex I Habitats were recorded behind the embankments, at the outfall location or anywhere within the works area. Similarly, the access track at this location travels through Improved Agricultural Grassland before joining the existing embankment, where it is centred on Dry Meadows and Grassy Verges habitat.</p> <p>Extensive areas of salt marsh habitat are located on the seaward side of the embankment to the west of the proposed works but are entirely avoided by the proposed works.</p>	<ul style="list-style-type: none"> > Dry meadows and grassy verges [GS2] > Improved Agricultural Grassland [GA1] > Bramble Scrub [WS1] > Estuary [MW4] > Upper salt marsh [CM2] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
2 W	02	<p>There are no works proposed in this location.</p> <p>The embankment is dominated by rank grassland and bramble scrub. The seaward foot of the embankment is immediately adjacent to the shore while the landward side of the embankment is dominated by wet grassland with drainage ditches connecting to the back-drain network.</p>	<ul style="list-style-type: none"> > Dry meadows and grassy verges [GS2] > Wet Grassland [GS4] > Bramble Scrub [WS1] > Estuary [MW4] > 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
3 W	03	<p>This pump is located behind an embankment that is dominated by rank wet grassland and bramble scrub. There is a strip of saltmarsh habitat in front of the embankment.</p> <p>To the rear of the embankment, there are fields of Improved agricultural grassland that are divided by deep drains. The backdrain supported extensive reedswamp vegetation.</p> <p>Access to follow existing access track along top of embankment.</p> <p>No Annex I habitats were recorded on or behind the embankment.</p>	<ul style="list-style-type: none"> > Dry meadows and grassy verges [GS2] > Bramble Scrub [WS1] > Reedswamp [FS1] > Estuary [MW4] > Improved Agricultural Grassland [GA1] > Upper salt marsh [CM2] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
4 W	04	<p>This pump is located behind an embankment that is dominated by rank wet grassland and bramble scrub. There is a strip of saltmarsh habitat in front of the embankment. This saltmarsh habitat corresponds to Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) (1330)/Mediterranean salt meadows (<i>Juncetalia 25aritime</i>) [1410].</p> <p>To the rear of the embankment the habitats comprise wet grasslands and coniferous forestry that is divided by deep drains, which connect to the backdrain network.</p> <p>The access track will follow an existing forestry track before passing through agriculturally managed wet grassland habitat.</p> <p>No Annex I habitats were recorded behind the embankment.</p>	<ul style="list-style-type: none"> > Dry meadows and grassy verges [GS2] > Scrub [WS1] > Wet Grassland [GS4] > Estuary [MW4] > Coniferous Forestry [WD4] > Drainage Ditch [FW4] > Upper salt marsh [CM2] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
6 E	05	<p>This pump was located in a field of Improved Agricultural Grassland, which was heavily grazed by dairy cattle on the day of the site visit.</p> <p>The lands to the back of the embankment consisted of wet Improved Agricultural Grassland that is intensively managed and divided by a network of drains that connect in with the backdrains.</p> <p>The access to this pump largely follows an existing agricultural track with only a short section of new track required through highly managed Improved Agricultural Grassland.</p> <p>No Annex I habitats were recorded on or behind the embankments. The improved wet grassland provides good habitat for wintering wildfowl such as whooper swan, lapwing and gull species. Rabbit holes were recorded on the landward side of the embankment.</p>	<ul style="list-style-type: none"> > Improved Agricultural Grassland [GA1] > Estuary [MW4] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
7 E	05	<p>This pump was located on an embankment that was dominated by rank grasses and bramble scrub. The front of the embankment is at the waters edge with only a narrow strip of Reedswamp at the base. The lands to the back of the embankment consisted of wet Improved agricultural grassland that is intensively managed and divided by a network of drains that connect in with the backdrains.</p> <p>The access to this pump largely follows an existing agricultural track with only a short section of new track required through highly managed Improved Agricultural Grassland.</p> <p>No Annex I habitats were recorded on or behind the embankments.</p>	<ul style="list-style-type: none"> > Dry meadows and grassy verges [GS2] > Estuary [MW4] > Bramble Scrub (WS1) > Improved Agricultural Grassland (GA1) > Backdrain (Drainage Ditch) FW4 > Reedswamp (FS1) 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
Culvert between polders	05/06	The works in this area involve the installation of culverts between Polders 05 and 06. The culvert will be placed beneath an existing track with rank grasslands and drainage ditches on both sides. The lands on both sides are dominated by Improved agricultural grassland.	<ul style="list-style-type: none"> > Improved Agricultural Grassland [GA1] > Dry Meadows and Grassy Verges [GS2] > Drainage Ditch [FW4] > Buildings and Artificial Surfaces [BL3] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
9 W	07	<p>This pump is located in a field of improved agricultural grassland and wet grassland dominated by soft rush. The lands were heavily grazed by cattle on the day of the site visit.</p> <p>The access to this pump largely follows an informal agricultural track of managed Improved agricultural grassland.</p> <p>No Annex I habitats were recorded on or behind the embankments.</p>	<ul style="list-style-type: none"> > Improved Agricultural Grassland [GA1] > Dry Meadows and Grassy Verges [GS2] > Drainage Ditch [FW4] > Estuary [MW4] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
10 E	07/08	<p>The works here involve the linking of Polders 07 and 08 using culverts. The culverts will be installed under an existing road, which leads up to a bridge over the River Brick on embankments. The road embankments are dominated by rank grassland on both sides with agricultural lands on both sides. There is an access track running parallel to the southern side of the road. There are drainage ditches that connect with the network of backdrains behind the embankments that surround the tidal River Brick.</p> <p>No Annex I habitats were recorded at this location.</p>	<ul style="list-style-type: none"> > Dry meadows and grassy verges [GS2] > Buildings and Artificial Surfaces [BL3] > Drainage Ditch [FW4] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
11a&b (E)	10	<p>The proposed electric pump will be installed within a back drain with water pumped into the River Gortaneare. The River Gortaneare is a tributary of the River Brick which is in turn a tributary of the River Feale. The back drain is dominated by dense vegetation comprising of common reed (<i>Phragmites australis</i>), soft rush (<i>Juncus effusus</i>), bramble (<i>Rubus fruticosus</i> agg.) and cocks foot grass (<i>Dactylis glomerata</i>).</p> <p>The vegetation along the River Gortaneare comprises of common reed (<i>Phragmites australis</i>), soft rush (<i>Juncus effusus</i>), broad-leaved dock (<i>Rumex obtusifolius</i>), perennial ryegrass (<i>Lolium perenne</i>), creeping buttercup (<i>Ranunculus repens</i>), ragwort (<i>Senecio jacobaea</i>), spear thistle (<i>Cirsium vulgare</i>), cocksfoot grass (<i>Dactylis glomerata</i>). Aquatic vegetation within the River Gortaneare included broad-leaved pondweed (<i>Potamogeton natans</i>) and floating sweet-grass (<i>Glyceria fluitans</i>).</p> <p>No Annex I habitats were recorded on or behind the embankments.</p>	<ul style="list-style-type: none"> > Dry meadows and grassy verges [GS2] > Depositing/lowland rivers [FW2] > Drainage Ditch [FW4] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
12 E	11	<p>The proposed electric pump will be installed within a back drain with water pumped into the River Brick which is in turn a tributary of the River Feale.</p> <p>The back drain is dominated by dense vegetation predominantly comprising of common reed (<i>Phragmites australis</i>) and bramble (<i>Rubus fruticosus</i> agg.).</p> <p>The vegetation along the Brick River, to which the outfall will be situated, was dominated by common reed (<i>Phragmites australis</i>) and some sea club-rush (<i>Bolboschoenus maritimus</i>). Other species recorded on the river bank included broad-leaved dock (<i>Rumex obtusifolius</i>), perennial ryegrass (<i>Lolium perenne</i>), creeping buttercup (<i>Ranunculus repens</i>), ragwort (<i>Senecio jacobaea</i>), creeping thistle (<i>Cirsium arvense</i>), cocksfoot grass (<i>Dactylis glomerata</i>).</p> <p>The existing earth embankments is dominated by cocksfoot grass and creeping thistle. Ragwort, broad-leaved dock and red clover were also recorded present.</p> <p>An existing hardcore site access track exists providing ease of access to the site of the proposed pumping station. This has been</p>	<ul style="list-style-type: none"> > Depositing/lowland rivers [FW2] > Dry meadows and grassy verges [GS2] > Drainage Ditch [FW4] > Buildings and artificial surfaces (BL3) 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
		<p>assessed as Buildings and artificial surfaces (BL3).</p> <p>No Annex I habitats were recorded on or behind the embankments.</p>		
13 E	13	<p>This pump will be located behind an embankment that is entirely dominated by rank grassland and the toe of which is located in the estuary.</p> <p>The lands behind the embankment are dominated by Improved agricultural grassland and Wet grassland that is serviced with drainage ditches that connect into the backdrain network.</p> <p>Access is via an existing track through the agricultural fields.</p> <p>No Annex I habitats were recorded on or behind the embankments.</p>	<ul style="list-style-type: none"> > Dry meadows and grassy verges [GS2] > Estuary {MW4} > Drainage Ditch [FW4] > Improved Agricultural Grassland [GA1] > Wet Grassland [GA1] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
14 W	14	<p>This pump is located behind an embankment that is dominated by rank grassland. The seaward toe of the embankment borders a narrow strip of upper salt marsh at the edge of the estuary. This saltmarsh habitat corresponds to Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) (1330)/Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410].</p> <p>Behind the embankment, the lands were dominated by fields of Improved agricultural grassland that were separated by drains that connected into the backdrain network. There was an agricultural access track directly behind the embankment.</p> <p>A mammal path (likely to be otter) ran from the backdrain, over the embankment and into the estuary.</p>	<ul style="list-style-type: none"> > Upper salt marsh [CM2] > Dry meadows and grassy verges [GS2] > Drainage Ditch [FW4] > Improved Agricultural Grassland [GA1] > Recolonising Bare Ground [ED3] > Estuary [MW4] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
15 W	12C	<p>The back drain was dominated by common reed (<i>Phragmites australis</i>) with some saw sedge (<i>Gahnia aspera</i>), false oat-grass (<i>Arrhenatherum elatius</i>) and nettle (<i>Urtica dioica</i>).</p> <p>The existing earth embankment comprised of hair grass (<i>Deschampsia cespitosa</i>), perennial ryegrass (<i>Lolium perenne</i>), soft rush (<i>Juncus effusus</i>), dandelion (<i>Taraxacum officinalis agg.</i>) and common sorrel (<i>Rumex acetosa</i>).</p> <p>The main channel of the Drommartin River, in which the outfall will be located comprised of common reed (<i>Phragmites australis</i>), yellow flag iris (<i>Iris pseudacorus</i>), redshank (<i>Persicaria maculosa</i>).</p> <p>No Annex I habitats were recorded at this pump location.</p>	<ul style="list-style-type: none"> ➤ Dry meadows and grassy verges [GS2] ➤ Depositing/lowland rivers [FW2] ➤ Drainage Ditch [FW4] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
16 E	15	<p>Embankment and surrounding area dominated by improved agricultural and dry meadows and grassy verges. The lands outside to the east of the site comprise of plantation forestry (WD4).</p> <p>No Annex I habitats were recorded on or behind the embankments.</p>	<ul style="list-style-type: none"> ➤ Improved Agricultural Grassland [GA1] ➤ Dry Meadows and Grassy Verges [GS2] ➤ Drainage Ditch [FW4] ➤ Estuary [MW4] 	
17 W	16	<p>The habitat likely to be affected by the footprint of the proposed pump comprises mainly of wet grassland dominated by soft rush (<i>Juncus effusus</i>), Yorkshire-fog (<i>Holcus lanatus</i>), common sorrel (<i>Rumex acetosa</i>), creeping buttercup (<i>Ranunculus repens</i>), creeping cinquefoil (<i>Potentilla reptans</i>), hair grass (<i>Deschampsia cespitosa</i>) and nettle (<i>Urtica dioica</i>). Bramble (<i>Rubus fruticosus</i> agg.) and willow (<i>Salix</i> spp.) are beginning to establish along the embankment.</p> <p>The vegetation along the main channel comprised mainly of common reed (<i>Phragmites australis</i>), nettle (<i>Urtica dioica</i>)</p>	<ul style="list-style-type: none"> ➤ Dry meadows and grassy verges [GS2] ➤ Wet grassland (GS4) ➤ Drainage Ditch [FW4] ➤ Depositing/lowland rivers [FW2] 	

Pump No.	Polder No.	Habitat Description and Species	List of Habitats	Photo
		<p>and wavy hair grass (<i>Deschampsia cespitosa</i>).</p> <p>No Annex I habitats were recorded on or behind the embankments.</p>		
18 W	17	<p>The vegetation occurring within the pump station footprint was assessed as improved agricultural grassland, dominated by perennial ryegrass (<i>Lolium perenne</i>). Species recorded along the embankment were characteristic of Dry meadows and grassy verges with bramble (<i>Rubus fruticosus</i>), marsh thistle (<i>Cirsium palustre</i>), common bent grass (<i>Agrostis capillaris</i>) and cocksfoot grass (<i>Dactylis glomerate</i>) occurring.</p> <p>The vegetation within the backdrain was dominated by soft rush (<i>Juncus effusus</i>).</p> <p>No Annex I habitats were recorded on or behind the embankments.</p>	<ul style="list-style-type: none"> ➤ Improved agricultural grassland [GA1] ➤ Dry meadows and grassy verges [GS2] ➤ Drainage Ditch [FW4] 	

W: Wind Pump; E: Electric Pump

4.3.2 Faunal Surveys

Dedicated otter (*Lutra lutra*) [1355] surveys of the areas surrounding the proposed infrastructure sightings and signs of otter were recorded. Table 4.3 provides a summary of all records with the location of each. The habitat within the study area was found to be suitable for otter; however, no otter holts, or layup areas were recorded during the dedicated surveys of the site.

Table 4.3 Location of all otter records record during dedicated otter surveys of the proposed project

Pump No.	Polder No.	Observation
12 E	11	Otter observed in the Drommartin River to the northwest of the proposed pump location. Following a comprehensive otter survey of the site of the proposed infrastructure no holt, couch or other signs of otter were recorded.
14 W	14	Otter track recorded near the site of the proposed infrastructure indicating that the species uses both the nearby river channel and the backdrain habitat at this location. Following a comprehensive otter survey of the site of the proposed infrastructure no holt, couch or other signs of otter were recorded.
15 W	12C	Otter slide observed in riverside vegetation.

As described in the Screening for Appropriate assessment report, Appendix 1 of this NIS, the proposed works have the potential to cause deterioration in water quality during the construction, operation and decommissioning phases of the development, potentially affecting the following downstream aquatic faunal species and their supporting habitat:

- > [1095] Sea Lamprey (*Petromyzon marinus*)
- > [1096] Brook Lamprey (*Lampetra planeri*)
- > [1099] River Lamprey (*Lampetra fluviatilis*)
- > [1106] Atlantic Salmon (*Salmo salar*) (only in freshwater)

Given the proximity of the proposed development to suitable supporting habitat for these species, it is assumed from a highly precautionary approach that these species occur within the main river channels adjacent to the proposed development. They are therefore considered further in this assessment.

5. ASSESSMENT OF POTENTIAL ADVERSE EFFECTS & ASSOCIATED MITIGATION

This Natura Impact Statement presents the data and information on the project and provides an analysis of the potential adverse effects on the aforementioned EU designated site. Potential adverse effects are assessed in view of best scientific knowledge, on the basis of objective information in relation to the proposed project including the proposed avoidance, reduction and preventive measures that are described in Section 3 above.

The following sections provide a review of the site-specific pressures and threats as well as the potential impacts pathways for each of the ‘screened-in’ EU Designated Sites. Mitigation measures for the avoidance of impact are then provided, followed by an assessment of potential effect, post implementation of the mitigation measures.

5.1 Potential for Direct Adverse Effects on the European Sites

Potential for direct effects on the QIs of the Lower River Shannon SAC have been identified in this NIS. The proposed project involves the installation of pumping stations and associated outfalls, as described in Section 3.2, many of which are located adjacent to or partly within the EU Designated Site boundary. As the proposed pumping stations are located within back drains, away from the main river channels which forms part of the SAC, potential for short-term direct impact on QI habitats is restricted to:

- The installation of the proposed outfalls during the construction phase of the proposed development, potentially affecting the following habitats in the absence of mitigation:
 - [1130] Estuaries
 - [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
 - [1410] Mediterranean salt meadows (*Juncetalia maritimi*)

Potential for direct effect on QI faunal species, particularly otter, is also restricted to the installation of the proposed outfalls during the construction phase of the proposed project.

The below subsections describe the measures in place for the avoidance of adverse effects on the QIs of the Lower River Shannon SAC. The construction, operational and decommissioning phases of the proposed development therefore have been designed to avoid any potential for adverse effects on the QIs and thus prevent any adverse effect on the EU Designated Site. The measures described ensure that the proposed project does not cause adverse effects, prevent or obstruct any of the Qualifying Interests of the Lower River Shannon SAC from reaching a Favourable Conservation Status, as per Article 1 of the EU Habitats Directive. A definition of Favourable Conservation Status is provided below:

‘conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory referred to in Article 2;

The conservation status will be taken as ‘favourable’ 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, and
- 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.’

5.1.1 Habitat Loss/ Disturbance and Deterioration

As described in Section 4.1.4, the only QI habitats identified within the footprint of the proposed project, and thus potentially subject to direct effect, included:

- [1130] Estuaries
- [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- [1410] Mediterranean salt meadows (*Juncetalia maritimi*)

Upper salt marsh (CM2) habitat was identified where the outfalls are proposed at locations 3, 4 and 14 (all wind pumps), due to their proximity to the tidal estuary. From a precautionary perspective, this Upper salt marsh (CM2) habitat has been assessed as potentially conforming to both Atlantic/Mediterranean salt meadows (1330 & 1410) in this assessment.

The QI habitat Estuary (1130) has been mapped in the detailed Conservation Objective Supporting Document (NPWS, 2012). Following a review of the NPWS (2012) document and associated maps, the QI habitat Estuary is located adjacent to the following pumping stations; 1W, 2W, 3W, 4W, 6E, 7E, 9W, 13E, 14W and 16E.

The following sections provide an assessment of the potential impacts on these QIs during the construction, operational and decommissioning phase of the proposed project.

5.1.1.1 Construction

As described in Section 4.3.1, the only habitats listed as QIs habitats occurring within or immediately adjacent to the proposed development footprint were Estuaries, Atlantic salt meadows and Mediterranean salt meadows. In order to avoid and minimise any potential for adverse effects on these habitats during construction, best practice construction measures will be implemented to ensure that there will be no potential for adverse effects on the receiving habitats associated with the construction phase of the proposed development. Such measures include, but are not limited to;

- **Vegetation stripping** to a depth of 300mm where salt marsh habitat has been identified and subsequent immediate replacement to ensure immediate revegetation of the works area and no loss of saltmarsh habitat.
- **Site supervision** by a suitably qualified Project Ecologist (ECoW).

5.1.1.1.1 Construction Methodologies for the Avoidance of Adverse Effects

The construction of the pumping stations will require excavation of material for the installation of the sump and pumping station foundations. There are no demolition works associated with the proposed development. The operation of the pumping stations will therefore not generate waste.

Due to the nature of the sites, the proposed designs have focused on prefabricated and off-site construction where possible. This is intended to minimise the on-site construction durations and reduce the environmental impact of the construction works. The installation of standardised precast concrete elements for the inlet headwalls, pumping sump and valve chambers will avoid the use of concrete batching on site and thus minimise the risk of water pollution occurring.

Vegetation stripping and replacement

As described in Section 4.3.1, salt marsh habitat has been identified at pumps 3, 4 and 14 (all wind pumps). In order to avoid impact on this habitat, the following measures will be implemented in addition to those described above:

- Prior to the commencement of works, temporary fencing will be erected to limit the size of the works area that is affected/required. Such measures will therefore avoid loss, disturbance/displacement or damage to bankside vegetation.
- During the initial commencement of excavation works, the vegetated turves within the works area on the estuary side of the embankment will be stripped, fully intact, to a depth of 300mm. This will ensure that all vegetated turves temporarily removed will remain intact for reinstatement.
- All vegetated turves removed from the estuary side of the embankment will be temporarily stored on timber plywood sheeting adjacent to the works area. This will ensure that the adjacent habitat is also protected from indirect damage.
- Any subsoil excavated from the working trench will also be excavated and placed separately to one side on timber plywood sheeting.
- This temporary storage area will be marked out prior to the commencement of the works and a series of silt fences installed between the storage area and the watercourses to ensure the protection of water quality.
- Following the installation of the infrastructure, the subsoil will then be placed back into the works area followed by the intact vegetated turves. This will ensure immediate revegetation of the works area and no loss of this habitat. An example of the reinstated section associated with the construction of the existing Rattoo pumping station is provided in Plate 5-3 below.
- These works will be fully supervised by the Project Ecologist and documented.
- Following the completion of the works the working bank will be left intact with all surplus materials removed from riverbank.
- The area will be fenced off with stock proof fencing to ensure that there is no damage via poaching or overgrazing.

The above measures for the protection of salt marsh habitat are proven construction phase mitigation measures⁵ and will ensure no loss of saltmarsh habitat within the study area associated with the proposed project.

⁵ *Ecological Advisory and Consultancy Services (EACS)*, Habitat reinstatement, restoration and creation on the Corrib Gas Onshore Pipeline in Co Mayo, Ireland - challenges and solutions. 2015, *Habitat reinstatement, restoration and creation*, Online, Available at: <https://documents.in/document/habitat-reinstatement-restoration-and-creation-on-habitat-reinstatement-restoration.html>, Accessed 22.01.2021



Plate 5-3 Example of the revegetated habitat at Rattoo pumping station.

5.1.1.2 Operation

The operational phase of the proposed project will not result in the loss of any QI habitats for which the SAC has been designated. As described in Section 3.2.1, the proposed outfall locations have been designed to avoid any scouring effects associated with the pumping of water to the main river channel. This will be avoided by the use of boulders placed at the outfall of the riverbank for the operational phase of the proposed project (see Plate 5.2).

5.1.1.3 Decommissioning

The proposed project is considered to be long term. However, any decommissioning works are likely to be similar to those associated with construction and standard best practice measures prescribed in Section 5.1.1 will be implemented for the avoidance of adverse effects on habitat loss/deterioration.

5.1.2 Potential for Direct Effect on Otter

5.1.2.1 Construction

Potential for direct adverse effect on otter is restricted to the potential for mortality during construction. As described in Section 4.1.4, although otter was observed during the site visits and signs of otter were recorded in close proximity to the proposed infrastructure, no otter holt or layup areas were recorded. There will therefore be no direct impact on otters associated with the construction phase of the proposed project. From a precautionary perspective, standard best practice and mitigation measures have been incorporated into the proposed project for the avoidance of direct impact on otter. As described in Section 5.1.1, there will be no in-stream works within the main river channels associated with the construction phase of the proposed project. Works associated with the installation of the proposed pumping stations will be undertaken outside of the SAC within existing back drains. All

works associated with the installation of the proposed outfalls will take place from the riverbank with only a small area of riverbank temporarily disturbed to facilitate the installation of the precast concrete outfall, see Plate 5-2 above.

Mitigation for the avoidance of direct effect on otter

Prior to any works being carried out, a pre-construction otter survey will be undertaken by a qualified ecologist to ensure that otter has not taken up residence within or close to the proposed works area. In addition, “*Drainage Maintenance and Construction Environmental Guidance*’ OPW (2019) will be implemented in full during all phases of the project.

5.1.2.2 **Operation**

The operational phase of the proposed development does not have the potential to result in direct effect on otter. The proposed pumps will be submerged and encased within sealed structure and will not result in direct mortality. Should any holt be encountered during the pre-construction surveys, it will be subject to exclusion procedures as outlined in the TII/NRA guidelines (2006) in consultation with the National Parks and Wildlife Service (NPWS).

Mitigation

None required.

5.1.2.3 **Decommissioning**

The proposed project is considered to be long term. Any decommissioning works are likely to be similar to those associated with construction and standard best practice measures prescribed in Section 5.1.1.1 and 5.1.2.2 above will be implemented for the avoidance of adverse effect during decommissioning. Therefore, all measures described in the preceding sections above will be implemented in full.

Based on the above, it can be concluded in view of best scientific knowledge, on the basis of objective information that the proposed project will not adversely affect the Conservation Objectives of the Lower River Shannon SAC.

5.2 **Potential for Indirect Adverse Effects on the European Sites**

The field study and desk study undertaken as part of the proposed project has identified a number of QI habitats and species that occur in close proximity to the proposed project or could be indirectly affected as a result of deterioration in downstream water quality, or alterations in local hydrology associated with the proposed project. The following sections assess the potential for adverse effect and the associated mitigation.

5.2.1 **Deterioration in Surface Waters**

This NIS has identified potential for indirect effect on a number of QIs located adjacent to or downstream of the proposed project, including;

- [1130] Estuaries
- [1140] Mudflats and sandflats not covered by seawater at low tide
- [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- [1310] *Salicornia* and other annuals colonising mud and sand

- [1160] Large shallow inlets and bays
- [1170] Reefs
- [1095] Sea Lamprey (*Petromyzon marinus*)
- [1096] Brook Lamprey (*Lampetra planeri*)
- [1099] River Lamprey (*Lampetra fluviatilis*)
- [1106] Atlantic Salmon (*Salmo salar*) (only in freshwater)
- [1355] Otter (*Lutra lutra*)

The following subsections identify potential for indirect effect on the above QIs associated as a result of deterioration in water quality during the construction, operation and decommissioning phase of the proposed project.

5.2.1.1 Construction Phase

5.2.1.1.1 Preventative measures to avoid adverse effect on water quality

The pathway that would allow potential impacts to occur was considered in the design of the project. This section of the NIS sets out the environmental management framework to be adhered to during the proposed construction works and it incorporates the mitigating principles to ensure no adverse effect on the integrity of European Sites. These include comprehensive detail regarding site set up, pollution prevention, hydrocarbon management, disturbance limitation, construction monitoring and biosecurity.

In order to avoid any potential for adverse effect on QI habitats during construction, best practice construction measures will be implemented to ensure that there will be no potential for adverse effect on the receiving habitats associated with the construction phase of the proposed development. Such measures include, but are not limited to;

- The management of **surface water runoff** and subsequent treatment prior to release off-site.
- The use of **precast concrete**, thereby avoiding the need for pouring concrete at the edge of the estuary and potential water pollution associated with such methods.

In addition to the above measures, the “*Drainage Maintenance and Construction Environmental Guidance*’ OPW (2019) document will be implemented in full during all phases of the project. The below provide a summary of additional standard best practice measures incorporated into the proposed project.

Site set up

- Prior to the commencement of works, all works areas will be clearly demarcated using marking tape or temporary fencing and no works will be undertaken outside of these areas.
- The site compound will be located within a defined works area, securely fenced off.

Pollution Prevention

The CEMP prepared for the proposed development provides pollution prevention measures. Specifically, Section 6.10 *Works adjacent to River Feale, Brick, Galey and Natura 2000 sites* of the CEMP sets out the best practice measures for the works including measures including:

- “All hazardous materials will be stored and handled in bunded areas located at least 50m from the river, and silt fences/settlements tanks will be used to intercept suspended sediments”.
- “To avoid excessive silt runoff, site clearance is not to be undertaken during wet conditions, when rainfall of more than 0.5 mm/hour is forecast within the next 24 hours”.
- “The surface water from the works will be drained, in accordance with the principles of Sustainable Urban Drainage Systems (SUDS). Dublin City Council & South Dublin City Council will ensure that measures for the attenuation, de-silting and hydrocarbon interception,

where necessary, will be installed for all surface water discharges during the construction phase”.

- *“To avoid contamination of the estuary during an extreme flood event, no works likely to generate soiled water is to be carried out when there is a forecast within the next five days in Cashen estuary”.*
- *“Fuelling and lubrication of equipment is not to be carried out on site”.*

These, and other measures, described in the CEMP will ensure the protection of water quality adjacent to River Feale, Brick and Galey. In addition to the above measures and those described in the CEMP, the following best practice measures will also be incorporated into the project:

- All site plant will be inspected at the beginning of each day prior to use. Defective plant shall not be used until the defect is satisfactorily fixed. All major repair and maintenance operations will take place off site.
- Vehicles will never be left unattended during refuelling. Only dedicated trained and competent personnel will carry out refuelling operations and plant refuelling procedures shall be detailed in the operatives method statements.
- Fuels, lubricants and hydraulic fluids for equipment used on the site will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment.
- Potential impacts caused by spillages etc. during the construction phase will be reduced by keeping spill kits and other appropriate equipment on-site.
- Material excavated from the works area will be removed off the riverbank and spread to adjoining lands on the landward side of the existing back drains and away from the watercourse. Excavated material will be reseeded immediately to stabilise the soil and avoid the generation of suspended solids.
- A silt fence will be installed on the down gradient side of all works to avoid any potential suspended solids runoff.

Site set up, particularly the silt curtain will be checked by an ecologist. The site will be visited by a suitably qualified ecologist (ECoW) periodically. An audit of the works will be undertaken during these weekly visits and it will be ensured that the prescribed methods are employed.

The measures described in this report and in the OPW SOP's ensure that the proposed works do not prevent or obstruct any of the qualifying interests from reaching favourable conservation status as per Article 1 of the EU Habitats Directive.

Pump installation

The proposed pumps will be constructed at low points in the backdrains behind the embankments. These will be generally close to the existing gravity outfall points. During the installation of the pumps, management of surface water runoff and subsequent treatment prior to release off-site will be undertaken during construction work as follows:

- Prior to any excavation works within the back drains, where pumping stations will be installed, the drain either side of the works area will be sealed off to prevent any water ingress during construction. This will further reduce the potential volume of water requiring treatment/management. The works area will then be dewatered prior to any excavation works allowing for a dry working area.
- Prior to any excavation works within the back drains, where pumping stations will be installed, the drain either side of the works area will be sealed off. The works area will then be dewatered prior to any excavation works.
- Water pumped from the works area will be discharged to adjoining lands within the polder, 30 metres from the works area, via a silt bag surrounded by a series of silt fences. Water will then percolate to ground and there will be no direct discharge to nearby drainage ditches or

watercourses. There will therefore be no potential for direct effect on the water quality within the SAC.

- No pumped construction water will be discharged directly into any watercourse;
- Daily monitoring (as further described below) and inspections of site drainage during construction will be completed;
- Earthworks will take place during periods of low rainfall to reduce run-off and potential siltation of watercourses. When installing the proposed outfalls, these works will be undertaken during periods of low tide.
- As described above, the pumping sump and valve chambers (see typical example in Plate 5-1 below) will avoid the use of concrete batching on site and thus minimise the risk of water pollution occurring.

Outfall pipe and headwall installation

The installation of the proposed outfall pipes will be the only works within the SAC and the only works on the seaward side of the embankments.

The outfall pipes, see Plate 3.2, leading from the new pumping stations will be installed through the existing embankments to the adjacent river via a headwall. Such works will require a very narrow works area and thus minimal short-term disturbance to the vegetation within the works area.

Management of surface water runoff and subsequent treatment prior to release off-site will be undertaken prior to and during construction work as follows:

- All works associated with the installation of the proposed outfalls will be accessed via the landward side of the existing flood defence structure (where the proposed pumps will be located). This will avoid any tracking along the riverbank at each section of the main river channels. Such measures will therefore avoid disturbance/displacement or damage to bankside vegetation etc.
- Prior to the installation of the headwall, sandbags will be installed around the outfall location to maintain a dry works area. In addition, a silt curtain will be installed to ensure no release of any slit material from the works area.
- The works area will then be dewatered prior to any excavation works.
- Water pumped from the works area will be discharged to adjoining lands via a silt bag surrounded by a series of silt fences on the landward side of the embankment. Water will then percolate to ground and there will be no direct discharge to nearby drainage ditches/back drain.
- No pumped water will be discharged directly into any rivers/watercourse;
- In order to avoid impacts on the existing vegetation within the narrow works area required to facilitate the installation of the proposed outfall pipe and headwall, vegetation stripping and reinstatement will be required. This is described in further detail below.
- The proposed outfall headwall will be constructed from precast concrete (see Plate 5-2 below). Thereby avoiding the need for pouring concrete at the edge of the estuary and potential water pollution associated with such methods. Additionally, boulders will be placed at the outfall to avoid the potential for scouring of the riverbank and associated habitats during the operational phase of the proposed project (see Plate 5.2).
- There will be no requirement for in-stream works by machinery. All works associated with the installation of the proposed outfalls will be accessed from the existing riverbank.
- Following the installation of the precast concrete outfall headwall, the works area will be fully reinstated, including replacing the vegetated turves as described below.
- Daily monitoring and inspections of site drainage during construction will be completed;
- Earthworks will take place during periods of low rainfall to reduce run-off and potential siltation of watercourses. When installing the proposed outfalls, these works will be undertaken during periods of low tide.



Plate 5-1 Example of pumping sump and valve chambers at the Rattoo pumping station.



Plate 5-2 Existing headwall constructed from precast concrete and rock armour at the Rattoo pumping station.

Installation of connecting culverts

The installation of the connection culverts (preliminarily sized at 1.05m diameter pre-cast concrete pipe) will be small scale in nature. The proposed culvert infrastructure is illustrated in drawings 20649-NOD-00-XX-DR-C-03208 (*Culvert No. 8 - Plan & Section*) and 20649-NOD-00-XX-DR-C-03211 (*Culvert No. 10A - Plan & Section*). Both proposed culverts are located entirely outside of the SAC, on the landward side of the existing flood defence embankments.

As described in the EcoEireann (2020) document, ‘*the creation and installation of 2 new culverts providing connectivity between Polders 5 & 6 and Polders 7 & 8, should be conducted in the dry (as far as possible) to reduce the chances of sediment pulses and construction related pollutants entering the adjoining agricultural drains during construction*’. In addition, the following additional measures are proposed for the installation of connecting culverts:

- Prior to any excavation works within the back drains, where culverts will be installed, the drain either side of the works area will be sealed off. The works area will then be dewatered prior to any excavation works.
- Water pumped from the works area will be discharged to adjoining lands via a silt bag surrounded by a series of silt fences. Water will then percolate to ground and there will be no direct discharge to nearby drainage ditches or watercourses.
- Water pumped from the works area will be discharged to adjoining lands within the polder, 30 metres from the works area, via a silt bag surrounded by a series of silt fences. Water will then percolate to ground and there will be no direct discharge to nearby drainage ditches or watercourses.
- Earthworks will take place during periods of low rainfall to reduce run-off and potential siltation of watercourses.
- The proposed connection culverts will then be installed and the surrounding material reinstated before water is again allowed back into the works area.

Site access track installation

Much of the proposed site access tracks will follow existing access tracks which will be upgraded. In order to access pump locations approximately 3-4km of access track will be required in total. All proposed new access tracks are located outside of the SAC and on the landward side of the existing flood defence embankments. The proposed site access tracks will be constructed along the landward side of the existing earth embankments as shown in drawing no. 20649-NOD-00-XX-DR-C-03101 (*Overall Site Location Map - Key Plan of Access Roads to Pumping Stations*).

The tracks will be constructed of clean locally sourced crushed stone of the same chemical/geological composition. The following measures will be implemented for the avoidance of impact on water quality during the construction phase of the proposed site access tracks.

- Prior to the construction of new site access tracks, silt fencing will be placed between the proposed site access track and any adjacent backdrains where they occur.
- New site access tracks will be located away from backdrains by a buffer of 5 metres to avoid any potential for surface water runoff during construction and operation.
- Material will be delivered to the site by truck and spread in place as it arrives using a track machine.
- There will be no storage of materials within 50 metres of any watercourse with all materials instated as they arrive on site.

Directional drilling for ESB electricity infrastructure

The directional drilling method of ESB cable/duct installation will be carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant, will be utilised for the horizontal directional drilling at watercourse crossings required. The launch and reception pits will be approximately 0.55m wide, 2.5m long and 1.5m deep. In all cases, both the launch and reception pits will be located on the landward side of the existing flood defence embankments. The pits will be excavated with a suitably sized excavator. The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod and the operator shall commence to drill into the launch pit to a suitable angle which will enable him to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore shall continue with the addition of 3 metres long drill rods, mechanically loaded and connected into position.

During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as *Clear Bore™* and water is pumped through the centre of the drill rods to the reamer head and is forced into the void, to enable the annulus which has been created to support the surrounding sub soil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it may be necessary to repeat the drilling process by incrementally increasing the size of the reamers. When the reamer enters the launch pit, it is removed from the drill rods which are then passed back up the bore to the reception pit and the next size reamer is attached to the drill rods and the process is repeated until the required bore with the allowable tolerance is achieved.

The use of a natural, inert and biodegradable drilling fluid such as *Clear Bore™* is intended to negate any potential adverse impacts arising from the use of other, traditional polymer-based drilling fluids and will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the reception or drilling pits, it will be contained and removed from the site in the same manner as other subsoil materials associated with the drilling process to an approved disposal site.

Backfilling of launch and reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches. Sufficient controls and monitoring, as listed below, will be put in place during drilling to prevent frack-out, such as the installation of casing at entry points where reduced cover and bearing pressure exists.

- The area around the *Clear Bore™* batching, pumping and recycling plants shall be bunded using terram and sandbags in order to contain any spillages;
- One or more lines of silt fences shall be placed between the works area and adjacent watercourses on both banks;
- Accidental spillage of fluids shall be cleaned up immediately and transported off site for disposal at a licensed facility; and,

Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush.

Surface water monitoring

A Construction Environmental Management Plan (CEMP) has been prepared as part of the proposed development and has been submitted as part of the application documentation. This includes for:

A “Project Control Plan will be carried out through weekly inspections during the construction phase and this will include inspections of sub-contractors. Actions raised will be brought to the attention of the Contractor’s site representative and an agreed timescale will be met to close out the issues raised. A project ecologist will monitor the works”.

The monitoring measures employed in the CEMP will both determine that the proposed mitigation measure are working as planned as well as informing the need for any alterations to the onsite mitigation and drainage design. All such measures will be overseen and implemented by a dedicated project Environmental Clerk of Works.

5.2.1.2 Operational Phase

The operational phase of the proposed project will result in the pumping of clean water to the main river channel. There will therefore be no change in water quality associated with the operational phase of the proposed project and thus no potential for adverse effect. As described in the EcoEireann (2020) report, the operational phase of the proposed development will result in a ‘*minor increase in discharge of existing agricultural drainage channels to supplement the level of discharge to that of the previously existing discharge levels*’. As also described in the EcoEireann (2020) report, ‘*all the proposed pumping stations will only be active within the active grazing period between March-October within any one year, with electric pump activity being restricted during this period to when existing gravity discharge requires supplementation, such as periods of high rainfall or tidal inundation*’. ‘*The wind pumps will be continuously active (depending on wind conditions), providing continuous minor supplementation to existing drainage*’. The report concludes that ‘*the project is not expected to result in significant deterioration or change in surface water body status*’ as per the modelled flow rates, see Table 3-1 *Cashen Estuary Modelled Pump Rates*.

5.2.1.3 Decommissioning

The proposed project is considered to be long term. However, any decommissioning works are likely to be similar to those associated with construction and standard best practice measures prescribed in Section 5.1.1.1 and Section 5.2.1.1.1 will be implemented for the avoidance of impact on water quality.

5.2.2 Disturbance to QI Faunal Species

5.2.2.1 Construction

No otter breeding or resting sites were identified during the site visit and no direct adverse effect on the species is anticipated. Sightings and signs of otter were recorded during the site visits and suitable habitat for the species does exist in close proximity to the proposed project infrastructure. The main river channels were also identified as being suitable for salmon and lamprey species. Taking a precautionary approach, a potential pathway for indirect adverse effects to otter, salmon and lamprey species, was identified in the form of disturbance.

Otter are predominantly crepuscular in nature and construction activity will be confined to daytime hours, thus minimizing potential disturbance related impacts to the species. In addition, the majority of works are unlikely to differ significantly from agricultural activity. Irish Wildlife Manual No 76 (*National*

Otter Survey of Ireland 2010/2012) notes that the occurrence of otter was unaffected by perceived levels of disturbance at the survey sites. It also notes that there is little published evidence demonstrating any consistent relationship between Otter occurrence and human disturbance (Mason & Macdonald 1986, Delibes et al. 1991; Bailey & Rochford, 2006). Irish Wildlife Manual No 23 (*National Otter Survey of Ireland 2004/2005*) found no significant relationship between disturbance and otter occurrence. It also states “the lowest percentage occurrence was found at the sites with the lowest recorded disturbance”.

Based on the above, no adverse effect to the otter population of Lower River Shannon SAC is anticipated. However, taking a precautionary approach the best practice preventative measures will be adhered to prior to and during the desilting works.

5.2.2.1.1 **Preventive Measures to Avoid Disturbance/Displacement to Otter During Construction**

Although no otter holts were recorded, from a precautionary perspective, prior to the commencement of construction works, the following measures will be undertaken for the avoidance of disturbance/displacement and direct mortality and to ensure that no otter holts/breeding sites have been established since the original surveys undertaken (TII, 2007⁶):

- From a precautionary basis, a pre-commencement otter survey will be undertaken in accordance with standard best practice guidance prior to the commencement of site works. In the unlikely event that an otter holt is identified within or immediately adjacent to the proposed development footprint, consultation will be undertaken with the National Parks and Wildlife Service and a derogation licence applied for.
- All conditions of a derogation licence will be implemented in full.
- No works should be undertaken within 150m of any holts at which breeding females or cubs are present.
- No wheeled or tracked vehicles (of any kind) should be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance should also not take place within 15m of such holts, except under licence (TII, 2006⁷).

All of the above works will be undertaken or supervised by an appropriately qualified ecologist.

