River Poddle Flood Alleviation Scheme

Water Framework Directive (WFD) Screening Assessment

cbec eco-engineering UK Ltd

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Culvert and associated pedestrian crossing at downstream extent of Tymon Park

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1. INTRODUCTION

cbec eco-engineering UK Ltd was commissioned by Nicholas O'Dwyer Ltd to undertake a Water Framework Directive (WFD) Screening Assessment for the proposed River Poddle Flood Alleviation Scheme in southwest Dublin. Interventions extend along the river from Tymon Park (west of the M50) in Tallaght to Mount Argus Close in Harold's Cross, from Irish Grid Reference O 10717 28750 at the upstream extent to O 14016 31385 at the downstream extent, with additional manhole works at St. Theresa's Gardens, Dunore, at O 14583 32506 and O 14224 32957.

This report therefore aims to assess the potential impacts of the proposed scheme on the WFD status of any affected waterbodies.

2. LEGISLATIVE BACKGROUND

The EU Water Framework Directive (WFD) (2000/60/EC) requires all EU member states to protect and enhance all waterbodies within their jurisdiction. In Ireland, the WFD was given legal effect by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003). The Directive applies to all waterbodies within the state up to one nautical mile from the coast. Separated into distinct spatial units, the WFD applies to all lakes, rivers, transitional waters (estuaries), coastal and groundwaters, but also the wetlands and terrestrial ecosystems that directly depend on them. The specific objectives of the WFD state that all waterbodies must meet 'Good Ecological Status' by 2027 and that there is no deterioration in existing status. All artificial and heavily modified waterbodies are also required to achieve 'Good Ecological Potential'.

The assessment of ecological status is based on biological quality elements as well as supporting elements such as hydromorphological (the shape and flow of water courses), chemical and physico-chemical quality. Ecological status is defined by the EPA as comprising five status classes: high, good, moderate, poor, and bad. 'High status' is considered the 'reference condition' and it is defined as the conditions associated with either very low or no human pressure. The WFD requires Ireland to produce River Basin Management Plans (RBMPs) in order to plan and manage these enhancements. Reviewed in six-year cycles, these RBMPs seeks to ensure compliance with the WFD through a catchment-based approach. The WFD is currently in its third planning cycle (2022-2027) where Ireland is now managed as a single River Basin District comprising of 46 catchment management units.

Under the European Communities Environmental Objectives (Surface Waters) Regulations 2009 S.I. No. 272/2009 (as amended), all new works that modify a surface waterbody or have the potential to impact on the water environment are now required to comply with the objectives of the WFD. This includes ensuring that no changes occur to a waterbody that will result in a downgrading of its current ecological status or prevent it from achieving its future status objectives. However, the EU Floods Directive (FD) (2007/60/EC) which aims to manage and reduce the risk of flood on human health, economic activity, the environment and cultural heritage, may adversely impact the hydromorphology of water bodies. Therefore, the WFD also states that a waterbody may be designated as a Heavily Modified Water Body (HMWB) if the changes required to achieve Good or High Ecological Status present appreciable adverse effects on flood protection (Article 4(3)a(iv)). It is within this legal context that this WFD Screening Assessment for the proposed River Poddle Flood Alleviation Scheme has been commissioned.

The River Poddle is a candidate Heavily Modified Water Body (HMWB) based on an analysis, undertaken by the EPA, that identified lateral and longitudinal constraints on connectivity that result from the river's urban setting.

3. METHODOLOGY

The potential impacts of the proposed flood alleviation scheme on the WFD status of the affected waterbodies were undertaken through as desktop study.

The WFD target status for a HMWB is 'Good Ecological Potential', a definition that takes account of practical and financial constraints and aims for the best possible Biological Quality Elements (BQE) status given the limitations on remedial action to a waterbody. This differs from the target 'Good Status', used for water bodies not designated as heavily modified, which does not take account of any constraints.

Datasets and information required for the high-level review and WFD screening process included the following sources:

- Data provided by the EPA on the current WFD status of the River Poddle waterbody and associated catchments was accessed online at https://gis.epa.ie/EPAMaps/
- The detailed description of the proposed flood alleviation scheme was provided in the Environmental Impact Assessment Report (EIAR), Volume 2, Part I.
- WFD data for the River Poddle waterbody was provided in the '3rd Cycle Draft Liffey and Dublin Bay Catchment Report (HA 09)'. Available online at https://www.catchments.ie/data/#/?_k=9v3dnw
- River Basin Management plans developed as part to the WFD 2nd and 3rd cycles were accessed at https://www.gov.ie/en/publication/429a79-river-basin-management-plan-2018-2021/#

Available information was reviewed by expert freshwater specialists. Both direct and indirect effects of the proposed scheme on the River Poddle and receiving waters were considered.

4. DESCRIPTION OF PROPOSED SCHEME

The River Poddle Flood Alleviation Scheme has been developed in collaboration with the Office of Public Works (OPW), Dublin City Council (DCC) and South Dublin County Council (SDCC). The proposed works comprise of flood protection, flood storage and flood prevention measures at locations along a 6 km stretch of the River Poddle from Tymon North, Tallaght to St. Teresa's Gardens, Donore Avenue. A location plan is provided in Figure 4-1 below and key planning drawings are presented alongside WFD screening metrices in Section 6. A more detailed description of the proposed scheme is provided in the Environmental Impact Assessment Report (EIAR), Volume 2, Part I, Chapter 5.

Key sites and interventions on the River Poddle are summarised as follows:

- **St. Teresa's Gardens** – Sealing manhole works in the area to prevent surcharging during storms

- **Mount Argus Close** – New linear retaining wall to provide localised flood protection
- **St. Martin's Drive** – New linear retaining wall to provide localised flood protection
- **Ravensdale Park** – Creation of flood storage area, construction of a new retaining wall and replacement footbridge within the park. Sealing manholes in the area to prevent surcharging during storms
- **St Ann's Terrace** – New linear retaining wall to provide localised flood protection
- **Whitehall Park and Wainsfort Manor** – Regrading and realignment of the channel to provide clearance from adjacent properties, construction of an earthen embankment, and stone and concrete retaining walls to provide localised flood protection
- **Tymon Park** – Creation of flood storage area, incorporating earthen embankments, replacement of existing flow control structure and footbridge, and installation of an Integrated Constructed Wetland (ICW)
- **Ancillary works and associated development** – Including drainage channel clearance and removal of trees; biodiversity enhancements including installation of floating nesting platforms in Tymon Lake; and landscape mitigation and restoration at Tymon Park and Whitehall Park in addition to public realm improvements, biodiversity enhancements and tree planting and landscaping. Installing flap valves at all culverts draining to the river and, where required, rehabilitating or installing culvert screens at required locations
- **Temporary works** – Include establishing a main construction compound in Tymon Park with access off Limekiln Road, which will be in operation for the entire duration of the works. Additional temporary works/set down areas at Wainsfort Manor Crescent, St. Martin's Drive and Ravensdale Park, which will be in use for the duration of the works to be carried out in these locations. Other temporary works include temporary stockpiling of excavated earth in Tymon Park; temporary channel crossings at Tymon Park (west and east of the M50) in Tallaght, and channel diversions at Tymon Park, Tallaght and Whitehall Park, Templeogue to enable the works along the River channel to be carried out.

The scheme is subject to a planning application by South Dublin County Council and Dublin City Council submitted to An Bord Pleanála on 21 February 2020 (reference: JA06S.306725).

