River Bride (Blackpool)

Certified Drainage Scheme

Supplementary Information Response

In relation to issues raised in Judicial Review

Ground 6 - Water Framework Directive

Water Body Status Assessments

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Acronyms

ABP	An Bord Pleanála
AWB	Artificial water body
BQE	Biological Quality Elements
CJEU	Court of Justice of the European Union
EC	European Commission
EcIA	Ecological Impact Assessment
EIAR	Environmental Impact Assessment Report
EQR	Environmental Quality Ratio
EQS	Environmental Quality Standard
FCS2	Fisheries Classification Scheme 2
GEP	Good ecological potential
GES	Good ecological status
GPC	General physicochemical
HMWB	Heavily modified water body
IFI	Inland Fisheries Ireland
MEP	Maximum Ecological Potential
RBMP	River Basin Management Plan
RWB	River water body
EPA	Environmental Protection Agency
WFD	Water Framework Directive

Glossary of Terms

Good ecological potential	Good Ecological Potential (GEP) and good chemical status are the environmental objectives for designated modified waterbodies (AWB and HMWB). GEP is site specific, taking into account the constraints imposed by the effect of physical alterations upon water body hydromorphology and therefore upon its biology. It is the equivalent of achieving Good Ecological Status in unmodified water bodies where the impact of physical modifications necessary to support the specified use have been taken into account.
Good ecological status	Article 2 (22) defines good ecological status as classified in accordance with Annex V which states GES is when "*there are slight changes in the [specific biological quality element] compared to the type-specific communities*".

Good surface water status	Article 2(18) of the WFD: "*the status achieved by a surface water body when both its ecological status and its chemical status are at least 'good'*"
Good surface water chemical status	Physicochemical and nutrient conditions are within the ranges established to ensure the functioning of the ecosystem and the achievement of the values specified for the biological quality elements and (Article 2 (24) of the WFD) "*in which concentrations of pollutants do not exceed the established environmental quality standards*".
Heavily modified water body	Article 2(9) of the WFD: "*a body of surface water which as a result of physical alterations by human activity is substantially changed in character*"
Surface water status	Article 2(17) of the WFD: "*the general expression of the status of a body of surface water, determined by the poorer of the ecological status and the physicochemical status*"

1 INTRODUCTION

The Bride (Blackpool) Certified Drainage Scheme was confirmed on March 11th 2021. Notice was subsequently served, on June 23rd 2021, of a Court Order granting leave to an application for judicial review including a stay on works.

On foot of the issues raised in the judicial review (*Moody et al. v MPER & AG* 2021/520 JR), and to assist in a decision on whether or not to confirm the scheme, the Department of Public Expenditure and Reform (DPER) have made a request for supplementary information.

Ryan Hanley Consulting Engineers contracted Lauren Williams (Freshwater Ecologist) to provide technical input to the supplementary information response, which requested the following:

1) An assessment of the in-combination effects of this scheme with the Lower Lee Flood Relief Scheme and the Morrison's Island scheme.
2) The implications of the issues raised in Ground 6 of the plaintiffs' action relating to the status of the waterbodies involved and how the proposed works will impact on said waterbodies.
3) Any further information in relation to the issues raised in any of the grounds in the Judicial Review which you feel is relevant to the Minister's decision in relation to this scheme, and in particular its impact on the environment and the Habitats Directive.

The following response addresses Point (2) as relates to aquatic biodiversity and objectives for water body status under the Water Framework Directive (2000/60/EC).

2 METHODOLOGY AND SOURCES OF INFORMATION

2.1 Resources

The following resources were consulted to inform this response:

- Water Framework Directive (2000/60/EC) text;
- WFD Common Implementation Strategy (CIS) Guidance
- Relevant Litigation relating to WFD, most importantly *Sweetman v An Bord Pleanála* [2021] IEHC 16 and *Case C-461/13 Bund für Umwelt und Naturschutz Deutschland* ECLI:EU:C:2015:433 (the *Weser* case);
- Environmental Protection Agency (EPA) maps and data: https://www.catchments.ie/
- Inland Fisheries Ireland (IFI) data
- Published scientific literature / journals.