As described in Section 3.2 ‘*Characteristics of the Proposed Development*’ of this EcIA and further described in Section 6 ‘*Construction Methodology*’ of the accompanying CEMP, the proposed development has been designed to avoid impacts on receiving water quality and habitats. The

⁶TII, 2007, *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes*, Online, Available at: <https://www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Treatment-of-Otters-prior-to-the-Construction-of-National-Road-Schemes.pdf>, Accessed 25.03.2021

⁷NRA, 2006. *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes*. Dublin: Transport Infrastructure Ireland. Available at: www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Treatment-of-Otters-prior-to-the-Construction-of-National-Road-Schemes.pdf

construction methodology, as further described in Section 5.2.1.1.1 previously, provides details of how water quality will be protected during the construction of the proposed development.

In addition to the measures described in Section 5.2.1.1.1 previously for the protection of water quality, the CEMP also sets out measures for the minimisation or avoidance of impacts on sensitive faunal species, such as otter, including the following:

- “The site will be bound by a 3m high timber hoarding to screen visibility of the site and activities fully from the adjacent Natura 2000 site and reduce disturbance to species such as birds and mammals in the vicinity”.
- “Disturbance to nocturnal species such as bats and other mammals, from lighting will be reduced by avoiding light spillage to adjacent habitats by keeping light directed on site only – avoid upward light of the sky and light spill from the site onto adjacent areas”.
- “Regarding construction activities, reference will be made to BS 5228-1, which offers detailed guidance on the control of noise from demolition and construction activities”.
- The following best practice guidance will be followed for the control and avoidance of vibration associated impacts:
 - “British Standard BS 7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration;
 - British Standard BS 5228-2: 2009: Code of Practice for Noise and Vibration Control on Construction and Open Sites: Vibration;
 - NRA: 2004: Guidelines for the Treatment of Noise and Vibration in National Road Schemes;

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15Hz and 50 mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings”.

All of the measures described above along with all additional measures incorporated within this CEMP will be implemented during construction. The measures described in Section 5.2.1.1 and in the OPWs “*Drainage Maintenance and Construction Environmental Guidance*” (OPW, 2019) include measures to limit disturbance to fauna. The measures ensure that the proposed works do not prevent or obstruct otter from reaching favourable conservation status as per Article 1 of the EU Habitats Directive.

The measures described in Section 5.2.1.1 and in the OPW SOPs ensure that the proposed works do not adversely affect the integrity of the otter population associated with Lower River Shannon SAC.

5.2.2.2 Operational

Given the scale and nature of the proposed pumping stations, their location on the landward side of existing flood defense earth embankments and the minimal noise levels anticipated, no potential for adverse effect is predicted on faunal species for which the Lower River Shannon SAC has been designated.

5.2.2.3 Decommissioning

The proposed project is considered to be permanent. However, any decommissioning works are likely to be similar to those associated with construction and standard best practice measures prescribed in Section 5.2.1.1 will be implemented for the avoidance of impact on water quality. However, should the infrastructure require decommissioning, this will be subject to separate assessment.

6. ASSESSMENT OF RESIDUAL ADVERSE EFFECTS

The sections of the report detail the site-specific residual adverse effects assessment in relation to the relevant QIs of the Lower River Shannon SAC in light of its site-specific targets and attributes.

As potential for adverse effects has been identified as a result the construction, operation and decommissioning phases of the proposed project, the assessment takes into consideration the proposed measures to avoid, reduce and block identified pathways for impact.

This Natura Impact Statement presents the data and information on the project and provides an analysis comprising the scientific examinations of the Proposed Project and its implications for the European site referred to in the preceding sections in view of their conservation objectives and provides an analysis of the potential adverse effects on the above listed European Site. Potential adverse effects are assessed in view of best scientific knowledge, based on objective information in relation to the proposed project including the proposed avoidance, reduction and preventive measures.

6.1 Lower River Shannon SAC [002165]

The potential for adverse effects on each of the individual Qualifying Interests that were identified as being at risk of potential likely significant effects in the AA Screening Report is assessed in this section in view of the Conservation Objectives of those habitats and species. Tables 6.1 to 6.12 provide an assessment of the proposed development against the nominated attributes and targets for the QI species requiring further assessment, following the implementation of mitigation.

6.1.1 Estuaries [1130]

The identified pathway for effect is via deterioration in water quality during the construction and operational phases of the proposed development. An assessment of the proposed development against the attributes and targets for this habitat is provided in Table 6.1.

Table 6.1 Targets and attributes associated with nominated site-specific conservation objectives for Estuaries

Attribute	Target	Assessment
Habitat area	The permanent habitat area is stable or increasing, subject to natural processes.	Pathways for adverse effects on water quality were considered in the design of the proposed development, see Section 3.2. A range of mitigation and pollution prevention measures (outlined in Section 5.2.1 of this report) are in place to avoid adverse effects due to habitat loss/damage and water pollution during all phases of the proposed project. A detailed hydrological assessment submitted as part of the application, prepared for the development concludes that the discharge of clean water from the drainage ditches to the main river bodies within the Lower River Shannon SAC will not alter the water quality within the European Site (EcoEireann, 2020).
Community distribution	Conserve the following community types in a natural condition: Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Estuarine subtidal muddy sand to mixed sediment with gammarids community complex; Subtidal sand to mixed sediment with <i>Nucula nucleus</i> community complex; Subtidal sand to mixed sediment with <i>Nephtys</i> spp. community complex; Fucoid-dominated intertidal reef community complex; Faunal turf-dominated subtidal reef community; and Anemone-dominated subtidal reef community.	

		There will be therefore be no adverse effects to the habitat area or the community distribution of this habitat.
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6.1.1.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Project will not adversely affect Estuaries associated with Lower River Shannon SAC.

6.1.2 Mudflats and sandflats not covered by seawater at low tide [1140]

The identified pathway for effect is via deterioration in water quality during the construction and operational phases of the proposed development. An assessment of the proposed development against the attributes and targets for this habitat is provided in Table 6.2.

Table 6.2 Targets and attributes associated with nominated site-specific conservation objectives for Mudflats and sandflats not covered by seawater at low tide

Attribute	Target	Assessment
Habitat area	The permanent habitat area is stable or increasing, subject to natural processes.	<p>Pathways for adverse effects on water quality were considered in the design of the proposed development, see Section 3.2. A range of mitigation and pollution prevention measures (outlined in Section 5.2.1 of this report) are in place to avoid habitat loss/damage and water pollution during all phases of the proposed project.</p> <p>A detailed hydrological assessment submitted as part of the application, prepared for the development concludes that the discharge of clean water from the drainage ditches to the main river bodies within the Lower River Shannon SAC will not alter the water quality within the European Site (EcoEireann, 2020).</p> <p>There will be no adverse effects on the extent and the community distribution of this habitat.</p>
Community distribution	Conserve the following community types in a natural condition: Intertidal sand with <i>Scolecipis squamata</i> and <i>Pontocrates</i> spp. community; and Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex.	

6.1.2.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Project will not adversely affect Mudflats and sandflats not covered by seawater at low tide associated with Lower River Shannon SAC.

6.1.3

Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]

The identified pathway for effect is via deterioration in water quality and habitat loss/damage during the construction and operational phases of the proposed development. An assessment of the proposed development against the attributes and targets for this habitat is provided in Table 6.3.

Table 6.3 Targets and attributes associated with nominated site-specific conservation objectives for Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural processes, including erosion and succession.	<p>Pathways for adverse effects on water quality were considered in the design of the proposed development, see Section 3.2. Specific measures are in place to avoid habitat loss, see Section 5.1.1.1. A range of mitigation and pollution prevention measures (outlined in Section 5.2.1 of this report) are in place to avoid adverse effects due to habitat loss/damage and water pollution during all phases of the proposed project.</p> <p>A detailed hydrological assessment submitted as part of the application, prepared for the development concludes that the discharge of clean water from the drainage ditches to the main river bodies within the Lower River Shannon SAC will not alter the water quality within the European Site (EcoEireann, 2020).</p> <p>There will be no adverse effects on the extent or distribution of this habitat.</p>
Habitat distribution	No decline or change in habitat distribution, subject to natural processes.	
Physical structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions.	<p>No physical obstructions will be created as a result of the proposed development. There will be no potential for impact on the physical structure of this habitat or alteration to the flood regime as fully described in the detailed hydrological report (EcoEireann, 2020).</p>
Physical structure: creeks and pans	Maintain creek and pan structure, subject to natural processes, including erosion and succession.	
Physical structure: flooding regime	Maintain natural tidal regime.	
Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.	<p>The proposed development will not result in any adverse effects on the vegetation structure and composition derived from degradation in water quality. In addition, there will be no significant changes to the flooding or tidal regime.</p>
Vegetation structure: vegetation height	Maintain structural variation within sward.	
Vegetation structure: vegetation cover	Maintain more than 90% of the saltmarsh area vegetated.	

Vegetation composition: typical species and sub-communities	Maintain range of subcommunities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009).	
Vegetation structure: negative indicator species - <i>Spartina anglica</i>	No significant expansion of common cordgrass (<i>Spartina anglica</i>), with an annual spread of less than 1%.	

6.1.3.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Project will not adversely affect Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) associated with Lower River Shannon SAC.

6.1.4 Mediterranean salt meadows (*Juncetalia maritimi*) [1410]

The identified pathway for effect is via deterioration in water quality during the construction and operational phases of the proposed development. An assessment of the proposed development against the attributes and targets for this habitat is provided in Table 6.4.

Table 6.4 Targets and attributes associated with nominated site-specific conservation objectives for Mediterranean salt meadows (*Juncetalia maritimi*)

Attribute	Target	Assessment
Habitat area	Area increasing, subject to natural processes, including erosion and succession.	<p>Pathways for adverse effects on water quality were considered in the design of the proposed development, see Section 3.2. Specific measures are in place to avoid habitat loss, see Section 5.1.1.1. A range of mitigation and pollution prevention measures (outlined in Section 5.2.1 of this report) are in place to avoid habitat loss/damage and water pollution during all phases of the proposed project.</p> <p>A detailed hydrological assessment submitted as part of the application, prepared for the development concludes that the discharge of clean water from the drainage ditches to the main river bodies within the Lower River Shannon SAC will not alter the water quality within the European Site (EcoEireann, 2020).</p> <p>There will be no adverse effects on the extent and the community distribution of this habitat.</p> <p>There will be no adverse effects on the area or distribution of this habitat.</p>
Habitat distribution	No decline, or change in habitat distribution, subject to natural processes.	

Physical structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions.	No physical obstructions will be created as a result of the proposed development. There will be no potential for impact on the physical structure of this habitat
Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession.	
Physical structure: flooding regime	Maintain natural tidal regime	
Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	The proposed development will not result in any adverse effect on the vegetation structure and composition derived from degradation in water quality
Vegetation structure: vegetation height	Maintain structural variation within sward	
Vegetation structure: vegetation cover	Maintain more than 90% of area outside creeks vegetated	
Vegetation composition: typical species	Maintain range of subcommunities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	
Vegetation structure: negative indicator species - <i>Spartina anglica</i>	No significant expansion of common cordgrass (<i>Spartina anglica</i>), with an annual spread of less than 1%	

6.1.4.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Project will not adversely affect Mediterranean salt meadows (*Juncetalia maritima*) associated with Lower River Shannon SAC.

6.1.5 *Salicornia* and other annuals colonising mud and [1310]

The identified pathway for effect is via deterioration in water quality during the construction and operational phases of the proposed development. An assessment of the proposed development against the attributes and targets for this habitat is provided in Table 6.5.

Table 6.5 Targets and attributes associated with nominated site-specific conservation objectives for *Salicornia* and other annuals colonising mud and [1310]

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural processes, including erosion and succession.	Pathways for adverse effects on water quality were considered in the design of the proposed development, see Section 3.2. A range of mitigation and pollution prevention measures (outlined in Section 5.2.1 of this report) are in place to avoid habitat
Habitat distribution	No decline, or change in habitat distribution, subject to natural processes.	

		<p>degradation as a result of water pollution during all phases of the proposed project where it occurs downstream. There is no potential for habitat loss and damage for this habitat.</p> <p>A detailed hydrological assessment submitted as part of the application, prepared for the development concludes that the discharge of clean water from the drainage ditches to the main river bodies within the Lower River Shannon SAC will not alter the water quality within the European Site (EcoEireann, 2020).</p> <p>There will be no adverse effects on the extent and the community distribution of this habitat.</p> <p>There will be no adverse effects on the area or distribution of this habitat.</p>
Physical structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions.	No physical obstructions will be created as a result of the proposed development. There will be no potential for adverse effects on the physical structure of this habitat or alteration to the flood regime as fully described in the detailed hydrological report (EcoEireann, 2020).
Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession.	
Physical structure: flooding regime	Maintain natural tidal regime	
Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	<p>The proposed development will not result in any adverse effect on the vegetation structure or composition. A range of mitigation and pollution prevention measures (outlined in Section 5.2.1 of this report) are in place to avoid habitat degradation as a result of water pollution during all phases of the proposed project where it occurs downstream. There is no potential for habitat loss and damage for this habitat.</p> <p>In addition, there will be no significant changes to the flooding or tidal regime.</p>
Vegetation structure: vegetation height	Maintain structural variation within sward	
Vegetation structure: vegetation cover	Maintain more than 90% of area outside creeks vegetated	
Vegetation composition: typical species and sub-communities	Maintain the presence of species-poor communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	
Vegetation structure: negative indicator species- <i>Spartina anglica</i>	No significant expansion of common cordgrass (<i>Spartina anglica</i>), with an annual spread of less than 1%	

6.1.5.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Project will not adversely affect *Salicornia* and other annuals colonising mud and [1310] associated with Lower River Shannon SAC.

6.1.6 Large shallow inlets and bays [1160]

The identified pathway for effect is via deterioration in water quality during the construction and operational phases of the proposed development. An assessment of the proposed development against the attributes and targets for this habitat is provided in Table 6.6.

Table 6.6 Targets and attributes associated with nominated site-specific conservation objectives for Large shallow inlets and bays

Attribute	Target	Assessment
Habitat area	The permanent habitat area is stable or increasing, subject to natural processes.	<p>Pathways for adverse effects on water quality were considered in the design of the proposed development, see Section 3.2. A range of mitigation and pollution prevention measures (outlined in Section 5.2.1 of this report) are in place to avoid habitat degradation as a result of water pollution during all phases of the proposed project where it occurs downstream. There is no potential for habitat loss and damage for this habitat.</p> <p>A detailed hydrological assessment submitted as part of the application, prepared for the development concludes that the discharge of clean water from the drainage ditches to the main river bodies within the Lower River Shannon SAC will not alter the water quality within the European Site (EcoEireann, 2020).</p> <p>There will be no adverse effects on the extent and the community distribution of this habitat.</p>
Community distribution	Conserve the following community types in a natural condition: Intertidal sand with <i>Scolecopsis squamata</i> and <i>Pontocrates</i> spp. community; Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Subtidal sand to mixed sediment with <i>Nucula nucleus</i> community complex; Subtidal sand to mixed sediment with <i>Nephtys</i> spp. community complex; Furoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone dominated subtidal reef community; and Laminaria dominated community complex.	

6.1.6.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Project will not adversely affect Large shallow inlets and bays associated with Lower River Shannon SAC.

6.1.7 Reefs [1170]

The identified pathway for effect is via deterioration in water quality during the construction and operational phases of the proposed development. An assessment of the proposed development against the attributes and targets for this habitat is provided in Table 6.7.

Table 6.7 Targets and attributes associated with nominated site-specific conservation objectives for Reefs

Attribute	Target	Assessment
Habitat distribution	The distribution of Reefs is stable, subject to natural processes.	<p>Pathways for adverse effects on water quality were considered in the design of the proposed development, see Section 3.2. A range of mitigation and pollution prevention measures (outlined in Section 5.2.1 of this report) are in place to avoid habitat degradation as a result of water pollution during all phases of the proposed project where it occurs downstream. There is no potential for habitat loss and damage for this habitat.</p> <p>A detailed hydrological assessment submitted as part of the application, prepared for the development concludes that the discharge of clean water from the drainage ditches to the main river bodies within the Lower River Shannon SAC will not alter the water quality within the European Site (EcoEireann, 2020).</p> <p>There will be no adverse effects on the extent, area or the community distribution of this habitat.</p>
Habitat area	The permanent habitat area is stable, subject to natural processes.	
Community distribution	Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and Laminaria-dominated community complex.	

6.1.7.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Project will not adversely affect Reefs associated with Lower River Shannon SAC.

6.1.8 *Petromyzon marinus* (Sea Lamprey) [1095], *Lampetra planeri* (Brook Lamprey) [1096] and *Lampetra fluviatilis* (River Lamprey) [1099]

The identified pathway for effect is via deterioration in water quality and habitat quality during the construction and operational phases of the proposed development. An assessment of the proposed development against the attributes and targets for this habitat is provided in Table 6.8.

Table 6.8 Targets and attributes associated with nominated site-specific conservation objectives for *Petromyzon marinus* (Sea Lamprey) [1095], *Lampetra planeri* (Brook Lamprey) [1096] and *Lampetra fluviatilis* (River Lamprey) [1099]

Attribute	Target	Assessment
Distribution: extent of anadromy	Greater than 75% of main stem length of rivers accessible from estuary.	As described in Section 3.2, no instream works that would prevent use of the estuary by lamprey species are proposed and thus there is no potential for impacts on lamprey distribution within the catchment associated with the proposed project.

Population structure of juveniles	At least three age/size groups present	There will be no adverse effects on the population structure of juveniles or juvenile density as there are no instream works proposed that would directly or indirectly prevent the species from maintaining a diverse age/size structure or population density. In addition, pathways for impacts on water quality were considered in the design of the proposed development, see Section 5.2.1.
Juvenile density in fine sediment	Juvenile density at least 1/m ²	
Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds	There will be no adverse effects on the extent and distribution of spawning habitat or the availability of juvenile habitat as there are no instream works proposed and thus no loss of suitable spawning habitat. In addition, pathways for adverse effects on water quality were considered in the design of the proposed development, see Section 5.2.1.
Availability of juvenile habitat	More than 50% of sample sites positive	

6.1.8.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Project will not adversely affect Sea, Brook or River Lamprey associated with Lower River Shannon SAC.

6.1.9 *Salmo salar* (Salmon) [1106]

The identified pathway for effect is via deterioration in water quality and habitat quality during the construction and operational phases of the proposed development. An assessment of the proposed development against the attributes and targets for this habitat is provided in

Table 6.9.

Table 6.9 Targets and attributes associated with nominated site-specific conservation objectives for *Salmo salar* (Salmon) [1106]

Attribute	Target	Assessment
Distribution: extent of anadromy	100% of river channels down to second order accessible from estuary.	As described in Section 3.2, no instream works that would prevent use of the estuary by salmon are proposed and thus there is no potential for adverse effects on salmon distribution within the catchment associated with the proposed project. There will be no barriers to connectivity, loss of spawning/nursery habitat or reduction in the distribution of redds as a result of the proposed development.
Adult spawning fish	Conservation Limit (CL) for each system consistently exceeded.	
Salmon fry abundance	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	
Out-migrating smolt abundance	No significant decline.	
Number and distribution of redds	No decline in number and distribution of spawning redds due to anthropogenic causes.	

Water quality	At least Q4 at all sites sampled by EPA	<p>Pathways for adverse effects on water quality were considered in the design of the proposed development, see Section 3.2. A range of mitigation and pollution prevention measures (outlined in Section 5.2.1 of this report) are in place to avoid habitat loss/damage and water pollution during all phases of the proposed project.</p> <p>A detailed hydrological assessment submitted as part of the application, prepared for the development concludes that the discharge of clean water from the drainage ditches to the main river bodies within the Lower River Shannon SAC will not alter the water quality within the European Site (EcoEireann, 2020).</p> <p>There will be no decline in water quality as a result of the proposed development.</p>
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6.1.9.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Project will not adversely affect Salmon associated with Lower River Shannon SAC.

6.1.10 *Lutra lutra* (Otter) [1355]

The identified pathway for effect is via deterioration in water quality, disturbance and direct mortality during the construction and operational phases of the proposed development. An assessment of the proposed development against the attributes and targets for this habitat is provided in Table 6.7.

Table 6.10 Targets and attributes associated with the site-specific conservation objectives for otter [1355]

Attribute	Target	Assessment
Distribution.	No significant decline	As described in Section 3.2, no instream works that would prevent use of the estuary and river channels by otter are proposed and thus there is no potential for adverse effects on otter distribution within the catchment associated with the proposed project.
Extent of terrestrial habitat	No significant decline.	There will be no decline in the extent of terrestrial or freshwater habitat associated with the proposed development, with the application of standard and best practice control measures, as outlined above in Sections 3.2 and 5.2.1 of this report.
Extent of freshwater (river) habitat	No significant decline.	
Extent of freshwater (lake habitat)	No significant decline.	
Couching sites and holts.	No significant decline	No couching sites or holts were recorded during the dedicate otter surveys of the site as described in Section 4.1.4. There will be no decline in couching sites and holts as a result of the proposed development, with the application of standard and best practice control measures, as outlined above in this report.

Fish biomass available	No significant decline.	There will be no decline in availability of fish biomass associated with the proposed development as there will be no in-stream works. In addition, pathways for indirect adverse effects on water quality were considered in the design of the proposed development, see Section 3.2.1. A range of measures (outlined in Section 5.2.1 of this report) are in place to avoid all water pollution, and thus the avoidance of impact on fish species, during all phases of the proposed project.
Barrier to connectivity	No significant increase	The proposed development will not result in any barrier to connectivity within or outside the SAC.

6.1.10.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Project will not adversely affect otter associated with Lower River Shannon SAC.

6.2 Conclusion of Residual Adverse effects Assessment

Taking cognisance of best practice and mitigation measures incorporated into the project design, the Proposed Development will not result in adverse impacts on the integrity of the European Site. It will not prevent the QIs of the European Site from achieving favourable conservation status in the future, as defined in Article 1 of the EU Habitats Directive. A definition of Favourable Conservation Status is provided below:

‘conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory referred to in Article 2’

The conservation status will be taken as ‘favourable’ 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, and
- 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.’

Based on the above, it can be concluded in view of best scientific knowledge, on the basis of objective information that the Proposed Development will not adversely affect the Qualifying Interests associated with Lower River Shannon SAC and thus will not adversely affect the integrity of the Lower River Shannon SAC.

7.

CUMULATIVE ADVERSE EFFECTS

A search and review in relation to plans and projects that may have the potential to result in cumulative and/or in-combination impacts on European Sites was conducted. This assessment focuses on the potential for cumulative in-combination effects on the European Sites where potential for adverse effects was identified at the Screening stage (Appendix 1). This included a review of the following information:

- Online Planning Registers,
- Development plans and other available information, and
- Ongoing and future OPW maintenance of the Arterial Drainage Scheme.

Such information served to identify past and future plans and projects, their activities and their predicted environmental effects.

7.1

Other Projects

The online planning system for Kerry County Council, was consulted on the 24/03/2021. Projects Considered in the Cumulative Assessment are described below. Relevant projects identified within the development footprint in the last 5 years include:

- Permission to (1) construct of an Integrated Constructed Wetland (ICW) for the treatment of combined waste water from the Lixnaw agglomeration, comprising of two settlement ponds, four treatment cells and pump station, (2) construction of a viewing window to the river brick, (3) decommission existing waste water treatment plant and pump station and (4) ancillary works associated with the development [Pl.Ref.: 171061]
- Permission for the development of a solar photovoltaic panel array consisting of up to 39,100 m² of solar panels on ground mounted steel frames, 2 no. Electricity control cabins, underground cable and ducts, inverter units, hardstanding area, boundary security fence, site entrance, access tracks, CCTV, all associated site services and works and demolition of existing agricultural buildings. Also planning permission is sought for a period of 10 years [Pl.Ref.: 16802]
- Planning permission with a duration of 10 years for a solar pv farm with an operational lifespan of 35 years to export up to 50mw of electricity to the national grid. The development will comprise approx. 357, 500 sq.m. of solar panels together with all ancillary cabling and electrical infrastructure including approx. 25 no. combined inverter / transformer stations (with option to provide these as separate inverter transformer units); provision of new access tracks and upgrading of existing agricultural access tracks; landscaping; temporary construction compound; battery storage and control units; boundary and security fencing; CCTV security system; new vehicular access point to the 1-1009 9 (at site of existing agricultural gate); approx. 4m telecommunications mast and all ancillary site development works all on a site of approximately 99.2ha. A Natura Impact Statement will be submitted to the planning authority with the application [Pl.Ref.: 18720]

In addition to the above planning applications, and as described in Section 3.2.1 of this report, the OPW have a responsibility to maintain the existing River Feale Certified Drainage Scheme. This includes periodic embankment repairs.

7.2

Other Plans

Table 7.1 Review of plans

Plans	Key Policies/Issues/Objectives Directly Related to European Sites, Biodiversity and Sustainable Development in the Zone of Influence	Assessment of development compliance with policy
<p>Kerry County Development Plan 2015-2021</p>	<p><u>NE-2</u> Ensure that the requirements of relevant national and EU legislation, including the Habitats Directive (92/43/EEC), the EU (Birds) Directive (79/409/EEC), the Environmental Impact Assessment Directive (85/337/EEC), the Water Framework Directive (2000/60/EC), and the Flood Directive (2007/60/EC), are met by the Council in undertaking its functions.</p> <p><u>NE-11</u> Ensure that all projects likely to have a significant effect on a Natura 2000 / European site will be subject to Habitats Directive Assessment prior to approval.</p> <p><u>NE-12</u> Ensure that no projects which will be reasonably likely to give rise to significant adverse direct, indirect or secondary impacts on the integrity of any Natura 2000 sites having regard to their conservation objectives, shall be permitted on the basis of this Plan (either individually or in combination with other plans or projects) unless imperative reasons of overriding public interest can be established and there are no feasible alternative solutions.</p> <p><u>NE-13</u> Maintain the nature conservation value and integrity of all Natural Heritage Areas (NHAs), proposed Natural Heritage Areas (pNHAs), Nature Reserves and Killarney National Park. This shall include any other sites that may be designated at national level during the lifetime of the plan in co-operation with relevant state agencies</p>	<p>The Development plan was comprehensively reviewed, with particular reference to Policies and Objectives that relate to the Natura 2000 network. No potential for cumulative adverse effects, considered in conjunction with the proposed project, were identified.</p> <p>Detailed ecological surveys have been undertaken within the study area to provide robust scientific data on which the findings of this report rely.</p> <p>The proposed on-site drainage has been designed in order to avoid any potential for direct or indirect adverse effects on downstream Designated Sites.</p>

Plans	Key Policies/Issues/Objectives Directly Related to European Sites, Biodiversity and Sustainable Development in the Zone of Influence	Assessment of development compliance with policy
	<p><u>NE-14</u> Protect species of plants listed in the Flora Protection Order (S.I. No. 94 of 1999) and their habitats, species and the habitats of species that require strict protection under the Habitats Regulations (S.I. No. 94 of 1997, 233 of 1998 and 378 of 2005) and animal and bird species and their habitats protected under the Wildlife Acts 1976-2000.</p> <p><u>NE-15</u> Achieve water quality targets by implementing the River Basin Management Plans (and associated programmes of measures) and to ensure that development undertaken or permitted by local authorities; other public agencies or private operators, shall not contravene the objectives of the Water Framework Directive, the European Communities Environmental Objectives (Surface Waters) Regulations 2009 SI 272 of 2009 and the European Communities Environmental Objectives (Groundwaters) Regulations 2010, SI 9 of 2010.</p> <p><u>NE-16</u> (a) Promote the protection of Protected Areas as outlined in Annex (IV) of the Water Framework Directive and the application of relevant Government Guidance in this area. Implement Sub-basin (b) Management Plans in accordance with the Fresh Water Pearl Mussel Regulations (SI 296 of 2009).</p> <p><u>NE-19</u> Ensure that planning applications are assessed with regard to the Groundwater Protection Scheme and the likely impacts the development may have on groundwater quality. Development considered inappropriate by the Council will be prohibited in the vicinity of important aquifers. Cumulative impacts shall also be taken into consideration.</p>	

Plans	Key Policies/Issues/Objectives Directly Related to European Sites, Biodiversity and Sustainable Development in the Zone of Influence	Assessment of development compliance with policy
	<p>NE-22 Protect rivers, streams and other watercourses including those outside Protected Areas and maintain them where possible in an open state capable of providing suitable habitat for fauna and flora and to work with other agencies, as appropriate, to prevent the spread of invasive species in or along the county’s aquatic habitats by implementing biosecurity measures, where appropriate.</p>	
<p>River Basin Management Plan for Ireland 2018 - 2021⁸</p>	<p>The River Basin Management Plan for Ireland 2018-2021 sets out the actions that Ireland will take to improve water quality and achieve ‘good’ ecological status in water bodies (rivers, lakes, estuaries and coastal waters) by 2027. The RBMP has been prepared under the Water Framework Directive (WFD).</p>	<p>The proposed project has been designed in order to avoid any potential for direct or indirect adverse effects on downstream waterbodies, or EU or Nationally Designated Sites.</p>
<p>National Biodiversity Action Plan 2017 - 2021</p>	<p>Objective 5.1.2 - Implement measures to achieve good ecological and environmental status of marine and coastal habitats as required by the Habitats, Directive, Water Framework Directive and Marine Strategy Framework Directive (MSFD) and in line with the OSPAR Convention (Convention for the protection of the marine environment in the NorthEast Atlantic)</p>	<p>The proposed project will not have any potential for adverse effects on any of the QI/SCI habitats or species of any EU Designated Sites.</p>

⁸ Department of Housing, Planning and Local Government (2018), River Basin Management Plan for Ireland 2018-2021 [Online], Available at: https://www.housing.gov.ie/sites/default/files/publications/files/rbmp_report_english_web_version_final_0.pdf, Accessed 15/02/2021.

7.2.1 Conclusion of Cumulative Assessment

Following the detailed assessment provided in the preceding sections, it is concluded that, the proposed development will not result in any residual adverse effects on any of the European Sites, their integrity or their conservation objectives when considered on its own. There is therefore no potential for the proposed development to contribute to any cumulative adverse effects on any European Site when considered in-combination with other plans and projects.

In the review of the projects that was undertaken, no connection, that could potentially result in additional or cumulative impacts was identified. Neither was any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the proposed development.

Taking into consideration the reported residual adverse effects from other plans and projects in the area and the predicted impacts with the current proposal, no residual cumulative adverse effects have been identified with regard to any European Site.

8. **CONCLUDING STATEMENT**

This NIS has provided an assessment of all potential direct or indirect adverse effects on European Sites.

Where the potential for any adverse effect on any European Site has been identified, the pathway by which any such effect may occur has been robustly blocked through the use of avoidance, appropriate design and mitigation measures as set out within this report and its appendices. The measures ensure that the construction and operation of the proposed development does not adversely affect the integrity of European sites.

Therefore, it can be objectively concluded that the Proposed Development, individually or in combination with other plans or projects, will not adversely affect the integrity of any European Site.

9.

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APPENDIX 1

APPROPRIATE ASSESSMENT SCREENING REPORT

Article 6 (3) Appropriate Assessment Screening Report

Proposed Cashen Estuary
Pump Installation, Co. Kerry





DOCUMENT DETAILS

Client: **Nicholas O'Dwyer Ltd**

Project Title: **Proposed Cashen Estuary Pump Installation, Co. Kerry**

Project Number: **190937**

Document Title: **Article 6 (3) Screening for Appropriate Assessment**

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03	Final	13/07/2021	OOG	PR

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1. INTRODUCTION

1.1 Background

MKO has been appointed to provide the information necessary to allow the competent authority to conduct an Article 6(3) Screening for Appropriate Assessment of the proposed construction of No. 17 pumping stations and all associated infrastructure, within existing polders along the River Feale, Co. Kerry. In addition, the project includes for the installation of two connecting culverts within the existing polders within the study area.

Screening for Appropriate Assessment is required under Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive). Where it cannot be excluded that a project or plan, either alone or in combination with other projects or plans, would have a significant effect on a European Site then same shall be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives. The current project is not directly connected with, or necessary for, the management of any European Site consequently the project has been subject to the Appropriate Assessment Screening process.

The assessment in this report is based on a desk study and field surveys undertaken on the 8th October 2019. It specifically assesses the potential for the proposed project to result in significant effects on European sites in the absence of any best practice, mitigation or preventative measures.

This Appropriate Assessment Screening Report has been prepared in accordance with the European Commission's *Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC* (EC, 2001) and *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (EC, 2018) as well as the Department of the Environment's *Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities* (DoEHLG, 2010).

In addition to the guidelines referenced above, the following relevant documents were also considered in the preparation of this report:

1. *Council of the European Commission (1992) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal of the European Communities. Series L 20, pp. 7-49.*
2. *EC (2000) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg.*
3. *EC (2007) 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.*
4. *EC (2013) Interpretation Manual of European Union Habitats. Version EUR 28. European Commission.*

1.2 Appropriate Assessment

1.2.1 Screening for Appropriate Assessment

Screening is the process of determining whether an Appropriate Assessment is required for a plan or project. Under Part XAB of the Planning and Development Act, 2000, as amended, screening must be carried out by the Competent Authority. As per Section 177U of the Planning and Development Act, 2000, as amended 'A screening for appropriate assessment shall be carried out by the competent authority to assess, in view of best scientific knowledge, if that Land use plan or proposed development,

individually or in combination with another plan or project is likely to have a significant effect on the European site'. The Competent Authority's determination as to whether an Appropriate Assessment is required must be made on the basis of objective information and should be recorded. The Competent Authority may request information to be supplied to enable it to carry out screening.

Consultants or project proponents may provide for the competent authority, the information necessary for them to determine whether an Appropriate Assessment is required and provide advice to assist them in the Article 6(3) Appropriate Assessment Screening decision.

Where it cannot be excluded beyond reasonable scientific doubt at the Screening stage, that a proposed plan or project, individually or in combination with other plans and projects, would have a significant effect on the conservation objectives of a European site, an Appropriate Assessment is required.

Where an Appropriate Assessment is required, the Competent Authority may require the applicant to prepare a Natura Impact Statement.

The term Natura Impact Statement (NIS) is defined in legislation¹. An NIS, where required, should present the data, information and analysis necessary to reach a definitive determination as to 1) the implications of the plan or project, alone or in combination with other plans and projects, for a European site in view of its conservation objectives, and 2) whether there will be adverse effects on the integrity of a European site. The NIS should be underpinned by best scientific knowledge, objective information and by the precautionary principle.

This Article 6(3) Appropriate Assessment Screening Report has been prepared in compliance with the provision of section 177U of the Planning & Development Act 2010 as amended.

1.2.2 Statement of Authority

Baseline ecological surveys were undertaken on the 8th of October 2019 by David McNicholas (B.Sc., M.Sc., MCIEEM) and Pat Roberts (B.Sc., MCIEEM). This report has been prepared by David McNicholas and Pat Roberts. David is an experienced ecologist with over 9 years professional consultancy experience. Pat has over 14 years' experience in ecological consultancy and management.

¹ As defined in Section 177T of the Planning and Development Act, 2000 as amended, an NIS means a statement, for the purposes of Article 6 of the Habitats Directive, of the implications of a proposed development, on its own and in combination with other plans and projects, for a European site in view of its conservation objectives. It is required to include a report of a scientific examination of evidence and data, carried out by competent persons to identify and classify any implications for the European site in view of its conservation objectives

2. DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 Site Location

The proposed development of pumping stations will pump water into the Rivers Brick, Galey, and Feale from adjacent lands between Ferry Bridge and Lixnaw, Co. Kerry [IG Ref: Q 89581 33860].

The Feale River forms part of the Lower River Shannon SAC [002165]. The proposed works areas are located adjacent to, or overlap with, the Lower River Shannon SAC. The Cashen estuary discharges to the 'Mouth of the Shannon' coastal waterbody, also forming part of the Lower River Shannon SAC [002165]. A site location map is provided in Figure 2.1.

2.2 Characteristics of the Proposed Development

2.2.1 Description of the project

The River Feale Certified Drainage Scheme was constructed by the Commissioners of Public Works between 1951 and 1957. The Scheme included the dredging of the Cashen Estuary and comprises of 295km of river channel, 144 km of Flood Defence Embankments, 338 Bridges/Culverts, 193 Sluice Structures and one pumping station on the River Brick. The objective was to protect agricultural land from inundation by high tides. The Office of Public Works (OPW) is required, under the 1945 Arterial Drainage Act, to maintain the scheme in an effective condition, and to improve drainage to assist farming activities to continue uninterrupted.

Local stakeholders and landowners reported to the OPW that 'higher and more prolonged flooding has been occurring in the low-lying polders that are drained by the OPW's sluiced back drain systems and that this is having a significant impact upon land drainage adjacent to the estuary. Subsequent consideration of the problem has identified that the bed levels at the estuary mouth have risen significantly in the intervening years since the River Feale Certified Drainage Scheme due to the progressive natural deposition of sand within the unmaintained wide section of the estuary, where tidal flows from the Atlantic Ocean meet the fluvial flows of the Feale catchment. This has resulted in reduced flow capacity through the estuary mouth on ebb tides, causing higher water levels in the main channel which in turn has reduced the discharge capability of existing sluices through the embankments and back-drain systems at certain times within the tidal cycle' (EcoEireann, 2020). As a result, fields flood more regularly, and the existing drainage channels and sluice system is less effective at draining the land.

The proposed development which will be carried out under Section 38 of the Arterial Drainage Act 1945, will pump water into the Rivers Brick, Galey, and Feale. The pumping stations within the catchment will pump water from the polders into the adjacent watercourse; however, as water is already discharged via gravity from existing drainage ditches there is no new hydrological connection or pathway for pollutants. The operation of the pumping stations will assist with the drainage of 3,651ha of agricultural land. The confluence of the Rivers Brick, Galey, and Feale forms the Cashen River which flows into the Atlantic Ocean via the Cashen Estuary, all of which comprises part of the Lower River Shannon SAC.

Following a detailed options appraisal process, a preferred option to provide pumping in each polder was selected. A pumping station or a number of pumping stations will be installed into each polder (with the exceptions of 12A and 12B which already have a pumping station), augmenting the existing gravity drainage, pumping water from existing drainages ditches on the defended side of the embankment into the river side regardless of the water level in the river.



Map Legend

 Study Area Boundary

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Drawing Title	
Site Location Map	
Project Title	
Cashen Estuary Drainage	
Drawn By	Checked By
OOG	JH
Project No.	Drawing No.
190937	Figure 2.1
Scale	Date
1:67537	2021-07-13
	
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A total of 16 pumping stations (7 electric and 9 wind driven) are proposed. The pumps will augment existing gravity drainage to reproduce drainage conditions when the scheme was first constructed (prior to sea level rise and sediment deposition in the main channel). The proposed site infrastructure layout is provided in Drawing no. 20649-NOD-00-XX-DR-C-03101. All 9 wind pump locations, i.e., sites No. 1, 3, 4, 11A, 11B, 14, 15, 17 & 18, and 7 electric powered pumps i.e., locations at sites No. 6, 7, 9, 10, 12, 13 and 16, are shown in this drawing. No works are proposed at point number No. 2 or No. 5, and site location No. 8 on the drawing is a link culvert.

As described above, increased sediment loading in the estuary has resulted in the non-return valves functioning for a shorter period of time than originally envisaged. This has been compounded by sea level rise. The proposed installation of the pumping infrastructure within the catchment therefore aims to augment the current discharge in order to compensate for the amount of water that would have originally drained via gravity when water levels in the estuary were lower. The pumps will be carefully managed, by OPW personnel, to improve the existing drainage as per the original scheme; electric pumps will only be in operation from March to October when the polders are actively grazed. The pumps will only be used periodically, during the grazing period (March-October), when existing gravity discharge requires supplementation such as periods of high rainfall or tidal inundation (EcoEireann, 2020).

The selection of electric versus wind driven pump solutions and prioritisation of interventions was derived based on size and quality of the land protected and the associated cost. Along with these measures, the OPW will continue to maintain the existing embankments, forming part of the River Feale Certified Drainage Scheme. There will be no change to the current ongoing maintenance programme. Such maintenance is assessed in the cumulative assessment in Section 7 of this NIS.

The proposed pumping infrastructure has been assessed as the least invasive option comprising of a number of small-scale pump infrastructure, associated access tracks and power supply.

2.2.2 Proposed Works

As described above, a total of 16 pumping stations (7 electric and 9 wind driven) are proposed. Each pumping station will require approximately 10m x 10m, plus the embankment outside that, and the inlet and outlets beyond. The proposed development will consist of the construction of the following pumping stations along the banks of the River Feale polders:

- 9 No. Windmill powered pumping solutions at Sites No. 1, 3, 4, 11A, 11B, 14, 15, 17 & 18.
- 7 No. Electrically powered pumping stations at Sites No. 6, 7, 9, 10, 12, 13 and 16.

The typical site plan for the electric powered pump chambers is provided in Drawing no. 20649-NOD-XX-XX-DR-C-03400 (*Typical Site Plan Standard Pump Chamber 400mm Outfall*). The typical site plan for the wind powered pump chambers is provided in Drawing no. 20649-NOD-XX-XX-DR-C-03410 (*Typical 7m High Windmill Pump Plans*).

In addition, 2 No. Link Culverts; one each between Polders 5 & 6, and Polders 7 & 8 are also proposed, see Drawing no. 20649-NOD-00-XX-DR-C-03101. The Proposed Development culvert infrastructure is illustrated in drawings 20649-NOD-00-XX-DR-C-03208 (*Culvert No. 8 - Plan & Section*) and 20649-NOD-00-XX-DR-C-03211 (*Culvert No. 10A - Plan & Section*).

The electric pumping stations will typically be used to drain larger polder areas and pump large volumes of water (>100 l/s). The wind driven pumps will have a slower response with a lower discharge capacity (typically <5 l/s) compared to the electric pumps, though they operate throughout the year, gradually reducing water levels and on average maintaining them at levels equivalent to the original scheme design.

It is proposed that pumping stations are sited near existing outfalls on the basis that this will be the low point in the existing drainage system and cause less disruption by minimising the need for re-grading the existing back drains. Each pumping station will require the following associated infrastructure:

- Access track – approximately 3-4km of access track will be required in total. Where possible, the access track will follow the edge of a field to avoid breaking up of land parcels;
- Fencing and security set up – each pumping station will be surrounded by palisade fencing for safety reasons;
- Sump (depth to be determined following ground investigations);
- Possible intake weir (where required) set at a level sufficiently below surrounding ground level to enable drainage, but high enough to prevent drying out of drains – potentially stop log adjustable;
- Outlet pipe/channel through or over embankment with access (path and railing); and
- Outfall potentially including flap gate/valve, depending on outlet pipe/channel arrangement, including scour protection features downstream as required.