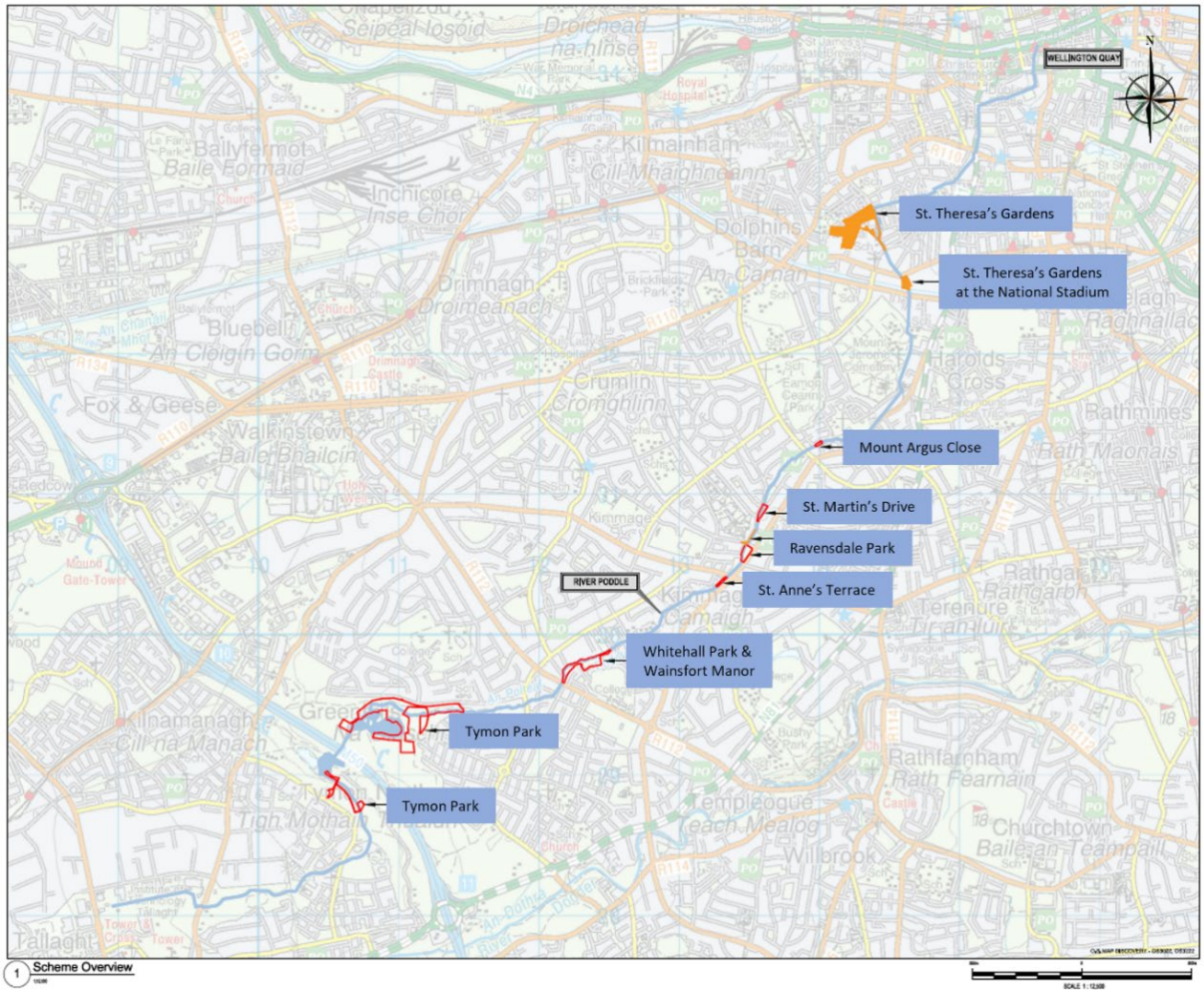

Figure 4-1 Location plan: River Poddle Flood Alleviation Scheme. Adapted from Nicholas O'Dwyer

5. CATCHMENTS, SUBCATCHMENTS AND WATERBODIES

5.1 OVERVIEW

Online data was obtained from the EPA for the WFD status of the River Poddle waterbody and associated catchments, summarised in Table 5-2 and Table 5-3 below.[1] A map of the Poddle and the Dodder subcatchment is provided in Figure 5-1.

[1] Sources: www.catchments.ie/data and https://gis.epa.ie/EPAMaps/Water

Figure 5-1 Map of the Poddle waterbody and Liffey and Dublin Bay sub-catchment. Source: https://gis.epa.ie/EPAMaps/Water

WFD - BQE Known Status

The River Poddle was subject to an electrofishing survey and a benthic invertebrate survey in 2020[2]. The invertebrate Q value was 3 while the fish Q value was 1. A river such as the Poddle, in natural condition, would be expected to support brown trout (*Salmo trutta*) and European eel (*Anguilla anguilla*). Both species were absent. As the river is able to support a benthic invertebrates assemblage consistent with moderately polluted water, it was concluded that the low Q value for fish was as a result of the poor hydromorphological quality; specifically barriers to fish movement, the long culverted sections of channel and the absence of suitable holding pools.

WFD - Supporting Elements

Water chemistry data is available from the EPA for the River Poddle at The Priory, Kimmage Road, Monitoring Station code RS09P030400. Data is available for the period from October 2007 to February 2022. Water chemistry indicates the channel is subject to nutrient enrichment and slightly elevated organic matter, see Table 5-1.

[2] Aquafact, 2020 *Electrofishing survey and Q value analyses for the River Poddle*. Aquafact International Services, Galway.

No formal fluvial audit was available from the EPA. However, cbec Chief Designer and fluvial geomorphologist, Dr Hamish Moir, had provided design advice on Nature Based Solutions for the river Poddle site. His field observations confirm the channel is subject to extensive culverting and there are lateral constraints on the channel. These features are also observable on aerial photography and the flood alleviation scheme drawings and are consistent with the candidate HMWB status.

Table 5-1. Water chemistry data for the River Poddle at The Priory, Kimmage Road Data collected between 2007 and 2022. Sites were sampled two to five times per year. Not all chemical parameters were tests for on each sampling occasion

	Units	Mean	Standard Deviation
Alkalinity-total (as CaCO3)	mg/l	154	40
Ammonia-Total (as N)	mg/l	0.071	0.098
BOD - 5 days (Total)	mg/l	1.9	0.8
BOD, 5 days with Inhibition (Carbonaceous BOD)	mg/l	2	1
Chloride	mg/l	32	16
Conductivity @20°C	µS/cm	443	120
Conductivity @25°C	µS/cm	473	104
Dissolved Oxygen	% Saturation	100	12
Dissolved Oxygen	mg/l	10.9	1.8
Fluoride	mg/l	0.3	0.1
Nitrate (as N)	mg/l	1.20	0.75
Nitrite (as N)	µg/l	21.40	23.22
Nitrite (as N)	mg/l	0.019	0.012
ortho-Phosphate (as P)	mg/l	0.050	0.032
pH	pH units	8.2	0.2
Sulphate	mg/l	37	10
Temperature	°C	11.3	4.1
Total Hardness (as CaCO3)	mg/l	205	55
Total Oxidised Nitrogen (as N)	mg/l	1.22	0.76
True Colour Hazen		14	6
True Colour	mg/l Pt Co	12	5

Table 5-2. Summary of WFD data for the River Poddle waterbody

Water body details			
Water body name	Poddle_010	**Code**	IE_EA_09P030800
Subcatchment	09_16 Dodder_SC_010		
Catchment	09 Liffey and Dublin Bay		
Current Ecological Status or Potential (2013-2018)	Poor		
Assessment technique	Expert judgement	**Status Confidence**	Low
Heavily Modified	Unknown (proposed Heavily Modified Waterbody under the Third Cycle River Basin Management Plan, subject to consultation)		
Artificial	Unknown		
High Status Objective	No		
Protected Area	Liffey Estuary (Nutrient Sensitive Area) Code: IETW_EA_2001_0027a		
Element	**Value (2013-2018)**	**Element**	**Value (2013-2018)**
Supporting Chemistry Conditions	Pass	**Nutrient Conditions**	Pass
General Conditions	Pass	**Nitrogen Conditions**	High
Oxygenation Conditions	Pass	**Nitrate**	High
Dissolved Oxygen (% Sat)	Pass	**Ammonium**	High
Other determinand for oxygenation conditions	High	**Phosphorus Conditions**	Good
Acidification Conditions	Pass	**Orthophosphate**	Good
pH	Pass		
Previous data			
	2010-2015	**2010-2012**	**2007-2009**
Ecological Status or Potential	Unassigned	Unassigned	Poor
Assessment technique	-	-	Monitoring
Status confidence	No information or unknown	No information or unknown	No information or unknown
Biological Status or Potential	-	-	Poor
Invertebrate Status or Potential	-	-	Poor

Source: www.catchments.ie/data/#/waterbody/IE_EA_09P030800?_k=7mjx13

5.2 RECEIVING AND POTENTIALLY DEPENDENT WATERBODIES

The River Poddle drains into the Liffey Estuary Upper, a transitional waterbody located in the city of Dublin, which is considered 'At Risk'. Water bodies located downstream of Liffey Estuary Upper are the Liffey Estuary Lower, Tolka Estuary, Dublin Bay, as well Dublin (groundwater body); these are illustrated in Figure 5-2 and summarised in Table 5-3 below.

Table 5-3. Receiving and potentially dependent waterbodies

Code	Name	Type	Local Authority	WFD Risk
Receiving waterbody				
IE_EA_090_0400	Liffey Estuary Upper	Transitional	Dublin City Council	At risk
Potentially dependent waterbodies				
IE_EA_090_0300	Liffey Estuary Lower	Transitional	Dublin City Council	At risk
IE_EA_090_0200	Tolka Estuary	Transitional	Dublin City Council	At risk
IE_EA_090_0000	Dublin Bay	Coastal	Dublin City Council	Not at risk
IE_EA_G_008	Dublin	Groundwater	South Dublin County Council	Not at risk

Source: www.catchments.ie/data/#/catchment/09?_k=s9xqfa

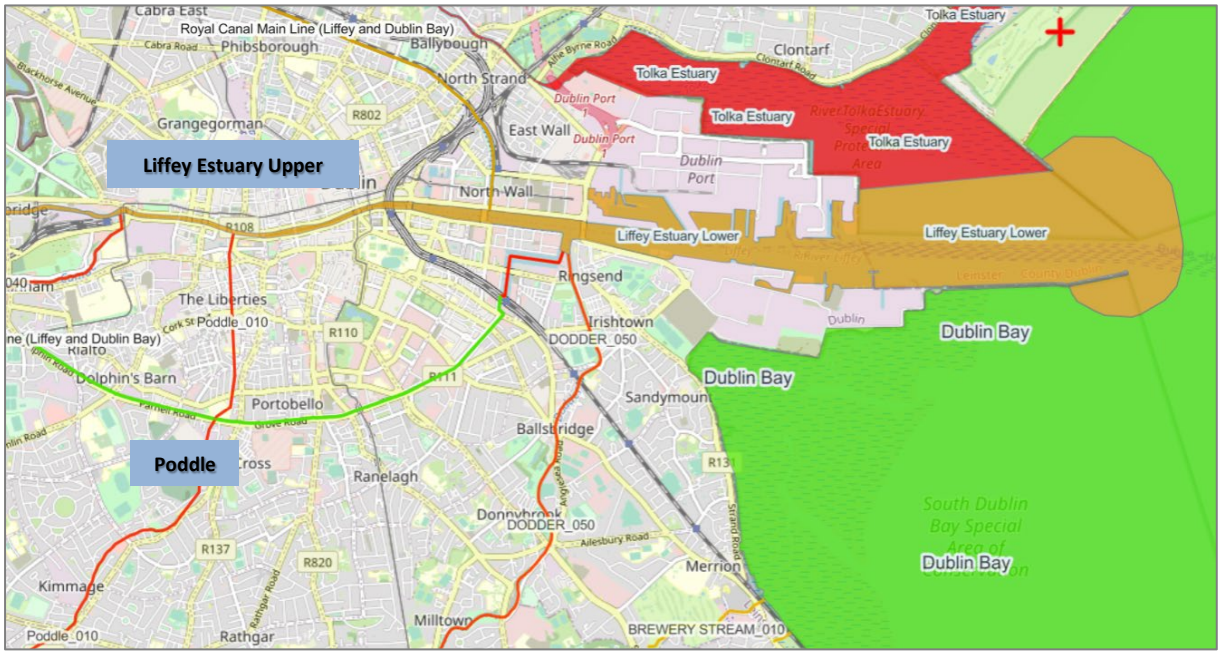

Figure 5-2 Map of potentially dependent water bodies. Source: https://gis.epa.ie/EPAMaps/Water

5.3 SIGNIFICANT PRESSURES IN 'AT RISK' WATERBODIES WITHIN THE PROJECT AREA

For the third cycle of WFD reporting the EPA undertook a risk assessment to identify waterbodies that were 'At Risk' of not achieving their WFD objectives by 2027. The risk to a waterbody was then assessed using an evidence-based process that considered monitoring data, trends in water quality, along with the scale of the challenges the waterbody faced in meeting WFD objectives. In instances where a waterbody was identified as being 'At Risk', an assessment plan was undertaken to identify the significant pressures impacting on the affected waterbody.

According to the most recent reporting, of a total of 127 waterbodies in the Liffey and Dublin Bay Catchment, 56 (44%) are At Risk, 30 (24%) in Review and 41 (32%) are Not At Risk.

Significant issues in 'At Risk' river waterbodies in the Liffey and Dublin Bay catchment have been identified as: nutrient pollution (34), organic pollution (24), morphological impacts (13), sediment (11), other (7) and hydrological impacts (2). The primarily issues identified for groundwater bodies include; nutrient pollution (4), chemical pollution (3), other impacts (2) and sediment (1). As the only waterbody directly affected by the proposed flood alleviation scheme, the River Poddle (Waterbody Poddle_010) has been classed as 'At Risk' of not meeting its WFD objects with the most significant pressure being identified as urban run-off.

6. WATER FRAMEWORK DIRECTIVE SCREENING ASSESSMENT

The WFD screening assessment provides a high-level assessment of the influence of projects on the WFD status of a water body. It is based on expert opinion of specialists with an in-depth knowledge of the WFD and biotic responses to physical and water quality alternations to their environment.

Table 6-1 below provides an explanation of the scoring system used to assess active intervention in the channel and riparian zone; surface water drainage or ancillary works have not been considered (soft landscaping, park biodiversity enhancements, sealing manholes).

Each site is scored individually for BQEs and Supporting Elements. The construction phase and operational phase are considered. WFD Screening matrices for each of the interventions are provided in Tables 6-2 to 6-7.

Table 6-1. Scoring system used to assess the impact at individual sites of the planned flood alleviation scheme

Effect on quality elements or Mitigation Measures (MM)
No deterioration/ Positive benefit / No impact on or contributes to delivery of MM
Does not impact quality elements / contribute to MM or prevent delivery - No change
Deterioration-further assessments needed / conflicts with or prevents delivery of MM
Indicates the same response as the row above

Table 6-2 WFD Screening matrix for the proposed works at Mount Argus Close

Water body name & ID: Poddle_010 (IE_EA_09P030800) Mount Argus Close				
Activities	Replacing retaining wall			
Description of activities	New linear retaining wall to provide localised flood protection			
Element (current status) *** indicates status not currently assigned**	**Construction**	**Operation**	**Overall impact**	**Further WFD Assessment or Mitigation**
Biological Quality Elements				
Fish *	Potential for mobilisation of sediment, or fuel spillage during construction but mitigation measures are specified and sufficient	Very minor - no change from current condition	Little change anticipated from current condition	Risk of sediment and chemical spillages to be managed by Contractor Consider adding large wood structures instream to diversity physical habitat
Invertebrates *	As above	As above	As above	As above
Macrophytes & Phytobenthos *	As above	As above	As above	As above
Hydromorphological quality elements *				
Quantity and Dynamics of river flow *	Potential for temporary flow diversion during construction of retaining wall but mitigation measures are specified and sufficient	No significant change	No significant change anticipated from current condition	Risks during construction to be managed by Contractor
Connection to Groundwater bodies *	No significant change	As above	As above	As above
River continuity *	As above	As above	As above	As above
Floodplain connectivity*	As above	Reduced access to right bank due to imposition of new retaining wall. No negative impacts anticipated as existing flood area is an artificial surface	As above	n/a
River depth and width variation *	As above	No significant change under low flows. Minor change under flood flows.	As above	n/a
Structure and substrate of the riverbed *	Potential for temporary disturbance to river bed composition during construction	No significant change anticipated	As above	Risks during construction to be managed by Contractor

	but mitigation measures are specified and sufficient			
Structure of the riparian zone *	Potential for impact on vegetation and soil compaction during construction but mitigation measures are specified and sufficient	Removal of some bank top vegetation. Very minor impact	As above	As above
Physico-chemical quality elements				
Oxygenation Conditions & Dissolved Oxygen (pass)	Potential for mobilisation of sediment, or fuel spillage during construction but mitigation measures are specified and sufficient	Very minor - no change from current condition	No significant impact	Risk of sediment and chemical spillages to be managed by Contractor
Other determinand for oxygenation conditions (high)	As above	As above	As above	As above
Ammonium (high)				
pH & Acidification Conditions (pass)				
Nutrient Conditions (pass)				
Nitrogen and Nitrate Conditions (high)				
Phosphorus Conditions (good)				
Orthophosphate (pass)				
Supporting Chemistry Conditions (pass)				
Chemical elements				
Priority Substances / Priority Hazardous Substances *	As above	As above	As above	As above