2.2.3 Description of the Baseline Ecological Environment

Assessing the impacts of any project and associated activities requires an understanding of the ecological baseline conditions prior to and at the time of the project proceeding. Ecological baseline conditions are those existing in the absence of proposed activities (CIEEM, 2018).

The habitats within and adjacent to the proposed pumping stations and all associated infrastructure were assessed on the 8th of October 2019 by David McNicholas (B.Sc., M.Sc., MCIEEM) and Pat Roberts (B.Sc., MCIEEM) in line with NRA (2009) guidelines (*Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*). The walkover survey was designed to detect the presence, or likely presence, of a range of protected habitats and species. Seasonal factors that affect distribution patterns and habits of species were considered when conducting the surveys. A thorough and comprehensive ecological assessment was achieved, as all the habitats within and adjacent to the proposed development site were readily identifiable during the site visit. The habitat classifications and codes correspond to those described in ‘*A Guide to Habitats in Ireland*’ (Fossitt, 2000).

2.2.3.1 Survey Findings

Given the location on the landward side of the proposed pumping stations and adjacent to the existing back drains, the habitats within the proposal footprints were largely dominated by **Dry meadows and grassy verges [GS2]** with some areas also comprising of **Wet grassland [GS4]**. The back drains were mapped as **Drainage ditches [FW4]** with the main channel of the River Feale mapped as **Depositing/lowland rivers [FW2]**.

The vegetation within each of the habitats was assessed during the site visit. The existing embankments comprised largely of Perennial ryegrass (*Lolium perenne*), tufted hair grass (*Deschampsia cespitosa*), dandelion (*Taraxacum officinalis agg.*), ragwort (*Senecio jacobaea*), broad-leaved dock (*Rumex obtusifolius*), red clover (*Trifolium pratense*) and common sorrel (*Rumex acetosa*). The back drains were largely dominated by common reed (*Phragmites australis*), soft rush (*Juncus effusus*), bramble (*Rubus fruticosus agg.*) and nettle (*Urtica dioica*), see Plate 2.3. The fringe vegetation of the main River Feale channel comprised largely of common reed (*Phragmites australis*), yellow flag iris (*Iris pseudacorus*), redshank (*Persicaria maculosa*), common club-rush (*Schoenoplectus lacustris*) and sea club-rush (*Bolboschoenus maritimus*). An example of the marginal vegetation along the River Feale is shown in Plate 2.4.

Habitats listed as Qualifying Interests (QIs) for which the Lower River Shannon SAC has been designated were searched for in the immediate area surrounding each of the proposed pumping

stations. The only QI habitats recorded within or adjacent to the sites of the proposed infrastructure include:

- > Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) (1330)
- > Estuaries (1130)

Pumping stations located closer to the estuary were also found to have **Upper Salt Marsh [CM2]** habitat in close proximity to the proposed infrastructure. This is due to the tidal nature and proximity to the coast at these locations.

Signs of faunal species for which the Lower River Shannon SAC has been designated were searched for during the site visit as well as areas of suitable supporting habitat. The only QI species recorded during the site visit was otter (*Lutra lutra*).



Plate 2.1 Example of existing back drain located on the landward side of the embankments. The back drains will be temporarily blocked off and the works area dewatered before installation of the proposed pump stations, as shown in the plate above



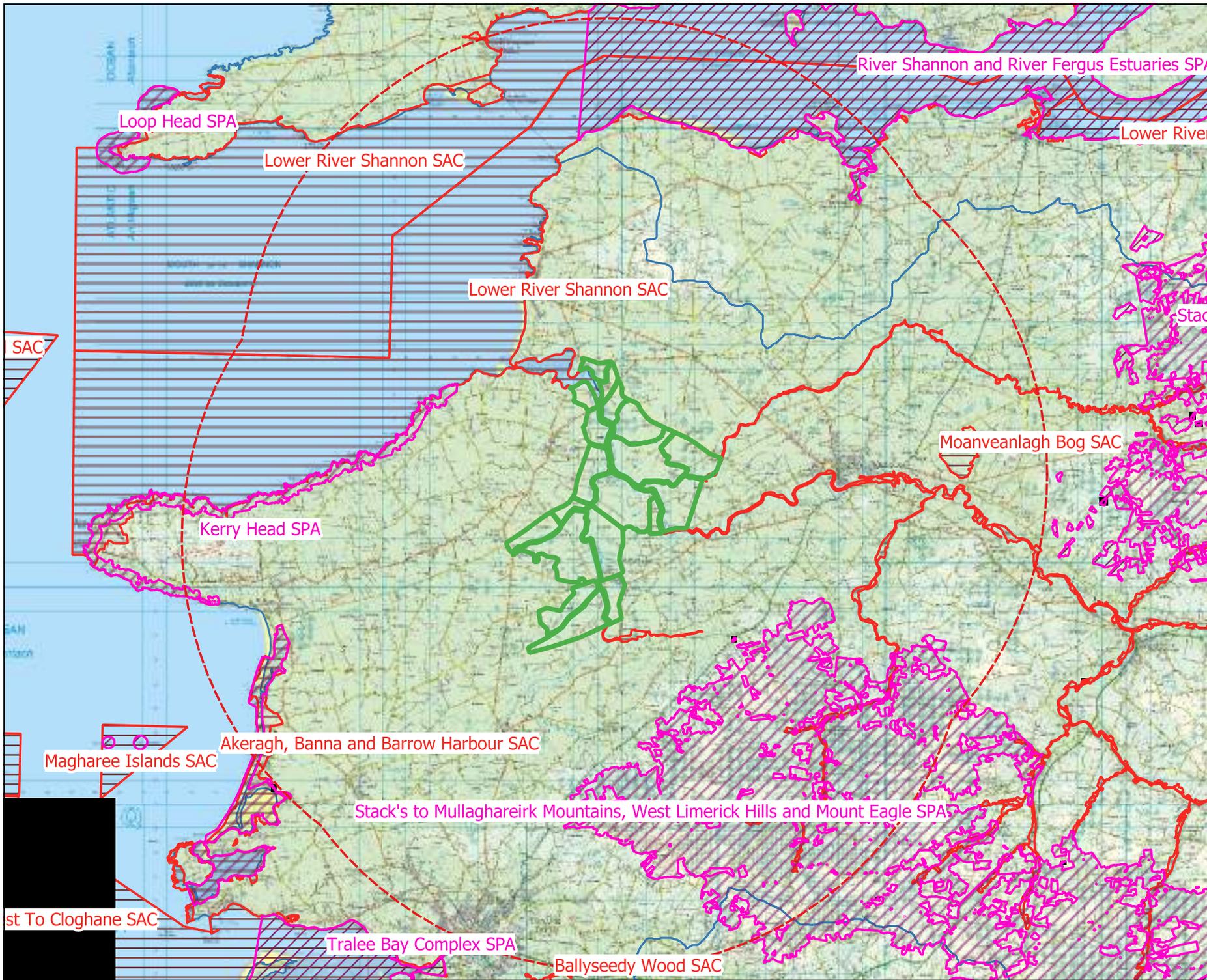
Plate 2.4 Example of marginal vegetation along the River Feale. Typical location of the proposed discharge outlets as shown in Plate 2.2.

3. IDENTIFICATION OF RELEVANT EUROPEAN SITES

3.1 Identification of the European Sites within the Likely Zone of Impact

The following methodology was used to establish which European Sites are within the Likely Zone of Impact of the proposed development:

- Initially the most up to date GIS spatial datasets for European designated sites and water catchments were downloaded from the NPWS website (www.npws.ie) and the EPA website (www.epa.ie) on the 24/03/2021. The datasets were utilized to identify European Sites which could feasibly be affected by the proposed development.
- All European Sites within a distance of 15km surrounding the development site were identified and are shown on Figure 3.1. In addition, the potential for connectivity with European Sites at distances of greater than 15km from the proposed development was also considered in this initial assessment. In this case, no potential connectivity with sites located at a distance of over 15km from the proposed development was identified.
- The catchment mapping was used to establish or discount potential hydrological connectivity between the site of the proposed development and any European Sites.
- In relation to Special Protection Areas, in the absence of any specific European or Irish guidance in relation to such sites, the Scottish Natural Heritage (SNH) Guidance, ‘Assessing Connectivity with Special Protection Areas (SPA)’ (2016) was consulted. This document provides guidance in relation to the identification of connectivity between proposed development and Special Protection Areas. The guidance takes into consideration the distances species may travel beyond the boundary of their SPAs and provides information on dispersal and foraging ranges of bird species which are frequently encountered when considering plans and projects.
- Table 3.1 provides details of all relevant European Sites as identified in the preceding steps and assesses which are within the likely Zone of Impact. The assessment considers any likely direct or indirect impacts of the proposed development, both alone and in combination with other plans and projects, on European Sites by virtue of the following criteria: size and scale, land-take, distance from the European Site or key features of the site, resource requirements, emissions, excavation requirements, transportation requirements and duration of construction, operation and decommissioning were considered in this screening assessment
- The site synopses and conservation objectives of these sites, as per the NPWS website (www.npws.ie), were consulted and reviewed at the time of preparing this report 24/03/2021.
- Where potential pathways for Significant Effect are identified, the site is included within the Likely Zone of Impact and further assessment is required.



Map Legend

- Study Area Boundary
- 15km Buffer
- Special Area of Conservation (SAC)
- Special Area of Protection (SPA)
- Hydrological Catchment Boundary

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Drawing Title
EU designated sites within 15km buffer zone

Project Title
Cashen Estuary Drainage

Drawn By OOG	Checked By JH
Project No. 190937	Drawing No. Figure 3.1
Scale 1:205000	Date 2021-07-13



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Table 3-1 Identification of Designated sites within the Likely Zone of Impact

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 24/03/2021	Conservation Objectives	Likely Zone of Impact and Significant Effects Determination
Special Areas of Conservation (SAC)			
<p>Lower River Shannon SAC [002165]</p> <p>The development lies within the European Site</p>	<ul style="list-style-type: none"> > [1029] Freshwater Pearl Mussel (<i>Margaritifera margaritifera</i>) > [1095] Sea Lamprey (<i>Petromyzon marinus</i>) > [1096] Brook Lamprey (<i>Lampetra planeri</i>) > [1099] River Lamprey (<i>Lampetra fluviatilis</i>) > [1106] Atlantic Salmon (<i>Salmo salar</i>) (only in freshwater) > [1110] Sandbanks which are slightly covered by sea water all the time > [1130] Estuaries > [1140] Mudflats and sandflats not covered by seawater at low tide > [1150] *Coastal lagoons > [1160] Large shallow inlets and bays > [1170] Reefs > [1220] Perennial vegetation of stony banks 	<p>Detailed conservation objectives for this site, (Version 1, August 2012), were reviewed as part of the assessment and are available at www.npws.ie</p>	<p>The proposed pump sites are located partly within this European Site. Although many of the pumping stations are located outside of the SAC boundary, within back drains behind the flood defence structures, the proposed discharge pipe infrastructure is located within the SAC boundary. Following preliminary assessment, it is considered to be within the Likely Zone of Impact.</p> <p>Following a review of the Site-Specific Conservation Objective supporting document (NPWS, 2012), potential pathways for effect were identified on the following QIs as a result of potential habitat loss/deterioration, deterioration in water quality or disturbance/displacement to fauna:</p> <ul style="list-style-type: none"> > [1130] Estuaries > [1140] Mudflats and sandflats not covered by seawater at low tide > [1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) > [1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) > [1310] <i>Salicornia</i> and other annuals colonising mud and sand > [1095] Sea Lamprey (<i>Petromyzon marinus</i>) > [1096] Brook Lamprey (<i>Lampetra planeri</i>) > [1099] River Lamprey (<i>Lampetra fluviatilis</i>) > [1106] Atlantic Salmon (<i>Salmo salar</i>) (only in freshwater) > [1355] Otter (<i>Lutra lutra</i>) <p>Due to the scale and nature of the proposed development, no potential for indirect effects has been identified on the QIs located beyond the Cashen River estuary, including Large shallow inlets and bays [1160] and Reefs [1170].</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 24/03/2021	Conservation Objectives	Likely Zone of Impact and Significant Effects Determination
	<ul style="list-style-type: none"> > [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts > [1310] <i>Salicornia</i> and other annuals colonising mud and sand > [1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) > [1349] Bottlenose dolphin (<i>Tursiops truncatus</i>) > [1355] Otter (<i>Lutra lutra</i>) > [1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) > [3260] Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation > [6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) > [91E0] *Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) 		<p>Potential for indirect effects on the following QIs has been excluded due to the distance to the development or the lack of connectivity pathways identified:</p> <ul style="list-style-type: none"> > [1029] Freshwater Pearl Mussel (<i>Margaritifera margaritifera</i>) > [1150] *Coastal lagoons > [1220] Perennial vegetation of stony banks > [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts > [3260] Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation > [6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) > *Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) > [1349] Bottlenose dolphin (<i>Tursiops truncatus</i>) > [1110] Sandbanks which are slightly covered by sea water all the time <p>No potential for indirect effects has been identified on the terrestrial QIs for which the SAC has been designated.</p> <p>Potential for likely significant effects have been identified and the SAC is within the Likely Zone of Impact. Further assessment is required.</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 24/03/2021	Conservation Objectives	Likely Zone of Impact and Significant Effects Determination
Moanveanlagh Bog SAC [002351] Distance: 10.5km	<ul style="list-style-type: none"> ➤ [7110] Active raised bogs* ➤ [7120] Degraded raised bogs still capable of natural regeneration ➤ [7150] Depressions on peat substrates of the <i>Rhynchosporion</i> 	Detailed conservation objectives for this site, (Version 1, December 2015), were reviewed as part of the assessment and are available at www.npws.ie	<p>There will be no direct effect as the proposed project footprint is located outside of the European site.</p> <p>No pathway for indirect effect has been identified as the QIs for which the SAC has been designated are terrestrial in nature.</p> <p>There is no potential for significant effects and the SAC is not located within the Likely Zone of Impact.</p>
Akeragh, Banna and Barrow Harbour SAC [000332] Distance: 11.4km	<ul style="list-style-type: none"> ➤ [1210] Annual vegetation of drift lines ➤ [1310] Salicornia and other annuals colonising mud and sand ➤ [1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) ➤ [1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) ➤ [2110] Embryonic shifting dunes ➤ [2120] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) ➤ [2130] Fixed coastal dunes with herbaceous vegetation (grey dunes)* 	Detailed conservation objectives for this site, (Version 1, January 2017), were reviewed as part of the assessment and are available at www.npws.ie	<p>There will be no direct effect as the proposed project footprint is located outside of the European site.</p> <p>No pathway for indirect effects has been identified on the QIs for which the SAC has been designated. Due to the nature and scale of the proposed development and its distance to this European Site, no potential for effect exists on the SAC.</p> <p>There is no potential for significant effects and the SAC is not located within the Likely Zone of Impact.</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 24/03/2021	Conservation Objectives	Likely Zone of Impact and Significant Effects Determination
	<ul style="list-style-type: none"> > [2190] Humid dune slacks > [4030] European dry heaths 		
Special Protection Area (SPA)			
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA [004161] Distance: 4.6km	<ul style="list-style-type: none"> > [A082] Hen harrier (<i>Circus cyaneus</i>) 	Generic conservation objectives (NPWS Generic Version 8.0, 2021) are available for this site: "To maintain or restore the favourable conservation status of habitats and species of community interest" and "To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA"	There will be no direct effect as the proposed project footprint is located outside of the European site. No potential for indirect effects was identified given the nature and scale of the proposed project. The proposed development will not involve any loss or deterioration of habitat for hen harrier and is sufficiently removed from the SPA such that there is no potential for disturbance related effects. There is no potential for significant effects and the SPA is not located within the Likely Zone of Impact.
Kerry Head SPA [004189]	<ul style="list-style-type: none"> > [A009] Fulmar (<i>Fulmarus glacialis</i>) > [A346] Chough (<i>Pyrrhocorax pyrrhocorax</i>) 	Generic conservation objectives (NPWS Generic Version 8.0, 2021) are available for this site:	There will be no direct effects as the proposed project footprint is located outside of the European site.

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 24/03/2021	Conservation Objectives	Likely Zone of Impact and Significant Effects Determination
<p>Distance: 5.8km</p>		<p>“To maintain or restore the favourable conservation status of habitats and species of community interest”</p> <p>and</p> <p>“To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA”</p>	<p>No pathway for indirect effects has been identified on the SCIs for which the SPA has been designated given the nature and scale of the proposed project. The proposed development will not involve any loss or deterioration of habitat for the SCI species and is sufficiently removed from the SPA such that there is no potential for disturbance related effects. No potential for indirect effects exists.</p> <p>There is no potential for significant effects and the SPA is not located within the Likely Zone of Impact.</p>
<p>River Shannon and River Fergus Estuaries SPA [004077]</p> <p>Distance: 10.0km</p>	<ul style="list-style-type: none"> > [A017] Cormorant (<i>Phalacrocorax carbo</i>) > [A038] Whooper Swan (<i>Cygnus cygnus</i>) > [A046] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) > [A048] Shelduck (<i>Tadorna tadorna</i>) > [A050] Wigeon (<i>Anas Penelope</i>) > [A052] Teal (<i>Anas crecca</i>) > [A054] Pintail (<i>Anas acuta</i>) > [A056] Shoveler (<i>Anas clypeata</i>) 	<p>Detailed conservation objectives for this site, (Version 1, September 2012), were reviewed as part of the assessment and are available at www.npws.ie</p>	<p>There will be no direct effects as the proposed project footprint is located outside of the European site.</p> <p>Nautra Environmental Consultants carried out waterbird surveys of the Cashen Estuary during the winter 2017-2018 period. They concluded that ‘Of the non-breeding birds recorded in this survey, numbers of Golden Plover and Wigeon in the estuary are of national importance. Whooper Swans recorded here are part of a flock of international importance which may move around a number of sites within the north Kerry and Limerick area (Boland et al. 2010).’</p> <p>As per SNH (2016), Golden Plover have a core foraging range of 3km while Whooper Swan have a core foraging range of less than 5km. Wigeon have a core foraging range of 2.8km (Johnston et al., 2014). As the proposed works are located over 10km from this European site, no pathway for</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 24/03/2021	Conservation Objectives	Likely Zone of Impact and Significant Effects Determination
	<ul style="list-style-type: none"> > [A062] Scaup (<i>Aythya marila</i>) > [A137] Ringed Plover (<i>Charadrius hiaticula</i>) > [A140] Golden Plover (<i>Pluvialis apricaria</i>) > [A141] Grey Plover (<i>Pluvialis squatarola</i>) > [A142] Lapwing (<i>Vanellus vanellus</i>) > [A143] Knot (<i>Calidris canutus</i>) > [A149] Dunlin (<i>Calidris alpina</i>) > [A156] Black-tailed Godwit (<i>Limosa lapponica</i>) > [A157] Bar-tailed Godwit (<i>Limosa lapponica</i>) > [A160] Curlew (<i>Numenius arquata</i>) > [A162] Redshank (<i>Tringa tetanus</i>) > [A164] Greenshank (<i>Tringa nebularia</i>) > [A179] Black-headed Gull (<i>Chroicocephalus ridibundus</i>) > [A999] Wetlands 		<p>indirect effects has been identified on the SCIs for which the SPA. has been designated given the nature and scale of the proposed project including the separation in distance from the SPA.</p> <p>There is no potential for significant effects and the SPA is not located within the Likely Zone of Impact.</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 24/03/2021	Conservation Objectives	Likely Zone of Impact and Significant Effects Determination
<p>Tralee Bay Complex SPA [004188]</p> <p>Distance: 13.0km</p>	<ul style="list-style-type: none"> ➤ [A038] Whooper Swan (<i>Cygnus cygnus</i>) ➤ [A046] Brent Goose (<i>Branta bernicla hrota</i>) ➤ [A048] Shelduck (<i>Tadorna tadorna</i>) ➤ [A050] Wigeon (<i>Anas Penelope</i>) ➤ [A052] Teal (<i>Anas crecca</i>) ➤ [A053] Mallard (<i>Anas platyrhynchos</i>) ➤ [A054] Pintail (<i>Anas acuta</i>) ➤ [A062] Scaup (<i>Aythya marila</i>) ➤ [A130] Oystercatcher (<i>Haematopus ostralegus</i>) ➤ [A137] Ringed Plover (<i>Charadrius hiaticula</i>) ➤ [A140] Golden Plover (<i>Pluvialis apricaria</i>) ➤ [A141] Grey Plover (<i>Pluvialis squatarola</i>) ➤ [A142] Lapwing (<i>Vanellus vanellus</i>) ➤ [A144] Sanderling (<i>Calidris alba</i>) ➤ [A149] Dunlin (<i>Calidris alpina alpina</i>) 	<p>Detailed conservation objectives for this site, (Version 1, April 2014), were reviewed as part of the assessment and are available at www.npws.ie</p>	<p>There will be no direct effects as the proposed project footprint is located outside of the European site.</p> <p>Nautra Environmental Consultants carried out waterbird surveys of the Cashen Estuary during the winter 2017-2018 period. They concluded that ‘Of the non-breeding birds recorded in this survey, numbers of Golden Plover and Wigeon in the estuary are of national importance. Whooper Swans recorded here are part of a flock of international importance which may move around a number of sites within the north Kerry and Limerick area (Boland et al. 2010).’</p> <p>As per SNH (2016), Golden Plover have a core foraging range of 3km while Whooper Swan have a core foraging range of less than 5km. Wigeon have a core foraging range of 2.8km (Johnston et al., 2014). As the proposed works are located over 10km from this European site, no pathway for indirect effects has been identified on the SCIs for which the SPA has been designated given the nature and scale of the proposed project including the separation in distance from the SPA.</p> <p>There is no potential for significant effects and the SPA is not located within the Likely Zone of Impact.</p>

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 24/03/2021	Conservation Objectives	Likely Zone of Impact and Significant Effects Determination
	<ul style="list-style-type: none"> > [A156] Black-tailed Godwit (<i>Limosa limosa</i>) > [A157] Bar-tailed Godwit (<i>Limosa lapponica</i>) > [A160] Curlew (<i>Numenius arquata</i>) > [A162] Redshank (<i>Tringa tetanus</i>) > [A169] Turnstone (<i>Arenaria interpres</i>) > [A179] Black-headed Gull (<i>Chroicocephalus ridibundus</i>) > [A182] Common Gull (<i>Larus canus</i>) > [A999] Wetlands 		

3.2 European Sites with the Potential to be Significantly Affected by the Proposed Development

Preliminary assessment has found the proposed development has the potential to affect the following European Sites and their QIs/SCIs:

Lower River Shannon SAC [002165]

Following a review of the detailed Conservation Objective Supporting Documents and the known location of the proposed infrastructure in relation to the SAC, potential for direct and indirect effects has been identified in the absence of mitigation on the following QIs associated with the construction, operational and decommissioning phases of the proposed project and therefore require further assessment:

- > [1130] Estuaries
- > [1140] Mudflats and sandflats not covered by seawater at low tide
- > [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- > [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- > [1355] Otter (*Lutra lutra*)
- > [1160] Large shallow inlets and bays
- > [1170] Reefs
- > [1095] Sea Lamprey (*Petromyzon marinus*)
- > [1096] Brook Lamprey (*Lampetra planeri*)
- > [1099] River Lamprey (*Lampetra fluviatilis*)
- > [1106] Atlantic Salmon (*Salmo salar*) (only in freshwater)

3.3 Likely Cumulative Impact of the Proposed Works on European Sites, in-combination with other plans and projects

Where potential pathways for effect have been identified in Table 3.1, the potential for cumulative effects resulting from the proposed infrastructure when considered in combination with other plans and projects, cannot be discounted at this stage and further assessment is required.

4. ARTICLE 6(3) APPROPRIATE ASSESSMENT SCREENING STATEMENT AND CONCLUSIONS

The findings of this Screening Assessment are presented following the European Commission's Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2001) and Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EC, 2018) as well as the Department of the Environment's Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DoEHLG, 2010).

4.1 Data Collected to Carry Out Assessment

In preparation of the report, the following sources were used to gather information:

- Review of project specific information including detailed design drawings, hydrological and engineering reports/data.
- Review of NPWS Site Synopses, Conservation Objectives for the European Sites
- Review of 2019, 2013 and 2007 EU Habitats Directive (Article 17) Reports.
- Review of online web-mappers: National Parks and Wildlife Service (NPWS), EPA, Water Framework Directive (WFD).
- Review of OS maps and aerial photographs of the site of the proposed project.
- Review of relevant databases including National Biodiversity Ireland Database and available literature of previous surveys conducted in the area.
- Review of other plans and projects within the area.
- Site visit undertaken on the 8th of October 2019 by David McNicholas (B.Sc., M.Sc., MCIEEM) and Pat Roberts (B.Sc., MCIEEM).

4.2 Concluding Statement

It cannot be excluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the proposed development, individually or in combination with other plans and projects, would be likely to have a significant effect on the Lower River Shannon SAC.

It can be excluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the proposed development, individually or in combination with other plans and projects, would not be likely to have a significant effect on the Moanveanlagh Bog SAC, Akeragh, Banna and Barrow Harbour SAC, Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, Kerry Head SPA, River Shannon and River Fergus Estuaries SPA, Tralee Bay Complex SPA.

As a result, an Appropriate Assessment is required, and a Natura Impact Statement shall be prepared in respect of the proposed project.

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APPENDIX 2

**WATER FRAMEWORK
DIRECTIVE SCREENING
ASSESSMENT REPORT
(ECOEIREANN, 2020)**



Water Framework Directive Screening Assessment

Cashen Estuary Drainage Project

August 2020

Draft Report

Report Prepared For:

Black & Veatch on behalf of the OPW

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V02	Draft	09.11.2020	Incorporation of Screening Table and Agri-Economic Report	Not confidential	EC	JT	JT

Field Investigations and Data

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work. Where any data supplied by the client or from other sources have been used it has been assumed that the information is correct. No responsibility can be accepted by EcoNorth Ltd. for inaccuracies in the data supplied by any other party.

Declaration of Compliance

"The information which we have prepared and provided is true, and has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management's Code of Professional Conduct. We confirm that the opinions expressed within this document are our true and professional bona fide opinions."

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1. Introduction

EcoÉireann was commissioned by Black & Veatch Ltd on behalf of the Office of Public Works (OPW) to carry out a Water Framework Directive (WFD) Screening Assessment for the proposed improvement works to the River Feale Certified Drainage Scheme, Co. Kerry, central grid reference Q 903 333.

The purpose of this report is to provide information and appraise the potential for this project to have significant effects, either individually or in combination with other plans or projects, on any relevant waterbodies.

2. Legislation and Background

In response to the increasing threat of pollution and the increasing demand from the public for cleaner rivers, lakes and beaches, the European Union (EU) has developed the Water Framework Directive (WFD)(2000/60/EC). This Directive is unique in that, for the first time, it establishes a framework for the protection of all waters including rivers, lakes, estuaries, coastal waters and groundwater, and their dependent wildlife/habitats under one piece of environmental legislation. Previous European water legislation set objectives aimed at protecting particular uses of the water environment from the effects of pollution and guarding the water environment from dangerous chemical substances. The WFD takes many of these objectives forward. More importantly, it introduces additional, broader ecological objectives that are designed to defend, and where necessary restore the structure and function of aquatic ecosystems.

The Directive establishes an original, integrated approach to the protection, improvement and sustainable use of rivers, lakes, estuaries, coastal waters and groundwater within Europe. It impacts on the management of water quality and water resources and affects conservation, fisheries, flood defence, planning and environmental monitoring. It requires us to control all impacts – physical, polluting or otherwise – on our water resource.

Specifically, the WFD aims to:

- prevent further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems;
- promote sustainable water use based on a long-term protection of available water resources;
- enhance protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances;

- 
- ensures the progressive reduction of pollution of groundwater and prevents its further pollution; and
 - contributes to mitigating the effects of floods and droughts.

2.1 Water Framework Directive in Ireland

The WFD has been transposed into Irish law by means of a number of Regulations. These Regulations, listed below, cover governance, the shape of the WFD characterisation, monitoring and status assessment programmes in terms of assigning responsibilities for the monitoring of different water categories, determining the quality elements and undertaking the characterisation and classification assessments:

- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003);
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009);
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010);
- European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2010 (S.I. No. 610 of 2010);
- European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489 of 2011);
- European Union (Water Policy) Regulations 2014 (S.I. No. 350 of 2014).

The WFD requires EU Member States to consider a single system of water resource management through characterisation, protection and enhancement of water resources considered within the context of a river basin district (RBD). The WFD aims for monitoring are all-encompassing in the sense that all ambient surface water and ground-water monitoring and characterisation activity must relate to the achievement of the WFD objectives and must support ongoing programmes of measures aimed at maintaining or improving water quality (EPA, 2006).

The WFD aims to protect and enhance all waters – groundwater, rivers, lakes, transitional waters (estuaries) and coastal waters – and includes terrestrial ecosystems and wetlands directly dependent on aquatic systems. In contrast to the aims of many of the existing Water Directives, which seek to protect specific uses of water, the WFD is concerned, inter alia, with the protection of the aquatic ecosystem, prevention of further deterioration and, where necessary, its restoration, to achieve conditions (good status) in all waters that are no more than slightly degraded from those of the natural or reference state (EPA, 2008).

The default objectives of the WFD include the prevention of any deterioration in the existing status of waters, including the specific requirements to maintain 'high status' where it exists, and to ensure that all waters achieve at least 'good status' by December 2015. This new approach is different from previous water management strategies in that it is comprehensive



and structured. It is comprehensive in that it addresses the water environment in the whole river basin. It is structured in that it sets out specific activities that aim to identify and assess the status of all waters and characterise the pressures exerted on them, followed by the development and implementation of a prioritised management plan. The plan will set out objectives for each water body and contain appropriate measures to address identified problems (EPA, 2008).

The WFD makes provision for less stringent objectives or delayed targets in certain circumstances, including situations where the reversal of physical alterations is not practicable or is disproportionately expensive. In addition to the quality targets, the directive promotes the sustainable use of water resources, the progressive reduction and prevention of pollution of groundwater, the elimination of the discharge of specified hazardous substances and the mitigation of the effects of floods and droughts (EPA, 2008).

Article 4 of the WFD sets out the Directive's environmental objectives in detail, considers how those objectives will be best achieved and identifies possible exemptions from the objectives. The environmental objectives for Surface waters and Ground water are outlined below in Section 2.3 & 2.4, respectively.

The environmental objective for protected areas is:

- To achieve compliance with objectives and standards under which the individual protected areas have been established.

The Department of Housing, Planning and Local Government (DHPLG) is currently in the process of developing guidance in relation to a Water Framework Directive Screening Assessment in planning however, this process is ongoing, and not yet at a stage of development where it can be published. The Department are currently working towards a public consultation draft, which will be available in due course (Nicole Coughlan, DHPLG *pers comm*, 16/07/2020).

In Ireland, the presence of eutrophication is assessed using the Trophic Status Assessment Scheme (Toner et al., 2005). The scheme compares the compliance of individual parameters against a set of criteria indicative of trophic state. These criteria fall into three different categories which broadly capture the cause-effect relationship of the eutrophication process, namely nutrient enrichment, accelerated plant growth, and disturbance to the level of dissolved oxygen normally present:

- Eutrophic water bodies are those in which criteria in each of the categories are breached, i.e. where elevated nutrient concentrations, accelerated growth of plants and undesirable water quality disturbance occur simultaneously;
- Potentially Eutrophic water bodies are those in which criteria in two of the categories are breached and the third falls within 15 per cent of the relevant threshold value;
- Intermediate status water bodies are those which breach one or two of the criteria;

- 
- Unpolluted water bodies are those which do not breach any of the criteria in any category.

2.2 Second Cycle River Basin Management Plan (RBMP)

The directive runs in 6-year cycles with the second cycle currently active and running from 2016 - 2021. A RBMP for this period has been published by the Irish government and covers the whole of Ireland. The RBMP provides an assessment of the pressures on the water environment and proposed programme of measures to be implemented in the period to 2021.

This second-cycle plan aims to build on the positive aspects of the first cycle, and also to learn from those aspects which did not progress as well as they had been expected to do. Three key lessons emerged on the back of the first cycle River Basin Districts (RBDs), partly through the public consultation process, these were:

- the structure of multiple RBDs did not prove effective, either in developing the plans, or in implementing them. Therefore, a more sensible way of ensuring that resources are used efficiently and that the similar challenges faced across the country are addressed in a coherent way is through the development of a single River Basin Structure;
- governance and delivery structures in place for the first cycle were not as effective as expected. Due in part to the number of RBDs, the delivery arrangements were overly complex. In particular, the level of oversight of programme delivery and ongoing review was weak. Although national measures have generally been implemented effectively, the importance of local delivery for many measures was not well understood when the first-cycle Plans were being developed, or more importantly, when the implementation of the Plans was being considered;
- the targets set in the first cycle were not realistic. These targets were set at a time when the concept of river basin management planning was new both to EU member states and within an Irish context, before the economic downturn's impact on the capacity to deliver such targets was clear. Another issue was that the level of ambition was not necessarily grounded on a sufficiently well-developed evidence base.

The second cycle RBMP has classified the whole of the Republic of Ireland into a single Irish RBD which covers an area of 70,273km², with 46 catchment management units — consisting of 583 sub-catchments, with 4,829 water bodies.



2.3 WFD - Surface Waters

Under the WFD, surface water body status is classified on the basis of chemical and ecological status or potential. Ecological status is assigned to surface water bodies that are natural and considered by the EPA not to have been significantly modified for anthropogenic purposes. Ecological potential is assigned to artificial and man-made water bodies (such as canals), or natural water bodies that have undergone significant modification; these are termed Heavily Modified Water Bodies (HMWBs). The term 'ecological potential' is used as it may be impossible to achieve good ecological status because of modification for a specific use, such as navigation or flood protection. The ecological potential represents the degree to which the quality of the water body approaches the maximum it could achieve. The worst-case classification is assigned as the overall surface water body status, in a 'one-out all-out' system.

Ecological status is assessed using a number of specified biological quality elements such as phytoplankton, benthic invertebrates, macroalgae, angiosperms (seagrass and saltmarsh) and fish (transitional waters only). These elements are responsive to a variety of environmental pressures including nutrient and organic enrichment, hydromorphological alteration and chemical pollution. A number of physico-chemical parameters, such as dissolved oxygen and inorganic nitrogen and phosphorus, and a number of specific pollutants are also used in the assessment. Ecological status is classified into five categories based on the degree of deviation away from the reference condition for each of these individual elements. The five categories are high, good, moderate, poor and bad, which corresponds to a minor, slight, moderate, major and severe deviation from undisturbed conditions.

Chemical status is defined by compliance with environmental standards for chemicals that are priority substances and/or priority hazardous substances, in accordance with the Environmental Quality Standards Directive (2008/105/EC). This is assigned on a scale of good or fail. Surface water bodies are only monitored for priority substances where there are known discharges of these pollutants; otherwise surface water bodies are reported as being at good chemical status.

Any activity that has the potential to have an impact upon any of the components will need consideration to determine (i) whether it could cause deterioration in the status of a water body, (ii) whether it will compromise the ability of the water body to reach Good Ecological Status or Good Ecological Potential by the date specified in the RBMP.

Article 4 of the WFD sets out the Directive's environmental objectives in detail, considers how those objectives will be best achieved and identifies possible exemptions from the objectives. The environmental objectives for surface waters are outlined below:

- To prevent deterioration of the status of surface waters;
- To protect, enhance and restore surface waters, with the aim of achieving good status (ecological and chemical) for all water bodies;

- 
- To protect and enhance heavily modified water bodies and artificial water bodies in order to achieve good ecological potential and good chemical status;
 - To progressively reduce pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances into surface waters.

2.4 WFD - Groundwater

Classification of groundwater bodies differs from that undertaken for surface water bodies, in that the surface water standards relate to ecological status and these standards define the classification boundaries. Groundwater status does not directly assess ecology, but the classification process takes account of the ecological needs of the relevant rivers, lakes and terrestrial ecosystems that depend on contributions from groundwater.

Another key component of the groundwater classification is assessment of the impact of pollution on the uses (or potential uses) of groundwater from the groundwater body, for example water supply. Threshold values have been developed by the Environmental Protection Agency for forty pollutants that are causing a risk to groundwater bodies. They include inorganic substances, metals, pesticides and organic substances. Exceedance of a relevant threshold value at a representative monitoring point triggers further investigation to confirm whether the criteria for poor groundwater chemical status are being met. If the criteria for poor chemical status are met, a body or a group of bodies of groundwater is classified as being at poor chemical status.

Article 4 of the WFD sets out the Directive's environmental objectives in detail, considers how those objectives will be best achieved and identifies possible exemptions from the objectives. The environmental objectives for Groundwater are outlined below:

- To prevent deterioration of the status of groundwater;
- To protect, enhance and restore all bodies of groundwater and ensure a balance of abstraction and recharge, with the aim of achieving good groundwater status (quantitative and chemical);
- To reverse any significant and sustained upward trends in the concentration of pollutants in groundwater.



3. Guidance

This WFD screening report has been prepared with reference to the following guidance documents where relevant:

- Common Implementation Strategy for the Water Framework Directive. European Commission Guidance Note No. 3. Analysis of Pressures and Impacts;
- Common Implementation Strategy for the Water Framework Directive. European Commission Guidance Note No. 4. Identification and Designation of Heavily Modified and Artificial Water Bodies;
- Common Implementation Strategy for the Water Framework Directive. European Commission Guidance Note No. 5. Transitional and Coastal Waters – Typology, Reference Conditions and Classification Systems;
- Common Implementation Strategy for the Water Framework Directive. European Commission Guidance Note No. 10. Rivers and Lakes – Typology, Reference Conditions and Classification Systems;
- Common Implementation Strategy for the Water Framework Directive. European Commission Guidance Note No. 13. Overall Approach to the Classification of Ecological Status and Ecological Potential;
- Common Implementation Strategy for the Water Framework Directive. European Commission Guidance Note No. 21. Guidance for Reporting under the Water Framework Directive;
- Common Implementation Strategy for the Water Framework Directive and the Floods Directive. European Commission Guidance Note No. 35. WFD Reporting Guidance Version 6.0.6.

4. Methodology

4.1 Desk Study

The information collected for this report was based on a desktop study to screen the details of the proposed improvement works to the River Feale Certified Drainage Scheme.

Information relied upon included maps and ecological data from the following sources:

- Ordnance Survey of Ireland mapping and aerial photography available from www.osi.ie;
- Online data available on European sites as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie;
- Information on the location and operation of the potential development supplied by the client in the form of their own method statements, maps and related materials;

- 
- Information on the status and monitoring of waterbodies in Ireland (Environmental Protection Agency);
 - River Basin Management Plans developed as part of the Water Framework Directive (DHPLG);
 - Fishery data collected as part of the WFD classification process by Inland Fisheries Ireland.

4.2 Author's Qualifications & Expertise

This WFD Screening assessment has been prepared by Ecologist, Eoin Cussen MSc, reviewed by Principal Ecologist Claire Snowball BSc MSc MCIEEM, and approved by Senior Ecologist Mark Middleton BSc PGDip ACIEEM.

Eoin gained an honours degree in Zoology from University College Cork in 2014 and a Masters degree in Ecological Assessment from University College Cork in 2016. Eoin is an experienced ecologist and botanical specialist with over 2.5 years professional post-graduate experience. His relevant experience includes planning related casework for state and non-governmental organisations within Ireland, input to, and preparation of, Environmental Impact Statements (EIS), Appropriate Assessment (AA) screening assessments, Natura Impact Statements (NIS), preliminary habitat assessments & protected species assessments. He is an experienced ecologist and has extensive knowledge of survey and conservation management of forestry, coastal and estuarine habitats gained from professional experience. Eoin currently carries out a wide range of relevant work including ecological assessment and advisory works for a diverse group of commercial clients.

Claire has an honours degree in Zoology from Royal Holloway, University of London and a Masters degree in Wildlife Conservation and Management from the University of Newcastle upon Tyne. She has worked as an ecological consultant for over 15 years, undertaking surveys and assessments on small and large-scale projects throughout the UK and Ireland. Claire has worked on a large number of projects at all stages of the development process which require the assessment of impacts of works upon sites designated at a European level for their ecological importance.

Mark has an honours degree in Countryside Management from Liverpool John Moores University and a Postgraduate Diploma in Conservation Management from UEA. With over 25 years' experience working for regulatory agencies, charities and ecological consultancies Mark has gained considerable knowledge and expertise from working on a variety of environmental and ecology projects across the UK and Ireland. Recent roles have included assessing proposals and monitoring impacts of developments on nationally important and internationally important sites.



5. Overview of Proposed Project & the Receiving Environment

5.1 Description of Proposed Project

In the 1950's dredging of the estuary formed part of the wider River Feale Certified Drainage Scheme carried out by the Commissioners of Public Works, which also consisted of the construction of 295km of river channels, 144km of flood embankments and a number of hard structures including bridges, sluices and culverts. The objective of that scheme was to protect low-lying agricultural land (polders) from tidal inundation by high tides and provide a drainage outfall to the benefitting area of the scheme. In accordance with the 1945 Arterial Drainage Act, the Office of Public Works (OPW) is required to maintain the scheme in proper repair and effective condition.

It has been reported to OPW that higher and more prolonged flooding has been occurring in the low-lying polders that are drained by the OPW's sluiced back drain systems and that this is having a significant impact upon land drainage adjacent to the estuary. Subsequent consideration of the problem has identified that the bed levels at the estuary mouth have risen significantly in the intervening years since the River Feale Certified Drainage Scheme due to the progressive natural deposition of sand within the unmaintained wide section of the estuary, where tidal flows from the Atlantic Ocean meet the fluvial flows of the Feale catchment. This has resulted in reduced flow capacity through the estuary mouth on ebb tides, causing higher water levels in the main channel which in turn has reduced the discharge capability of existing sluices through the embankments and back-drain systems at certain times within the tidal cycle.