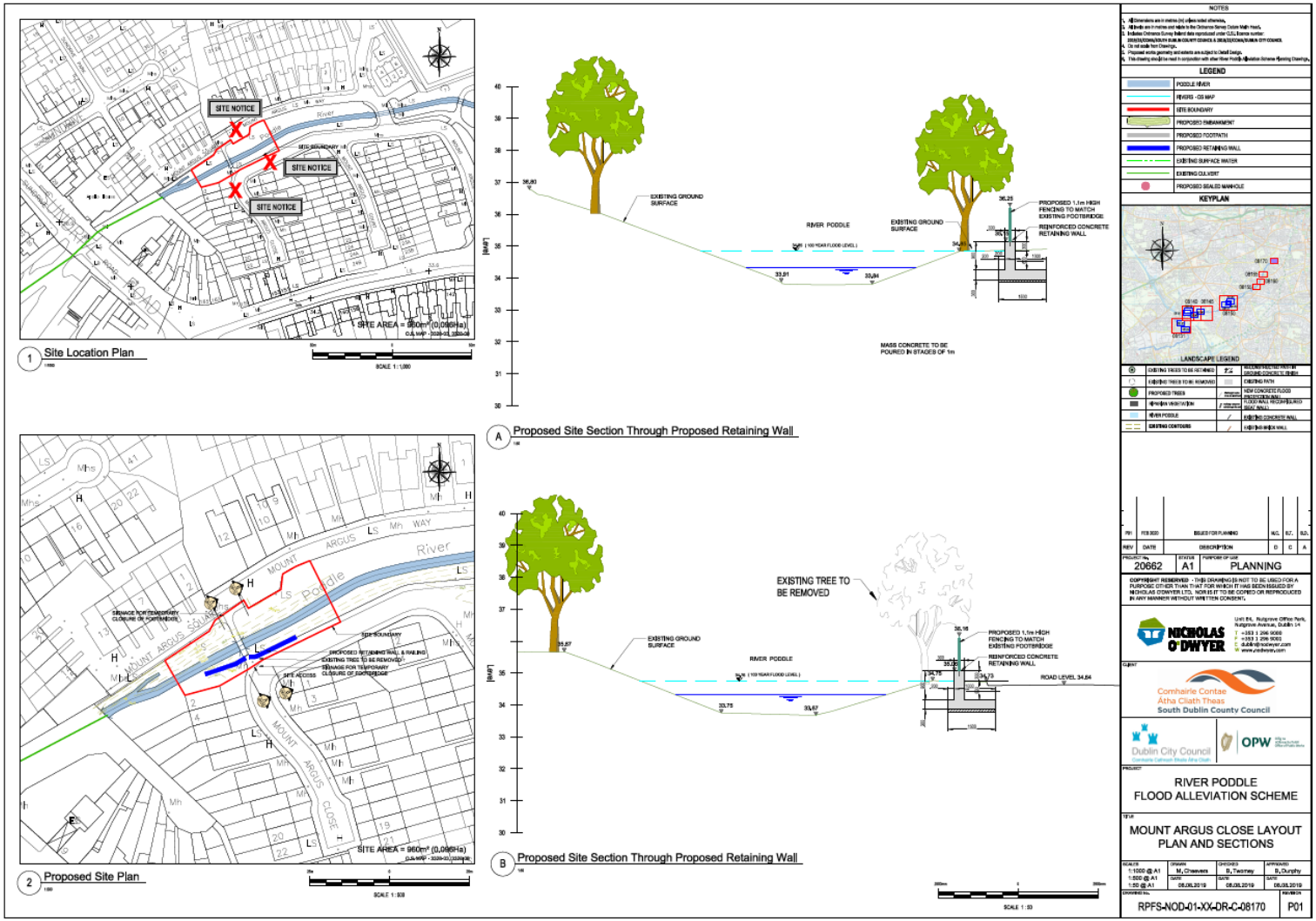

Figure 6-1 Plans for Mount Argus Close. Source: Nicholas O'Dwyer

Table 6-3 WFD Screening matrix for the proposed works at St. Martin's Drive

Water body name & ID: Poddle_010 (IE_EA_09P030800) St. Martin's Drive				
Activities	Building a new retaining wall			
Description of activities	New linear retaining wall along right bank to provide localised flood protection			
Element (current status) *** indicates status not currently assigned**	**Construction**	**Operation**	**Overall impact**	**Further WFD Assessment or Mitigation**
Biological Quality Elements				
Fish *	Potential for mobilisation of sediment, or fuel spillage during construction causing a direct or indirect reduction in water quality but mitigation measures are specified and sufficient	no significant change from current condition	no significant change	Consideration has been given to adding large wood structures instream to diversity physical habitat but site unsuitable. Coir rolls will be used on wall face
Invertebrates *	As above	As above	no significant change	As above
Macrophytes & Phytobenthos *	As above	Improved as coir rolls will encourage native marginal vegetation	improved	As above
Hydromorphological quality elements *				
Quantity and Dynamics of river flow *	Potential for temporary flow diversion during construction of retaining wall but mitigation measures are specified and sufficient	No significant change	No change anticipated from current condition	Consideration has been given to adding large wood structures instream to diversity physical habitat but site unsuitable. Coir rolls will be used on wall face
Connection to Groundwater bodies *	No significant change	As above	As above	n/a
River continuity *	No significante change anticipated	As above	As above	n/a
Floodplain connectivity*	No impact during construction as works to be undertaken during flow flows	Access to right bank top will be cut off but necessary for flood protection. no significant change from current status	no significant chang	n/a
River depth and width variation *	No significant change	no significant change from current status	no significant change	n/a
Structure and substrate of the riverbed *	Potential for temporary disturbance to river bed composition during construction	no significant change from current status	As above	Risks during construction to be managed by Contractor

	but mitigation measures are specified and sufficient			
Structure of the riparian zone *	Potential for impact on vegetation and soil compaction during construction but mitigation measures are specified and sufficient	Removal of significant amount of bank top vegetation and tree cover but mitigation measures include replacement with native riparian flora	improved	Risks during construction to be managed by Contractor
Physico-chemical quality elements				
Oxygenation Conditions & Dissolved Oxygen (pass)	Potential for mobilisation of sediment, or fuel spillage during construction causing a direct or indirect reduction in water quality but mitigation measures are specified and sufficient	No significant impact	No significant impact	Risks during construction to be managed by Contractor
Other determinand for oxygenation conditions (high)	As above	As above		
Ammonium (high)				
pH & Acidification Conditions (pass)				
Nutrient Conditions (pass)				
Nitrogen and Nitrate Conditions (high)				
Phosphorus Conditions (good)				
Orthophosphate (pass)				
Supporting Chemistry Conditions (pass)				
Chemical elements				
Priority Substances / Priority Hazardous Substances *				

Figure 6-2 Plans for St. Martin's Drive. Source: Nicholas O'Dwyer

Table 6-4 WFD Screening matrix for the proposed works at Ravensdale Park

Water body name & ID: Poddle_010 (IE_EA_09P030800)				
Activities	Creation of flood storage area at Ravensdale Park			
Description of activities	Creation of flood storage area, construction of a new retaining wall and replacement footbridge within the park			
Element (current status) *** indicates status not currently assigned**	**Construction**	**Operation**	**Overall impact**	**Further WFD Assessment or Mitigation**
Biological Quality Elements				
Fish *	Potential for mobilisation of sediment, or fuel spillage during construction causing a direct or indirect reduction in water quality but mitigation measures are specified and suitable	No significant change	No significant change anticipated from current condition	Consideration has been given to adding large wood structures instream and create wider river corridor by reprofiling river to diversify physical habitat and/or allowing channel to meander through the park but site unsuitable
Invertebrates *	As above	As above	As Above	As above
Macrophytes & Phytobenthos *	As above	Improved as coir rolls will encourage native marginal vegetation	Improved	
Hydromorphological quality elements *				
Quantity and Dynamics of river flow *	Potential for temporary flow diversion during construction of retaining wall proximal to channel but mitigation measures are specified and suitable	During storm events, water will be held back in the flood storage area at Ravensdale Park, with peak flows attenuated downstream	No significant change anticipated from current condition	Risks during construction to be managed by Contractor
Connection to Groundwater bodies *	No significant change	May contribute to groundwater recharge when the flood storage area is inundated	As above	n/a
River continuity *	As above	No significant change	As above	n/a
Floodplain connectivity*	No impact during construction anticipated as works undertaken during low flow conditions	No significant change	as above	n/a

River depth and width variation *	Potential for temporary flow diversion during construction of retaining wall proximal to channel but mitigation measures are specified and suitable	No significant change	No significant change anticipated from current condition	Risks during construction to be managed by Contractor
Structure and substrate of the riverbed *	Potential for temporary impact on substrate composition due to flow diversion during construction of retaining wall proximal to channel and footbridge but mitigation measures are specified and suitable	As above	As above	Risks during construction to be managed by Contractor
Structure of the riparian zone *	Potential for impact on vegetation and soil compaction during construction but mitigation measures are specified and suitable	Minimal reduction in total tree cover	As above	Risks during construction to be managed by Contractor
Physico-chemical quality elements				
Oxygenation Conditions & Dissolved Oxygen (pass)	Potential for mobilisation of sediment, or fuel spillage during construction but mitigation measures are specified and suitable	No significant impact	No significant impact	Risk of sediment and chemical spillages to be managed by Contractor
Other determinand for oxygenation conditions (high)	Potential for mobilisation of sediment, or fuel spillage during construction but mitigation measures are specified and suitable	As above	As above	As Above
Ammonium (high)				
pH & Acidification Conditions (pass)				
Nutrient Conditions (pass)				
Nitrogen and Nitrate Conditions (high)				
Phosphorus Conditions (good)				
Orthophosphate (pass)				
Supporting Chemistry Conditions (pass)				
Chemical elements				

Priority Substances / Priority Hazardous Substances *	Potential for fuel spillage during construction but mitigation measures are specified and suitable			Risk of sediment and chemical spillages to be managed by Contractor

Figure 6-3 Plans for Ravensdale Park indicating retaining wall and new footbridge. Source: Nicholas O'Dwyer

Table 6-5 WFD Screening matrix for the proposed works at St. Anne's Terrace

Water body name & ID: Poddle_010 (IE_EA_09P030800)				
Activities	St. Anne's Terrace retaining wall			
Description of activities	New linear retaining wall to provide localised flood protection			
Element (current status) *** indicates status not currently assigned**	**Construction**	**Operation**	**Overall impact**	**Further WFD Assessment or Mitigation**
Biological Quality Elements				
Fish *	Potential for mobilisation of sediment, or fuel spillage during construction but mitigation measures are specified and suitable	Very minor - no change from current condition	The impact will be little different from the current condition where a retaining wall exists	Risk of sediment and chemical spillages to be managed by Contractor Consider adding large wood structures instream to diversity physical habitat
Invertebrates *	As above	As above	As above	As above
Macrophytes & Phytobenthos *	As above	Improved as coir rolls will encourage native marginal vegetation	Improved	As above
Hydromorphological quality elements *				
Quantity and Dynamics of river flow *	Potential for temporary flow diversion during construction of retaining wall but mitigation measures are specified and suitable	No significant change	No change anticipated from current condition	Risks during construction to be managed by Contractor
Connection to Groundwater bodies *	No significant change	As above	As above	n/a
River continuity *	As above	As above	As above	n/a
Floodplain connectivity*	As above	No impact due to presence of existing wall along right bank	As above	n/a
River depth and width variation *	As above	As above	As above	n/a
Structure and substrate of the riverbed *	Significant disturbance to river bed composition during construction but mitigation measures are specified and suitable	short term impact with full recovery of channel substrate expected rapidly	Localised negative impact until channel recovers	Ensure gravels reintroduced are of appropriate size and size distribution to that present prior to intervention