Following a detailed options appraisal process, a preferred option to provide pumping in each polder was selected. A pumping station or a number of pumping stations will be installed into each polder (with the exceptions of 12A and 12B which already have a pumping station), augmenting the existing gravity drainage, pumping water from existing drainages ditches on the defended side of the embankment into the river side regardless of the water level in the river.

A total of 16 pumping stations (6 electric and 10 wind driven) are proposed. The pumps will augment existing gravity drainage to reproduce drainage conditions when the scheme was first constructed (prior to sea level rise and sediment deposition in the main channel).

The pumps will be carefully managed, by OPW personnel, to improve the existing drainage as per the original scheme; electric pumps will only be in operation from March to October when the polders are actively grazed. The pumps will only be used periodically, during the grazing period (March-October), when existing gravity discharge requires supplementation such as periods of high rainfall or tidal inundation.



The proposed development is shown in Figure 1, below, with existing drainage scheme shown in Figure 2. A closer view of the proposed development and existing drainage scheme is shown in Appendix A, Figures A1-A3. Site Photographs are provided in Appendix B.



Figure 1: Proposed development

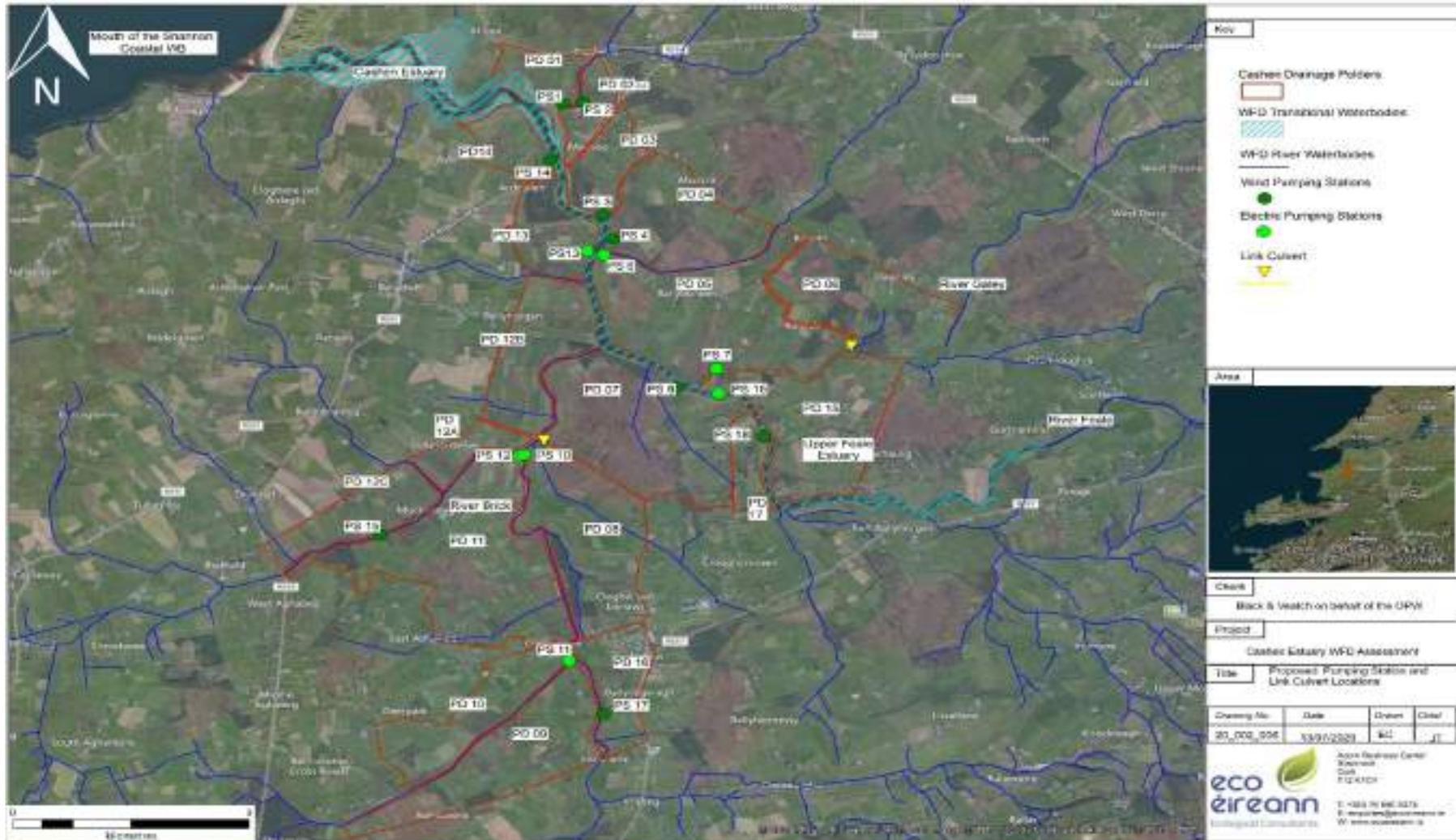




Figure 2: Existing OPW Drainage Scheme Modifications





The electric pumping stations will typically be used to drain larger polder areas and pump large volumes of water (>100 l/s). The pumping station will be similar to the existing installation at Rattoo, which pumps polders 12A and 12B, with submersible pumps (at least one duty and one assist) with all the necessary ancillaries such as screens, valves, sensors, telemetry, and power supply including transformers and electrical control panels.

The electric pumps are expected to have a very immediate benefit when fields are water-logged and a capacity of maintaining water levels in the polders relatively constant with a water-level controlled switch to trigger the pump on and off.

The wind driven pumps will have a slower response with a lower discharge capacity (typically <5 l/s) compared to the electric pumps, though they operate throughout the year, gradually reducing water levels and on average maintaining them at levels equivalent to the original scheme design.

It is proposed that pumping stations are sited near existing outfalls on the basis that this will be the low point in the existing drainage system and cause less disruption by minimising the need for re-grading the existing back drains. In addition, though existing outfalls do not necessarily have access tracks leading to their location, they are inspected on a relatively frequent basis which should make formalising access to them more straightforward.

Each pumping station will require the following associated infrastructure:

- Access track – approximately 3-4km of access track will be required in total. Where possible, the access track will follow the edge of a field to avoid breaking up of land parcels;
- Fencing and security set up – each pumping station will be surrounded by palisade fencing for safety reasons;
- Sump (depth to be determined following ground investigations);
- Possible intake weir (where required) set at a level sufficiently below surrounding ground level to enable drainage, but high enough to prevent drying out of drains – potentially stop log adjustable;
- Outlet pipe/channel through or over embankment with access (path and railing); and
- Outfall potentially including flap gate/valve, depending on outlet pipe/channel arrangement, including scour protection features downstream as required.

Wind driven installations would also require:

- Mechanical gear, steel tower and anchoring system.

Electric pumping station would also require:

- Pumps (submersible, cannister or other) with lifting davit(s), kiosk, etc., as required;

- Power supply and other electrical infrastructure such as transformers, MCC, electrical control panels and HV and LV Switchgear and variable-speed drives (VSD); and
- Sensors and telemetry system for pump controls.

Exact details of the requirements for each pumping station will be confirmed during the detailed design stage and following ground investigation and topographical survey.

Based on the proposed locations of the electric pumping stations 15-20km of new electric power supply cable will be required depending on the proposed connection points. The power supply will be provided via overhead pole mounted cables.

In addition to the pumping stations, two short culverts are proposed between Polders 5 and 6, and Polders 7 and 8 to provide suitable connectivity. The length of these culverts is estimated at 60m and 30m respectively. The culverts have been preliminarily sized as 1.05m diameter precast pipe culverts to allow free-flow conditions between the polders.

In the case of Polders 5 and 6, it was considered that hydraulic connectivity in the form of a connecting culvert between the polders would enable better drainage and that as a result, two pumping stations would be installed in Polder 5.

In the case of Polder 7 and 8, it is likewise proposed to connect the polders with a culvert just east of Sleveen Bridge and for a pumping station sited in Polder 8 to serve all of Polder 8 as well as the west section of Polder 7.

Water will be pumped from existing drainage ditches within the polders into the Rivers Brick, Galey and Feale which feed into the Cashen River at existing outfalls. Modelled pump rates for the proposed development are shown in Table 1, below. Water is already discharged from the polders to the rivers via gravity discharge from ditches, so a new hydrological connection is not being made. The method of discharge will be controlled to reduce the potential for to 'pulses' of potentially nutrient rich, anoxic water entering the watercourse.

Table 1: Cashen Estuary Modelled Pump Rates (June 2020)

Pump Station	Initial Proposed Type	Polder(s)	Peak Flow Through Existing Sluices	Max. Pump Rate – 6hrs	Max. Pump Rate –		Max. Average Flow Rate (30 day)
					24hrs	48hrs	
(m ³ /hr)							
1	Wind	01	3622	493	138	71	0.9
2	Wind	02	19148	5	1	1	0.0
3	Wind	03	17626	1358	483	255	3.6
4	Wind	04	14335	2162	795	462	19.2
6	Electric	½ of 05	28550	5315	2104	1431	30.0
7	Electric	½ of 05 & 06	35447	5700	2198	1500	32.2
9	Wind	½ of 07	12002	3081	1386	1147	52.2
10	Electric	½ of 07 & 08	38340	10957	4883	4039	174.7



Pump Station	Initial Proposed Type	Polder(s)	Peak Flow Through Existing Sluices	Max. Pump Rate – 6hrs	Max. Pump Rate – 24hrs	Max. Pump Rate – 48hrs	Max. Average Flow Rate (30 day)
11A	Wind	9	6846	828	303	196	4.9
11B	Wind	10	3738	452	193	170	10.7
12	Electric	11	46404	6395	2850	2229	53.8
13	Electric	13	16024	3596	1482	899	13.5
14	Wind	14	11401	1342	374	198	4.0
15	Wind	12C	2106	637	493	442	14.8
16	Electric	15	24372	3071	1230	926	25.3
17	Wind	16	9295	1234	375	220	3.7
18	Wind	17	5094	721	295	144	1.3

5.2 Description of Receiving Environment

The proposed project is located along and adjacent to the Cashen and Upper Feale Estuaries approximately 3km southwest of Ballybunnion in north-west Co. Kerry, adjacent to the Mouth of the River Shannon. The Upper Feale Estuary is located just downstream of Listowel and covers an area of 0.37km² (93 acres). The Upper Feale Estuary starts at the confluence of the River Galey and the River Feale and continues up to Finuge Bridge. The Cashen Estuary (area 2.67km²) is located adjacent to the town of Ballybunnion where it meets the Atlantic Ocean. The Cashen Estuary begins where the ocean meets it and extends upstream to the River Galey.

The majority of the riverbank, shoreline and channel in the estuary has been modified and manipulated over time by the OPW arterial drainage division with flood relief works. The River Feale and the Cashen Estuary have been identified as 'potentially modified' by the OPW, however, this designation has not been confirmed by the EPA. Therefore, they will be assessed as natural (i.e. 'unmodified') water bodies for the purposes of this assessment.

It should be noted that despite the Cashen and Upper Feale Estuaries not being characterised as Heavily Modified Waterbodies, a significant amount of hydromorphological modifications have been undertaken by the Commissioners of Public Works in the past (see, Figure 2, above). This includes the initial 1950's dredging of the estuary which formed part of the wider River Feale Certified Drainage Scheme. This scheme also consisted of the construction of 295km of river channels, 144km of flood embankments and a number of hard structures including bridges, sluices and culverts. The objective of that scheme was to protect low-lying agricultural land (polders) from tidal inundation by high tides and provide a drainage outfall to the benefitting area (86km²) of the scheme (CRFB, 2009; B&V and NOD, 2020).



The proposed works will take place within the Tralee Bay-Feale Catchment (Catchment ID No. 23) (Figure 3, below). This includes the area drained by the River Feale and all streams entering the tidal water of Tralee Bay and between Clogher Head and Kilconly Point, Co. Kerry, draining a total area of 1,780km² (EPA, 2018).

The catchment is characterised by an inland upland area underlain by shales and sandstones, with low-lying coastal area underlain by relatively pure karstified limestones with their associated features, and mountainous peninsular areas which are underlain by red sandstones. This catchment comprises the northern side of the Dingle Peninsula, and the catchment of the Feale River which drains the northern part of Kerry and the western edge of County Limerick (EPA, 2018). The Feale catchment is one of the most important sea trout *Salmo trutta* fisheries in Ireland and is also known as a salmon *Salmo salar* fishery (CRFB, 2008).

The Tralee Bay- Feale Catchment was initially included within River Basin Management Plan for the Shannon International River Basin District covering the period of 2009-2015. This Shannon International River Basin District was the largest RBD in Ireland covering more than 18,000km². It stretched from the source of the River Shannon in the Cuilcagh mountains in counties Cavan and Fermanagh to the tip of the Dingle peninsula in north Kerry. As well as the natural drainage basin of the Shannon river itself, which drains an extensive area of central Ireland, it also included coastal parts of Kerry and Clare which drain to the sea (including the River Feale catchment) (DEHLG, 2010).

The plan summarised the waterbodies that may not meet the environmental objectives of the WFD by 2015 and identified which pressures are contributing to the environmental objectives not being achieved. The plan also described the classification results and identified measures that can be introduced in order to safeguard waters and meet the environmental objectives of the WFD (DEHLG, 2010).

During the first cycle one river (within the Tralee Bay- Feale Catchment), the Smerlagh at the ford upstream of the river Feale confluence, failed chemical status assessments due to a breach of Polyaromatic Hydrocarbon standard (DEHLG, 2010).

The EPA has seven monitoring stations within the Cashen Estuary and three within the Upper Feale Estuary (Figure 4, below).

5.3 Cashen Estuary Agri-Economic Report

The potential financial and economic benefits of alleviating the constraints imposed on agriculture by the deterioration of the existing drainage conditions, within the project area, has been assessed by Morris Resource Economics Ltd (2018). The approach involved a high level assessment of the likely effects of hydraulic conditions in the river and arterial drainage network on field drainage conditions and hence on land use and the profitability of farming in the 'benefit area' served by the Cashen Scheme. The assessment focussed on the effects of impeded drainage on agricultural land use, rather than the effects of flooding per se.



Farming and land use in the lowland Feale catchment are characterised by grassland systems, mainly supporting dairy production and the fattening of dry livestock, mainly produced from dairy herds, with some beef cows suckling their offspring (Morris, 2018). Compared with the national average the dairy sector in Kerry and Limerick has marginally smaller average herd sizes (45 cows/farm cf 52), lower stocking rates (2.09 Lu/ha cf 2.24), grass used (8.2 t Dry Matter/ha cf 9.2), milk yields (5,139 litres/cow cf 5,332) and milk solids (841 kg/ha cf 955), and similar proportions of grass in the diet (81% of diet consumed cf 82%).

A review of livestock units by type of livestock over the period 2013-2017 showed that Dairy cows account for 39% of the total Livestock Units (LU) in the north Kerry area, Dairy Replacements 6%, Beef Cows 17% and Beef Cattle 37%.

A sample of 17 farmers showed that 65% of the farms and 80% of the total North Kerry area (much of which lies outside the Cashen benefit area) of this sample was associated with dairy farming, and the rest with the raising and fattening of cattle. Cereals were grown on less than 4% of the reported farm areas, with none grown within the adjacent project area. Stocking rates for the sample averaged about 0.9 LU/acre (2.15LU/ha) on dairy farms and 0.6 LU/acre (1.38 LU/ha) on drystock farms. These stocking rates broadly accord with national average for dairy farms at 2.24 LU/ha (2/55 LU/ha for the top 25% performing dairy farms) but are relatively low compared with the national average beef cattle farms at 1.77 LU/ha. A gradient of stocking rates is apparent within the project area between Good (1.74 -2.1 LU/ha), Bad (1.42 LU/ha) and Very Bad (0.75 LU/ha) drainage conditions.

Table 2: Main Farm Types within the Project Area based on a sample of 17 Farmers

Farm Types	No. of Farms	% of Farms	Total Acres	% of Total Area	Average Size (Acres)
Mainly Dairy	11	65%	1902	80%	173
Dry Stock/ Cattle	4	24%	339	14%	85
Let for Graze/ silage	2	12%	132	6%	66
All Farms	17	100%	2373	100%	140

The report concluded that there is a clear gradient of agricultural productivity and financial performance in the Cashen area according to variations in drainage conditions. High retained water levels in ditches and drains, reduced outfalls for field drainage and some localised pluvial flooding, have resulted in seasonally water-logged fields, in the worst cases making land unworkable. Approximately 1,700ha are estimated to benefit from the



improved drainage as part of this scheme. With the average net margin excluding subsidies, a measure of financial benefits to farmers, is about €200/ha over 1,676 ha on which drainage conditions change as a result of the project. The adjusted net margin, a measure of benefit to the economy, is about €120/ha. Expressed as a capital sum present value equivalent (over 50 years at 4%), the benefit due to the project is about €4,300/ha and €2,600/ha, respectively. These values indicate the potential 'losses' per ha incurred in the absence of a project, and hence the justification for intervention (Morris, 2018)

The review of farming performance confirms that dairy farming is far more profitable than drystock farming and is much less dependent on subsidies. Dairying is the main source of financial and economic benefits for drainage rehabilitation in the Cashen area. Therefore, dairy farming is the main driver for rehabilitation within the project area (Morris, 2018).

The report concluded that while dairy farming is the main driver for rehabilitation, in the absence of a project, it is likely that in the longer term high value dairy farming would not be lost, but would rather relocate elsewhere, to be substituted by drystock in the project area. This substitution was estimated to provide low margins to farmers and negative margins to the national economy.

Agriculture in the Cashen project area is an important contributor to the wider economy, through the incomes generated for farmers and workers and the effects of expenditure on supplies and services in the local area. Central estimates (in 2018 prices) indicate benefits to farmers of about €340,000/year excluding income support subsidies at full implementation, over a likely range of €230,000 to €430,000. Economic benefits to the national economy are about €200,000/year (likely range €80,000 to €320,000). 90% of benefits accrue to land within the polders.



Figure 3: Tralee Bay – Feale Catchment (Catchment ID: 23)





Figure 4: EPA monitoring Stations Within and Adjacent to the Project Area



6. Provision of Information for Screening

6.1 Relevant Catchments, Sub-catchments and Waterbodies

The proposed works will take place within the Tralee Bay-Feale Catchment (Catchment ID No. 23). This includes the area drained by the River Feale and all streams entering the tidal water of Tralee Bay and between Clogher Head and Kilconly Point, Co. Kerry, draining a total area of 1,780km² (EPA, 2018)

The River Feale rises near Rockchapel in the Mullaghareirk Mountains. The river flows northwest where it is joined by the Clydagh and Owveg Rivers. The Feale then flows through Abbeyfeale Town, where it is joined by the Allaghaun and Oolagh Rivers. The Feale is then joined by the Smearlagh River, which drains the central and eastern parts of the Stack's Mountains. It then flows westward, through Listowel collecting the River Galey and the River Brick before flowing out to sea through the Cashen Estuary 3 km south of Ballybunnion into the Mouth of the River Shannon Coastal Waterbody (EPA, 2018).

The Tralee Bay - Feale catchment comprises 14 sub-catchments with 80 river water bodies, 12 lakes, five transitional water bodies, seven coastal and eight groundwater bodies. There are no heavily modified or artificial water bodies in the Tralee Bay-Feale Catchment (EPA, 2018).

The Project area directly discharges to two Transitional waters; the Cashen Estuary (IE_SH_060_0100) and the Upper Feale Estuary (IE_SH_060_0200), which subsequently discharge into the Coastal waters of the Mouth of the Shannon (IE_SH_060_0000). The project area traverses two Ground waterbody areas; Kerry head (IE_SH_G_118) and Ballybunnion (IE_SH_G_027), details are shown in Table 3 below.

Table 3: Waterbodies (Surface and Groundwater) within the Project Area

Waterbody Name	Waterbody Type	Waterbody Code	WFD Status 2007-2009	WFD Status 2010-2012	WFD Status 2010-2015	WFD Status 2013-2018	WFD Risk
Cashen Estuary	Transitional	IE_SH_060_0100	Moderate	Moderate	Poor	Poor	At Risk
Upper Feale Estuary	Transitional	IE_SH_060_0200	Good	Good	Poor	Poor	At Risk
Mouth of the Shannon	Coastal	IE_SH_060_0000	Moderate	Good	Moderate	Good	Review
Kerry head	Ground	IE_SH_G_118	Good		Good	Good	Not at Risk
Ballybunnion	Ground	IE_SH_G_027	Good		Good	Good	Review
River Galey_050	River	IE_SH_23G010700	Poor	Good	Poor	Poor	At Risk
River Feale_090	River	IE_SH_23F010800	Moderate	Moderate	Moderate	Moderate	At Risk
River Brick_040	River	IE_SH_23B030700	Unassigned	Unassigned	Unassigned	Unassigned	Review



The project area is situated across five sub-catchments within the Tralee Bay-Feale Catchment, listed below in Table 4, and concentrated in the estuarine zone of these sub-catchments (see Figures 6 & 7, below).

Table 4: Sub-catchments within the Tralee Bay-Feale Catchment (Catchment ID: 23)

Sub-catchment ID	Sub-catchment Name	Relevance to Project
23_1	Galey_SC_020	Yes, adjoined to the project area
23_2	Feale_SC_010	No, situated upstream of project area, beyond the tidal reach
23_3	Galey_SC_010	No, situated upstream of project area, beyond the tidal reach
23_4	Feale_SC_030	No, situated upstream of project area, beyond the tidal reach
23_5	Feale_SC_020	No, situated upstream of project area, beyond the tidal reach
23_6	Brick_SC_010	Yes, adjoined to the project area
23_7	Ardfert_Oughter_SC_010	No, situated upstream of project area, beyond the tidal reach
23_8	Lee[Tralee]_SC_010	No, situated upstream of project area, beyond the tidal reach
23_9	Owencashla_SC_010	No, situated upstream of project area, beyond the tidal reach
23_10	Owenmore[Kerry]_SC_010	No, situated upstream of project area, beyond the tidal reach
23_11	AnDunRua_SC_010	No, situated upstream of project area, beyond the tidal reach
23_12	Glouria_SC_010	Yes, adjoined to the project area
23_13	Feale_SC_040	Yes, adjoined to the project area
23_14	Brick_SC_020	Yes, adjoined to the project area

Bold = relevant sub-catchments



Figure 5: Tralee Bay – Feale Sub-catchments





Figure 7: Surrounding Surface Waterbodies





A number of tributaries and minor streams flow through the proposed project area discharging directly into the Cashen and Upper Feale Estuaries, all of which have an 'Unassigned' WFD Status, except two, the River Feale and the River Galey whose classification ends upstream of the project area, where the River Galey becomes the Derra_West with an Unassigned Classification, these are listed below in Table 5.

Table 5: Tributaries & Minor Streams Discharging into the Project Area

Waterbody Name	Waterbody Code	WFD Status 2013-2018	WFD Risk	Sub-catchment Name & ID
Island Sack Little_010	IE_SH_23I100800	Unassigned	Review	Glouria_SC_010 (23_12)
Glouria_010	IE_SH_23G750710	Unassigned	Review	Glouria_SC_010 (23_12)
Knoppoge_South_010	IE_SH_23K120820	Unassigned	Review	Brick_SC_020 (23_14)
River Brick_040 (Drommartin)	IE_SH_23B030700	Unassigned	Review	Brick_SC_020 (23_14)
Mountcoal_010 (Ballyhennessy)	IE_SH_23M440980	Unassigned	Review	Feale_SC_040 (23_13)
River Feale_090	IE_SH_23F010800	Moderate	At Risk	Feale_SC_040 (23_13)
Derra_West_010 (River Galey)	IE_SH_23D090580	Unassigned	Review	Galey_SC_020 (23_1)
River Galey_050	IE_SH_23G010700	Poor	At Risk	Galey_SC_020 (23_1)

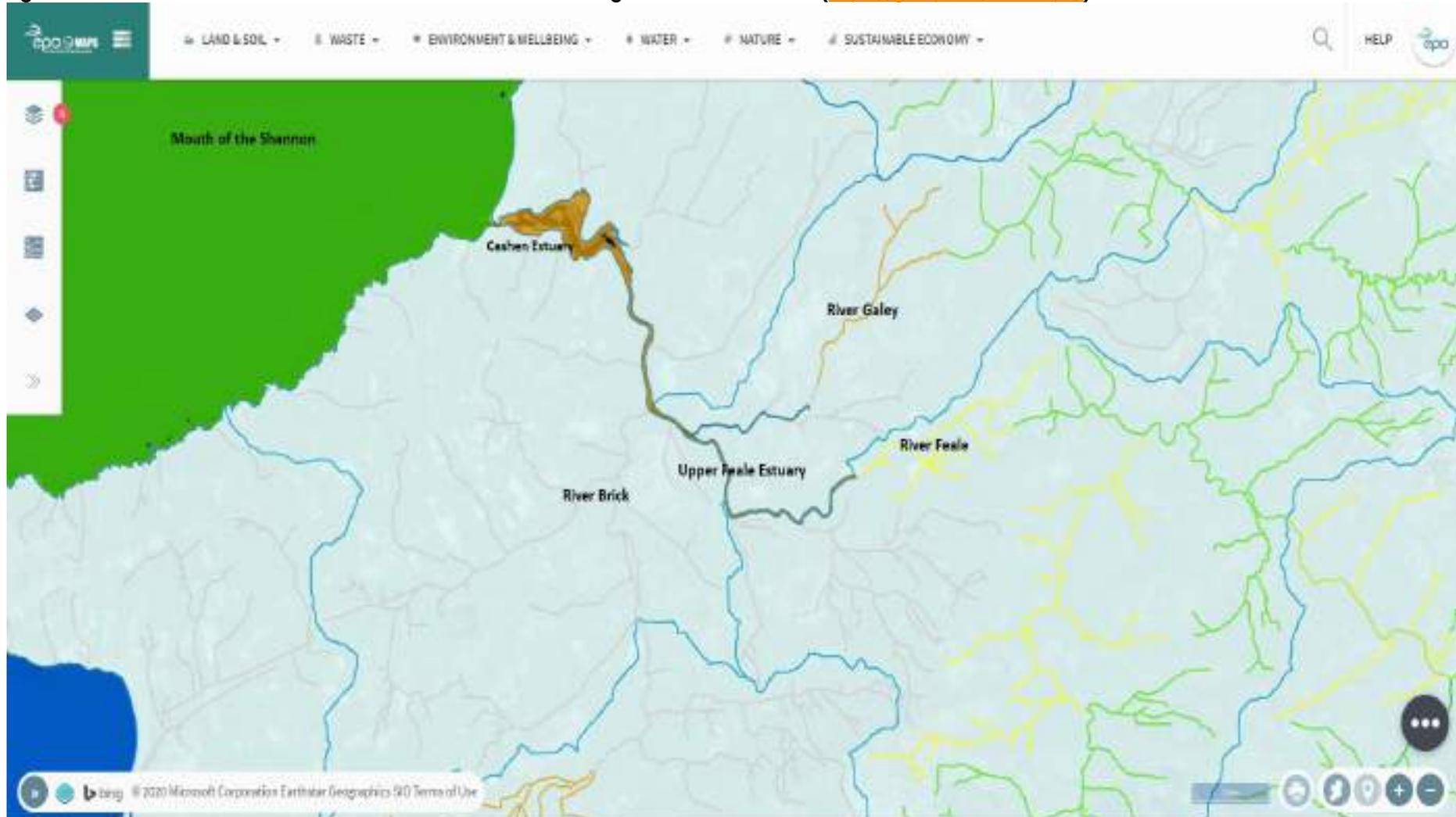
The River Feale (IE_SH_23F010800) is the main feeder river of the Upper Feale Estuary, and has been assigned a 'Moderate' WFD Status for 2013-2018 and is recorded as being 'At Risk'. Upstream of Listowel Town the River Feale has a 'Good' WFD classification for 2013-2018.

In the most recent WFD Classification, using data from 2013-2018, both the Cashen and Upper Feale Estuaries were classified as Poor. This Poor status was due to the Phytoplankton biological element (Ecological status), failing on both Chlorophyll values and species counts. It also failed in its oxygenation conditions (both DO% (dissolved oxygen percentage) and BOD (Biological oxygen demand)) and was classified as moderate (Georgina McDermott, EPA, pers comms. 13/07/2020).

In the most recent Trophic Status Scheme using data from 2017-2019, the Cashen Estuary was classified as intermediate, failing on dissolved oxygen conditions and biological oxygen demand. The Upper Feale was also classified as Intermediate due to high Chlorophyll values and also had the potential to fail the dissolved oxygen conditions (Georgina McDermott, EPA, pers comms. 13/07/2020).



Figure 8: Water Framework Directive 2013-2018 Status of Surrounding Surface Waterbodies (<https://gis.epa.ie/EPAMaps/>)



Green = Good, Yellow = Moderate, Brown/ orange = Poor, Grey = Unassigned; Blue lines demark the sub-catchments



The Cashen and Upper Feale Estuaries have been highlighted within the RBMP 2018-2021 (DHPLG, 2018) as Nutrient Sensitive Areas (NSAs), associated with the Listowel Wastewater Treatment Plant, as shown in Table 6 below. The Listowel WWTP was not compliant with the environmental objectives for NSAs and is not due to be upgraded to tertiary treatment.

Table 6: Nutrient Sensitive Areas and Associated WWTPs within the Project Area

Nutrient Sensitive Area		Agglomeration		Intersecting waterbodies		Objective met?	Notes
Name	Code	Name	Code	Name	Code		
Upper Feale Estuary	IETW_SH_2001_0035	Listowel	D0179	Upper Feale Estuary	IE_SH_060_0200	No	Tertiary treatment not in place. Not due to be included in 2021 upgrade
Cashen Estuary	IETW_SH_2001_0036			Derra_West_010	IE_SH_23D090580	No	

The Ballybunnion Groundwater body is in review for potential Risk of not meeting the WFD objectives due to elevated nitrate concentrations (EPA, 2018).

The River Feale has also been highlighted within the 2nd cycle RBMP 2018-2021 as an Area for Action (DHPLG, 2018), as indicated in Table 7 below.

Table 7: Recommended Areas for Action Impacting on the Project

Recommended Area for Action	No. of Waterbodies	Sub-catchments	Local Authority	Benefit
Feale	6	23_13 & 23_4	Kerry	<ul style="list-style-type: none"> • Would bring entire 23_4 sub-catchment to Good status. • Potential to work with local community groups that received LEADER Group funding. • One river water body is failing to meet protected area objectives for salmon. • One river water body is failing to meet protected area objectives for drinking water. • One transitional water body is failing to meet protected area objectives for Nutrient Sensitive Areas. • Headwaters to Upper Feale estuary. • Four deteriorated water bodies. • One At Risk High Ecological Status Objective water body.

As part of the programme of monitoring for the WFD a fish stock survey was carried out in the Cashen and Upper Feale Estuaries in September 2008. The report noted that the Feale catchment is one of the most important sea trout fisheries in Ireland and is also known as a salmon fishery. The report also noted that pollution problems have been recorded on the middle and lower reaches of the River Galey and on the main channel of the River Feale downstream of Listowel and at Abbeyfeale.

The fish stock surveys used a multi-method netting approach including two sampling methods (beach seines and fyke nets) during the Cashen and Upper Feale Estuary surveys. A total of 14 species were caught in the Cashen Estuary while 8 species were caught in the Upper Feale Estuary, as shown in Table 8 below. The majority of fish caught in the Upper Feale Estuary were freshwater species (CRFB, 2009).

Salinity values taken at the beach seine sites ranged from 1.5ppt to 0.0ppt in the Cashen Estuary and were 0.0ppt at all sites in the Upper Feale Estuary (CRFB, 2009).

Table 8: Fish Species and Abundance by Net Type in the Upper Feale and Cashen Estuaries, September 2008

Scientific Name	Common Name	Cashen Estuary		Upper Feale Estuary	
		Beach Seine	Fyke Net	Beach Seine	Fyke Net
<i>Chelon labrosus</i>	Thick Lipped Grey Mullet	1	-	-	-
<i>Platichthys flesus</i>	Flounder	184	31	45	151
<i>Sprattus sprattus</i>	Sprat	63	-	-	-
<i>Pomatoschistus microps</i>	Common Goby	329	-	76	-
<i>Pleuronectes platessa</i>	Plaice	4	-	-	-
<i>Ammodytes tobianus</i>	Lesser Sandeel	15	-	-	-
<i>Anguilla anguilla</i>	Eel	1	21	2	30
<i>Gobius niger</i>	Black Goby	-	-	1	-
<i>Pomatoschistus minutus</i>	Sand Goby	1,081	-	-	-
<i>Ciliata mustela</i>	5-bearded Rockling	-	2	-	-
<i>Salmo trutta</i>	Brown Trout	-	-	1	6
<i>Salmo trutta</i>	Sea Trout*	-	-	-	1
<i>Salmo salar</i>	Salmon	1	-	6	3
<i>Gasterosteus aculeatus</i>	3-spined Stickleback	5	-	7,268	-
<i>Scophthalmus rhombus</i>	Brill	6	-	-	-
<i>Syngnathus rostellatus</i>	Nilsson's Pipe Fish	2	-	-	-
<i>Spinachia spinachia</i>	15-spined Stickleback	1	1	-	-
<i>Phoxinus phoxinus</i>	Minnow	-	-	692	-

*Sea Trout were included as a separate "variety" of trout

Using a new WFD fish classification tool, Transitional Fish Classification Index (TFCI) developed for the island of Ireland using Northern Ireland Environment Agency (NIEA) and Central Fisheries Board (CFB) data; the Cashen Estuary was classified as 'Good' status (EQR = 0.60), while the Upper Feale Estuary was classified as 'Moderate' (EQR = 0.575) status (CRFB, 2009).

6.2 Significant Pressures in ‘At Risk’ Waterbodies within the Project Area

Where water bodies have been classed as ‘At Risk’ by water quality or survey data, significant pressures have been identified. The significant pressure affecting the greatest number of water bodies, including the River Feale and Galey, within the Tralee Bay-Feale Catchment is agriculture, followed by hydromorphological pressures, forestry, urban waste-water, peat workings, other (unknown), domestic waste-water and diffuse urban. The most significant pressures affecting Rivers are agriculture, Hydromorphology and forestry. The significant pressures affecting the majority of Transitional and Coastal water bodies in this catchment are agriculture, urban waste-water and diffuse urban run-off (EPA, 2018).

Agriculture

Agriculture is a significant pressure in the Cashen and Upper Feale Estuaries, the River Galey and the River Feale. The issues related to agriculture in these water bodies are diffuse phosphorus loss to surface waters due mainly in areas of improved pasture and point discharges from impervious surfaces such as yards and farm tracks, resulting in excess nutrients in surface waters (EPA, 2018).

Hydromorphology

The Upper Feale Estuary experiences a significant pressure due to the presence of embankments. Three river water bodies within Galey sub-catchment (SC23_1) are subject to extensive bank modification due to the presence of embankment schemes, while land drainage is impacting one river water body within the same sub-catchment. In addition, two river water bodies within the Galey sub-catchment are subject to extensive modification due to channelisation, which has led to high levels of siltation (EPA, 2018). Table 9 below identifies the Hydromorphological pressures.

Table 9: Hydromorphological Pressures in the Relevant Sub-catchments

Pressure	Sub-catchment	Waterbody Code
Channelisation	Galey_SC_020 (23_1)	Galey_040
	Galey_SC_020 (23_1)	Galey_050
Bank Modification (Embankment)	Galey_SC_020 (23_1)	Galey_050
	Galey_SC_020 (23_1)	Tarmon_Stream_010
Land Drainage	Galey_SC_020 (23_1)	Tarmon_Stream_010
	Galey_SC_020 (23_1)	IE_SH_060_0200 (Upper Feale Estuary)
In River Structures	Galey_SC_020 (23_1)	Galey_040

Urban Waste-water Treatment Plants

Urban Waste-Water Treatment Plants (WWTPs) and agglomeration networks have been identified as a significant pressure in both the Cashen and Upper Feale Estuaries (EPA, 2018) as illustrated in Table 10, below.



Table 10: WWTPs Identified as Significant Pressures in At Risk Waterbodies within the Project Area

Facility Name	Facility Type (p.e. – Population Equivalent)	Waterbody	2010-2015 Ecological Status	Expected upgrade Date
Listowel D0179	2,001 to 10,000 p.e.	Upper Feale Estuary	Poor	NA ¹
Listowel D0179	2,001 to 10,000 p.e.	Cashen Estuary	Poor	NA ¹
Ballybunnion D0183	2,001 to 10,000 p.e.	Cashen Estuary	Poor	NA ²
Ballyduff D0418	500 to 1,000 p.e.	Cashen Estuary	Poor	NA ²
Abbeydorney D0417	500 to 1,000 p.e.	Brick_020	Poor	NA ²
Lixnaw D0462	500 to 1,000 p.e.	Brick_040	Unassigned	NA ²

¹ The Listowel agglomeration network is scheduled to be upgraded by 2025, however, the WWTP, which is currently not scheduled to be upgraded, has been identified as the significant pressure impacting Upper Feale Estuary and Cashen Estuary.

² Currently not specified in improvement plans.

Extractive Industry

Peat drainage and working has been identified as a significant pressure in two relevant waterbodies – Galey_050 and Tarmon Stream_010 (Upstream headwaters of the River Galey). Excess sediment and elevated nutrient concentrations are the significant issues (EPA, 2018).

Diffuse Urban

Diffuse urban pressures, caused by misconnections, leaking sewers and runoff from paved and unpaved areas in Listowel, have been identified as a significant pressure in the Feale_090 river water body and are considered to be impacting on the Upper Feale Estuary. Elevated concentrations of phosphates and ammonia are the significant issues (EPA, 2018). Table 11 below summarises the information regarding the At Risk water bodies.



Table 11: Summary of Information on At Risk and Review Surface Waterbodies Within and Adjacent to the Project Area

Sub-catchment Code	Waterbody Name	Waterbody Code	Waterbody Type	Risk	WFD Status 2007-2009	WFD Status 2010-2015	High Ecological Status Objective Waterbody Y/N	Significant pressures	Date To meet Environmental Objective	Area For Action
23_1	Derra_West_010	E_SH_23D090580	River	Review	Unassigned	Unassigned	N	Hymo, Peat	2027	No
23_1	Galey_040	IE_SH_23G010500	River	At Risk	Moderate	Moderate	N	Ag, Hymo	2027	No
23_1	Galey_050	IE_SH_23G010700	River	At Risk	Poor	Poor	N	Ag, Hymo, Peat	2027	No
23_1	Tarmon_Stream_010	IE_SH_23T030500	River	At Risk	Poor	Moderate	N	Ag, Hymo, Peat	2027	No
23_12	Glouria_010	IE_SH_23G750710	River	Review	Unassigned	Unassigned	N	Ag, Hymo	2027	No
23_12	Island_Sack_Little_010	IE_SH_23I100800	River	Review	Unassigned	Unassigned	N	Ag, Hymo	2027	No
23_13	Mountcoal_23_010	IE_SH_23M440980	River	Review	Unassigned	Unassigned	N	Ag, Hymo	2027	No
23_14	Brick_040	IE_SH_23B030700	River	Review	Unassigned	Unassigned	N	Ag, Hymo, UWW	2027	No
23_14	Knoppoge_South_010	E_SH_23K120820	River	Review	Unassigned	Unassigned	N	Ag, Hymo, UWW	2027	No
23_13	Feale_080	IE_SH_23F010600	River	At Risk	Good	Moderate	N	Ag	2027	Feale
23_13	Feale_090	IE_SH_23F010800	River	At Risk	Moderate	Moderate	N	AG, DU, Hymo	2027	Feale
23_1	Cashen Estuary	IE_SH_060_0100	Transitional	At Risk	Moderate	Poor	N	Ag, UWW	2027	No
23_1	Upper Feale Estuary	IE_SH_060_0200	Transitional	At Risk	Good	Poor	N	Ag, Hymo, UWW	2027	Feale
23_12	Mouth of the Shannon (Has 23;27)	IE_SH_060_0000	Coastal	Review	Moderate	Moderate	N	Other	2027	No

Bold = Protected Areas - If a water body is one or more of the following: Drinking Water Protected Area; Bathing Water; Shellfish Area; Nutrient Sensitive Area or; a Natura 2000 site with a water dependent qualifying interest with a water quality and/or quantity conservation objective,



7. Assessment Methodology

Proposed developments that have the potential to impact on current or predicted WFD status are required to assess their compliance against the objectives defined for potentially affected water bodies. It should be considered whether the proposed development has the potential to:

- Cause a deterioration of a waterbody from its current or potential status; and/ or
- Prevent future attainment of Good status (or potential where not already achieved).

7.1 Deterioration Assessment

The European Court of Justice (CJEU) in July 2015 (C-461/13) clarified the definition of deterioration in the context of the WFD, in that;

- “deterioration of the status” of the relevant water body includes a fall by one class of any element of the “quality elements” even if the fall does not result in a fall of the classification of the water body as a whole;
- ‘Any deterioration’ in quality elements in the lowest class constitutes deterioration; and
- Certainty regarding a project’s compliance with the Directive is required at the planning consent stage; hence, where deterioration ‘may’ be caused, derogations under Article 4.7 of the WFD are required at this stage.

While deterioration within a status class does not contravene the requirements of the WFD, (except for Drinking Water Directive parameters in drinking water protected areas), the WFD requires that action should be taken to limit within-class deterioration as far as practicable. For groundwater quality, measures must also be taken to reverse any environmentally significant deteriorating trend, whether or not it affects status or potential.

The no deterioration requirements are applied independently to each of the elements that come together to form the water body classification as required by Annex V of the Water Framework Directive and Article 4 of the Groundwater Daughter Directive.