Structure of the riparian zone *	Potential for impact on vegetation and soil compaction during construction but mitigation measures are specified and suitable	No significant impact	No significant change anticipated from current condition	Risks during construction to be managed by Contractor
Physico-chemical quality elements				
Oxygenation Conditions & Dissolved Oxygen (pass)	Potential for mobilisation of sediment, or fuel spillage during construction causing a direct or indirect reduction in water quality but mitigation measures are specified and suitable	Very minor - no change from current condition	The impact will be little different from the current condition where a retaining wall exists	Risk of sediment and chemical spillages to be managed by Contractor
Other determinand for oxygenation conditions (high)	As above but mitigation measures are specified and suitable	As above	As above	As above
Ammonium (high)				
pH & Acidification Conditions (pass)				
Nutrient Conditions (pass)				
Nitrogen and Nitrate Conditions (high)				
Phosphorus Conditions (good)				
Orthophosphate (pass)				
Supporting Chemistry Conditions (pass)				
Chemical elements				
Priority Substances / Priority Hazardous Substances *				

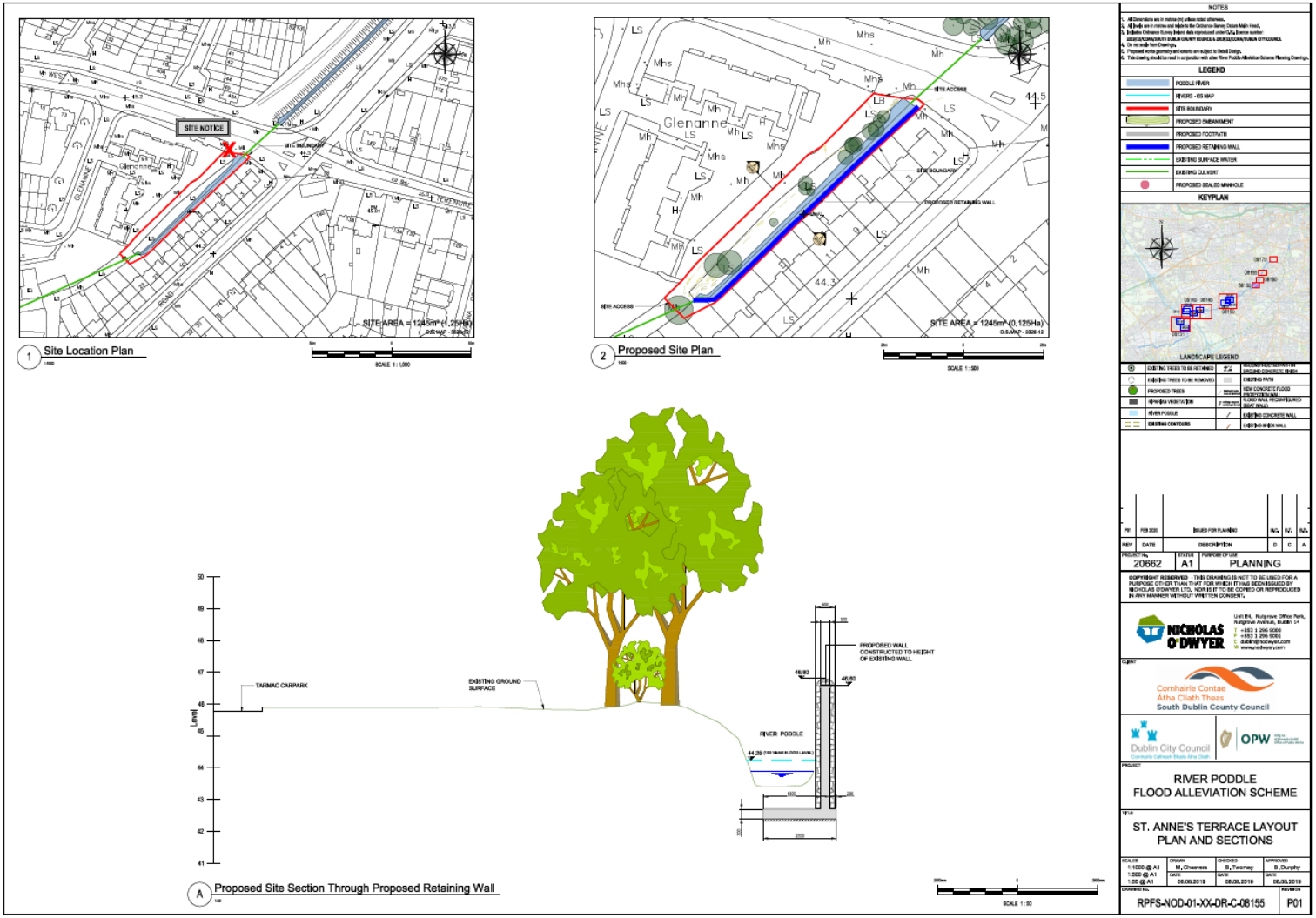

Figure 6-4 Plans for St. Anne's Terrace indicating position of retaining wall. Source: Nicholas O'Dwyer

Table 6-6 WFD Screening matrix for the proposed works at Whitehall Park and Wainsfort Manor

Water body name & ID: Poddle_010 (IE_EA_09P030800)				
Activities	Channel realignment and other works at Whitehall Park and Wainsfort Manor			
Description of activities	Regrading and realignment of the channel to provide clearance from adjacent properties, construction of an earthen embankment, and stone and concrete retaining walls to provide localised flood protection			
Element (current status) *** indicates status not currently assigned**	**Construction**	**Operation**	**Overall impact**	**Further WFD Assessment or Mitigation**
Biological Quality Elements				
Fish *	Significant disruption to flow dynamics during channel regrading and realignment works but mitigation measures are specified and suitable	The re-meandering of the channel at the upstream end of the site will create increased habitat diversity instream with positive benefits. The retaining wall will have a localised negative impact on the downstream section	Both positive and negative impacts.	Consider adding large wood structures instream to diversify physical habitat
Invertebrates *	Significant disruption to flow dynamics during channel regrading and realignment works but mitigation measures are specified and suitable	As above	Both positive and negative impacts.	As above
Macrophytes & Phytobenthos *	Significant disruption to flow dynamics during channel regrading and realignment works but mitigation measures are specified and suitable	As above	Both positive and negative impacts	As above
Hydromorphological quality elements *				
Quantity and Dynamics of river flow *	Significant disruption to flow dynamics during channel regrading and realignment works. Temporary channel diversion during construction of retaining wall proximal to channel but mitigation measures are specified and suitable	Associated channel realignment at Whitehall Park will alter channel function and will create more natural and variable flow types	Localised improvements in channel function and form	Risks during construction to be managed by Contractor
Connection to Groundwater bodies *	No impact	May contribute to groundwater recharge when the flood storage area is inundated	No significant change anticipated from current condition	n/a

River continuity *	Significant flow diversion during channel regrading and realignment works but mitigation measures are specified and suitable	No long-term impact on river continuity anticipated	As above	Risks during construction to be managed by Contractor
Floodplain connectivity*	No impact during construction as works to be undertaken during low flow conditions	Localised positive impact	Localised improvements at Whitehall Park	n/a
River depth and width variation *	Significant disruption to flow dynamics during retaining wall construction, channel regrading and realignment works but mitigation measures are specified and suitable	Associated channel realignment and regrading will significantly alter channel geometry creating more natural and variable range of flow types	Localised improvements	Risks during construction to be managed by Contractor. Consider adding large wood structures instream to diversify physical habitat
Structure and substrate of the riverbed *	Complete change and reorganisation of substrate composition due to channel realignment works. Likely to also have temporary impact downstream of realigned channel but mitigation measures are specified and suitable	Associated channel realignment at Whitehall Park will result in complete alteration of bed composition, creating more natural bedform units	Localised improvements	As above
Structure of the riparian zone *	Significant impact on vegetation composition and soil compaction during construction but mitigation measures are specified and suitable	Associated channel realignment and regrading at Whitehall Park will increase riparian area along left bank. Creation of bio-diversity enhancement area at Whitehall Park. Some removal of existing trees along right bank at Wainsfort Manor	Localised improvements	Risks during construction to be managed by Contractor
Physico-chemical quality elements				
Oxygenation Conditions & Dissolved Oxygen (pass)	Potential for mobilisation of sediment, or fuel spillage during construction causing a direct or indirect reduction in water quality but mitigation measures are specified and suitable	Very minor - no change from current condition	The impact will be little different from the current condition where a retaining wall exists	Risk of sediment and chemical spillages to be managed by Contractor
Other determinand for oxygenation conditions (high)	As above	As above	As above	As above
Ammonium (high)				

pH & Acidification Conditions (pass)				
Nutrient Conditions (pass)				
Nitrogen and Nitrate Conditions (high)				
Phosphorus Conditions (good)				
Orthophosphate (pass)				
Supporting Chemistry Conditions (pass)				
Chemical elements				
Priority Substances / Priority Hazardous Substances *	As above	As above	As above	As above