- **Surface Water:** To manage the risk of deterioration of the biological elements of surface waters, the no deterioration requirements are applied to the environmental standards for the physico-chemical elements, including those for the Moderate/Poor and Poor/Bad boundaries.
- **Groundwater:** The no deterioration requirements are applied to each of the four component tests for quantitative status and the five component tests for chemical status. The no deterioration requirement may not apply to elements at High status as elements at High status may be permitted to deteriorate to Good status, provided that:

- The water body's overall status is not High;
- The RBMP has not set an objective for the water body of High status;
- The objectives and requirements of other domestic or European Community legislation are complied with; and
- Action is taken to limit deterioration within High or Good status or potential classes as far as practicable.

Table 12: Surface Water Assessment Matrix

Effect	Description/ Criteria	Outcome
Major beneficial	Impacts, which taken on their own or in combination with others have the potential to lead to the improvement in the ecological status or potential of a WFD quality element for the entire waterbody.	Increase in status of one or more WFD element giving rise to a predicted rise in status class for that waterbody
Minor/ Localised Beneficial	Impacts when taken on their own or in combination with others have the potential to lead to a minor localised or temporary improvement that does not affect the overall WFD status of the waterbody or any quality elements.	Localised improvement, no change in status of WFD element
No Impact	No measurable change to any quality elements.	No change
Localised/ temporary adverse effect	Impacts when taken on their own or in combination with others have the potential to lead to a minor localised or temporary deterioration that does not affect the overall WFD status of the waterbody or any quality elements.	Localised deterioration, no change in status of WFD element when balanced against mitigation measures embedded in the Project.
Adverse Effect on class of WFD element	Impacts when taken on their own or in combination with others have the potential to lead to the deterioration in the WFD status class of one or more biological quality elements, but not in the overall status of the waterbody.	Decrease in status of WFD element when balanced against positive measures embedded in the Project.
Adverse effect on overall WFD class of waterbody	Impacts when taken on their own or in combination with others have the potential to lead to the deterioration in the ecological status or potential of a WFD quality element, which then lead to a deterioration of status/potential of waterbody.	Decrease in status of overall WFD waterbody status when balanced against positive measures embedded in the Project.



Table 13: Ground Water Assessment Matrix

Magnitude of Impact	Effect on WFD Element	Effect on WFD Status
Impacts lead to beneficial effect	Combined impacts have the potential to have a beneficial effect on the WFD element.	Improvement but no change to status of WFD element.
No measurable change to groundwater levels or quality.	No measurable change to WFD elements.	No change and no deterioration in status of WFD element
Minor localised or temporary effect	Combined impacts have the potential to lead to a minor localised or temporary adverse effect on the WFD element.	Combined impacts have the potential to lead to a minor localised or temporary effect on the WFD element. No change to status of WFD element and no significant deterioration at groundwater body scale.
Impacts when taken on their own have the potential to lead to a widespread or prolonged effect.	Combined impacts have the potential to have an adverse effect on the WFD element	Combined impacts have the potential to have an adverse effect on the WFD element, resulting in significant deterioration but no change in status class at groundwater body scale.
Impacts when taken on their own have the potential to lead to a significant effect.	Combined impacts in combination with others have the potential to have a significant adverse effect on the WFD element.	Combined impacts in combination with others have the potential to have an adverse effect on the WFD element AND change its status at the groundwater body scale.

7.2 Future Status Objectives

The RBMP is used to outline water body pressures and the actions that are required to address them. As highlighted above in Section 6 the River Feale has been classified as an Area for Action within the most recent RBMP, with a target date of 2027 to meet the environmental objectives of the WFD (DHPLG, 2018). Assessments on this project are based on the mitigation measures outlined within the 2nd cycle RBMP to alleviate identified significant pressures upon the water bodies.



8. Constraints

Although the Cashen and Upper Feale Estuaries are themselves classified under the WFD, the majority of the inflowing rivers and streams remain 'unassigned' under the WFD, especially the water bodies from the south, south-west and north-east including: the lower reaches of the River Brick and the River Glouria, the streams Island Sack Little, Knoppoge South and Mountcoal and numerous other minor streams and drains which discharge into the estuaries.

This lack of data for the majority of the inflowing minor water bodies however does not presents a large constraint on the overall assessment of the proposed project as the drainage scheme already exists currently with the aim of the project being to supplement/ upgrade the existing drainage in order to bring the affected area in line with previous drainage levels.

9. Water Framework Compliance Assessment

Both the surface water and ground water assessments examine the potential effects of the proposed project, which includes the installation and erection of 16 pumping stations (7 electric and 9 wind), installation of two new culverts (preliminarily sized at 1.05m diameter pre-cast concrete pipe), access track development and electricity connections (for the electric pumping stations only), on each of the WFD elements (biological, physico-chemical and hydromorphological surface water elements, and the quantitative and chemical groundwater elements).

9.1 Project Particulars

Each pumping station will require the following associated infrastructure:

- Fencing and security set up – each pumping station will be surrounded by palisade fencing for safety reasons;
- Sump (depth to be determined following ground investigations);
- Possible intake weir (where required) set at a level sufficiently below surrounding ground level to enable drainage, but high enough to prevent drying out of drains – potentially stop log adjustable;
- Outlet pipe/channel through or over embankment with access (path and railing); and
- Outfall potentially including flap gate/valve, depending on outlet pipe/channel arrangement, including scour protection features downstream as required.

Wind driven installations would also require:

- Mechanical gear, steel tower and anchoring system.

Electric pumping station would also require:

- Pumps (submersible, cannister or other) with lifting davit(s), kiosk, etc., as required;

- 
- Power supply and other electrical infrastructure such as transformers, MCC, electrical control panels and HV and LV Switchgear and variable-speed drives (VSD); and
 - Sensors and telemetry system for pump controls.

The overall project will also require 15-20km of new electric power supply cable, depending on the proposed connection points, provided by overhead pole mounted cables. Approximately 3-4km of access track will be required in total. Where possible, the access track will follow the edge of fields to avoid breaking up of land parcels.

The project will also include the creation of 2 short culverts to provide suitable connectivity between Polders 5 and 6 and 7 and 8. These will be inset 1.05m diameter precast concrete pipes to allow free flow conditions between the polders.

Key assumptions for the assessment of the project are as follows:

- Pumping station ground works - It is assumed that ground works will comprise excavation and levelling for foundations for placement of pump units, including realignment of the approach drainage channels and construction/ upgrade of the outflows including in stream scour protection measures (if required)
- Abstraction – it is assumed that no groundwater abstraction is required as part of the project, other than the already existent land drainage.
- Construction Environmental Management Plan (CEMP) – It is assumed that suitable plans will be put in place throughout the project through the implementation of a CEMP in order to reduce risks to the environment with specific reference to construction related surface water run-off and leakage of cementitious and construction related pollutants (i.e. fuels, lubricants etc.).

The construction components of significance include:

- Pump station ground works including excavation and levelling
- Realignment of the approach drainage channel to the pump station and embankment and outflow control structure (pipe/ channel through or over the embankments (with associated access path and railing))
- Construction and operation of access roads to the pump stations
- Construction of instream scour control measures (where necessary)

The operational components of significance include:

- Minor increase in discharge of existing agricultural drainage channels to supplement the level of discharge to that of the previously existing discharge levels

It is essential to note that all the proposed pumping stations will only be active within the active grazing period between March-October within any one year, with electric pump activity being restricted during this period to when existing gravity discharge requires supplementation, such as periods of high rainfall or tidal inundation. The wind pumps will be



continuously active (depending on wind conditions), providing continuous minor supplementation to existing drainage, see Table 1 above for modelled flow rates.

Table 14: Construction and Operational Phase Elements with the Potential to Affect Waterbodies

Activity	Works Element	Potential Effects
Access route and works-area construction	Potential excavation/ levelling of ground. Storage/ use of vehicles and construction materials	Generation of silt-laden/ hydrocarbon contaminated run-off/ spillage during creation, use or storage.
Pumping station construction	Ground works (site excavation and levelling including dewatering)	Generation of silt-laden/ hydrocarbon contaminated run-off
	Realignment of approach drainage channel including dewatering	
	Outfall creation including instream scour protection measures (if required)	
New culvert creation	Excavation and run-off including dewatering (if required)	Generation of silt-laden/ hydrocarbon contaminated run-off
Pumping station Operation	Discharge of agricultural drainage channels	Potential to cumulatively impact, with other upstream pressures, on the aim of the 2027 deadline to reach "Good" WFD Status for the Feale catchment

9.2 Key Baseline WFD Issues

The EPA have not classified the Cashen and Upper Feale Estuaries as Heavily Modified Waterbodies; despite this, a significant amount of modification has been undertaken by the Commissioners of Public Works in the past, including the creation of 295km of river channels, the embankment of 144km of river bank for flood protection purposes as well as numerous hard structures including sluices, bridges and culverts, and to ensure the low-lying polders, which are serviced by the Drainage Scheme, remain free from tidal and fluvial inundation, see Figure 2, above.

The EPA have highlighted that the Cashen and Upper Feale Estuaries were classified as 'Poor' in the latest WFD Status Assessment; this was due to the phytoplankton biological element, failing on both Chlorophyll values and Species counts. The estuaries also failed in their oxygenation conditions (Both DO% (dissolved oxygen percentage) and BOD (biological oxygen demand)). In the most recent Trophic Status Scheme using data from 2017-2019, the Cashen Estuary was classified as 'Intermediate' failing on DO% and BOD. The Upper Feale Estuary was also classed as 'intermediate' due to high chlorophyll values and also had the potential to fail on DO% conditions.

As highlighted above in Sections 6.2 & 6.3 the local estuarine and riverine environment is classed as having "Poor" or "Unassigned" WFD status with the overall objective to elevate overall WFD status to "Good" by 2027. The key factors contributing to the current "Poor" status include the phytoplankton biological element, failing on both Chlorophyll values and



Species counts and oxygenation conditions (Both DO% (dissolved oxygen percentage) and BOD (biological oxygen demand)). The most significant pressures impacting on the waterbodies within the project area are: agriculture, hydromorphology, Wastewater Treatment Plants, peat extraction and diffuse urban pollution.

9.3 Potential Source Impacts/ Pressures

For surface water the potential effects identified are as a result of:

- Pollution i.e. mobilisation of sediment (excavation, disturbed ground and stockpiles) and potential spillage of hydrocarbons/ pollutants from construction plant operations;
- Increased modification to the estuary, through the instream installation of outflows and scour protection measures;
- Temporary diversion of drainage channels during realignment;
- Increased discharge of existing agricultural drainage channels at times when the existing gravity drainage requires supplementation to dewater the polders between March-October of any one year.

For Groundwater the potential effects identified are as a result of:

- Pollution due to discharges/ spillages during the construction phase.

The erection of the overhead electric cabling is not considered to impact on the surrounding waterbodies, so long as surface water run-off precautionary measures are implemented as part of the CEMP, to prevent excess siltation within the adjoining agricultural drains.

The erection of the surrounding security fences are also not considered to impact on the surrounding waterbodies, so long as surface water and construction run-off precautionary measures are implemented as part of the CEMP, to prevent excess siltation and pollutants entering the adjacent agricultural drains.

The creation and installation of 2 new culverts providing connectivity between Polders 5 & 6 and Polders 7 & 8, should be conducted in the dry (as far as possible) to reduce the chances of sediment pulses and construction related pollutants entering the adjoining agricultural drains during construction.

9.4 No Deterioration Assessment

9.4.1 Surface Waterbodies

The project is directly connected to arterial drainage channels which discharge to the adjacent WFD surface water bodies and subsequently into the adjoining transitional and coastal WFD waterbodies.



There is the potential for localised effects from land take and ground works as a result of construction in close proximity to the existing agricultural drains which may cause a loss of habitat. However, this is unlikely to be significant at waterbody scale and it is considered that habitats will recover naturally.

There is the potential for localised temporary impacts on water quality in the adjoining surface waterbodies from the mobilisation of sediment or release of hydrocarbons, or pollutants due to the excavation works required to create the pumping stations, realigned drainage channels and outflows. This impact is not expected to increase at the waterbody scale and any impacts are likely to be minor and localised to the agricultural drains and the area of outflow.

Should any unforeseen water quality issues be identified during future ground investigations, which are likely to follow the commissioning of the project, further mitigation measures will be embedded into the design to limit any adverse impacts on the surface waterbodies.

The Outline CEMP will mitigate potential impacts on the adjoining waterbodies from spillages, sedimentation and pollution during construction. Construction methods should follow Inland Fisheries Ireland guidance – Guidelines on the Protection of Fisheries During Construction Works in and adjacent to water (2016).

There is potential for minor impacts on habitat, water quality and hydromorphology as a result of the realignment of the agricultural drainage channels and construction of outflows during the construction and operation phases of the project. Any impacts are likely to be localised to the agricultural drains and the area of outflow creation/ upgrade and are not expected to be significant at the water body scale.

Therefore overall, the project is not expected to result in significant deterioration or change in surface water body status.

9.4.2 Ground Waterbodies

It is anticipated that the project will involve some minor dewatering of pumping station excavations, although the potential to impact the WFD status of the groundwater body is very low as the impacts will be localised to the area of the pumping station and given the presence of low permeability soils and adjacent surface water flows, these will limit the potential construction impacts of the project on the groundwater waterbody.

Should any unforeseen water quality issues be identified during future ground investigations, which are likely to follow the granting of the project further mitigation measures will be embedded into the design to limit any adverse impacts on the groundwater body. Overall, the Project is not expected to result in significant deterioration or change in groundwater body status.

Overall, the project is not expected to result in significant deterioration or change in the ground-waterbody status.

9.4.3 Future Status Objective

A portion of the River Feale catchment has been highlighted within the 2nd cycle RBMP 2018-2021 as one of 190 Areas for Action prioritised nationally for particular attention during this RBMP cycle (2018–2021), which requires multidisciplinary and cross-agency approaches to improving water quality (DHPLG, 2018). This designation does not however include the estuarine waterbodies but focusses on the freshwater portion of the River Feale upstream from the project area.

The overall WFD status objective in the 2nd Cycle RBMP 2018-2021 for the adjoining waterbodies is “Good” by 2027. Current WFD status is highlighted below in Table 15.

Table 15: WFD Type, Status and Risk Status of Potentially Affected Waterbodies

Waterbody Name	Waterbody Type	Waterbody Code	WFD Status 2013-2018	Risk
Mouth of the Shannon	Coastal	IE_SH_060_0000	Good	review
Cashen Estuary	Transitional	IE_SH_060_0100	Poor	At Risk
Upper Feale Estuary	Transitional	IE_SH_060_0200	Poor	At Risk
River Feale	River	IE_SH_23F010800	Moderate	At Risk
River Galey	River	IE_SH_23G010700	Poor	At Risk
River Brick	River	IE_SH_23B030700	Unassigned	Review
Island Sack Little	River	IE_SH_23I100800	Unassigned	Review
Glouria	River	IE_SH_23G750710	Unassigned	Review
Ballyhennessy 23 (mountcoal_010)	River	IE_SH_23M440980	Unassigned	Review
Knoppoge_South	River	IE_SH_23K120820	Unassigned	Review
Drommartin (tributary of River Brick)	River	IE_SH_23B030700	Unassigned	Review
Kerry Head	Groundwater	IE_SH_G_118	Good	Not at Risk
Ballybunnion	Groundwater	IE_SH_G_027	Good	Review

The objective of the groundwater and coastal waterbodies is “Good” which for these waterbodies is currently being met. The focus therefore will be on the prevention of deterioration of the status of these waterbodies.

National measures set out within the 2nd Cycle RBMP 2018-2021, to achieve the objectives of the plan relate to the pressures outlined in Section 6.2, above, which are:

- Agriculture
- Hydromorphology
- Urban Waste-water Treatment Plants
- Extractive Industry
- Diffuse Urban

It is considered, as stated above in Section 9, that the existing agricultural drains are currently actively discharging through gravity sluices which have since their initial installation lost a significant proportion of their discharge capabilities and are causing waterlogging of the



adjacent fields (Polder areas). The proposed project is focussed on supplementing these existing drainage sluices via electric and wind driven pump stations to provide drainage supplementation during the active grazing season (March- October in any one year) when the fields are in use.

Considering the existing nature of the discharge from the agricultural drainage sluices, the proposed minor increase in discharge in a restricted timeframe and the lack of potential for long-term effects from the development, it is considered that the project will not prevent the WFD objectives from being achieved.

10. Conclusion

The mobilisation of sediment and potential spillage of construction related fuels or chemicals are temporary impacts and can be managed through the implementation of a CEMP, and so these impacts will be localised and should not affect the overall WFD status of the waterbodies or the aim for the waterbodies to reach 'Good' WFD status by 2027.

It is considered that due to the limited extent and minor dewatering required as part of proposed project and the likely presence of low permeability soils in the project area, that the proposed project will have no effect on groundwater WFD status..

The minor increase in modification to the already somewhat heavily modified estuary, see Figure 2 above and Appendix B below, is considered likely to have a very minimal effect due to the dispersed nature and the localised limited numbers of the development across a large area of the estuary and the relatively minor works proposed (i.e. upgrade of existing sluices and potentially (unconfirmed) instream scour protection measures, if required). It is considered that these proposed works will have a minimal impact on the existing WFD status and will likely not limit the waterbodies goal for achieving 'Good' WFD status by 2027 due to the existing modified nature of the estuary. Furthermore, these will comprise very small scale works at discrete locations throughout an extensive catchment.

As stated above this project has been proposed to maintain the long-term functionality of the existing agricultural drainage scheme. The majority of potential impacts related to the project are construction related surface water run-off/ pollution which can be prevented and mitigated against through the production of a CEMP. From the data available it is clear that the proposed project will result in a minor overall increase in agricultural drains discharging to the Cashen and Upper Feale Estuaries. This minor increase is not considered to impact on the waterbodies at the waterbody scale due to the limited and dispersed nature of the project across a large estuarine system. However as this project is directly linked to the adjacent waterbodies it should be considered, an aim of the project, to incorporate the benefitting land owners into an agri-environmental scheme focussed on water quality enhancement, further consideration of this opportunity is set out below in Section 11. On this basis the proposed project screens out for detailed assessment, with a number of recommendations outlined below.



11. Recommendations

Measures have been identified within the Second Cycle River Basin Management Plan to address the 'Significant Pressures' in 'At Risk' waterbodies, outlined in Appendix D and E, below. A number of these measures could be implemented or encouraged by the OPW throughout the project area. Specifically, in relation to reducing rural diffuse and point source pollutants from agricultural sources. The freshwater sections of the River Feale have also been highlighted within the Second Cycle River Basin Management Plan as an 'Area for Action' which requires inter-disciplinary and cross-departmental co-operation to employ effective methods of enhancing water quality in the area. A collaborative approach will be required in this instance whereby the OPW should work closely with the Local Authority, Kerry County Council's Water Division, Inland Fisheries Ireland (IFI) and the Environmental Protection Agency (EPA).

As stated in the Agri-Economic report (Morris, 2018) the promotion and adoption of Best Environmental Practice should be encouraged by the OPW through the uptake of the Green, Low-carbon, Agri-environment Scheme (GLAS) and the Nitrates Action Programme among landowners directly benefiting from and bounding the project area. The new (4th) NAP includes measures aimed at further strengthening the protection of water and attaining a level of soil fertility that is consistent both with efficient agricultural production and with effective water quality protection. The new measures — which include fencing off cattle to protect watercourses, distancing of drinking points from watercourses and prohibiting direct discharges to watercourses from farm roadways — also focus on intercepting and breaking nutrient-transport pathways and preventing sediment and nutrient losses to waters, through the provision of un-grazed/ cultivated buffer strips. Additional requirements placing limits on the application of fertiliser on high-organic content soils are also aimed at affording additional protection to sensitive areas (DHPLG, 2018).

It is recommended that a Construction Environmental Management Plan (CEMP) be developed to limit the potential impacts of the proposed project on the adjacent surface and groundwater waterbodies. This CEMP should detail all construction methods and should follow Inland Fisheries Ireland guidance – Guidelines on the Protection of Fisheries During Construction Works in and adjacent to Water (2016). This CEMP should be provided to the EPA and Local Authority Water Management Units for approval, prior to granting of the project.



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Appendix A – WFD Screening Assessment

Table A1 – Kerry Head & Ballybunnion Groundwater WFD Risk Screening Assessment

Groundwater		Scheme Elements	Cashen Arterial Drainage Scheme Upgrade			Overall Impact	Further WFD Assessment or Mitigation
IE_SH_G_118 & IE_SH_G_027		Phase (Construction / Operation)	Construction	Construction & Operation	Operation		
Kerry Head & Ballybunnion		Identified Quantitative Impacts	Pollution from spillages	Below Ground level works causing contamination	Below ground level pumping station (potentially mobilising contamination)		
Quantitative Elements	<p>1. Saline or other intrusions.</p> <p>To identify groundwater bodies where the intrusion of poor-quality water as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions.</p>	Predicted Change to Status Elements (Green = None, yellow = possibly, Red = Likely)	Minor dewatering potentially required within excavations for pumping stations, impacts considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area, the adjacent surface waterbody flows and the localised minor nature of the dewatering.	Minor excavations required to create drainage pumping station (including realignment of existing drains and dewatering) potentially causing an intrusion of poor-quality water. Impacts considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area, the adjacent surface waterbody flows and the localised minor nature of the works.	Below ground foundations could potentially cause intrusion of poor-quality water. Impacts are considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area, the adjacent surface waterbody flows and the localised minor nature of the works.	Potential localised minor impacts to surface waters. Potential to impact groundwater waterbody considered unlikely.	Impact considered unlikely to be significant at waterbody scale. A CEMP will be drawn up to minimise potential surface water run-off and spillages.
	<p>2. Surface water.</p> <p>To assess the impact of groundwater abstractions on the ecological status of surface water bodies.</p>		Minor dewatering potentially required within excavations for pumping stations, impacts considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area and the localised minor nature of the dewatering. A CEMP will be developed to reduce the potential of impacts to adjacent surface waterbodies from pollution and sedimentation.	Minor excavations required to create drainage pumping station (including realignment of existing drains). Impacts considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area, the adjacent surface waterbody flows and the localised minor nature of the works.	Impacts are considered to be unlikely on the ground-waterbody due to the low permeability soils underlying the area and the adjacent surface water flows. Impacts consider likely to affect adjacent surface waterbodies directly. A CEMP will be developed to reduce the potential of impacts to adjacent surface waterbodies from pollution and sedimentation.	Potential localised minor impacts likely only to the adjacent surface waterbodies	Impact considered unlikely to be significant at waterbody scale. A CEMP will be drawn up to minimise potential surface water run-off and spillages.
	<p>3. Groundwater Dependent Terrestrial Ecosystems (GWDTE's).</p> <p>To assess the impact of groundwater abstractions on the condition of GWDTE'S</p>		Minor dewatering potentially required within excavations for pumping stations, impacts considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area and the	Minor excavations required to create drainage pumping station (including realignment of existing drains) impacts considered to be unlikely due to low permeability soils underlying the area, the adjacent surface water flows and	Impacts considered to be unlikely due to low permeability soils underlying the area, the adjacent surface water flows and the localised nature of the project.	Potential localised minor impacts likely only to the adjacent surface waterbodies	Impact considered unlikely to be significant at waterbody scale. A CEMP will be drawn up to minimise potential surface



Chemical Assessment	4. Water balance. To identify groundwater bodies where abstractions exceed the available resource.	Predicted Change to Status Elements (Green = None, yellow = possibly, Red = Likely)	localised minor nature of the dewatering.	the localised nature of the project.			water run-off and spillages.
	Minor dewatering potentially required within excavations for pumping stations, impacts considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area and the localised minor nature of the dewatering.		Minor excavations required to create drainage pumping station (including realignment of existing drains) impacts considered to be unlikely due to low permeability soils underlying the area, the adjacent surface water flows and the localised nature of the project.	Impacts considered to be unlikely due to low permeability soils underlying the area, the adjacent surface water flows and the localised nature of the project.	Potential localised minor impacts likely only to the adjacent surface waterbodies	Impact considered unlikely to be significant at waterbody scale. A CEMP will be drawn up to minimise potential surface water run-off and spillages.	
	1. Saline or other intrusions. To identify groundwater bodies where the intrusion of poor quality water as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions.	Minor dewatering potentially required within excavations for pumping stations. impacts considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area, the adjacent surface waterbody flows and the localised minor nature of the dewatering.	Minor excavations required to create drainage pumping station (including realignment of existing drains) impacts considered to be unlikely due to low permeability soils underlying the area, the adjacent surface water flows and the localised nature of the project.	Below ground foundations could potentially cause intrusion of poor-quality water. Impacts are considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area, the adjacent surface waterbody flows and the localised minor nature of the works.	Potential localised minor impacts likely only to the adjacent surface waterbodies	Impact considered unlikely to be significant at waterbody scale. A CEMP will be drawn up to minimise potential surface water run-off and spillages.	
	2. Surface water. To assess the impact of groundwater abstractions on the ecological status of surface water bodies.	Minor dewatering potentially required within excavations for pumping stations. . impacts considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area, the adjacent surface waterbody flows and the localised minor nature of the dewatering.	Minor excavations required to create drainage pumping station (including realignment of existing drains) impacts considered to be unlikely due to low permeability soils underlying the area, the adjacent surface water flows and the localised nature of the project.	Impacts are considered to be unlikely on the ground-waterbody due to the low permeability soils underlying the area and the adjacent surface water flows. Impacts consider likely to affect adjacent surface waterbodies directly.	Potential localised minor impacts likely only to the adjacent surface waterbodies	A CEMP will be drawn up to minimise potential surface water run-off and spillages. A CEMP will be drawn up to minimise potential surface water run-off and spillages.	
3. GWDTE's. To assess the impact of groundwater abstractions on the condition of GWDTE'S	Minor dewatering potentially required within excavations for pumping stations. impacts considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area, the adjacent surface waterbody flows and the localised minor nature of the dewatering.	Minor excavations required to create drainage pumping station (including realignment of existing drains) impacts considered to be unlikely due to low permeability soils underlying the area, the adjacent surface water flows and the localised nature of the project.	Impacts are considered to be unlikely on the ground-waterbody due to the low permeability soils underlying the area and the adjacent surface water flows. Impacts consider likely to affect adjacent surface waterbodies directly.	Potential localised minor impacts likely only to the adjacent surface waterbodies	Impact considered unlikely to be significant at waterbody scale. A CEMP will be drawn up to minimise potential surface water run-off and spillages.		
4. Drinking Water Protected Areas (DrWPAs). To identify groundwater bodies failing to meet the	Minor dewatering potentially required within excavations for pumping stations. impacts considered to be unlikely on the ground-waterbody due to	Minor excavations required to create drainage pumping station (including realignment of existing drains) impacts considered to be unlikely due to low permeability	Impacts are considered to be unlikely on the ground-waterbody due to the low permeability soils underlying the area and the adjacent	Potential localised minor impacts likely only to the adjacent surface waterbodies	A CEMP will be drawn up to minimise potential surface		



<p>DrWPA objectives defined in Article 7 of the WFD or at risk of failing in the future.</p>		<p>low permeability soils underlying the area, the adjacent surface waterbody flows and the localised minor nature of the dewatering. impacts considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area, the adjacent surface waterbody flows and the localised minor nature of the dewatering.</p>	<p>soils underlying the area, the adjacent surface water flows and the localised nature of the project.</p>	<p>surface water flows. Impacts consider likely to affect adjacent surface waterbodies directly.</p>		<p>water run-off and spillages. A CEMP will be drawn up to minimise potential surface water run-off and spillages.</p>
<p>5. General quality assessment. To identify groundwater bodies where widespread deterioration in quality has or will compromise the strategic use of groundwater.</p>		<p>Minor dewatering potentially required within excavations for pumping stations. impacts considered to be unlikely on the ground-waterbody due to low permeability soils underlying the area, the adjacent surface waterbody flows and the localised minor nature of the dewatering.</p>	<p>Minor excavations required to create drainage pumping station (including realignment of existing drains) impacts considered to be unlikely due to low permeability soils underlying the area, the adjacent surface water flows and the localised nature of the project.</p>	<p>Impacts are considered to be unlikely on the ground-waterbody due to the low permeability soils underlying the area and the adjacent surface water flows. Impacts consider likely to affect adjacent surface waterbodies directly.</p>	<p>Potential localised minor impacts likely only to the adjacent surface waterbodies</p>	<p>Impact considered unlikely to be significant at waterbody scale. A CEMP will be drawn up to minimise potential surface water run-off and spillages.</p>



Table A2 Surface water WFD Risk Screening Assessment

Surface Waterbodies		Scheme Elements	Cashen Arterial Drainage Scheme Upgrade					Overall Impact	Further WFD Assessment or Mitigation	
IE_SH_060_0100 & IE_SH_060_0200		Phase (Construction / Operation)	Construction	Construction	Construction	Construction	Construction			Operation
Cashen & Upper Feale Estuaries		Identified Quantitative Impacts	Noise and Vibration	Temporary Landtake	Pollution due to discharges/ spillages	Scour	Realignment of drains & permanent Landtake	Increased discharge of agricultural drains		
WFD Classification Elements	Macrophyte & Phytobenthos - combined	Predicted Change to Status Elements (Green = None, yellow = possibly, Red = Likely)	Inensitive to impact. No measurable change to element anticipated.	Potential temporary effects from construction close to agri-drains due to the loss of habitat during works. This is unlikely to be significant at a waterbody scale and likely to recover naturally	Possible minor impacts where works are close to the agri-drains including excavations for pumping stations, may possibly mobilise contaminated sediments into the drains. Unlikely to affect the status at a waterbody scale following implementation of CEMP	Potential for increase in scour caused by works in and adjacent to the agri-drains. Due to the localised nature of the project across a large area it is considered unlikely to be significant at a waterbody scale.	Diversion/ realignment of agri-drains will result in the temporary loss of habitat within these drains. Impacts considered unlikely to be significant at a waterbody scale. With these habitats recovering over time. Landtake for pumping stations will mean some loss of habitat (mainly agricultural grassland) in proximity to the estuary considered unlikely to be significant at a waterbody scale	No significant impact anticipated due to the minor nature of these agri-drains and the size of the subsequent receiving waterbodies. With implementation of agri-environment schemes focussed on water quality enhancement it is considered that the impact of increased discharge of agricultural drains is unlikely to be significant.	Potential localised impacts, however, no overall deterioration in waterbody status anticipated	Potential impacts are unlikely to be significant at water body scale following implementation of a CEMP and implementation of agri-environment schemes focused on Water quality enhancement within the project area.
	Macroinvertebrates		Inensitive to impact. No measurable change to element anticipated.	Potential temporary effects from construction close to agri-drains due to the loss of habitat during works. This is unlikely to be significant at a waterbody scale and likely to recover naturally	Possible minor impacts where works are close to the agri-drains including excavations for pumping stations, may possibly mobilise contaminated sediments into the drains. Unlikely to affect the status at a waterbody scale following implementation of CEMP	Potential for increase in scour caused by works in and adjacent to the agri-drains. Due to the localised nature of the project across a large area it is considered unlikely to be significant at a waterbody scale.	Diversion/ realignment of agri-drains will result in the temporary loss of habitat within these drains. Impacts considered unlikely to be significant at a waterbody scale. With these habitats recovering over time. Landtake for pumping stations will mean some loss of habitat (mainly agricultural grassland) in proximity to the estuary considered unlikely to be significant at a waterbody scale	No significant impact anticipated due to the minor nature of these agri-drains and the size of the subsequent receiving waterbodies. With implementation of agri-environment schemes focussed on water quality enhancement it is considered that the impact of increased discharge of agricultural drains is unlikely to be significant.	Potential localised impacts, however, no overall deterioration in waterbody status anticipated	Potential impacts are unlikely to be significant at water body scale following implementation of a CEMP and implementation of agri-environment schemes focused on Water quality enhancement within the project area.
	Fish		Possible temporary displacement effects from construction woks close to estuary. Drains directly affected considered unlikely to support migratory species due to their limited extent and primarily agricultural drainage purposes	Potential temporary effects from construction close to agri-drains due to the loss of habitat during works. This is unlikely to be significant at a waterbody scale and likely to recover naturally	Possible minor impacts where works are close to the agri-drains including excavations for pumping stations, may possibly mobilise contaminated sediments into the drains. Unlikely to affect the status at a waterbody scale following implementation of CEMP	Potential for increase in scour caused by works in and adjacent to the agri-drains. Due to the localised nature of the project across a large area it is considered unlikely to be significant at a waterbody scale.	Diversion/ realignment of agri-drains will result in the temporary loss of habitat within these drains. Impacts considered unlikely to be significant at a waterbody scale. With these habitats recovering over time. Landtake for pumping stations will mean some loss of habitat (mainly agricultural grassland) in proximity to the estuary considered unlikely to be significant at a waterbody scale	No significant impact anticipated due to the minor nature of these agri-drains and the size of the subsequent receiving waterbodies. With implementation of agri-environment schemes focussed on water quality enhancement it is considered that the impact of increased discharge of agricultural drains is unlikely to be significant.	Potential localised impacts, however, no overall deterioration in waterbody status anticipated	Potential impacts are unlikely to be significant at water body scale following implementation of a CEMP and implementation of agri-environment schemes focused on Water quality enhancement within the project area.



Physico-chemical Elements	Ammonia	Predicted Change to Status Elements	No measurable change to element anticipated.	No measurable change to element anticipated.	Potential Minor impact where excavations and realignment of drains may possibly mobilise contaminated sediments. Unlikely to affect the status at a waterbody scale following implementation of a CEMP	Potential for minor impact where scour caused by works close or from the agri-drains may possibly mobilise contaminated sediments. Unlikely to affect the status at a waterbody scale following implementation of a CEMP	Possible minor impacts from mobilisation of sediments during drain realignment and substation excavation. Unlikely to affect the status at a waterbody scale following implementation of a CEMP.	Minor increase in existing discharge rate of agri-drains, not considered significant at a waterbody scale due to the minor dispersed nature of the drains and the size of the receiving waterbodies. With implementation of agri-environment schemes focussed on water quality enhancement it is considered that the impact of increased discharge of agricultural drains is unlikely to be significant.	Implementation of a CEMP and agri-environment schemes focused on water-quality enhancement will ensure potential impacts to water quality are limited spatially and temporally. No deterioration of status anticipated	Potential impacts are unlikely to be significant at water body scale following implementation of a CEMP and implementation of agri-environment schemes focused on Water quality enhancement within the project area.	
	Dissolved Oxygen										
	pH										
	Phosphate										
	Temperature										
	Copper										
	Zinc										
	Specific Pollutants										
Hydromorphological Elements	Quantity & Dynamics of River Flow	Predicted Change to Status Elements (Green = None, yellow = possibly, Red = Likely)	No measurable change to element anticipated.	No measurable change to element anticipated.	No measurable change to element anticipated.	Potential for minor impact at outflow locations. Unlikely to be significant impact at the water body scale.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	Potential localised impacts, however, no overall deterioration in waterbody status anticipated	Potential impacts are unlikely to be significant at water body scale following implementation of a CEMP and implementation of agri-environment schemes focused on Water quality enhancement within the project area.	
	Connection to Groundwater		No measurable change to element anticipated.	No measurable change to element anticipated.	Possible minor impact where foundations into groundwater may possibly mobilise contaminated sediments into the agri-drains. Unlikely to affect the status at a water body scale.	No measurable change to element anticipated.	No measurable change to element anticipated.	No measurable change to element anticipated.	Potential localised impacts, however, no overall deterioration in waterbody status anticipated	Potential impacts are unlikely to be significant at water body scale following implementation of a CEMP and implementation of agri-environment schemes focused on Water quality enhancement within the project area.	
	River Continuity		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	River Depth & Width		No measurable change to element anticipated.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	No measurable change to element anticipated.	Potential for minor impact at outflow locations. Unlikely to be significant impact at the water body scale.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	Potential localised impacts, however, no overall deterioration in waterbody status anticipated	Potential impacts are unlikely to be significant at water body scale following implementation of a CEMP and implementation of agri-environment schemes focused on Water quality enhancement within the project area.
	Structure & Substrate of river bed		No measurable change to element anticipated.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	No measurable change to element anticipated.	Potential for minor impact at outflow locations. Unlikely to be significant impact at the water body scale.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	Potential localised impacts, however, no overall deterioration in waterbody status anticipated	
	Structure of Riparian Zone		No measurable change to element anticipated.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	No measurable change to element anticipated.	Potential for minor impact at outflow locations. Unlikely to be significant impact at the water body scale.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	Potential for minor impact on agri-drains. Unlikely to be significant impact at the water body scale.	Potential localised impacts, however, no overall deterioration in waterbody status anticipated	



Appendix B - Proposed and Existing Sluices within the Project Area

Figure B1: Proposed Pumping Stations and Existing Sluices in the Northern Section of the Proposed Project

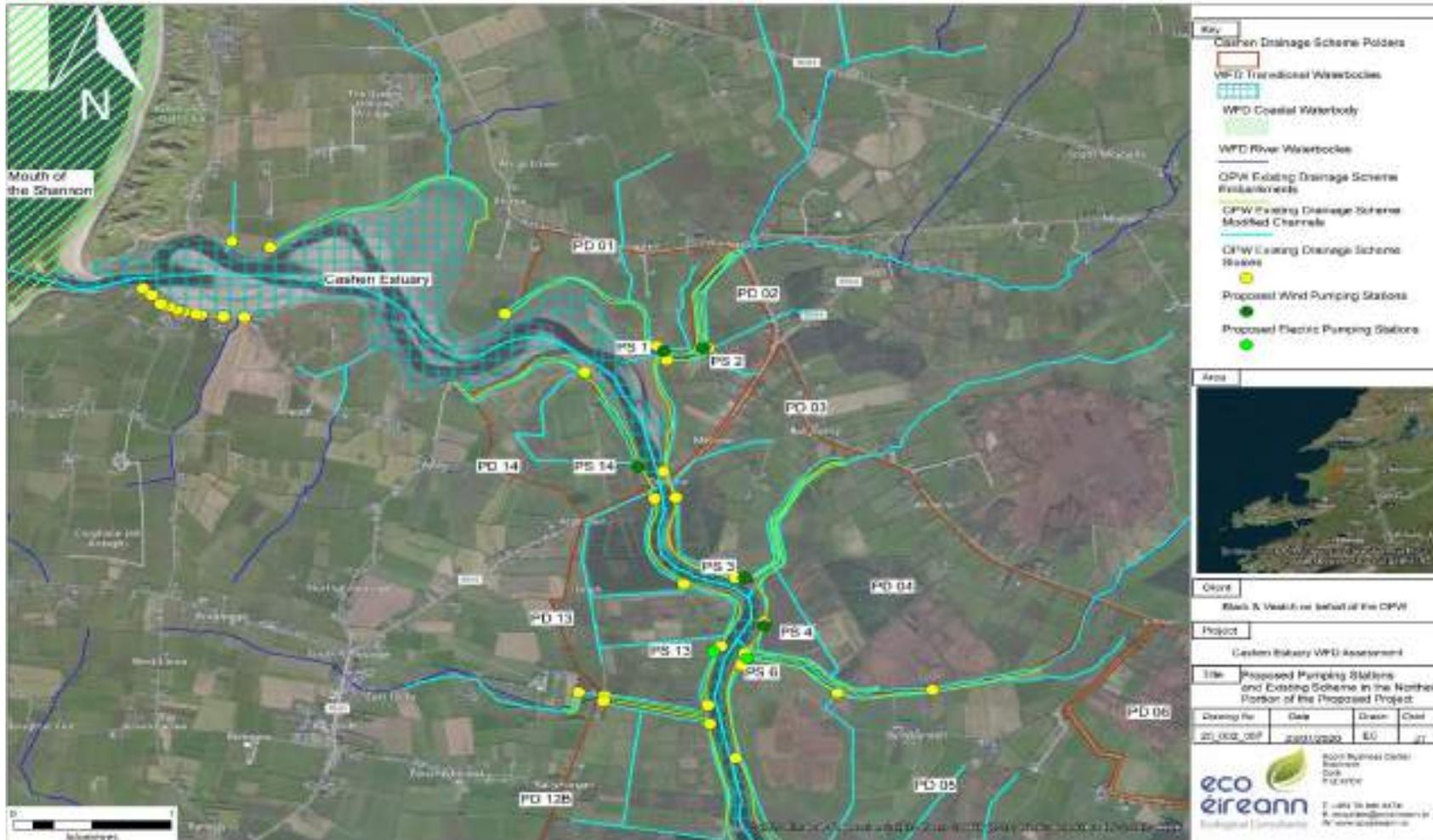




Figure B2: Proposed Pumping Stations and Existing Sluices in the Middle Section of the Proposed Project