Figure 6-5 Proposed plans for Whitehall Park and Wainsfort Manor indicating river realignment, embankment, biodiversity enhancements and retaining wall. Source: Nicholas O'Dwyer

Table 6-7 WFD Screening matrix for the proposed works at Tymon Park

Water body name & ID: Poddle_010 (IE_EA_09P030800)				
Activities	Creation of flood storage area at Tymon Park			
Description of activities	Creation of flood storage area, incorporating earthen embankments, replacement of existing flow control structure and footbridge, and installation of an integrated constructed wetland (ICW)			
Element (current status) *** indicates status not currently assigned**	**Construction**	**Operation**	**Overall impact**	**Further WFD Assessment or Mitigation**
Biological Quality Elements				
Fish *	Minor impact	Inline wetland - positive benefits to habitat and water quality Flow control structure – to be considered Embankment – no significant change	Inline wetland - positive Flow control structure - to be determined Embankment -no significant change	Proposed flow control structure and new weir downstream of ICW to be assessed for impact on fish passage
Invertebrates *	Minor impact	As above	Positive	As above
Macrophytes & Phytobenthos *	Minor impact	As above	Positive	As above
Hydromorphological quality elements *				
Quantity and Dynamics of river flow *	Potential for temporary flow diversion during construction but mitigation measures are specified and suitable	During storm events, water will be held back in the park, with peak flows attenuated downstream	Improvement in the attenuation of peak flows	Risks during construction to be managed by Contractor
Connection to Groundwater bodies *	No significant change	May contribute to groundwater recharge when the flood storage area is inundated	Potential impact during high flows	n/a
River continuity *	Potential for temporary flow diversion during construction but mitigation measures are specified and suitable	Flow control structure will allow continuity of flows downstream. New weir to create ICW	Attenuation of peak flows in ICW	Risks during construction to be managed by Contractor
Floodplain connectivity*	No impact during construction as works to be undertaken during flow flows	Presence of ICW to provide positive local impact	Positive impact	n/a
River depth and width variation *	Potential for temporary flow diversion during construction but mitigation measures are specified and suitable	Change in channel cross-sectional geometry at Tymon Park under peak flow due to proposed embankment	Potential impact during high flows and attenuation of water in ICW	Risks during construction to be managed by Contractor

Structure and substrate of the riverbed *	Potential for temporary disruption during construction but mitigation measures are specified and suitable	Localized positive change in channel bed composition in reach affected by ICW	Potential localised improvements	As above
Structure of the riparian zone *	Potential for impact on vegetation and soil compaction during construction but mitigation measures are specified and suitable	Marginal and riparian zone to be enhanced by the ICW. Localised removal of riparian tree cover	Potential localised improvements	As above
Physico-chemical quality elements				
Oxygenation Conditions & Dissolved Oxygen (pass)	Potential for mobilisation of sediment, or fuel spillage during construction but mitigation measures are specified and suitable	ICW will improve overall water quality at the site and downstream	Both local and downstream improvements to water quality	Risk of sediment and chemical spillages to be managed by Contractor
Other determinand for oxygenation conditions (high)				
Ammonium (high)				
pH & Acidification Conditions (pass)				
Nutrient Conditions (pass)				
Nitrogen and Nitrate Conditions (high)				
Phosphorus Conditions (good)				
Orthophosphate (pass)				
Supporting Chemistry Conditions (pass)	Potential for fuel spillage during construction but mitigation measures are specified and suitable	ICW will improve overall water quality at the site and downstream	Both local and downstream improvements to water quality	Risk of sediment and chemical spillages to be managed by Contractor
Chemical elements				
Priority Substances / Priority Hazardous Substances *	Potential for fuel spillage during construction but mitigation measures are specified and suitable	ICW will improve overall water quality at the site and downstream	Both local and downstream improvements to water quality	Risk of sediment and chemical spillages to be managed by Contractor

Figure 6-6 Proposed plans for the lake at Tymon Park indicating embankment and flow control structure. Source: Nicholas O'Dwyer

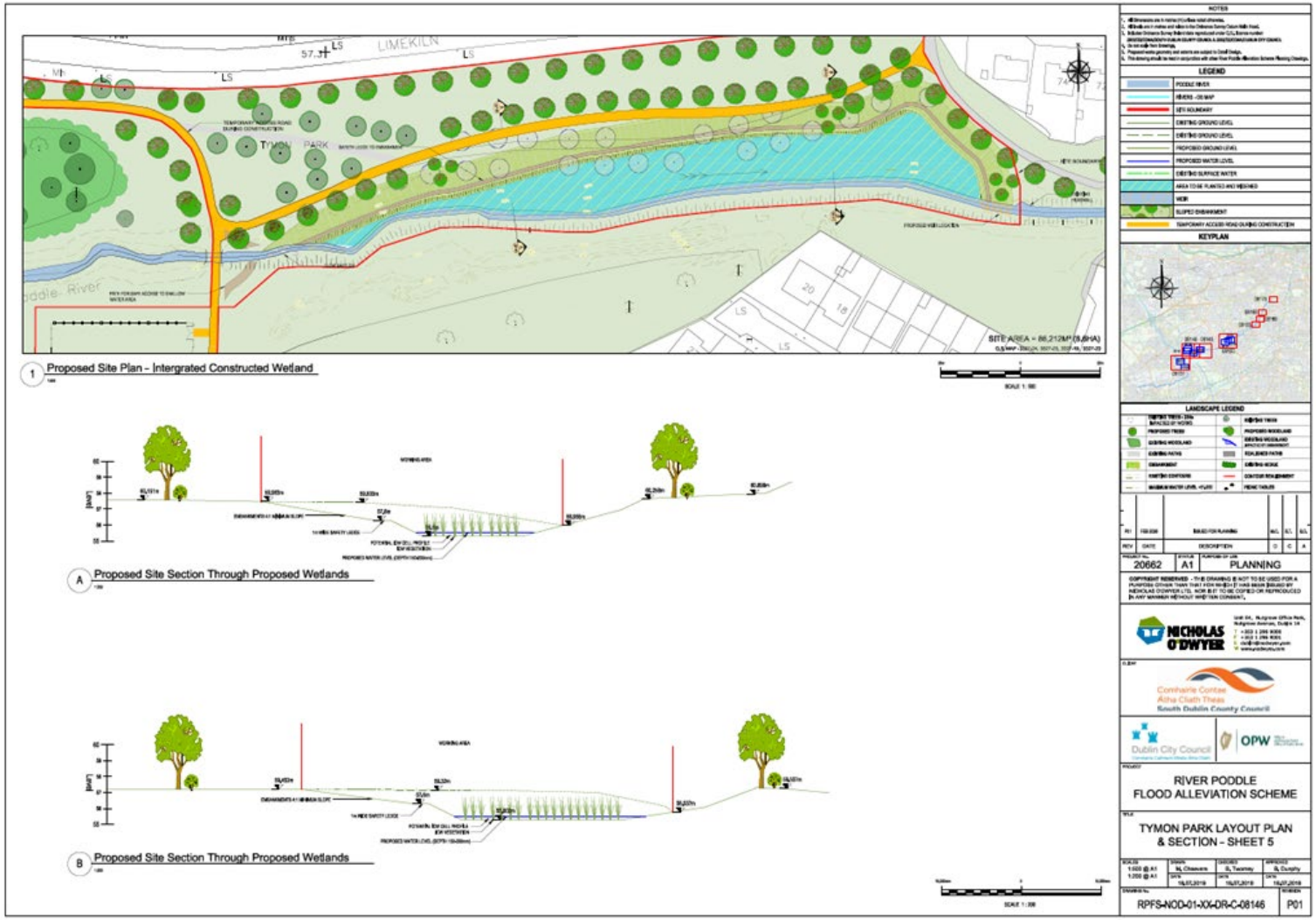

Figure 6-7 Plans for Tymon Park indicating Integrated Constructed Wetland (ICW). Source: Nicholas O'Dwyer