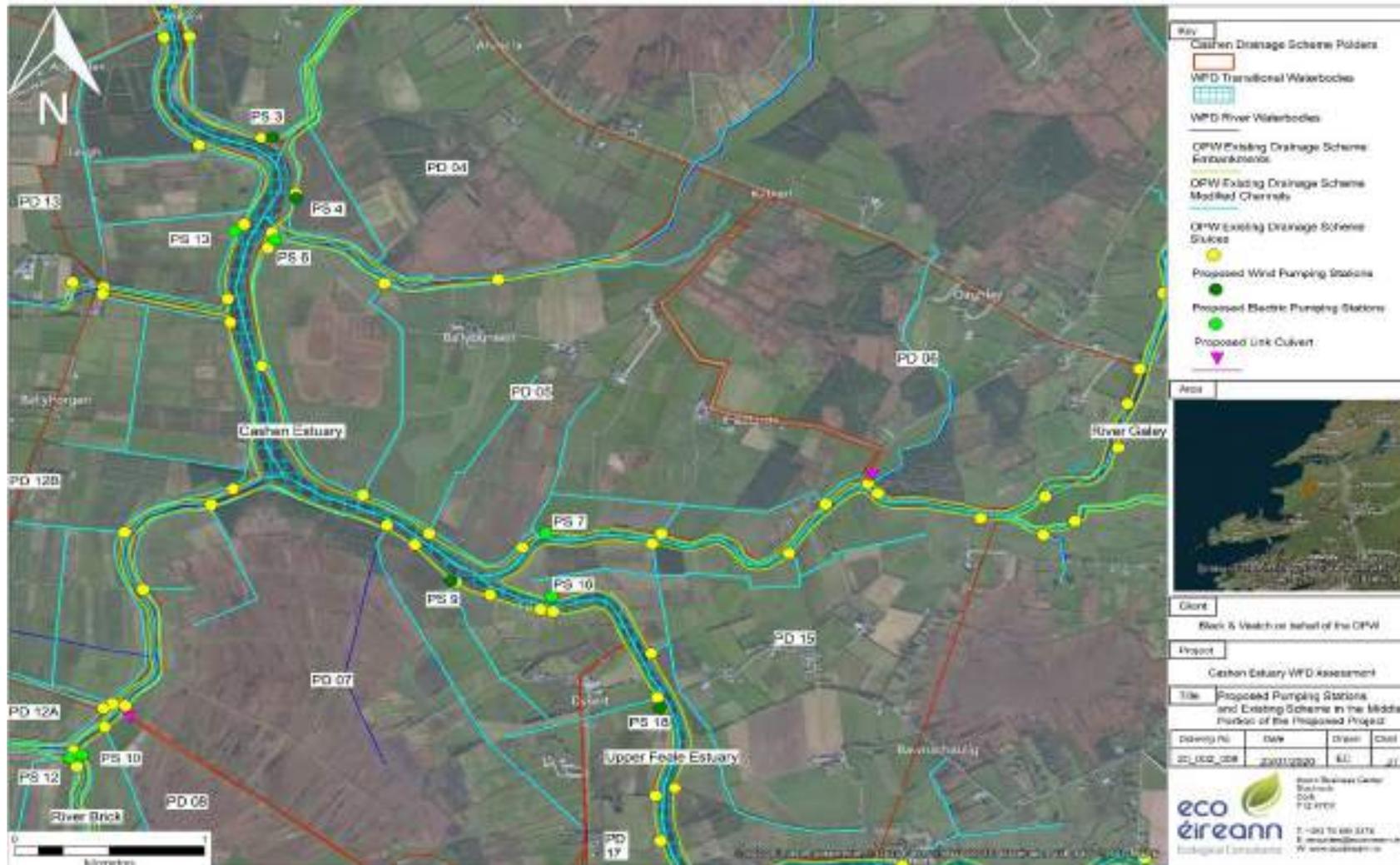
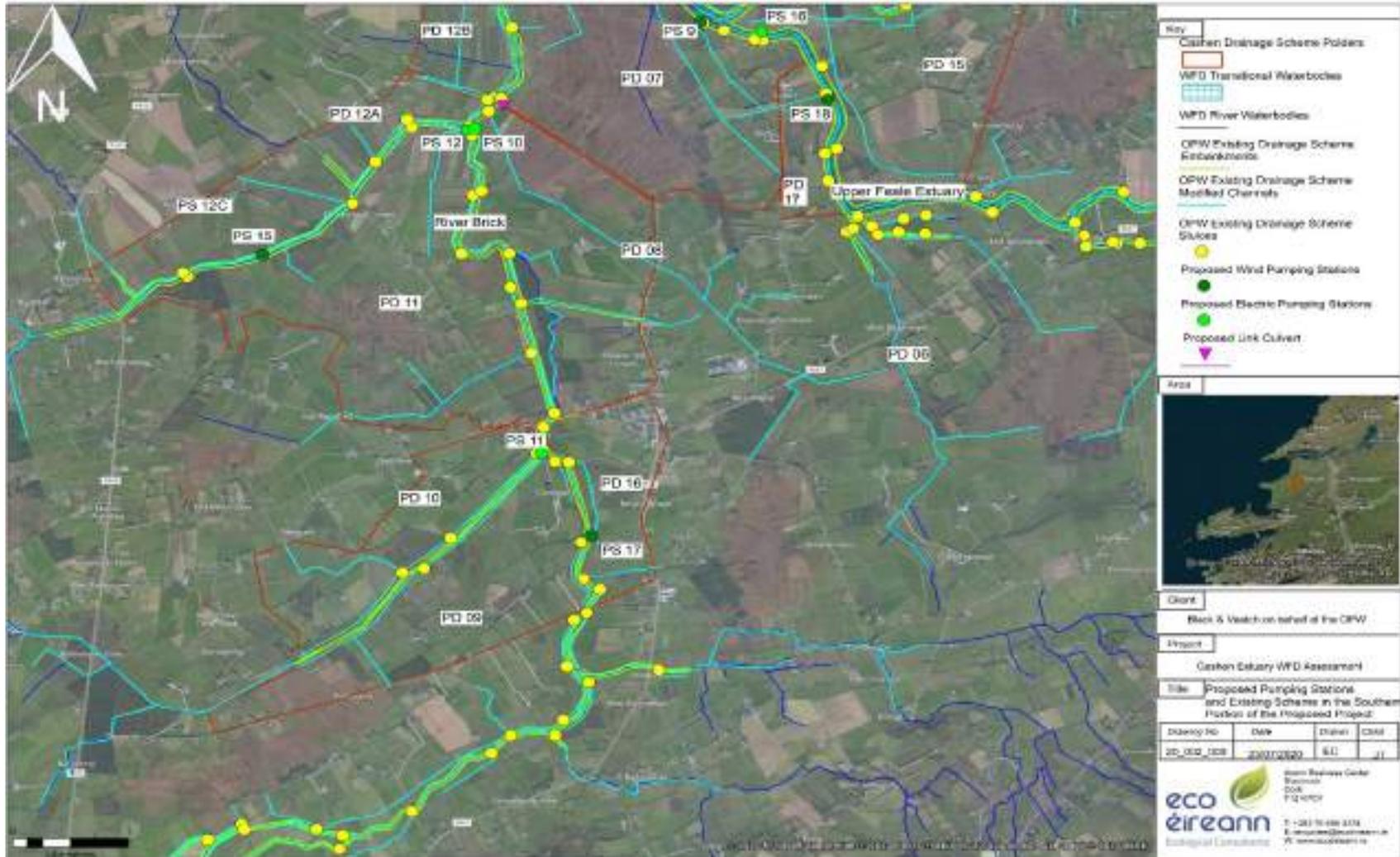




Figure B3: Proposed Pumping Stations and Existing Sluices in the Southern Section of the Proposed Project





Appendix C – Site Photographs

Photo 1: Existing Pumping station at Rattoo



Photo 2: Existing Pumping station at Rattoo





Photo 3: Existing Pumping station at Rattoo



Photo 4: Existing Pumping station at Rattoo





Photo 5: Existing pumping station outfall at Rattoo



Photo 6: View of existing pumping station outfall at Rattoo and embankment on right side of photo





Photo 7: Proposed location of new pumping station



Photo 8: Proposed location of new pumping station





Photo 9: Proposed location of new pumping station



Photo 10: View of existing gravity drainage sluices





Photo 11: View of embanked section of the Upper Feale Estuary



Photo 12: View of the Cashen Estuary



Appendix D – Significant Pressures on the Water Environment

Environmental pressures can arise either from “point-source pollution” from human activities undertaken in specific locations (e.g. farmyards, waste-water treatment plants and septic-tank systems) or “diffuse-source pollution” from widely dispersed human activities (e.g. land-spreading of fertilizers and surface runoff in urban areas) (DHPLG, 2018).

A risk assessment process was carried out, by the EPA, to identify water bodies that were at risk of not achieving their WFD objectives. The risk was assessed on the basis of the monitoring data for the period 2007–2015, including data on status, water quality trends and the scale of the challenges involved in meeting the environmental targets set by the WFD. Where the monitoring data indicated that there was a risk that the environmental objectives would not be achieved in respect of certain water bodies, an assessment was then carried out to identify the significant pressures impacting on water status (DHPLG, 2018).

The risk assessment of the significant pressures considered the linkages and dependencies between the sources of environmental pressures, and the pathways linking those pressures to the receptors, such as rivers, lakes or groundwater. Account was taken of the sensitivity of some water-based ecosystems to nutrients and/or sediment and/or water abstraction arising from human activities, and of physical alterations to surface waters — such as dredging, riverbank works and channelisation — which can also damage aquatic ecosystems. Models were used to help determine the most important environmental issues and pressures in each sub-catchment and to identify the key areas to target to achieve improved outcomes (DHPLG, 2018). Environmental Pressures are identified in the Table 8 below.

Table D: Environmental Pressures on Waterbodies Identified within the RBMP for Ireland 2018-2021 (DHPLG, 2018)

Environmental Pressure on Waterbodies	Description
Agriculture	Agriculture has been identified as a significant pressure in 780 (53%) of the 1,460 water bodies identified as At Risk of not meeting their environmental objective. Of these water bodies, 629 are rivers, 80 are lakes, 8 are coastal waters, 32 are transitional waters, and 31 are groundwater. Along the southern catchments, where the soils and subsoils are free draining, the estuaries are impacted by excess nitrogen from the contributing catchment areas.
Hydromorphology	Hydromorphology is a significant pressure in 345 (24%) water bodies identified as At Risk. Of these water bodies, 329 are rivers, 10 are lakes, and 6 are transitional waters. The pressure relates to physical modification or damage to habitat and natural river/lake processes, and changes functions caused by channelisation, land drainage, dams, weirs, barriers and locks, overgrazing, embankments and culverts.
Urban Waste-Water	Urban waste-water is a significant pressure in 293 (20%) water bodies identified as At Risk. This equates to 252 rivers, 15 lakes, 3 coastal waters, and 23 transitional waters. It should be noted that many water bodies contain multiple urban waste-water discharges of differing agglomeration



Environmental Pressure on Waterbodies	Description
	<p>sizes. The distribution of urban waste-water treatment plants means that they are largely focused in the eastern half of the country and are coincident with higher population centres</p>
Forestry	<p>Forestry is a significant pressure in 238 (16%) water bodies identified as At Risk. This equates to 215 rivers, 18 lakes, and 5 groundwater bodies. The pressure is largely associated with sediment from clear felling, drainage, and planting and establishment. The significant pressure is predominantly located in catchment headwaters and is often coincident with catchment boundaries.</p>
Peat Extraction	<p>Peat extraction has been identified as causing a significant risk to ecological status in 119 water bodies, which represents 8% of all water bodies that have been identified as At Risk. Of these, 115 are rivers, 3 are lakes and 1 is groundwater. The environmental impacts generally relate to suspended solids, ammonia and hydromorphological alterations. There is evidence that high levels of ammonia are being released from peat-extraction activities during the draining process and, along with suspended solids, may be causing ecological impacts in receiving water bodies.</p>
Domestic Waste-Water	<p>Domestic waste-water includes septic-tank systems associated with one-off housing and unlicensed private urban waste-water treatment plants, and is a significant pressure in 166 (11%) water bodies identified as At Risk. Of these, 137 are rivers, 15 are lakes, 2 are coastal waters, 6 are transitional waters and 6 are groundwater bodies.</p>
Urban Run-off	<p>Urban runoff relates to a mixture of misconnections, leakage from sewers and runoff from paved and unpaved areas and is a significant pressure in 136 (9%) water bodies identified as At Risk. This equates to 126 rivers, 2 lakes, 1 coastal water body and 7 transitional waters.</p>
Invasive Alien Species	<p>Invasive Alien Species (IAS) are non-native species introduced outside their natural range that threaten ecosystems, habitats and native species with environmental or socio-economic harm. Currently 37 species have been identified across the EU as a high priority for management, and nine of these occur in Ireland. The river basin public consultations on significant water-management issues in 2015 identified IAS as a significant issue for water management. For example, two species that pose a threat to aquatic ecosystems when present in riparian zones — Japanese Knotweed and Himalayan balsam — have been recorded throughout a significant proportion of the countryside by the National Biodiversity Centre.</p>
Water Abstraction	<p>Water abstraction is the taking of water from a surface water or groundwater body, either permanently or temporarily. Abstraction of water can involve pumping, piping, diverting water into a reservoir, or sinking a borehole or well. Water is abstracted for many purposes including public and private drinking-water supply, industrial use, use in the food and drink industry, hydro-power generation, agricultural and agri-industry use, recreational use (such as golf courses) and use in fisheries. The overall potential impact on the supporting flow and level conditions for rivers and lakes that is posed by known water abstractions is low.</p> <p>Nationally, abstractions from 137 (4% of 3,192 total) river water bodies, 76 (9% of 812 total) lakes and 41 (8% of 513 total) groundwater bodies have been identified for further assessment to determine if those abstractions are</p>



Environmental Pressure on Waterbodies	Description
	having a significant impact on the supporting flow and level conditions needed to support river and lake ecology.
Industry	Industry is a significant pressure in 101 (7%) water bodies identified as At Risk. Pressures include IPPC (20) and IE (26) facilities licensed by the EPA and industries with Section 4 Discharge to Water licenses (43) issued by local authorities. Of these 101 water bodies, 78 are rivers, 3 are lakes, one is a coastal water body, one is a transitional water body, and 18 are groundwater bodies.

Appendix E - Measures to Address Identified Significant Pressures

The 2nd Cycle RBMP 2018-2021 highlights a number of measures aimed at achieving progress across the RBD and how more local, catchment and water body-specific measures will be developed and implemented.

Agriculture

The Nitrates Regulations and the Nitrates Action Programme (NAP) are the basic measures laid out within the 2nd cycle RBMP for the protection of waters from pollution from agricultural sources. The primary focus is on preventing and reducing water pollution from nutrients (nitrogen and phosphorus) arising from agricultural sources. A number of complementary supporting measures are also outlined including (DHPLG, 2018):

- knowledge transfer initiatives to promote the adoption of best environmental practices
- targeted agri-environment schemes under the Rural Development Programme (RDP) 2014–2020
- the Agricultural Catchment Programme (ACP) and
- monitoring and modelling initiatives to assess the impact of sectoral changes on water quality.

The provisions of the Nitrates Regulations and the associated measures outlined in the NAP set the minimum environmental baseline that all Irish farmers must achieve. The latest (4th) NAP includes measures aimed at further strengthening the protection of water and attaining a level of soil fertility that is consistent both with efficient agricultural production and with effective water quality protection. The new measures — which include fencing off cattle to protect watercourses, distancing of drinking points from watercourses and prohibiting direct discharges to watercourses from farm roadways — also focus on intercepting and breaking nutrient-transport pathways and preventing sediment and nutrient losses to waters (DHPLG, 2018; DAFM, 2018).

The All Ireland RBMP highlights nine principal actions to address rural diffuse and point source pollution from agriculture, list below in Table 12 (DHPLG, 2018).

Table E1: Principal Actions to Address Rural Diffuse and Point Source Pollution from Agriculture

Principal Actions	
1	The new, strengthened Nitrates Action Programme (2018–2021) will be the key agricultural measure for preventing and reducing water pollution from nutrients (nitrogen and phosphorus) arising from agricultural sources. It will be complimented by other supporting measures listed below.
2	The integrated Governmental approach to the enforcement of the Nitrates Action Programme (2018–2021) will be maintained and strengthened. The inter-agency/ inter-departmental Water Quality and Agriculture working group will ensure increased targeting of inspections by local authorities based on water quality results and the outputs of the characterisation process.



Principal Actions	
3	The Pesticides Regulations and the Agriculture Environmental Impact Assessment Regulations will continue to form a key part of the actions over the second cycle. These will be strengthened by other supporting measures as outlined.
4	A new collaborative initiative between Government and industry called the "Sustainability Support and Advisory Programme" has been put in place for cycle 2 (2018–2021) to support the implementation of best practice (1) in 190 prioritised Areas for Action, to address existing environmental pressures and (2) across all dairy farmers through the Dairy Sustainability Initiative. A total of 30 sustainability advisers are being assigned to the programme, 20 of whom will be located in Teagasc, while 10 will operate within the dairy processors' organisational structures. The objective of the new approach is to encourage and support behavioural change, to facilitate knowledge transfer and to achieve better on-farm environmental outcomes.
5	The Dairy Sustainability Initiative — a joint industry/farmer/government forum, initiated by the Irish Dairy Industry Association — will drive the development and rollout of a targeted knowledge-transfer programme to all 18,000 dairy farms. This will effectively deliver the key lessons from the Agricultural Catchments Programme to dairy farmers. It is envisaged that this will consist of both cooperative- led farm pilot programmes and wider promotion programmes for nutrient management and management of farm pollution point sources.
6	In addition, and to promote the adoption of best environmental practice across different sectors of agriculture, €100 million has been allocated from the Rural Development Programme (RDP) for a knowledge-transfer programme with the purpose of upskilling farmers and agricultural advisers. Over the lifetime of the RDP, this programme will, on a voluntary basis, roll out professional advisory and knowledge-transfer services to around 20,000 farmers across all sectors.
7	Teagasc will promote best practice in water-quality protection through its discussion groups and on-farm advisory services. Teagasc will also facilitate the training of non-Teagasc advisers/consultants to facilitate the wider dissemination of water-quality advice to farmers. To further support good nutrient management across the entire country, an online nutrient-management planning system has been launched by Teagasc and made available to all Farm Advisory System (FAS)- approved planners. Use of this system is mandatory for farmers in Green, Low Carbon, Agri-environment Scheme (GLAS) and for derogation farmers — accounting for almost 60,000 farmers.
8	The GLAS Scheme, which is under the RDP, has a budget of €1.4 billion for the period 2014–2020. This period will see 50,000 farmers participating in the scheme and implementing actions to improve the rural environment, including actions to improve water quality. The GLAS Scheme prioritises vulnerable and high-status catchments, and has a strong focus on ensuring that farmers understand the environmental benefits of their actions. Also under the RDP, the TAMS scheme will facilitate total investment of around €500–600 million for better management and storage of animal manures, including more efficient spreading equipment. The "targeting" of these agri-environmental schemes and interventions rolled out by the DAFM will continue, responding to emerging knowledge and evidence (such as catchment characterisation).
9	It is accepted that Ireland faces significant challenges in meeting water quality targets while increasing production in the agricultural sector, and a key recommendation of the Food Wise 2025 strategy is that the environmental impacts of the strategy should be monitored. The DAFM will work closely with relevant agencies to ensure that this monitoring takes place. In particular, the Agricultural Catchments Programme (ACP) programme will model and monitor the impacts of agricultural development under Food Wise 2025 in specific catchments. The ACP will develop an integrated environmental-economic modelling system to identify the impacts of expansion under Food Wise 2025 and to advise on the overall costs and benefits associated with sustainable intensification practices at field, farm and catchment scales. New targeted initiatives will be developed as necessary to ensure that the sustainability objectives of Food Wise 2025 are met.



Urban Waste-water

The priority objective for the 2nd cycle RBMP is to secure compliance with the Urban Waste Water Treatment Directive and to contribute to the improvement and protection of waters in keeping with the water-quality objectives established by the Plan. Irish Water has begun the process of identifying new projects for the next capital-investment period which will run from 2020 to 2024. These new projects, which will be subject to revenue control by the Commission for Regulation of Utilities (CRU), have not yet been identified and have not been taken into account in predicting water quality improvements for the purposes of the 2nd cycle RBMP (DHPLG, 2018).

It is envisaged that it will take several investment cycles for Irish Water to address all of the urban waste-water pressures identified. It is also expected that new priorities will emerge over time as pressures from both human population centres and development increase. Taking this and other factors into account, Irish Water will continually review the outputs of catchment characterisation and will prioritise future investment (DHPLG, 2018).

The EPA is responsible for authorising and regulating urban waste-water discharges. Licences are required where the population equivalent of the urban area is greater than 500, and certificates of authorisation are required for urban populations below this threshold. Authorisations include a requirement to address compliance with the Urban Waste Water Treatment Directive and, where necessary, provide for higher levels of treatment in order to achieve a water-quality objective identified in an RBMP, or in order to address the requirements of EU legislation (DHPLG, 2018).

Irish Water's planned capital investment in the upgrading of waste-water treatment plants and collection systems will address the priorities set out in the 2nd cycle RBMP, in order to:

- Achieve compliance with the Urban Waste Water Treatment Directive
- Support the protection of protected areas (shellfish and bathing waters)
- Support the protection of high-status waters
- Support the prevention of deterioration and support targeted water-quality improvements.

Although it will not be possible to address all urban waste-water pressures during the current Irish Water capital-investment cycle, these will be progressively dealt with by Irish Water on a prioritised basis during future capital-investment cycles within the framework of ongoing river basin management planning. The 255 projects to upgrade waste-water treatment plants that are currently committed to are due to be completed by 2025 (DHPLG, 2018).

In addition to the high-level measures outlined above, a number of supporting measures aimed at addressing urban waste-water pollution are in place or are planned. These include:

- Improved operational and maintenance practices
- Targeted investment in sub-threshold wastewater treatment plants (WWTPs)

- Research and innovation in the management of urban wastewater.

Over the period of this second cycle, Irish Water will continue to develop and implement standard operating procedures for the operation, maintenance and inspection of wastewater treatment plants and collection systems. Irish Water will also continue the development of asset registers and the refinement of treatment plant capacities, which facilitate improved asset management (DHPLG, 2018).

It is recognised that, in some instances, the performance of smaller plants, which are subject to certificates of authorisation, can be the cause of significant pressures in water bodies that have been prioritised for action in this RBMP. Expenditure of €12 million, targeted at such plants, has been included in the current Irish Water Investment Plan (for 2017–2021) (DHPLG, 2018).

The CRU established the Water Services Innovation Fund to allow Irish Water to invest in innovative projects in order to explore novel technologies and operating arrangements designed to deliver benefits for customers. Proposed research projects must further a range of objectives, including achievement of relevant environmental standards and of WFD objectives. Irish Water is also currently involved in a number of research projects and programmes — including the EPA research programme, Science Foundation Ireland, Horizon 2020, INTERREG and Water JPI Research schemes — that will further support the long-term needs of Ireland's water and wastewater sector (DHPLG, 2018).

As stated above in Section 6.1, Table 4 the Listowel WWTP is not meeting the environmental objectives of the Nutrient Sensitive Area of the River Feale. The Listowel WWTP is due to be upgraded, however not to the tertiary treatment standards required by the NSA.

The All Ireland RBMP highlights eight principal actions to address rural diffuse and point source pollution from agriculture, list below in Table 13 (DHPLG, 2018).

Table E2: Principal Actions to Address Urban Wastewater and Urban Runoff

Principal Actions	
1	Over the period 2017–2021, Irish Water will invest approximately €1.7 billion in waste-water projects, programmes and asset maintenance. This investment will include €880 million for 255 major waste-water treatment projects, €350 million for capital investment in collection systems in 41 areas and €465 million for capital maintenance and national upgrade programmes.
2	Drainage Area Plans (DAPs) for waste-water collection systems will be completed for 44 urban areas by 2021, with the prioritisation of plans based on compliance with the Urban Waste Water Treatment Directive and the achievement of other environmental objectives.
3	Expenditure of €12 million, targeted at smaller plants causing significant pressures, has been included in the current Irish Water Investment Plan (for 2017–2021).
4	The EPA will continue to authorise and regulate waste-water discharges from urban areas.
5	The EPA will review urban waste-water discharge licences to reflect the improved evidence base that has gone into the preparation of this RBMP and to ensure that urban waste-water licences appropriately reflect the RBMP's objectives.
6	Irish Water will continue to develop and implement best operational practice across all of their assets. Among other things, this will entail developing and implementing standard operating



Principal Actions	
	practices for all waste-water treatment plants, developing a full asset register and completing a review of treatment plant capacities.
7	Irish Water will commence development of its waste-water compliance strategy in 2018. Building on existing plans, projects and programmes, this will provide a long-term strategy for ensuring compliance with the requirements of the Urban Wastewater Treatment Directive and meeting the requirements of river basin management plans in a cost-effective manner.
8	There will be ongoing research and innovation in the areas of urban wastewater management, funded at both national and European levels.

Extractive industry (Peat)

The DHPLG is currently progressing draft regulations that will put in place a streamlined licensing system for large-scale peat extraction to be regulated solely by the EPA. The new system will apply to peat extraction on any area exceeding 30ha., regardless of when the extraction commenced, and will operate seamlessly across local authority boundaries. As part of the implementation of EU Directives, Environmental Impact Assessment (EIA) will be mandatory in the consideration of licence applications. Appropriate Assessment (AA) will also be carried out, as necessary. On the introduction of the new system, peat extraction on any area exceeding 30ha. will become exempt from the requirement to obtain planning permission, thereby taking such peat extraction out of the planning regime (DHPLG, 2018).

A National Peatlands Strategy was published by the National Parks and Wildlife Service of the Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs in 2016. This Strategy aims to provide a long-term framework within which all of the peatlands within the State can be managed responsibly in order to optimise their social, environmental and economic contribution to the well-being of this and future generations. In relation to water quality, the key principle established in the strategy is that "Policies and decisions relating to the use of peatlands shall take full consideration of potential impacts on water quality and the attainment by the State of mandatory water quality standards" (DHPLG, 2018).

The Strategy expressly identifies peat harvesting as a pressure on water quality in certain areas and sets out high level actions to be undertaken by public authorities to ensure that any existing peat production does not have a detrimental impact on water quality, and to ensure that peatlands can contribute positively to achieving the objectives of the WFD. These actions are;

- For all peatland related activities, it should be demonstrated that they do not, either individually or in-combination with other activities, adversely impact on the environmental objectives of the WFD, associated daughter Directives and national regulations.
- Peatland related activities should not significantly alter the environmental supporting conditions for Natura 2000 sites such that these cause a failure of the conservation

objective for that designated habitat and by inference cause a risk of the WFD environmental objectives relating to protected areas not being met.

The All Ireland RBMP highlights five principal actions to address rural diffuse and point source pollution from agriculture, list below in Table 14 (DHPLG, 2018).

Table E3: Principal Actions to Address Impacts on Water Quality caused by Peatland Harvesting

Principal Actions	
1	The Minister for Housing, Planning and Local Government intends to make regulations as soon as possible that will require the EPA to carry out EIA for all existing and new large-scale peat extraction (> 30ha) as part of its examination of IPC license applications for the activity. When these regulations are made, proposals will be developed for public consultation relating to a new regulatory regime that will bring smaller-scale commercial peat extraction (≤ 30ha) under a new local authority licensing system incorporating EIA and AA, as necessary, and enforcement powers.
2	The DCHG, together with the Peatlands Strategy Implementation Group, will oversee the implementation of the National Peatland Strategy and the first national management plan for Ireland's raised-bog Special Areas of Conservation (SACs) network. The principal aims of these are: <ul style="list-style-type: none"> To provide a long-term framework within which all of the peatlands in the State can be managed responsibly in order to optimise their social, environmental and economic contribution to the well-being of this and future generations In the case of the National Raised Bog Special Areas of Conservation Management Plan 2017–2022, to specifically set out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland
3	Bord Na Móna will implement its Sustainability 2030 Strategy and Biodiversity Action Plan 2016–2021, which addresses the long-term rehabilitation of its cutaway bogs.
4	By 2021, Bord Na Móna will rehabilitate an additional 25 peatlands covering approximately 9,000ha. This is subject to several assumptions, including the availability of cutaway bogs for rehabilitation.
5	The EPA has identified this priority issue as the subject of a research proposal for inclusion in its 2018 research call. The proposal involves evaluating mitigation strategies for improving water quality from drained peatlands. The project proposal, if selected, is intended to integrate with the ongoing mitigation trials being undertaken by Bord Na Móna.

Hydromorphology

There is increasing evidence that the physical condition (hydromorphology) of surface waters is as important to maintaining healthy ecosystems as the quality of the water sustaining them. In particular, abnormally high siltation levels are a cause for concern. In addition, physical barriers in rivers, such as impassable weirs, can impede the movement of water and sediment, and can also prevent the migration of certain protected fish species, consequently affecting the health of their populations. The catchment characterisation process found hydromorphology to be a significant pressure in approximately 24% of water bodies identified as At Risk (DHPLG, 2018).

While there has been a substantial improvement in international engagement on the development of a collective understanding of the ecological impacts of hydromorphological alterations to surface waters, much work remains to be completed



across Europe, particularly in the context of integrating hydromorphology more fully into the formal ecological status classification (DHLG, 2018).

The DHPLG has identified that the ultimate goal is to have a statutory control regime in place to manage activities impacting on the physical condition of the water environment — as well as a prioritised programme of restoration for impacted waters — by the time the third RBMP is published in December 2021. The Department envisages that the control regime will be risk-based and proportionate, consisting of a tiered approach that includes general binding rules, registration and licensing. In preparation for this, between 2018 and 2021, substantial technical work is planned by the EPA and IFI, with the support of other authorities, to further develop systems for the assessment of hydromorphological condition and its relationship with ecology (DHPLG, 2018).

There is increasing evidence that the impairment of the physical integrity of rivers, lakes and transitional waters can impact negatively on their ecosystems and hence on their ecological status. A key focus during this 2nd cycle will be to build the evidence base that will enable us to determine how significant physical conditions are in supporting good and/or high ecological status in surface waters. With the support of other agencies, the EPA will work to develop the necessary evidence base (DHPLG, 2018).

The All Ireland RBMP highlights seven principal actions to address impacts on water quality due to hydromorphological changes, list below in Table 15 (DHPLG, 2018).

Table E4: Principal Actions to Address Impacts on Water Quality caused by Hydromorphological Changes

Principal Actions	
1	Existing regulations, which (1) provide for EIA to mitigate the impact of planned land-use changes on waters and (2) reduced the exempted-development threshold for drainage of wetlands from 20 ha. to 0.1 ha., will continue to contribute to protecting surface waters from deterioration.
2	The EPA will improve assessment methods and knowledge of the physical condition of surface waters through a number of actions, including the development of a Morphological-Quality Index for Irish rivers and enhanced use of GIS for assessing lakes, transitional waters and coastal waters.
3	The EPA, with the support of other agencies, will develop the necessary evidence base for establishing the link between physical integrity of water bodies and ecological status. The EPA will also define appropriate environmental supporting conditions with regard to hydromorphology.
4	IFI will lead a multi-stakeholder programme that will collect and collate data to support the development of an inventory of barriers to fish migration nationally.
5	Mitigation measures incorporated in the OPW drainage maintenance programme will be applied for all such works.
6	The Minister for Housing, Planning and Local Government will establish a Steering Group to review and make recommendations on improving fish passage throughout the Shannon catchment within the period of this Plan.
7	A series of 4 EPA research projects related to hydromorphology (SILTFLUX, COSAINT, DETECT and RECONNECT) will be completed, and their outputs will be used to inform future actions to mitigate the impact of hydromorphological impacts.





APPENDIX 3

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)



OPW

Oifig na
nDroicheada Poiblí
Office of Public Works

OFFICE OF PUBLIC WORKS

CASHEN ESTUARY DRAINAGE PROJECT

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN



May 2021



OFFICE OF PUBLIC WORKS

CASHEN ESTUARY DRAINAGE PROJECT

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

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A	Updated for Detailed Design	O O'Brien	J Hughes	B Dunphy	Sept 20
B	Updated based on new foundation design	O O'Brien	J Hughes	B Dunphy	March 21
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D					

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1 INTRODUCTION

This Construction Environmental Management Plan (CEMP) has been prepared to identify the minimum standards of environmental controls together with monitoring, inspection and reporting mechanisms to be adopted for all construction works related to the Cashen Estuary Drainage Project.

The CEMP incorporates the proposed management programme, during the construction and operational stages and will be updated by the successful Contractor to include any additional conditions arising out of the public display process.

Relevant legislation and best practice UK CIRIA (Construction Industry Research and Information Association) guidance that have been considered includes, but not limited to, the following:

- C532 Control of water pollution from construction sites: guidance for consultants and contractors.
- C648 Control of water pollution from linear construction projects.
- SP156 Control of water pollution from construction sites – guide to good practice.
- This plan is designed with cognisance of the adjacent Natura 2000 sites and incorporate the items listed in the Section on Works adjacent to Feale river and Natura 2000 below. An Environmental Constraints Study has been undertaken to provide a robust and proportionate analysis of the environmental constraints present within the scheme area. Given the sensitivity of the sites, a suitably qualified ecologist will provide input to the final Construction and Environmental Management Plan.
- All works will be monitored by a Residential Engineer and onsite Ecologist, as required.
- A project specific Waste Management Plan will be formulated by the Contractor and will form part of the final Construction Management Plan of the proposed Scheme. The Waste Management Plan will encourage waste minimisation, segregation, reuse, and recycling principles to be adopted on the project where possible. Any contaminated ground that is encountered within the areas of made ground which has been excavated will be removed and disposed off-site. Contaminated soils will be assessed, excavated, and disposed off-site in accordance with the Waste Management Acts, 1998-2006.
- A Dust Minimisation Plan will be formulated by the Contractor for the construction phase of the project, as construction activities are likely to generate some dust

emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with ambient conditions including rainfall, wind speed and wind direction.

- Site construction roads will also avail of a spray seal or use a water bowser to mitigate against the formation of dry dust particles. Road cleaning along the adjacent public roads will also be undertaken when necessary to ensure that it is kept clear of any construction related debris.
- The use of water suppressants will be used during these dry weather conditions (if required). Where temporary stockpiles are required the material will be stored in designated areas and will be covered with tarpaulins and/ or regularly dampened during dry weather periods.
- All potentially polluting substances such as oils and chemicals used during construction will be stored in designated storage areas. These will be bunded to a volume of 110% capacity of the largest tank/container within the bunded area with all filling and draw-off points fully located within the bunded area. Drainage for the bunded area will be diverted for dedicated collection and safe disposal.
- Refuelling of machinery will be undertaken with a fuel bowser equipped with appropriate emergency spill kits. OPW use low sulphur fuels and biodegradable oils.
- As stated above all domestic effluent generated on site will be discharged to temporary sewage containment facilities prior to transport and treatment off-site.
- An Emergency Plan will be formulated by the Contractor for the construction period in case of leaks, spills or other incidents that may pose a risk to the surrounding environment. This will consist of spill kits stored within site compound, in foreman's vehicle and on all machines.
- Effective management of run-off during the construction period will be implemented which will control silt laden water. Portable Environmental settlement tanks and settlement bags will be located at all active work areas and will be moved to each new works area. The contractor will demonstrate the operation of this system to the project ecologist and the RE, who will monitor the works as required. The project ecologist and RE will report any inadequacies to the OPW and Kerry County Council Environmental Officer and works will stop if the contractor does not fulfil their obligation to control silt runoff to the local surface water drainage system. Trenches will be dewatered with pumps into the settlement tanks and oil interceptor and the clarified run-off will be discharged into the surface water drainage system. The dewatered silt will be disposed of off-site to a licensed dump. Certification of disposal will be provided to the RE and onsite ecologist.

- Excavators are hot power washed before taken to site and before being moved to another site.
- Road sweeping will be undertaken as required to keep the public roads clean.
- Construction noise will be kept to a minimum in accordance with British Standard BS 5228.
- A detailed Construction Traffic and Pedestrian Management Plan will be developed by the Contractor and agreed with Kerry County Council and OPW and implemented at the commencement of the works. The plan will identify the traffic and pedestrian routes to the sites. Points of access and egress from the sites will be identified and marked with warning signs in accordance with the requirements of Kerry County Council Roads Department, the Traffic Signs Manual and the Safety, Health & Welfare (Construction) Regulations, 2013. The Construction Traffic Management Plan will be regularly reviewed and updated to consider the changing patterns of both the existing traffic and the construction traffic following consultation with Kerry County Council Roads Department. The routing of any exceptional loads will also require liaison with the Garda Síochána.
- Designated wash areas will be for concrete trucks in site compound.
- Construction traffic will follow fixed traffic routes.

1.1 Project Location

The Cashen Estuary Drainage Project is in the Cashen Estuary, County Kerry. The proposed scheme extends throughout the area of the polders along river Feale, Brick and Galey as it aims to protect the low-lying land from flooding during high tides. The proposed development will consist of the construction of 16 pumping stations (either electric or wind-driven pumps) along the banks of the River Feale polders. The site locations of these pumping stations are set out in drawings 20649-NOD-00-XX-DR-C-03301 to 03319.

1.2 Scope of Works

The proposed works include the construction of drainage infrastructure to augment the existing gravity drainage and reproduce the drainage conditions that were in place when the scheme was first constructed (prior to sea level rise and sediment deposition in the main channel). The construction activities for the proposed drainage works are as follows:

- Construct temporary site compounds and secure the sites;
- Construct new culverts;
- Construct new outfall structures;

- Upgrade the existing sluices;
- Construct new electric/ wind pumping stations at each site;
- Installation of precast concrete piles to support the electric/ wind pumping stations and valve chambers;
- Installation of sensors and telemetry system for pumps controls;
- Construct new valve chambers or sumps at each site;
- Install pipework connecting the proposed pumping station and existing river;
- Extend the existing ESB network and develop new electric power supply cable routes across river channels using both open cut and directional drilling techniques;
- Installation of pump bases, mechanical gear, steel tower and anchoring system for the wind driven pumps;
- Construct new access roads, and the improvement of existing access roads, to the proposed pumping stations;
- Construct security fencing at the areas of the proposed works; and
- Complete external works, including finishes and landscaping,
- All associated ancillary works.

The construction of the proposed pipelines will involve the crossing of embankments and rivers. It is envisaged that the construction of the pipelines at these crossings will be performed using either open cut measures or directional drilling method.

1.3 The Surrounding Environment

Cashen Estuary is in the southwest of Ireland in County Kerry, adjacent to the towns of Ballybunion and Ballyduff. It is fed by the River Feale as well as the River Galey to its north and River Brick to its south. The pumping station sites fall within the Lower River Shannon SAC, Cashen River Estuary pNHA and within proximity to the Kerry Head SPA.

A desktop assessment of the archaeological, cultural, and architectural heritage was conducted in the area around the pumping station sites. A total of twenty-one sites were identified within the study area. There are fifteen ringforts, one church, two burial grounds, three enclosures and one road identified from the records. Two of the pump stations have recorded monuments close to them. The Archaeology Report compiled on behalf of Binnies Ltd entitled "Archaeological desk-based assessment for Cashen Estuary Drainage Project" includes the full details of the archaeological assessment.

A Landscape and Visual Impact Assessment (LVIA) was completed in February 2021 and concluded that series of design measures, which were inherent to the design of the proposed development, have ensured that the proposed development does not result in any substantial landscape or visual effects, and therefore the proposed development can be appropriately absorbed into the landscape.

When producing the detailed CEMP, the EIAR and associated surveys will have been undertaken to better inform the potential effects on any sensitive receptors and the planning conditions will have been determined. The detailed CEMP will include protection and mitigation measures accordingly.

1.4 Construction Timescale

It is envisaged that the procurement, design and fabrication of the off-site pre-fabricated and pre-cast elements would be undertaken prior to the commencement of site works, and that the site works elements of the construction will commence in Spring 2022, subject to approvals, the duration of the entire project would be approximately 12 months. Construction will commence from the most northern point of the project area and move southwards. This works sequencing will be agreed with the OPW prior to commencement taking account of seasonal restrictions, landowner/residence access agreements, etc.

Construction activities will take place Monday to Friday, between 07:00 and 18:00. Evening and night-time work is not expected to take place although it is possible that limited 24 hours working may be required to take place on occasion as some of the works may be impacted by the tides. This will only take place with the prior agreement of Kerry County Council and Office of Public Works.

1.5 Inductions, Toolbox Talks, Specialist Training

All site personnel will undertake site induction prior to carrying out any activity. Induction topics to be covered include:

- Protection of the Parkland and Riverside sites and responsibilities
- Duties and responsibilities
- Emergency response procedure
- Site rules
- Environmental requirements and best practice
- Waste management and housekeeping
- Toolbox talks
- Covid-19 Control Measures

Toolbox talks specific to this project will include working in a tidal environment, Weil's Disease, Japanese Knotweed and invasive species management and surface water/groundwater management and pollution control during construction.

1.6 Continuous Monitoring

Compliance with legal requirements and the CEMP and Project Control Plan will be carried out through weekly inspections during the construction phase and this will include inspections of sub-contractors. Actions raised will be brought to the attention of the Contractor's site representative and an agreed timescale will be met to close out the issues raised. A project ecologist will monitor the works.

All records of environmental requirements, correspondence etc. will be maintained in a dedicated Project Environmental File.

Reviews will be carried out throughout the construction process. Aspects outlined below will be considered when conducting an environmental review:

- Water Quality - Surface Water Controls/Groundwater Controls
- Waste Management
- Noise & Vibration
- Materials Management
- Air Quality
- Operation and Maintenance of Plant and Machinery
- Pollution Control

2 WATER QUALITY – GROUNDWATER AND SURFACE WATER CONTROLS

Contamination of ground and surface water by mobilisation of soil particles will be prevented through management, monitoring, interception, removal and/or treatment of silt run-off. Fail-safe site drainage and bunding through drip trays on plant and machinery shall be provided to prevent discharge of chemical spillage from the sites to surface water. All hard-standing areas with potential for contamination shall be drained to settlement tank and interceptor where work is progressing where they can be stored for removal and disposal off-site.

2.1 Site Compound

The project will not have one primary site compound, but rather temporary site compounds which will be established at each site location. The site will have site offices, keep stored materials and plant and to minimise any potential disturbance. Only plant and materials necessary for the construction of the works will be permitted to be stored at the compound location.

Site establishment by the Contractor will include the following:

- Setting up of access control to the site;
- Construction traffic alert signage;
- Site offices;
- Site facilities (canteen, toilets, drying rooms, etc.);
- Office for construction management team;
- Covid-19 Management & Control Measures;
- Secure compound for the storage of all on-site machinery and materials;
- Temporary car parking facilities;
- Permanent and temporary fencing; 2.4m hording/fencing will be required along the construction site;
- Site security to restrict unauthorized entry. A dedicated yard foreman will be provided to ensure compliance with environmental requirements;
- Bunded storage of fuels; and
- Drainage collection system for washing area to prevent run-off into surface water system.

2.2 Works adjacent to River Feale, Brick and Galey

The drainage works will be carried out along the banks of the River Feale, Brick and Galey. When not in use for construction purposes, all materials, plant and machinery will be stored in the site compound away from the river. All fuel storage will be away from the riverbanks and drains.

2.3 Re-fuelling On Site

As required, all refuelling of vehicles will be carried out at the machine location using a fuel bowser and only ADR trained personnel will be permitted to operate fuel bowsers.