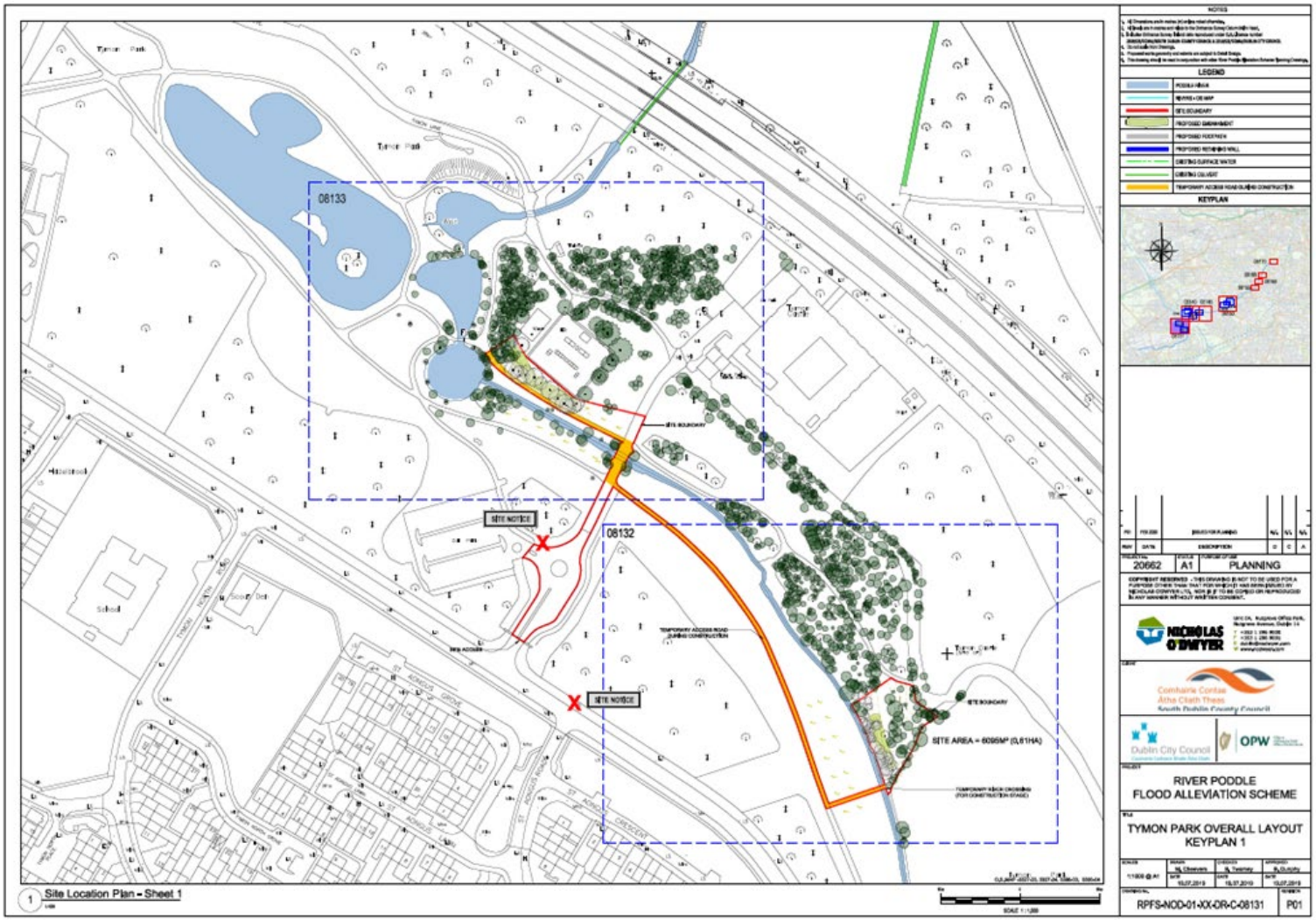

Figure 6-8 Proposed plans for Tymon Park indicating embankments. Source: Nicholas O'Dwyer

7. CONCLUSIONS AND RECOMMENDATIONS

Evidence from the EPA and other sources indicate that the River Poddle is subject to multiple stressors including hydromorphological alteration and poor water quality. The poor water quality will result from nutrient and other chemical inputs from the urban environment through the drainage system. This has resulted in a depauperate invertebrate assemblage which lacks key indicator species and the absence of migratory fish species.

Hydromorphological impacts include substantial culverting, weirs and walls and other structures that laterally constrain the channel. The river's current course is also consistent with alterations to channel planform.

Due consideration has been given to the possibility for enhancing habitat where the lateral constraints on the floodplain and channel allow for this. An Integrated Constructed Wetland at Tymon Park and a re-meandered section of channel at Whitehall Park/Wainsfort Manor are included in the scheme.

The scheme involves physical changes to the channel and riparian zone. As such the main mechanism by which it influences WFD status, in the long-term, is through changes to hydromorphology, that is the physical habitat of the river. The Integrated Constructed Wetland will improve the water quality of the river.

At many of the sites the planned works will replace existing bankside walls with new, more robust versions. As these structures are replacements, their effect on the hydromorphological processes of the system can be viewed as neutral and will not cause further deterioration to WFD status of the channel itself or receiving waters.

The channel restoration at Whitehall Park is viewed as beneficial and would improve WFD status. It will create habitat instream for BQEs, specifically, fish, invertebrates, phytobenthos and macrophytes. It will also help reinstate hydromorphological processes locally.

The Integrated Constructed Wetland, located toward the downstream end of the channel at Tymon Park, will also diversify habitat and improve conditions for BQEs locally. Macrophytes in particular will improve. It will also help reduce nutrient flux from the River Poddle to receiving waters downstream.

As noted above, the River Poddle is subject to multiple stressors so the improvements to physical habitat may enable only a muted increase in BQE quality. The planned improvements are to be strongly encouraged as a move in the right direction. In order for these sites to achieve their full potential, they would also require a substantial improvement in chemical water quality. The ICW will contribute to water quality improvements but appropriate catchment management should be considered too albeit it is beyond the scope of this scheme.

Work is planned in the channel and adjacent to it. The mitigation measures identified are sufficient to ameliorate potential impacts during construction. This includes, but is not limited to, measures designed to minimise the introduction of fine sediment to the channel and other physical disturbances.

Physical disruption at locations of instream works is inevitable but will cause only very localised impacts with a large body of evidence indicating recovery will be rapid as freshwater invertebrates and fish are adapted to disturbances caused by flooding and the disturbance caused by instream works is similar.

The mitigation measures specified in Tables 6-2 to 6-7 are general best practice and other measures as contained in the existing scheme documentation. In addition to these measures, we recommend that where new flood walls are installed bankside, the foundations extend under the channel. It is important for fluvial process and BQE habitat that the river gravels are re-used or replaced with sediment of the same size and size distribution.

Part of the proposed flood alleviation works include the replacement of the existing weir flow control structure at Tymon Lake with a similar structure and new weir structure downstream of the ICW. The final design of these structures should incorporate appropriate measures to facilitate fish passage.

The planned scheme will introduce flood alleviation measures at a number of sites throughout the catchment. The WFD Assessment has concluded that, the overall impact of the scheme can be considered as neutral or beneficial from a WFD perspective, provided that the mitigation measures are implemented.

APPENDIX A

AUTHORS' QUALIFICATIONS AND EXPERTISE

Matthew O'Hare, Ph.D., Principal Consultant

Education

PhD Institute of Biomedical & Life Sciences University of Glasgow

BSc, Dept. of Zoology, University College Dublin

Professional Experience

September 2021 - present, cbec eco-engineering UK Ltd. Principal Consultant

January 2019 - October 2019, Centre for Ecology & Hydrology, Group leader Freshwater Restoration & Sustainability

June 2007 - December 2018 Centre for Ecology & Hydrology Senior Scientist

October 2003 - May 2007 Centre for Ecology & Hydrology, Aquatic Botany Group leader.

2000 - August 2003 EU project Eurolakes, University of Glasgow Project Manager.

1999 - 2000 Scottish Natural Heritage, Freshwater Advisory Officer

1994. Dept. of Land and Water Conservation New South Wales, Australia, Freshwater officer.

Dr Matthew O'Hare is an internationally recognised expert, with over 25 years experience working across the UK and Europe, on freshwater systems subject to multiple stresses. His work has combined applied and fundamental research with practical management. He has been heavily involved in the practical implementation of environmental policy and legislation, especially the EU Water Framework Directive. He has provided technical advice to the EU, through ECOSTAT and on innovative, strategic development as an assessor of the 'Waterworks' programme, an EU Joint Programming Initiative (JPIs), Water JPI ("Water Challenges for a Changing World") and FACCE-JPI ("Agriculture, Food Security and Climate Change"). He has also provided advice to individual member states, most recently as a member of the advisory board on a large project run by the Irish EPA. In the UK he has advised the Environment Agency and the Scottish Environment Protection Agency on river restoration, biomonitoring and conveyance capacity of vegetated channels. Mattie advocates consideration of Nature Based Solutions, where appropriate. He is experienced in designing restoration project monitoring programmes, assessing and modelling project outcomes. He emphases the importance of incorporating the dynamics effects of hydrological and fluvial geomorphology on ecological processes. This approach is facilitated by his experience in developed tools for assessing whole river hydromorphological condition, the physical habitat suitability for vegetation, and the impact of vegetation on bed roughness and other physical processes. He also has a strong understanding of physical habitat preferences of freshwater invertebrates. Recently his advocacy of nature based solutions has drawn attention in countries especially vulnerable to the impact of climate change on freshwater systems, specifically he was invited to give keynote presentations at international conferences in Turkey and Japan; at the International Society for River Science (ISRS) meeting in Tokyo in 2018 and at 'Ecology 2017', Kayseri, Turkey. He is experienced in communicating to a wide range of audiences and tailors his delivery accordingly. Mattie also has extensive project management experience having lead substantial components of EU and UK projects, including REFORM (Restoring rivers for effective catchment management), involving input from 20+

partners, 450 person months of activity, He also has hands on experience of large engineering projects such as the Waverley Railway Project. With a strong academic background (over 60 ISI publications) he maintains a large international network in applied research as Associate Editor of the journal Aquatic Conservation Marine & Freshwater Systems.