2.4 Pollution Control and Spill Prevention

Spill kits containing absorbent pads, granules and booms will be stored in the site compound with easy access for delivery to site in the case of an emergency. A minimum stock of spill kits will always be maintained, and site foremen's vehicles and all machines will always carry large spill kits. Absorbent material will always be used with pumps and generators and used material disposed of in accordance with the waste Management Plan.

Regular inspections of plant and machinery checking for leaks, damage or vandalism will be made on all plant and equipment.

In the event of a spill the Contractor will ensure that the following procedures are in place:

- Emergency response awareness training for all Project personnel on-site works.
- Appropriate and sufficient spill control materials will be installed at strategic locations within the temporary working area adjacent to River Feale. Spills kits for immediate use will be kept in the cab of mobile equipment.
- Spill kits will be stored in the site compounds with easy access for delivery to site in the case of an emergency. A minimum stock of spill kits will always be maintained and site vehicles will always carry spill kits. Spill kits must include suitable spill control materials to deal with the type of spillage that may occur and where it may occur. Typical contents of an on-site spill kit will include the following as a minimum.
 - Absorbent granules
 - Absorbent booms
 - Absorbent mats/cushions
- Spill kits will contain gloves to handle contaminated materials and sealable disposal sacks.
- Track mats, drain covers and geotextile material.

- All potentially polluting substances, such as oils and chemicals used during construction will be stored in containers clearly labelled and stored with suitable precautionary measures such as bunding within the site compound.
- All tank and drum storage areas on the sites will, as a minimum, be bunded to a volume not less than the greater of the following:
 - 110% of the capacity of the largest tank or drum within the bunded area, or
 - 25% of the total volume of substances which could be stored within the bunded area.
- The site compound fuel storage areas and cleaning areas will be rendered impervious and will be constructed to ensure no discharges will cause pollution to surface, or ground waters.
- Designated locations for refuelling are within the Site Compound.
- Potentially contaminated run off from plant and machinery maintenance areas will be managed within the site compound surface water collection system to ensure they do not enter watercourses untreated.
- Damaged or leaking containers will be removed from use and replaced immediately.

2.5 Incident Management

Should an environmental incident occur on-site, the Contractor will record the event on an Environmental Incident Record. These records will include the following:

- Any malfunction of any environmental protection system,
- Any occurrence with the potential for environmental pollution,
- Any emergency.

The Environmental Incident Record will include relevant details associated with the incident and recommend measures which will prevent a similar incident occurring in the future.

Notification procedures for Environmental incidences with regulatory bodies are outlined below:

1. Damage to designated SAC/SPA:
 - a. Kerry County Council
 - b. National Parks and Wildlife
 - c. DECLG
 - d. Inland Fisheries Ireland

- e. Department of the Marine
- 2. Surface water Management Failure
 - a. Kerry County Council
 - b. National Parks and Wildlife
 - c. DECLG
 - d. Inland Fisheries Ireland
- 3. Pollution spill into Designated Area SAC/SPA
 - a. Kerry County Council
 - b. National Parks and Wildlife
 - c. DECLG
 - d. Inland Fisheries Ireland
- 4. Waste management Failure
 - a. Kerry County Council
 - b. National Parks and Wildlife
 - c. DECLG
 - d. Inland Fisheries Ireland

3 ENVIRONMENTAL CONSTRAINTS

There are a range of environmental constraints to be considered in terms of dredging works and the consequential operational impacts of a reinstated drainage scheme. An environmental constraints study was performed by Black & Veath to highlight any vulnerable environmental features, specifying high level potential impacts of short-listed options and an approach to managing environmental risks through scheme design and management. The report entitled "Cashen Estuary Drainage Project Environmental Constraints Study" is included in the Contract Documents.

3.1 Invasive Species Management

Several invasive species including Himalayan Balsam (*Impatiens glandulifera*) and Japanese knotweed (*Fallopia japonica*) are listed on the Third Schedule and were identified within the study area during a search of online records on the Biodiversity Data Centre website. A survey of Invasive species should be performed within the proposed works area. Site staff and management will be made aware of the locations, which will be backed up with toolbox talks and posters within the site compound to help identify Japanese knotweed. No construction works will be permitted to take place within these zones.

3.2 Other Protected and Notable Species

The estuarine habitats of the Cashen River are likely to support a range of waders, ducks and geese listed as Annex I bird species of the Birds Directive. Although the study area is outside of any Special Protection Areas these species require consideration in relation to the proposed works.

4 NOISE AND VIBRATION

A variety of plant will be in use for the construction of the pumping stations and the ancillary civil work, such as excavators, crane lifting equipment, piling rigs, dumper trucks, compressors, and generators. There will be vehicular movements to and from the site that will make use of existing roads.

4.1 Noise

Due to the nature of the activities to be undertaken on a construction site, there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels. The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works, piling activities and lorry movements on uneven road surfaces.

Regarding construction activities, reference will be made to BS 5228-1, which offers detailed guidance on the control of noise from demolition and construction activities. The proposed practices that are to be adopted during construction, include:

- Limiting the hours during which site activities likely to create high levels of noise are permitted, i.e. piling;
- Establishing channels of communication between the contractor, Local Authority and residents; notification will be provided to residents as to the duration of piling works;
- A site representative responsible for matters relating to noise will be appointed to liaise with Kerry County Council and residents; and
- A noise monitoring programme at locations where residential properties are less than 100m from works being carried out during any critical piling activities. This monitoring will include an extended baseline survey prior to the commencement of works.

Furthermore, a variety of practicable noise control measures will be employed, as required. These include:

- Erection of barriers between any residential properties and construction works and around items such as generators or high duty compressors and piling rigs, where required.
- Erection of 3m hoarding along construction works to protect the Natura 2000 site from disturbance including noise, where required.

4.2 Vibration

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard BS 7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*;
- British Standard BS 5228-2: 2009: *Code of Practice for Noise and Vibration Control on Construction and Open Sites: Vibration*;
- NRA: 2004: *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*;
- BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15Hz and 50 mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS 5228 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (*i.e.* non-structural) damage should be taken as a peak particle velocity of 15 mm/s for transient vibration at frequencies below 15Hz and 20 mm/s at frequencies above 15Hz. Below these vibration magnitudes minor damage is unlikely, although where there is existing damage these limits may be reduced by up to 50%. In addition, where continuous vibration is such that resonances are excited within structures the limits discussed above may need to be reduced by 50%.

The NRA document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* contains information on the permissible construction vibration levels during the construction phase as detailed below.

Allowable Vibration (in terms of Peak Particle Velocity) at the closest part of Sensitive Property to the Source of Vibration

Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

The vibration from construction activities will be limited to the values set out above. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. The construction phase will be relatively short term and temporary in nature. Limiting the hours of noisy operations,

along with implementation of appropriate noise control measures, will ensure that noise and vibration impact is kept to a minimum and within appropriate levels.

5 TRAFFIC

The site compound and works are in a rural, agricultural area however a Traffic and Pedestrian Management Plan (TPMP) will be agreed between the Contractor, local authorities and client's Representative in order to:

- Comply with the requirements of the Traffic Signs Manual and the Safety, Health and Welfare at Work (Construction) Regulations, 2013;
- Limit the delivery times to 07:00-18:00, Monday to Friday;
- Where practical, restrict construction traffic to use suitable routes to and from the site; material deliveries to site to be restricted to quiet periods (outside rush hour/school drop off/collection times);
- Provide escorts and accommodation/reinstatement, where appropriate, to mitigate against the effects of any abnormal loads;
- Ensure appropriate timing of deliveries within quiet periods to mitigate against the effects of any abnormal loads;
- Provide wheel and vehicle body washing facilities, use water bowsers, dust suppression or similar apparatus and street sweepers to keep construction routes free from vehicle deposits and debris;
- Provision of appropriate information and signage along the construction routes: on approach roads either side of sit compound; and
- Ensure vehicle loads are securely sheeted and restrained, where appropriate, prior to dispatch.

5.1 Site Access

Construction traffic including trucks, (material and equipment deliveries) and cars / vans (Contractor's personnel, Kerry County Council Staff and Visitors) will enter and exit the Site via the temporary access tracks at each pump station site.

Prior to the commencement of construction, a detailed Traffic and Pedestrian Management Plan for the proposed works will be prepared to ensure the safety of road users and Construction operatives. Temporary construction stage traffic measures will be implemented together with traffic signage in accordance with the Department of Transport's Traffic Signs Manual and particularly Chapter 8 entitled "*Temporary Traffic Measures and Signs for Roadworks*," August 2019 and the Safety, Health and Welfare at Work (Construction) Regulations, 2013.

5.2 Site Preparation work

Site preparation work will initially involve the stripping of existing vegetation / topsoil from the work areas and the removal of any existing walls or defences as required. Excavated material will be retained, deposited and shaped for bulk fill or landscaping on site. An excess material will be removed from site and disposed of in accordance with waste management legislation.

The Contractor shall ensure that all Site Preparation Works will be completed in accordance with the Construction Methodologies for the Avoidance of Impact, Vegetation Stripping and Replacement, as specified in the Natura Impact Statement.

The quantities of materials being moved off-site will be minimised and, where feasible, excavated material will be used for bulk fill. It is anticipated that the bulk excavation will be carried out early in the construction phase. Where there is risk that there are contaminated soils, continuous soil monitoring will be carried out during excavation and soils identified as such will be disposed of in accordance with waste management legislation.

6 CONSTRUCTION METHODOLOGY

6.1 Overview

The proposed drainage scheme consists of a series of physical interventions along the existing back-drains of the Cashen Estuary polders and adjacent to the route of the Feale, Brick and Galey River. The proposed works will be constructed following current best practice in a safe and efficient manner. In general, conventional construction techniques will be used, consistent with other similar projects in County Kerry and elsewhere in Ireland.

The Contractor shall ensure that all works are completed in the manner and sequence prescribed the *Section 5. Assessment of Potential Effects & Associated Mitigation* of the Natura Impact Statement. This shall include the timely completion of all required advance surveys and studies, effective management of the works and implementation of all control and mitigation measures.

There are 16 pump stations in total (7 electric and 9 wind driven), as summarised in the table below. The secure site area for the electric pump stations will measure approximately 10m x 10m and the wind driven pump stations require 15m x 6.5m or less, depending on the number of windmills on site. The outflow pipes from the pumping stations will discharge to the river via concrete headwalls installed in the embankments. These will be at or above the high-water line and there will be no works in the riverbed other than the installation of rock armour at the headwalls to minimise tidal erosion. Pump stations will be constructed on the field side of the embankments and the existing drainage system will be used.

Since the ground layer is made up of peat, the site investigation showed that the clay layer, which is allowable for foundations, is over 5m below ground level. As a result, precast concrete piles will be required to establish a foundation for the pump stations and chambers, reducing the need for deep excavations.

Table 6-1: Pump station details

Site Ref.	Type	Structures	No. of Piles
1	Wind	2 No. Windpumps	8 No.
2	N/A		
3	Wind	2 No. Windpumps	8 No.
4	Wind	1 No. Windpumps	4 No.
5	N/A		
6	Electrical	2 No. Chambers	12 No.
7	Electrical	2 No. Chambers	12 No.
8	N/A		
9	Electrical	2 No. Chambers	12 No.
10	Electrical	4 No. Chambers	24 No.
11A	Wind	1 No. Windpumps	4 No.
11B	Wind	1 No. Windpumps	4 No.
12	Electrical	4 No. Chambers	24 No.
13	Electrical	2 No. Chambers	12 No.
14	Wind	2 No. Windpumps	8 No.
15	Wind	1 No. Windpumps	4 No.
16	Electrical	2 No. Chambers	12 No.
17	Wind	2 No. Windpumps	8 No.
18	Wind	1 No. Windpumps	4 No.

6.2 Pump Station Construction

Ahead of construction, the area of the proposed works will be surveyed and set out in consultation with the Employer's Representative and in consultation with relevant landowners/ occupiers. Before the construction commences, the work area that overlaps with public routes and pedestrian areas should be isolated, security fencing and construction hoarding will cordon off the works area. The contractor shall liaise with Kerry County Council for the development and implementation of Traffic Management Plans.

Most of the pumping stations will be installed inside the existing back-drains at their lowest ground level and perpendicular to the flow so that the existing gravity drainage will naturally guide the water inside the pump's chamber. For the in-stream works, coffer dams with silt barrages will be required, damming the river locally, to create the necessary dry

conditions for the installation of the pumping station. All pumping stations will be surrounded by 2.4m high security fence.

The construction of the pumping stations will require some movements of materials to and from the site. Most of the materials leaving the site will consist of spoil from the excavation works. The excess material from excavation works (not used as bulk fill, embankments or landscaping) spoil will be removed from the site and disposed of in accordance with relevant waste management legislation. Reinstatement of lands will be to the specification agreed with the construction management team, Kerry County Council and OPW.

Foundation

The foundation solution for the sites consists of the installation of a total of approximately 160 no. precast concrete 200mm x 200mm x c.8.0m piles. The piles will support precast pile caps, ground beams and prestressed slabs, which in turn support the various pump/valve chambers and windpump bases. Typical arrangement drawings showing precast concrete piles, are included in Volume B, Section 4.

For each pump station/ valve chamber, the following will be required:

- Precast concrete piles with protruding rebar to attach the pile caps, which will have to be grouted on site to form a connection between the pile and pile cap.
- Precast, L shaped concrete ground beams to allow bearing of slabs. These will have to be grouted on site to form a connection between the individual ground beams and between the beams and pile caps.
- 150mm thick prestressed concrete wide slabs, placed on the ground beams to form a foundation for the chamber. If a level base is required, a screed layer can be poured over this on site.
- Where localised grouting is required, a shroud or straw can be placed around and beneath the areas of grouting to prevent any spillage into the surrounding environment.

Electrical Pumps

For the construction of the pumping stations traditional methods will be used that involve:

- Netting along the back drains, existing riverbanks and channels to prevent material falling into the river.
- Excavation for foundation beneath the bed of the existing drainage channels. The footprint of the pumping station chamber will be outlined, and the proposed excavation will be carried out. The material excavated from the trenches will be

removed from site and disposed of in accordance with relevant waste management legislation.

- 200mm x 200mm sq. precast concrete piles, including pile caps, ground beams and slabs.
- Pumps (submersible, cannister or other) with lifting davit(s), kiosk, etc., as required.
- Concrete blinding to isolate the structure's foundation from the soil below.
- Steel fixing, formwork installation.
- Concrete pouring and curing. The concrete may be placed directly from the trucks, or it may be pumped or be placed by skips hoisted by a crane.
- Formwork stripping.
- Where feasible precast concrete elements may be utilised as an alternative to in-situ concreting operations.
- Installation of the required mechanical and electrical equipment.
- Backfilling and reinstatement, where required.

Based on the proposed locations of the electric pumping stations, 15-20km of new power supply cable will be required depending on the proposed connection points. The power supply will be provided via overhead pole mounted cables.

Wind driven pumps

The wind driven pumping stations would require the following:

- Excavation for the precast chambers. The material excavated from the trenches will be removed from site and disposed of in accordance with relevant waste management legislation.
- 200mm x 200mm sq. precast concrete piles, including pile caps, ground beams and slabs.
- Wind powered pump, with a pre-cast concrete base and 4m-7m high windmill.
- Mechanical gear, steel tower and anchoring system.
- Backfilling and reinstatement, where required.

Installation of sensors and telemetry system

Power supply and other electrical infrastructure such as transformers, MCC, electrical control panels, HV and LV Switchgear and variable-speed drives (VSD) would be required at the electrical pump station sites. Exact details of the sensors and telemetry system for

each pumping station will be confirmed during the detailed design stage and following ground investigation and topographical survey.

6.3 Outfall pipes

Once the chambers are in position, the required pipework will be connected. Before the construction commencement, the work area that overlaps with public routes and pedestrian areas should be isolated. Security fencing could be placed if required.

Outfall pipeline sizes through the embankment vary between 315mm, 400mm and 630mm in diameter. Installation of the 400mm and 630mm diameter HDPE pipelines through the embankment, connecting the electric pumping stations and existing river, will be performed using open cut trench method.

The wind pumping station 315mm diameter HDPE pipeline installation will be conducted using horizontal directional drilling, which includes:

- No disruption to the existing embankment or impacts to the environment of surrounding areas.
- Work carried out during the day to avoid impact on traffic or pedestrian areas while working.
- Mobilisation of directional drilling equipment.
- Installation of the pipeline using trenchless technology.
- Demobilisation of directional drilling equipment.
- Installation of standardised, precast concrete structures, handrails, and valves for all outlet headwalls at each project site.
- Installation of pipeline tie-in connections to outfall headwall.

6.4 Culvert construction

In addition to the pumping stations, two culverts are proposed between Polders 5 and 6, and Polders 7 and 8 to provide suitable connectivity. The length of these culverts is estimated at approximately 60m and 30m, respectively. The culverts have been preliminarily sized as 1050mm diameter pipes. The required excavation depth is not confirmed.

The box culverts will be constructed from two pre-cast U-sections for on-site assembly. The wing walls are retaining walls placed at the culvert entrance and exit. The tops of the walls are sloped to match soil contours. Wing walls help to form and protect the ends of the culvert and are designed and manufactured to match the precast culvert specifications

and ground conditions. Head walls, also known as head beams, are typically located between wing walls at the ends of the culvert. Head walls serve to retain any soil above the top slab of the culvert to form and protect the culvert entrance and exit.

6.5 Upgrade of existing sluices

The OPW construction team may perform upgrades on existing sluices as part of the overall project, but the design of these upgrades is not included in this scheme.

6.6 Access tracks

Throughout the area of the polders there are some existing rural tracks that can provide access to the location of the proposed works. However, most of them might not be suitable or wide enough for the necessary vehicles and equipment that might be used during construction, operation and maintenance of the scheme.

The existing unpaved tracks will be upgraded and improved to facilitate proper access to the areas of proposed works and where needed they will be extended. To facilitate improved sightlines, the vegetation either side of the access tracks will be trimmed on a regular basis.

During construction temporary bollard/ fencing will be set up at the perimeter of any access track that is adjacent to the water's edge to prevent any plant or equipment from coming into proximity with the edge of the existing riverbanks.

The proposed access tracks will be formed by:

- stripping topsoil;
- removal of soft spots with capping material placed and compacted in the voids;
- placement of suitable geotextile; and
- wearing surface formed of unbound compacted aggregate (gravel).

Where possible, the access track would follow the edge of a field to avoid breaking up of land parcels and to minimise the amount of new fencing required.

It is assumed that spoil generated from either sump excavation, pipe construction through the embankment or access track construction will simply be regraded locally into adjacent ground to raise the height or improve the profile.

6.7 Power Supply Network Extension

It is expected that the installation of the electric pumps at the study area will present a large draw on the local network so it is important to determine if the condition of the local

grid can meet this demand. Each electric pumping station will require three-phase electric power supply that may not be available for all the proposed locations of the pumping stations as Cashen Estuary is a rural, agricultural area.

In order to provide an adequate power supply to each individual pumping station, an ESB connection is needed at either the pumping station location or at a specific point in the ducting along the access tracks. In either scenario, the power supply for the electric pumping stations will be brought to site by overhead power lines, as agreed with ESB Networks.

Based on consultations with ESB, the power supply routes will only be made available to OPW once the individual quotes are approved and post establishment of the specific routes by ESB. Once the connection point is established and funding approved, ESB undertake the necessary works accordingly.

There are several locations where directional drilling techniques will be used to install pipelines for electric power supply cable routes across river channels. The details and locations of these have been finalised by OPW through consultation with ESB Networks. The locations of the directionally drilled river crossing are indicated on the drawings.

6.8 Plant

Equipment to be used during the construction of the works will be typical of a project of this scale. In general, the following machinery will be used:

- Diggers;
- Lorries;
- Tractors/ Trailers;
- Excavator;
- Rock Breakers;
- Cranes;
- Loader;
- Pile Driving Rig
- Vibratory compactor;
- Delivery vehicles for concrete and materials;
- Concrete pumps;
- Generator.

Heavy vehicle movements to the development sites are expected to consist predominantly of plant deliveries, material deliveries and waste removal. Most of the machinery associated with the construction phase are likely to remain onsite for an extended period, arriving at the beginning of the construction process and remaining onsite until the end of their works. Therefore, the traffic associated with these will be limited to their delivery and removal, with the intervening period comprising internal movements within the site.

In so far as possible, construction materials will be from local sources. All imported material that will be used on site will be procured from approved sources.

All construction products will be subject to the European Union (Construction Products) Regulations 2013. CE marking will be mandatory for all construction products placed on the market for which harmonised standards are in place. The Construction Products Regulation aims to ensure that reliable performance-related data is made available, by means of Declarations of Performance, in relation to construction products being placed on the European market.

It is envisaged that deliveries of materials will occur on a 'just in time' basis to reduce stocks on site. Temporary hard standing areas with drainage to a hydrocarbon interceptor will be constructed within the site compound before refuelling/servicing activities will be allowed onsite. Temporary bunded and suitably equipped areas will be in place before any potentially polluting materials (oils, lubricants, solvents, fuel, etc.) will be stored on-site. Temporary stockpiling and storage of construction materials will only be allowed in designated areas.

6.9 Waste Management

The wastes expected to arise because of construction include concrete, masonry, packaging, metal materials, glass and day-to-day municipal refuse (generated by construction workers). All solid waste generated during the construction phase will be adequately segregated and stored prior to transfer to an authorised facility for recovery/recycling/disposal.

During the construction phase, all domestic effluent generated on site will discharge to temporary sewage containment facilities prior to transport and treatment off-site by an authorised contractor.

Waste oils and solvents will be stored in a temporary bunded area prior to transport off-site by a licensed contractor. Surplus subsoils from site clearance will be stockpiled away from the quayside at the site compound until such time that it is removed from the site.

Any contaminated ground that is encountered within the areas of made ground which has been excavated will be removed and disposed off-site. Contaminated soils will be assessed,

excavated, and disposed off-site in accordance with the Waste Management Acts, 1998-2006.

6.10 Works adjacent to River Feale, Brick, Galey and Natura 2000 sites

All works throughout the area of the polders will be subject to site specific method statements and risk assessments (RAMS) agreed in advance with suitably qualified ecologists and the statutory authorities. The method statement will incorporate the following points:

- A toolbox talks on the importance to preserve intact the natural environment of the Natura 2000 sites and River Feale must be given to all construction workers prior to works commencing. The legal implications of these designations along with the potential impacts of the works and the proposed protection measures that form the design of the project will be outlined.
- The areas where access of construction machinery, storage of materials etc. is prohibited will be demarcated (on the ground) by signs and tapering (yellow tape).
- All hazardous materials will be stored and handled in bunded areas located at least 50m from the river, and silt fences/settlements tanks will be used to intercept suspended sediments.
- Appropriate construction methods must be agreed in advance to avoid suspended silt, concrete, cement, hydrocarbons and other chemical pollutants to reach the river and to be carried downstream during construction.
- To avoid excessive silt runoff, site clearance is not to be undertaken during wet conditions, when rainfall of more than 0.5 mm/hour is forecast within the next 24 hours.
- During site clearance, trees to be removed should be examined by a bat specialist prior to works and their recommendations implemented.
- Trees will be removed outside of the breeding bird season.
- The site will be bound by a 3m high timber hoarding to screen visibility of the site and activities fully from the adjacent Natura 2000 site and reduce disturbance to species such as birds and mammals in the vicinity.
- The surface water from the works will be drained, in accordance with the principles of Sustainable Urban Drainage Systems (SUDS). Dublin City Council & South Dublin City Council will ensure that measures for the attenuation, de-silting and hydrocarbon interception, where necessary, will be installed for all surface water discharges during the construction phase.

The main objectives are noted as follows:

- To control the quality of surface water on the construction site such that no unacceptable impact occurs to the associated waterways or the local stormwater system. To minimise disturbance to the hydrologic regime of the surrounding landscape.
 - To maximise opportunities for stormwater recycling on the site.
 - To protect groundwater and the Natura 2000 sites from contamination which could result from construction activities.
- To avoid contamination of the estuary during an extreme flood event, no works likely to generate soiled water is to be carried out when there is a forecast within the next five days in Cashen estuary.
 - Excavation to be carried out during dry weather, wherever possible.
 - Generation of dust will be minimised and controlled.
 - Soil cleared from the site and all materials associated with the building process are to be stored outside the flood zone and bunded to protect the site from runoff.
 - Raw or uncured waste concrete is not to be disposed of on site and must be removed from site through appropriate waste collection.
 - A lined and watertight skip, positioned well away from the river banks and above the level of the flood zone, is to be used as the only area on site where concrete activities are permitted to wash out, including mixers, barrows and rakes. If ready mixed concrete is used, the drum of the delivery lorries will return for washout to the batching plant with only chutes being washed out on site. On completion of construction works, this washwater is to be disposed of off-site in accordance with the Waste Management Plan.
 - Fuels, lubricants and hydraulic fluids for equipment used on the construction site, as well as any solvents and oils, is to be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment. These must be stored in a special containment area away from the river's banks within the site compound.
 - Fuelling and lubrication of equipment is not to be carried out on site. Any spillage of fuels, lubricants or hydraulic oils is to be immediately contained and the contaminated soil removed from the site and properly disposed of. Any accidental spillage into the river must be contained immediately. Kerry County Council, OPW and the EPA must be notified immediately of such a serious event.

- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling. The location of the temporary storage area is shown on the site plan.
- To avoid the introduction of invasive non-native species and fish pathogens, all plant and machinery utilised on site will be thoroughly cleaned and washed using high pressured steam cleaning before delivery to the site. A visual inspection for evidence of attached plant or animal material, or adherent mud or debris will be completed on all equipment that has encountered the water before leaving the site.
- Disturbance to nocturnal species such as bats and other mammals, from lighting will be reduced by avoiding light spillage to adjacent habitats by keeping light directed on site only – avoid upward light of the sky and light spill from the site onto adjacent areas.

6.11 Employment

It is estimated that the number of base staff will vary between approximately 10-20 people per day over the construction period, in addition to several consultants and external staff requiring irregular access. Site employees will be sourced locally as far as practicably possible.

6.12 Health and Safety

Contractors are obliged to comply with the Health and Safety Acts and Regulations which include the Safety, Health and Welfare at Work (Construction) Regulations 2013, as amended. As required by the Safety, Health and Welfare at Work (Construction) Regulations 2013, a Project Supervisor Design Process (PSDP) and a Project Supervisor Construction Stage (PSCS) will be appointed in writing before the detailed design and construction of the development, respectively.

A Construction Stage Site Specific Safety & Health Plan will be prepared by the PSCS which will address health and safety issues from the design stages through to the completion of the construction and maintenance phases. This plan will be reviewed as the development progresses. The contents of the Safety & Health Plan will comply with the requirements of the Regulations.

The construction stage of the project will be managed in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013, amendments and associated Codes of Practice and international best practice for projects of this type.

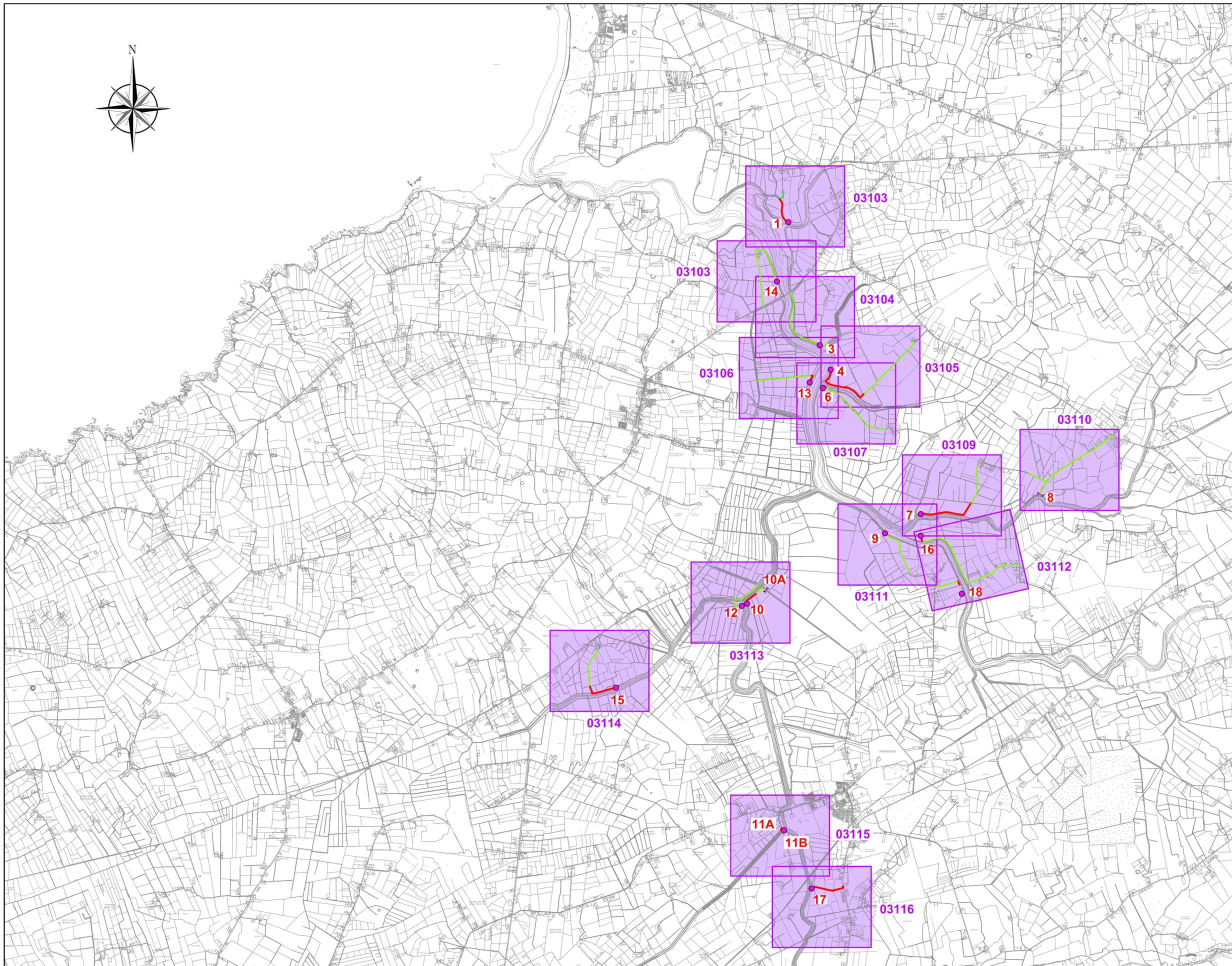
A Construction Stage Site Specific Safety & Health Plan will be developed to ensure that the safety of human beings is not impacted on in a negative way by the construction

works. The site will be adequately secured to prevent unauthorised access and all visitors to the site will be required to report to the site manager. When implemented these mitigation measures will not have any additional negative impact on the health and safety of human beings. The PSCS will have responsibility for ensuring that relevant health and safety legislation is adhered to and that recommended mitigation measures are implemented. The facility will be adequately secured to prevent any access to unauthorised areas of the site.



APPENDIX 4

DETAILED DESIGN DRAWINGS



NOTES

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LEGEND

- 2 PUMP STATION
- EXISTING ACCESS TRACK
- PROPOSED ACCESS TRACK
- - - PROPOSED ESB CABLES

P04	20.05.2021	PS 2 REMOVED	K.L.	J.H.	B.D.
P03	31.03.2021	FOR REVIEW AND COMMENT	K.L.	J.H.	B.D.
P02	28.09.2020	FOR REVIEW AND COMMENT	K.L.	J.H.	B.D.
P01.1	18.09.2020	FIRST ISSUE	K.L.	J.H.	B.D.
REV	DATE	DESCRIPTION	D	C	A
PROJECT No.	SUITABILITY	STAGE			
20649	S4	DETAILED DESIGN			

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 n-ádhmhaí Poblait
 Office of Public Works

PROJECT

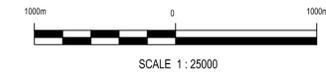
CASHEN ESTUARY DRAINAGE

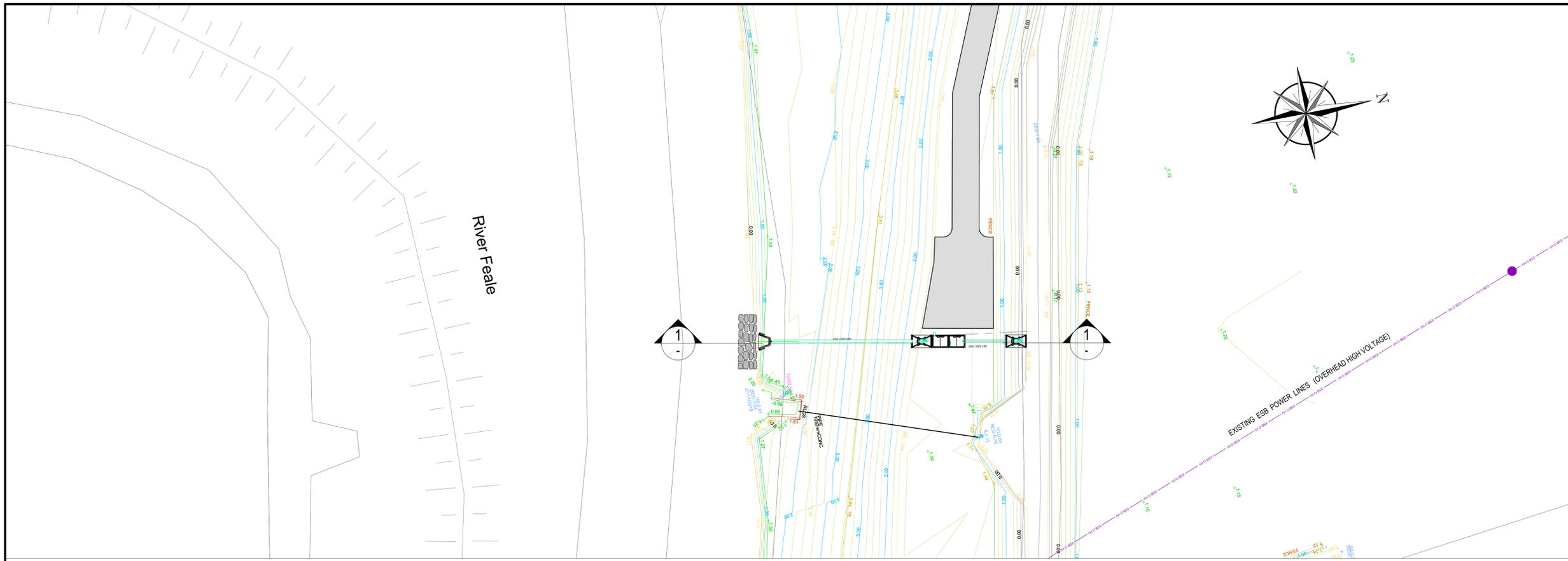
TITLE

OVERALL SITE LOCATION MAP
 KEY PLAN OF ACCESS ROADS
 TO PUMPING STATIONS

SCALES @ A1	DRAWN	CHECKED	APPROVED
1 : 25,000	K. Lim	J. Hughes	B. Dunphy
	DATE	DATE	DATE
	04.09.2030	04.09.2030	04.09.2030
DRAWING No.	REVISION		
20649-NOD-00-XX-DR-C-03101	P04		

SITE LOCATION MAP - KEY PLAN OF ACCESS ROADS TO PUMPING STATIONS
 SCALE 1 : 25,000





PUMPING STATION No. 1 - PLAN
SCALE 1 : 250 (A1)

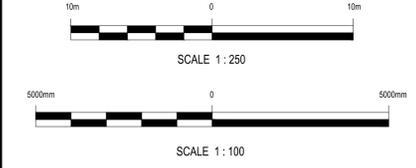
NOTES

- All Dimensions are in millimetres (mm) unless noted otherwise.
- All levels are in metres and relate to the Ordnance Survey Datum Malin Head.
- For Proposed Access Road and ESB Cable Trench Details, see Drawing No. 20649-NOD-00-XX-DR-C-03415.
- For Proposed Precast Headwall & Precast Chamber Details, see Drawing No. 20649-NOD-00-XX-DR-C-03413.

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LEGEND

	PROPOSED ESB CABLES
	DIRECTIONAL DRILLING ROUTES



REV	DATE	DESCRIPTION	D	C	A
P04	20.05.2021	ISSUED FOR CLIENT'S APPROVAL	K.L.	J.H.	B.D.
P03	22.10.2020	FOR REVIEW AND COMMENT	J.M.S.	J.H.	B.D.
P02	28.09.2020	FOR REVIEW AND COMMENT	K.L.	J.H.	B.D.
P01	18.09.2020	FIRST ISSUE	K.L.	J.H.	B.D.

PROJECT No.	SUITABILITY	STAGE
20649	S4	DETAILED DESIGN

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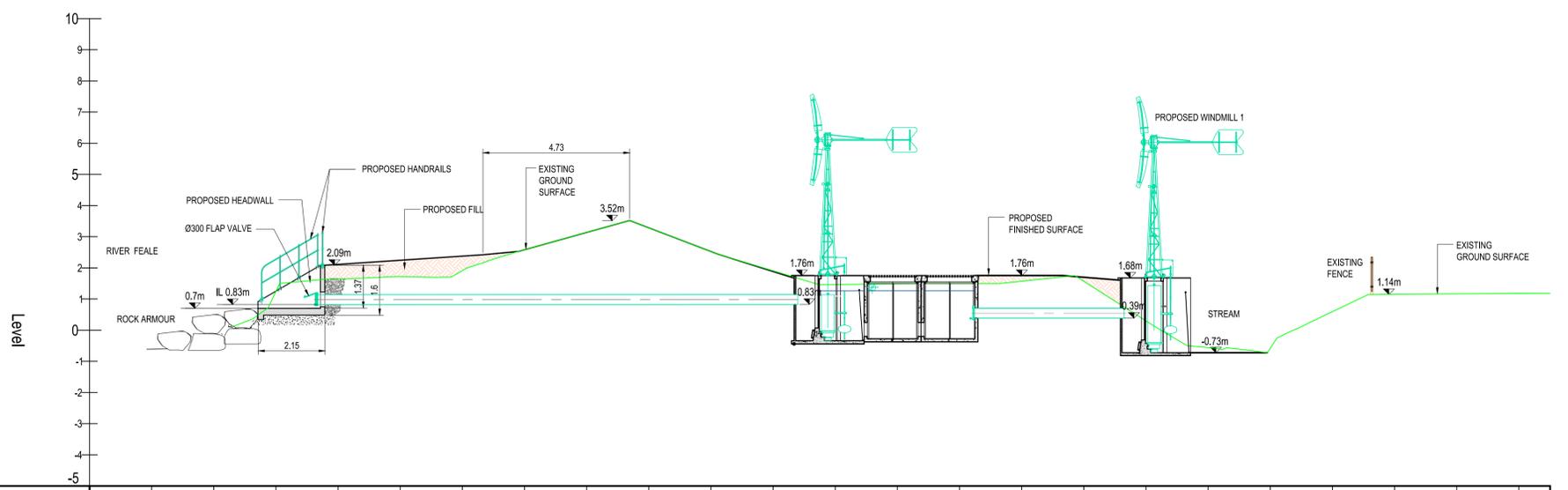
CLIENT
 OPW Office of Public Works

PROJECT
CASHEN ESTUARY DRAINAGE

TITLE
**PUMPING STATION No. 1
PLAN & SECTION
SHEET 1**

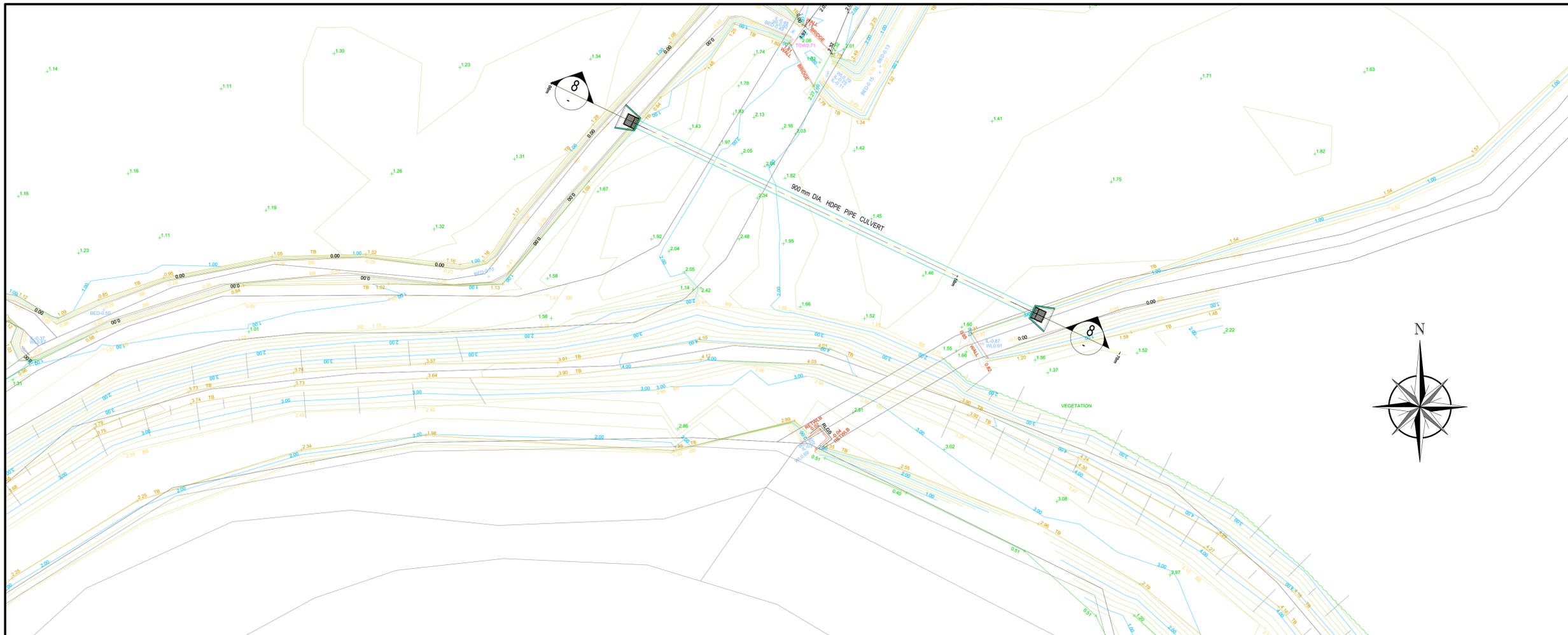
SCALES @ A1	DRAWN	CHECKED	APPROVED
1 : 100 1 : 250	K. Lim	J. Hughes	B. Dunphy
	DATE	DATE	DATE
	04.09.2020	04.09.2020	04.09.2020

DRAWING No.	REVISION
20649-NOD-00-XX-DR-C-03202	P04



GROUND LEVEL				1.25	1.65	1.72	1.91	2.58	3.14	3.29	2.52	1.91	1.47	1.49	1.50	1.57	1.57	0.30	-0.86	-0.69	0.59	1.15	1.17	1.18	1.19
CHAINAGE	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	47

PUMPING STATION No. 1 - SECTION
SCALE 1 : 100 (A1)



CULVERT No. 8 - PLAN
SCALE 1 : 250 (A1)

- NOTES**
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 - All levels are in metres and relate to the Ordnance Survey Datum Malin Head.
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 - For Proposed Precast Headwall & Precast Chamber Details, see Drawing No. 20649-NOD-00-XX-DR-C-03413.
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LEGEND

	PROPOSED ESB CABLES
	DIRECTIONAL DRILLING ROUTES

Scale bars for 1:250 and 1:100.