Selected Project Experience

Recent River Restoration Projects (2021 onwards) Mattie is currently managing a number of river restoration projects in the UK, Ireland and Norway. These projects have involved tasks including initial concepts, fluvial audits, outline designs, topographic surveys, hydraulic modelling, final design outputs and construction support. These include work for Stavanger Kommune, Inland fisheries Ireland, Natural Resource Wales, Edinburgh Council and ON Power in Iceland.

Fewer sites better data (2018), This work, commissioned by the Scottish Environment Protection Agency, identified ways of reducing their national river monitoring network, and by the inclusion of a small number of new sites, improve the representativeness of the data produced. Mattie managed the project and helped design and resource it. Dan Chapman, University of Stirling, conducted the statistical analysis.

RESAS programme (2016 – 2018), This was a Scottish Government funded programme. Mattie provided advice on the feasibility of restoring two river sites and co-designed baseline surveys. He also advised SEPA's ecohydrology committee on novel approaches to river management.

Project Feasibility Assessments, Scotland Denmark & Israel (2016, 2018), I assessed the feasibility of whole river restoration schemes for two charitable trusts, the Velux Foundation and a Rothschild foundation in Denmark and Israel respectively. The project in Scotland involved assessing the potential impact of a 'run of river' hydroscheme on protected mosses. Mattie assessed the suitability of the rivers, the measures to be taken, funds available and the project timescales. For the Scottish project he modelled the impact of hydrological changes on the riparian vegetation using Auble's approach.

REFORM – Restoring rivers for effective catchment management (2010 – 2015), This was a very large scale project that integrated fluvial geomorphology and hydrology into the implementation of the EU Water Framework Directive. It included analysis of very large national datasets (1000s of sites) and 12 restoration case studies. It raised awareness of hydromorphological impact, now recognised as effecting circa 50% of EU water bodies. Technical advances include a whole river assessment system (now incorporated into a new CEN standard), clear evidence of the response of WFD metrics to restoration and the development of management strategies. Mattie lead CEH's contribution, co-lead Work Package (WP3) coordinating input from 20+ partners with 450 person months of activity and contributed to WP2 and WP5.

Michael Green, MCIWEM, MSc, Senior Restoration/NFM Consultant

Education

MSc Integrated Management of Freshwater Environments, Queen Mary University of London

BSc (Hons) Geography, University of Bristol

Professional Experience

February 2021 – present, Senior Consultant, cbec

Nov 2016 – Feb 2021, Flood Risk Consultant, Project Centre

March 2016 – Nov 2016, NFM Consultant, cbec

Michael Green is a water and environmental professional with over five years' experience in river restoration, flood modelling and sustainable drainage systems. He works on the assessment and design of schemes, from feasibility and concept through to detailed design, focusing on nature-based solutions which deliver multiple benefits for both people and the environment. Michael has experience of working with stakeholders and communicating designs to a non-technical audience, as well as working with regulators including the Environment Agency to ensure that projects meet the latest

environmental standards. He also manages projects, ensuring that outputs are delivered to cbec's clients on time and within budget.

Michael was lead author of the Natural Flood Management Toolbox, a seven-step guide to scoping and implementing NFM schemes, published in 2016. He previously worked at an interdisciplinary engineering consultancy, as well as at a Lead Local Flood Authority, developing and raising funds for projects, as well as providing advice to the Local Planning Authority. Michael holds an MSc from Queen Mary University of London, where he specialised in fluvial geomorphology and the use of hydraulic models to assess river restoration schemes.

Selected Project Experience

Colin Glen: weir modification, (February to June 2021) cbec was commissioned by the Lagan Rivers Trust to assess and design options for modifying three weirs to improve fish passage on the Colin Glen River, a tributary of the River Lagan, in western Belfast. The lower and middle reaches of the river flow through the town of Dunmurry, where it has been engineered historically, including weirs which prevent the migration of fish, as well as constraining natural flows of water and sediment. Designs for rock ramps were developed to safely modify the weirs, whilst reducing risks to adjacent buildings and transport infrastructure. By grading out the head loss created by the weirs, the project will improve the river's ecology and allow fish to once again swim and spawn in its upper reaches. Michael was project manager and led reporting for the project, coordinating overseas fieldwork and development of design drawings, ensuring that the project was delivered on time and within budget.

Salmon's Brook: Stage 0 inception study, (February to July 2021) cbec was commissioned by Enfield Council to undertake a study to inform the initial development of a full floodplain restoration project, known as Stage 0, in the headwaters of the Salmon's Brook Catchment in outer north London. A comprehensive review of range of data on existing conditions and constraints at the site was required to inform what has the potential to be a landmark restoration project of international significance, with the inception study key to Identifying requirements for more detailed feasibility assessments, baseline surveys, as well as design and post-implementation monitoring. The study Identified that, whilst the Salmon's Brook may not meet some of the 'classic', restrictive criteria for a Stage 0 project, it is nonetheless a strong candidate for a scheme involving full floodplain restoration and restoration of natural hydrological regimes. Michael led the data analysis and reporting, including presenting regular project updates to the client, as well as delivering final reports.

New River Hydraulic Study, (January - June 2021) cbec was subcontracted to Arup to complete a topographic survey of the New River, a 36 km manmade channel that diverts flow from the River Lea (Hertford) to the Stoke Newington Reservoirs in London. The channel was created >150 years ago to provide water to the Hornsey Water Treatment Works, now operated by Thames Water, however over time the channel has become silted and flow capacity has been reduced. Thames Water have engaged Arup, cbec and Eden Vale Young to undertake an investigation into the current capacity of the channel, assessing the level of silt in the channel and advising on the most cost effective measures that can be implemented to improve flow conveyance to the Water Treatment Works. The topographic survey delineated channel geometry and silt levels in the channel for input into a 1-dimensional hydraulic model, used to assess the effect of different solutions on flow conveyance to Hornsey. Michael supported the field team with the topographic survey.

Natural Flood Management Toolbox, (*March – November 2016*) Commissioned by the Environment Agency as part of their Working With Natural Processes (WWNP) Framework, cbec wrote and researched the Natural Flood Management (NFM) Toolbox, a practical seven step guide for developing successful NFM strategies in rural catchments. This guidance aims to fill a gap in NFM practice by signposting practitioners and communities to relevant evidence, support mechanisms, practical assessment tools and case studies that help them deliver projects with both environmental and flood risk benefits. This evidence-based guidance covers data collection, tools for appraising NFM techniques, legislation and permits, stakeholder engagement and funding. The NFM Toolbox is available at: www.catchmentbasedapproach.org/deliver/nfm-toolbox. Michael was lead author for the Toolbox, analysing complex information and communicating it in a clear and concise style accessible to a wide audience.

Colm M. Casserly, Ph.D., Senior Technical Specialist & Geomorphologist

Education
2016 – 2022, University College Dublin
Ph.D. Geomorphology

Professional Experience
2022 – Present, Senior Technical Specialist, Geomorphologist, cbec eco-engineering UK Ltd.

2020 – 2022, Research Technician, Marine Sportsfish Team, Inland Fisheries Ireland Research

2016 – 2020, Researcher & Ph.D. Candidate, EPA-Funded Reconnect Project. UCD Dooge Centre for Water Resources Research (CWRR)

Colm Casserly is a Geomorphologist and Senior Technical Specialist with cbec's international team based in Ireland. Colm undertook his PhD at University College Dublin, where his doctoral research formed part of the EPA-funded Reconnect project that developed a validated methodology for prioritising in-stream barriers for either modification or removal. Specialising in fluvial processes, Colm's area of expertise centres on the geomorphic impact that low-head dams have on rivers and their capacity to disrupt sediment connectivity at the reach-scale. In addition to having a background in the construction industry, Colm has also worked in a research capacity at Inland Fisheries Ireland. Colm has developed skills in the use of RFID bedload tracking technology, suspended sediment monitoring, flow gauging, topographic surveying and geomorphic assessments. As a geomorphologist at cbec, Colm is responsible for undertaking geomorphic assessments, topographic surveys, WFD screening and the calculation of sediment budgets.

Selected Experience

Reconnect Project, (*2016 – 2020*) EPA-funded project that undertook the development of a validated methodology for identifying the locations of instream barriers (i.e. weirs, dams, culverts), and for prioritising their modification or removal in accordance with the Water Framework Directive. Incorporating multiple work packages, the project's results advanced efforts to improve the physical and ecological integrity of Ireland's rivers. The geomorphic element primarily focused on the development of a set of field procedures and techniques for assessing the impact low-head dams have on reach-scale sediment dynamics and channel responses post-removal. Work involved designing and executing field experiments at five different rivers over a 3-year period, including before and after barrier removal monitoring work. The geomorphic monitoring programme primarily focused on monitoring suspended sediment transport (using Nephelometric Turbidity Sensors and ISCO Auto-samplers), bedload transport (using RFID technology), hydraulic modelling and channel response to the removal of a significant ford crossing. The data and analysis has since contributed to EPA technical project reports and a number of peer-reviewed publications.

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