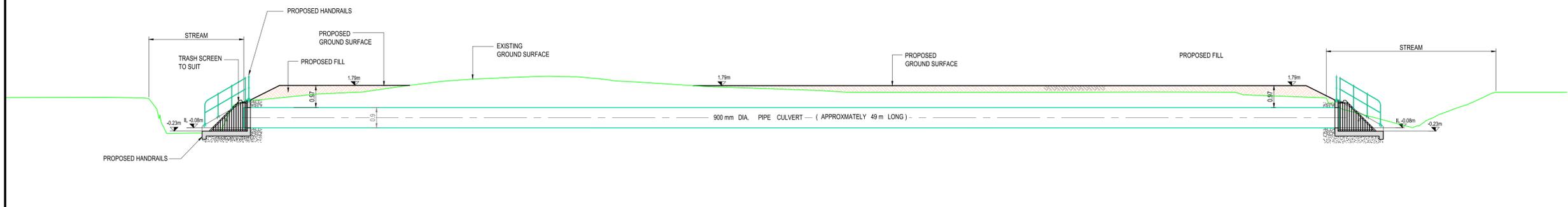
REV	DATE	DESCRIPTION	D	C	A
P03	20.05.2021	ISSUED FOR CLIENT'S APPROVAL	K.L.	J.H.	B.D.
P02	28.09.2020	FOR REVIEW AND COMMENT	K.L.	J.H.	B.D.
P01	18.09.2020	FIRST ISSUE	K.L.	J.H.	B.D.

PROJECT No. 20649, SUITABILITY S4, STAGE DETAILED DESIGN

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CULVERT No. 8 - SECTION
SCALE 1 : 100 (A1)

2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70
1.27	1.27	1.26	-0.33	-0.33	1.18	1.38	1.50	1.75	1.89	2.11	2.19	2.18	1.98	1.86	1.74	1.67	1.60	1.50	1.50	1.50	1.50	1.50	1.50	1.51	1.51	1.50	1.37	1.30	0.74	0.22	0.35	1.15	1.50	

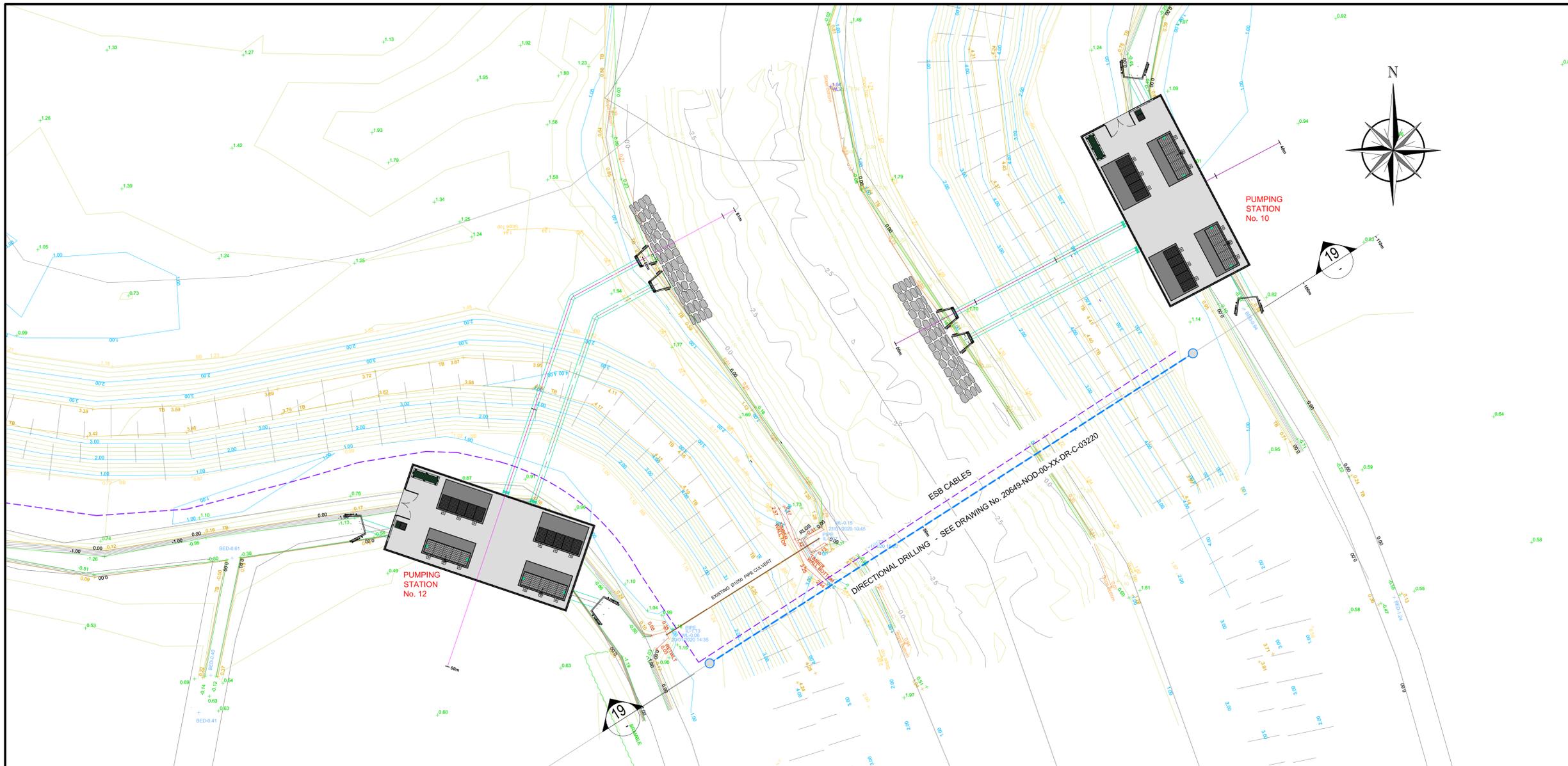
CLIENT
 OPW Office of Public Works

PROJECT
CASHEN ESTUARY DRAINAGE

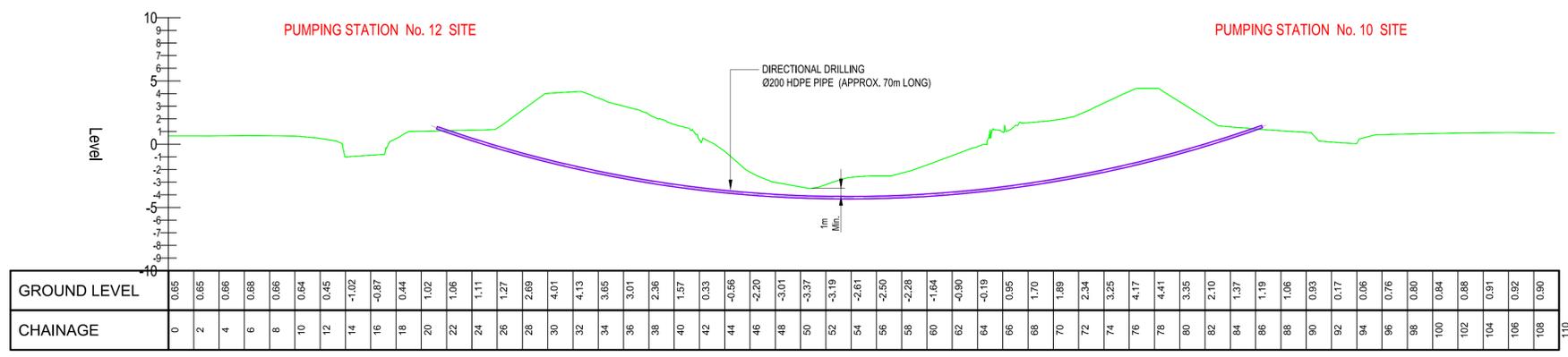
TITLE
CULVERT No. 8
PLAN & SECTION
SHEET 7

SCALES @ A1	DRAWN	CHECKED	APPROVED
1 : 100	K. Lim	J. Hughes	B. Dunphy
1 : 250	DATE 04.09.2020	DATE 04.09.2020	DATE 04.09.2020

DRAWING No. 20649-NOD-00-XX-DR-C-03208, REVISION P02



19 DIRECTIONAL DRILLING (PS12 TO PS10) - PLAN
SCALE 1 : 250 (A1)



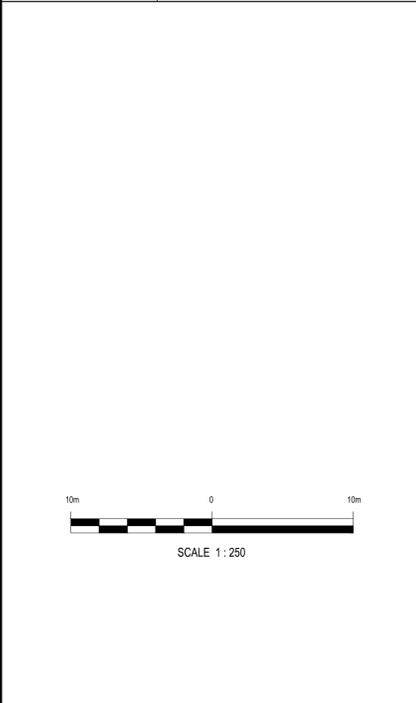
19 DIRECTIONAL DRILLING (PS12 TO PS10) - SECTION
SCALE 1 : 250 (A1)

NOTES

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LEGEND

- 2 PUMP STATION
- EXISTING ACCESS TRACK
- PROPOSED ACCESS TRACK
- PROPOSED ESB CABLES
- PROPOSED CULVERT
- EXISTING DRAINAGE CHANNEL
- DIRECTIONAL DRILLING ROUTES



REV	DATE	DESCRIPTION	D	C	A
P03	20.05.2021	ISSUED FOR CLIENT'S APPROVAL	K.L.	J.H.	B.D.
P02	28.09.2020	FOR REVIEW AND COMMENT	K.L.	J.H.	B.D.
P01	18.09.2020	FIRST ISSUE	K.L.	J.H.	B.D.

PROJECT No.	SUITABILITY	STAGE
20649	S4	DETAILED DESIGN

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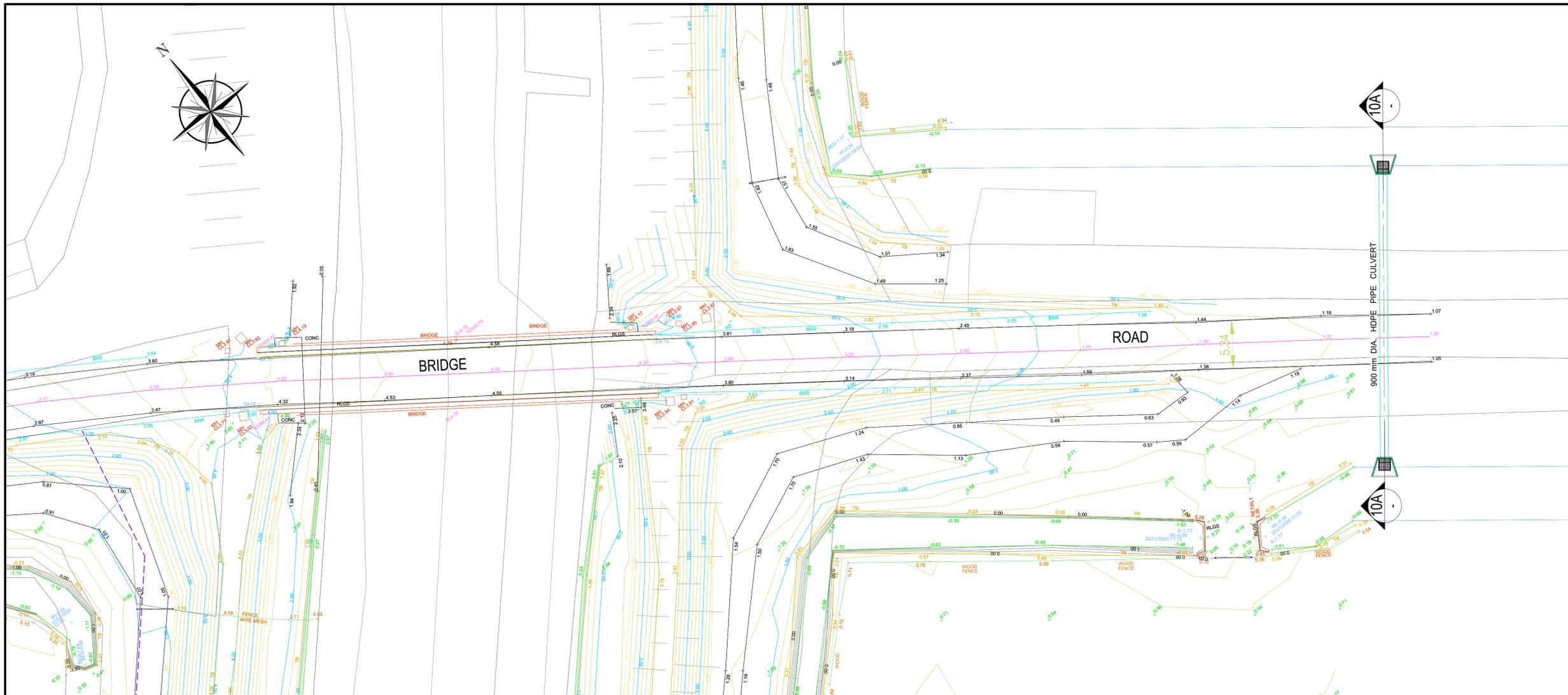
CASHEN ESTUARY DRAINAGE

TITLE

**DIRECTIONAL DRILLING (PS12-PS10)
PLAN & SECTION
SHEET 19**

SCALES @ A1	DRAWN	CHECKED	APPROVED
1 : 250	K. Lim	J. Hughes	B. Dunphy
	DATE 04.09.2020	DATE 04.09.2020	DATE 04.09.2020

DRAWING No.	REVISION
20649-NOD-00-XX-DR-C-03220	P03



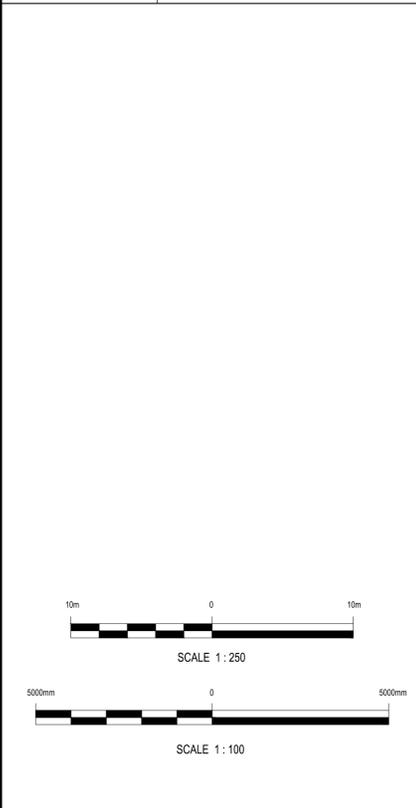
NOTES

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- For Proposed Access Road and ESB Cable Trench Details, see Drawing No. 20649-NOD-00-XX-DR-C-03415.
- For Proposed Precast Headwall & Precast Chamber Details, see Drawing No. 20649-NOD-00-XX-DR-C-03413.

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LEGEND

	PROPOSED ESB CABLES
	DIRECTIONAL DRILLING ROUTES



CULVERT No. 10A - PLAN
SCALE 1 : 250 (A1)

P03	20.05.2021	ISSUED FOR CLIENT'S APPROVAL	K.L.	J.H.	B.D.
P02	28.09.2020	FOR REVIEW AND COMMENT	K.L.	J.H.	B.D.
P01	18.09.2020	FIRST ISSUE	K.L.	J.H.	B.D.
REV	DATE	DESCRIPTION	D	C	A
PROJECT No.	SUITABILITY	STAGE			
20649	S4	DETAILED DESIGN			

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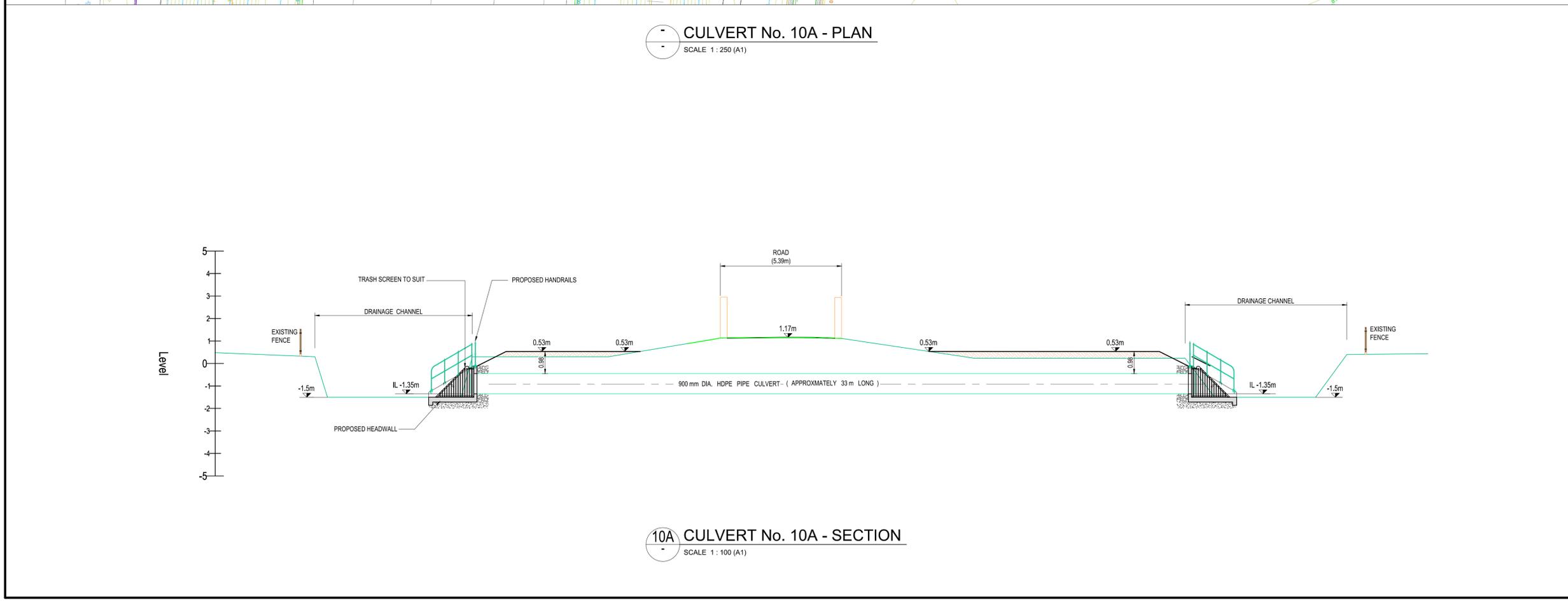
CLIENT
OPW Office of Public Works

PROJECT
CASHEN ESTUARY DRAINAGE

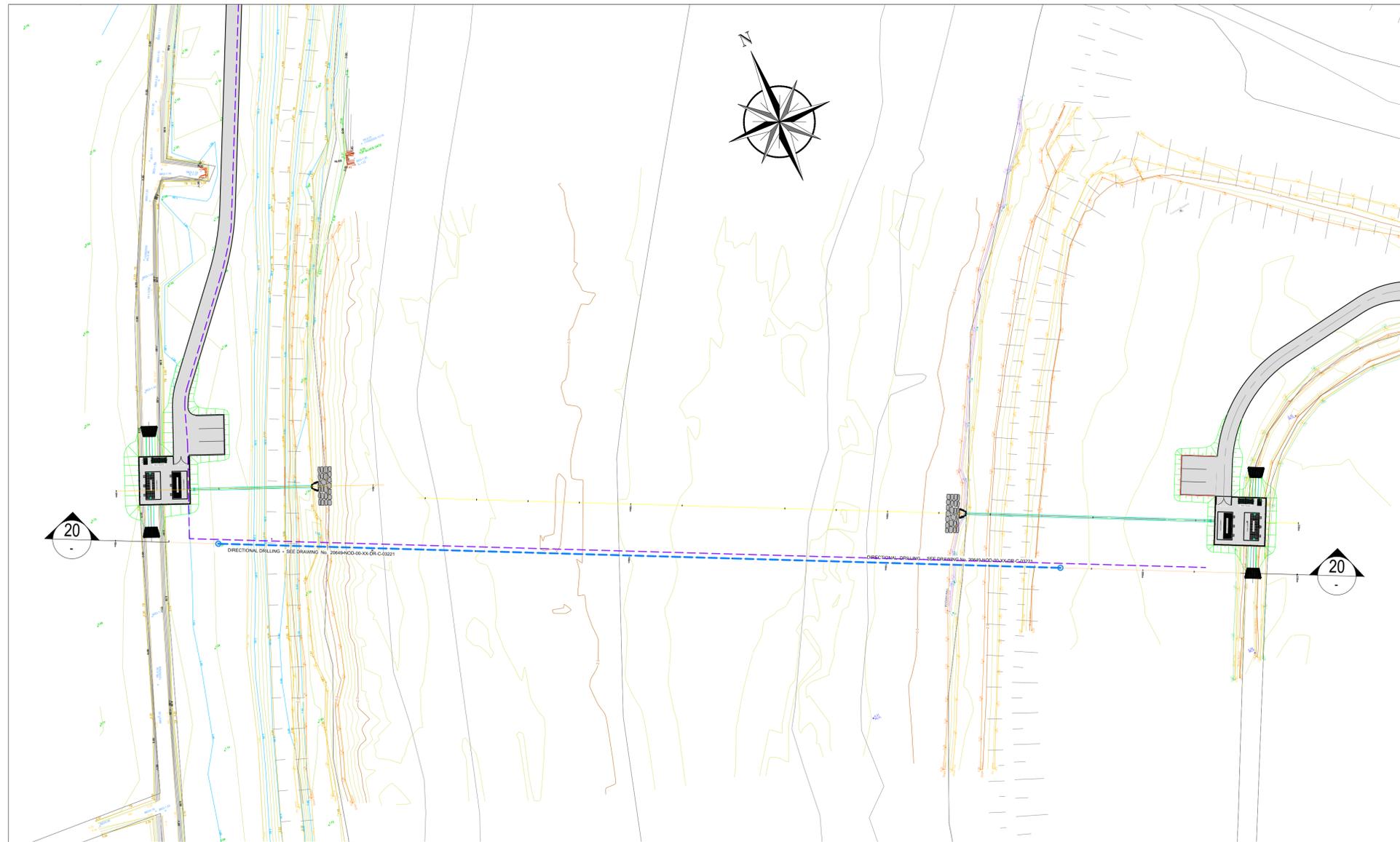
TITLE
**CULVERT No. 10A
PLAN & SECTION
SHEET 10**

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	DATE	DATE	DATE
	04.09.2020	04.09.2020	04.09.2020

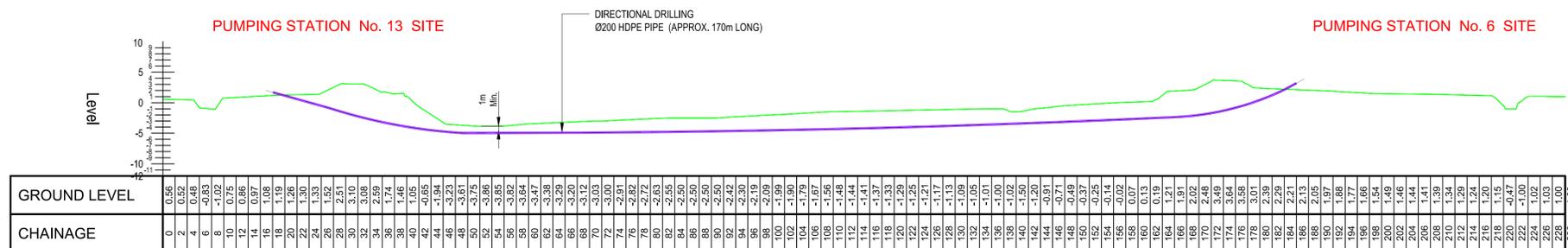
DRAWING No. 20649-NOD-00-XX-DR-C-03211 REVISION P03



10A CULVERT No. 10A - SECTION
SCALE 1 : 100 (A1)



20 DIRECTIONAL DRILLING (PS13 TO PS6) - PLAN
SCALE 1 : 500 (A1)

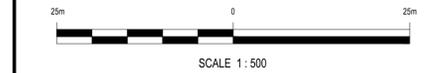


20 DIRECTIONAL DRILLING (PS13 TO PS6) - SECTION
SCALE 1 : 500 (A1)

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LEGEND

	PUMP STATION
	EXISTING ACCESS TRACK
	PROPOSED ACCESS TRACK
	PROPOSED ESB CABLES
	PROPOSED CULVERT
	EXISTING DRAINAGE CHANNEL
	DIRECTIONAL DRILLING ROUTES



P03	20.05.2021	ISSUED FOR CLIENT'S APPROVAL	K.L.	J.H.	B.D.
P02	28.09.2020	FOR REVIEW AND COMMENT	K.L.	J.H.	B.D.
P01	18.09.2020	FIRST ISSUE	K.L.	J.H.	B.D.
REV	DATE	DESCRIPTION	D	C	A

PROJECT No.	SUITABILITY	STAGE
20649	S4	DETAILED DESIGN

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PROJECT
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TITLE
DIRECTIONAL DRILLING (PS13-PS6)
PLAN & SECTION
SHEET 20

SCALES @ A1	DRAWN	CHECKED	APPROVED
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	DATE	DATE	DATE
	04.09.2020	04.09.2020	04.09.2020

DRAWING No.	REVISION
20649-NOD-00-XX-DR-C-03221	P03



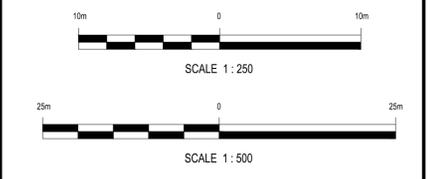
21 DIRECTIONAL DRILLING (PS7) - PLAN
SCALE 1 : 500 (A1)

NOTES

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LEGEND

- 2 PUMP STATION
- EXISTING ACCESS TRACK
- PROPOSED ACCESS TRACK
- PROPOSED ESB CABLES
- PROPOSED CULVERT
- EXISTING DRAINAGE CHANNEL
- DIRECTIONAL DRILLING ROUTES



P03	20.05.2021	ISSUED FOR CLIENT'S APPROVAL	K.L.	J.H.	B.D.
P02	28.09.2020	FOR REVIEW AND COMMENT	K.L.	J.H.	B.D.
P01	18.09.2020	FIRST ISSUE	K.L.	J.H.	B.D.
REV	DATE	DESCRIPTION	D	C	A
PROJECT No.	SUITABILITY	STAGE			
20649	S4	DETAILED DESIGN			

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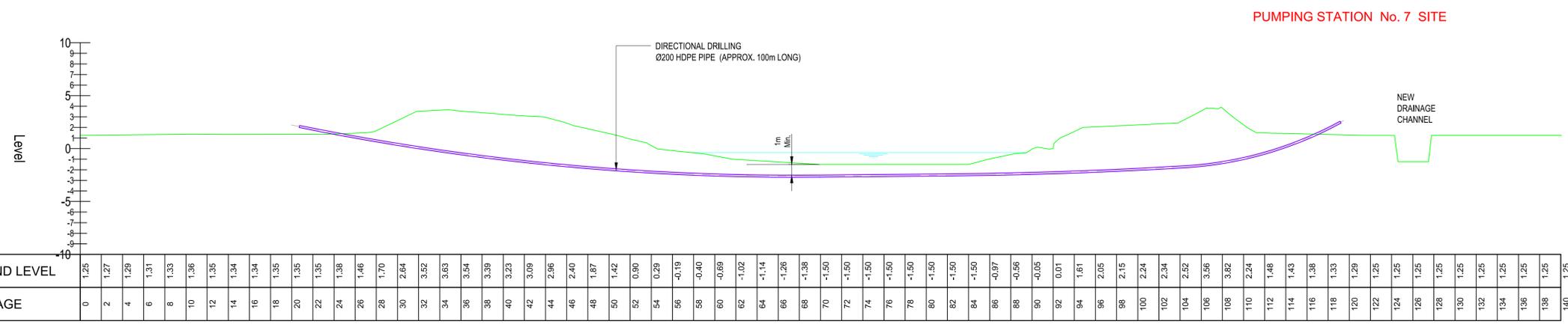
TITLE

**DIRECTIONAL DRILLING (PS7)
PLAN & SECTION
SHEET 21**

SCALES @ A1	DRAWN	CHECKED	APPROVED
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1 : 250			

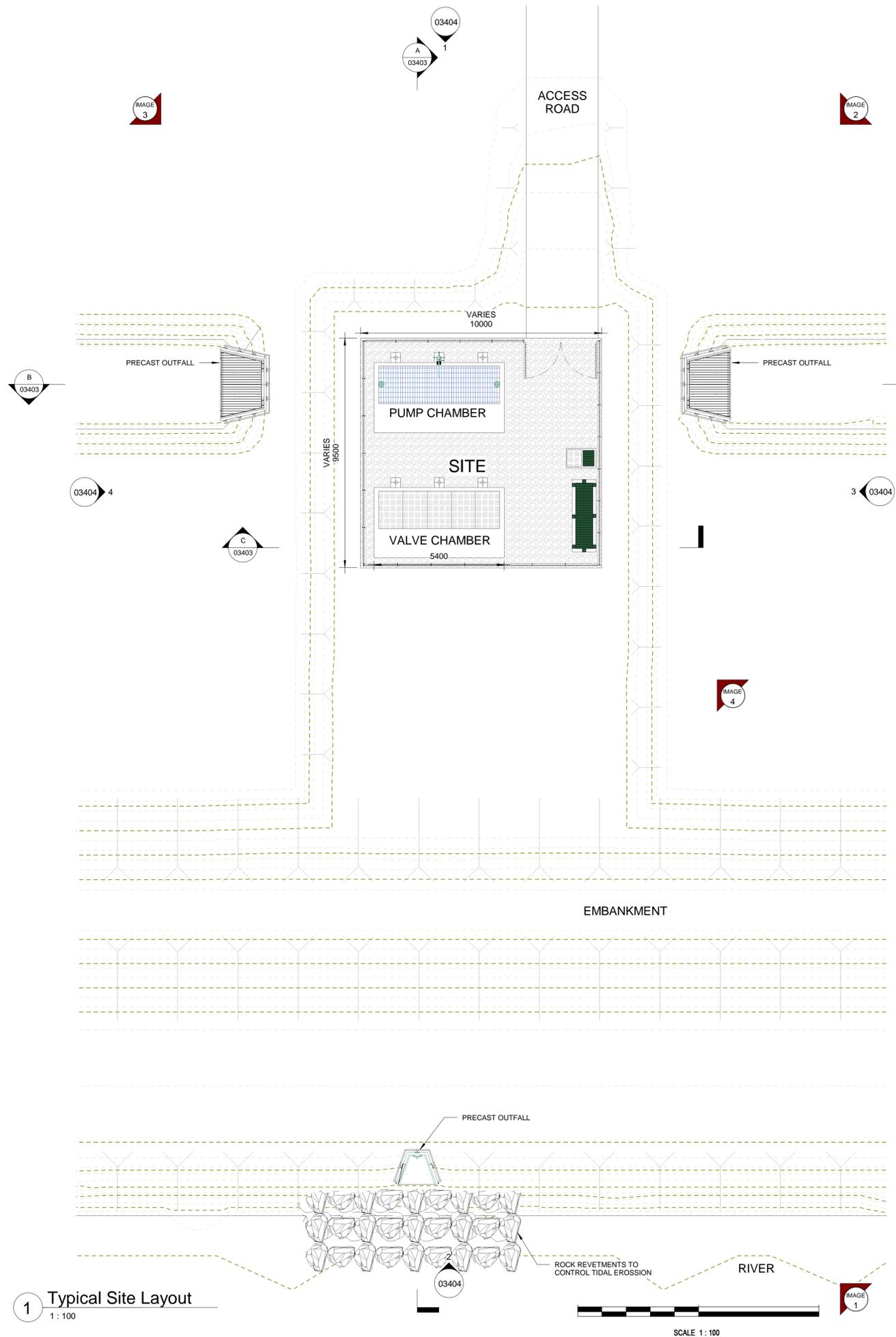
DRAWING No. 20649-NOD-00-XX-DR-C-03222

REVISION P03



21 DIRECTIONAL DRILLING (PS7) - SECTION
SCALE 1 : 250 (A1)

GROUND LEVEL	0	1.25	2	1.27	4	1.29	6	1.31	8	1.33	10	1.36	12	1.35	14	1.34	16	1.34	18	1.35	20	1.35	22	1.35	24	1.38	26	1.46	28	1.70	30	2.64	32	3.52	34	3.63	36	3.54	38	3.39	40	3.23	42	3.09	44	2.96	46	2.40	48	1.87	50	1.42	52	0.90	54	0.29	56	-0.19	58	-0.40	60	-0.69	62	-1.02	64	-1.14	66	-1.26	68	-1.38	70	-1.50	72	-1.50	74	-1.50	76	-1.50	78	-1.50	80	-1.50	82	-1.50	84	-1.50	86	-0.97	88	-0.56	90	-0.05	92	0.01	94	1.61	96	2.05	98	2.15	100	2.24	102	2.34	104	2.52	106	3.56	108	3.82	110	2.24	112	1.48	114	1.43	116	1.38	118	1.33	120	1.29	122	1.25	124	1.25	126	1.25	128	1.25	130	1.25	132	1.25	134	1.25	136	1.25	138	1.25	140	1.25
CHAINAGE	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140																																																																							



View 4



View 3



View 2



View 1

Notes

All Dimensions are in millimeters (mm) unless noted otherwise.

All levels are in meters and relate to the Ordnance Survey Datum Malin Head.

The location of existing services is based on information provided by the service provider. The contractor is responsible for contacting all service providers prior to commencing work in any area to locate the precise location of services.

Cross - Reference Numbering System

Ref: Detail Number
Drawing Sheet Number where Detail is Located

LEGEND

Proposed 350mm / 400mm D.I. Pipework

REV	DATE	DESCRIPTION	D	C	A
P03	20.05.2021	ISSUED FOR CLIENT'S APPROVAL	M.C.	J.H.	B.D.
P02	26.05.2020	REVIEW & COMMENT	M.C.	J.H.	B.D.
P01	08.08.2020	FIRST ISSUE	M.C.	J.H.	B.D.

PROJECT No: 20649 STAGE: DETAILED DESIGN

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CLIENT: **OPW** Oifig na nOibrescha Poiblí / Office of Public Works

PROJECT: **CASHEN ESTUARY DRAINAGE**

TITLE: **TYPICAL SITE PLAN
STANDARD PUMP CHAMBER
400mm OUTFALL**

SCALES	DRAWN	CHECKED	APPROVED
1:100 @ A1	M.Cheevers	B. Dunphy	J. Oliver
	DATE: 07.08.2020	DATE: 07.08.2020	DATE: 07.08.2020

SUITABILITY CODE: S4 SUITABILITY DESCRIPTION: FOR APPROVAL

DRAWING No: 20649-NOD-XX-XX-DR-C-03400 REVISION: P03



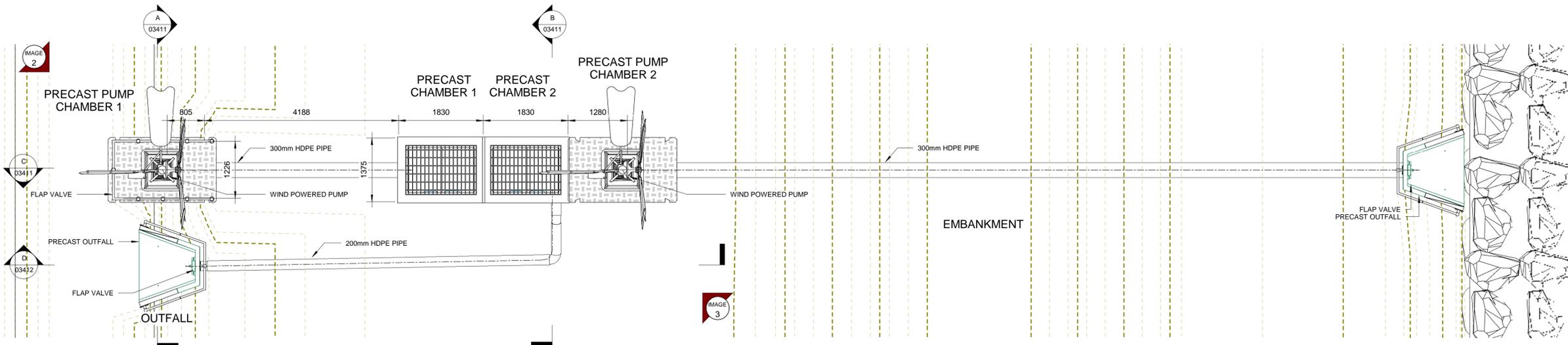
View 1



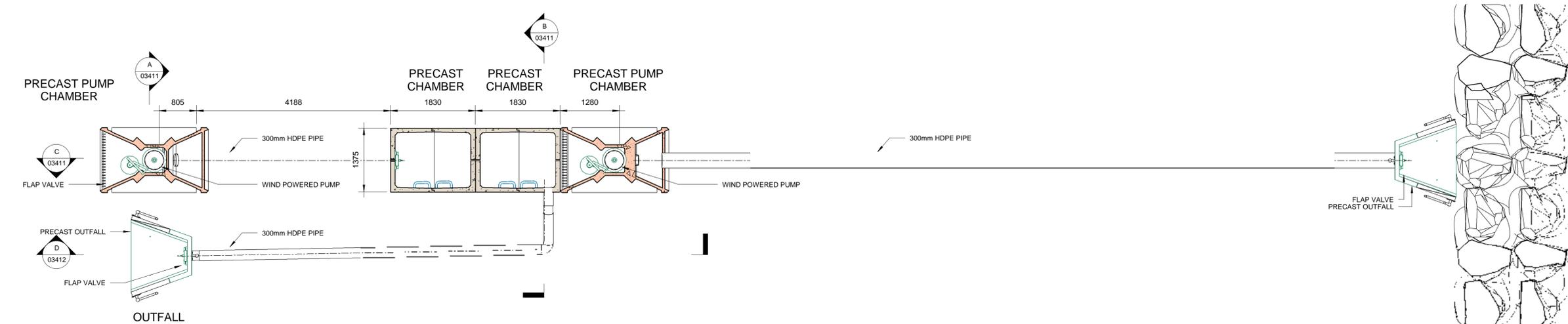
View 2



View 3



2 Typical Site Layout
1:50

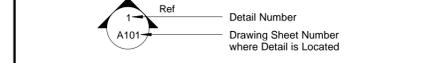


1 Windmill Pump Chamber Plan
1:50

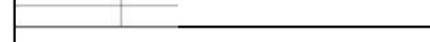
Notes

All Dimensions are in millimeters (mm) unless noted otherwise.
All levels are in meters and relate to the Ordnance Survey Datum Malin Head.
The location of existing services is based on information provided by the service provider. The contractor is responsible for contacting all service providers prior to commencing work in any area to locate the precise location of services.

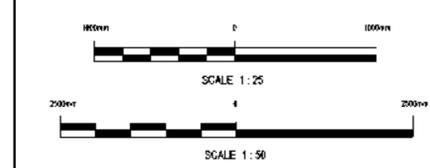
Cross - Reference Numbering System



LEGEND



REV	DATE	DESCRIPTION	D	C	A
P03	20.05.2021	ISSUED FOR CLIENT'S APPROVAL	M.C.	J.H.	B.D.
PR2	26.09.2020	REVIEW & COMMENT	M.C.	J.H.	B.D.
PR1	09.09.2020	FIRST ISSUE	M.C.	J.H.	B.D.



PROJECT No.	STAGE
20649	DETAILED DESIGN

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CLIENT
OPW Oifig na nOibrescha Poiblí / Office of Public Works

PROJECT
CASHEN ESTUARY DRAINAGE

TITLE
TYPICAL 7m HIGH WINDMILL PUMP PLANS

SCALES	DRAWN	CHECKED	APPROVED
1:25 @ A1 1:50 @ A1	M.Cheevers	B. Dunphy	J. Oliver
SUITABILITY CODE	SUITABILITY DESCRIPTION	DATE	DATE
S4	FOR APPROVAL	02.09.2020	02.09.2020

DRAWING No. 20649-NOD-XX-XX-DR-C-03410 **REVISION.** P03