2.2 Consultation

Written consultation by email, to inform this response, is summarised in **Table 2.1.**

Table 2.1 Consultation Record

Consultee	Response
EPA – Emma Quinlan	Upon query about when /if the [1]MQI tool for hydromorphology assessment will be available and whether this applies to WFD assessments in Ireland it was confirmed that while there are MQI-Ireland data available, the tool is currently in development and is not publicly disseminated as yet. It was also stressed that MQI-Ireland is not currently considered within the WFD hydromorphological (and therefore, ecological) status method – RHAT is still the primary tool to address hydromorphological status in high status and surveillance sites. Over the next year or so, EPA will consider how best to make the MQI-Ireland data available, but there are no definite timelines on these proposed tasks yet.
IFI – Ronan Matson	Upon query about potential fish status classification of the Bride (Cork City)_020, R. Matson explained that, on the basis of data in the EIAR, the fish community status would likely approximate "moderate" owing to similarities in species diversity as recorded in IFI surveys just downstream of the donor waterbody Blarney_010. It was stressed, however, that each sampling site has specific characteristics, and that overall fish status calculated using the WFD Fisheries Classification Scheme 2 (FCS2) tool, is based on case-by-case expected versus observed fish counts which take into account a number of variables. It is very difficult to confidently assign fish status without running the data through the probability-model that calculates fish EQR and status and this is not something that is publicly available.

2.3 Water Body Status/Potential Impact Assessment

The author developed a framework for assessing impacts on water body status/potential based on CIS guidance, with full cognisance of relevant case law, following examples set out in WFD Common Implementation Strategy No. 36 (CIS 2017). The process evaluates the effects of new physical modifications on ecological status/potential of surface water bodies and consequently tests compliance with WFD objectives.

[1] Morphological Quality Index

2.4 Statement of Competence

Lauren Williams BSc PGDip MCIEEM is a qualified freshwater ecologist with over 22yrs professional consultancy experience working in New Zealand (2yrs) and in Ireland (past 20yrs). Lauren holds a BSc in Zoology (University of Otago, NZ); a Certificate in Environmental Law (Open Polytechnic of NZ) and a Post Graduate Diploma in Environmental Monitoring Assessment and Engineering from Trinity College Dublin. She is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). Lauren specialises in water quality assessment, monitoring, aquatic ecological impact assessment and protected aquatic species and habitat surveys in relation to a wide range of infrastructural developments. Lauren has 22 years of experience identifying aquatic macroinvertebrates in field and laboratory and is an accredited River Habitat Survey operator (RHS - the UK precursor to RHAT). She has contributed field expertise to EPA national river monitoring programmes.

3 GROUND 6 – WATER FRAMEWORK DIRECTIVE

3.1 Background

Ground 6 of the plaintiffs' action (*Moody et al. v MPER & AG* 2021/520 JR) relates to the status of the water bodies and the implications of the Irish High Court findings of Hyland J. in *Sweetman v An Bord Pleanála* [2021] IEHC 16.

In that case, Hyland J. quashed a planning permission for a development because the EPA were yet to assign status to a water body. This meant it was technically impossible for the Board to make an assessment of whether the proposal was compliant with Article 4(1) of the Water Framework Directive (2000/60/EC).

Article 4(1)(a) of the WFD requires that, within specified time frames, Member States shall:

(i) prevent deterioration of the status of all bodies of surface water; and;
(ii) protect, enhance and restore all surface water bodies, with the aim of achieving good status; and;
(iii) protect and enhance all artificial and heavily modified bodies of water, with the aim of achieving good ecological potential and good surface water chemical status.

Hyland J. emphasised the issue was not with the quality of scientific information presented in the EIAR (see Section 4.1.3, below), but because the EPA, had not assigned status to the water body in question. The ruling made it clear that the EPA is the only agency in the state that could legally assign status under the WFD. This meant that technically the Board could not determine two key tests of WFD compliance established by the CJEU decision delivered in the [2]*Weser* case. The *Weser* decision, as interpretated in *Sweetman v An Bord Pleanála* [2021] IEHC 16 made it clear that: *[§102] "Member States are required to refuse authorisation for an individual project where it may cause a deterioration of the status of the body of surface water or where it jeopardises the attainment of good surface water status or of good ecological potential and good surface water chemical status by the date laid down by the Directive"*

The following analysis sets out a number of clarifications that are pertinent to the competent authorities' decision on the Bride (Blackpool) scheme in relation to WFD compliance. It examines the two key tests of WFD compliance in relation to the Bride (Blackpool) scheme as to whether:

1) deterioration of status may occur; and/or
2) attainment of good surface water status could be jeopardised.

3.2 Clarifications

3.2.1 EPA assigned water body status

The most important clarification is that the EPA assigned status in early 2022 to the water bodies potentially affected by the proposed Bride (Blackpool) scheme.

At the time of EIAR preparation and submission, the affected river water bodies were "*unassigned*" status and the scheme could technically not (on the basis of *Sweetman v An Bord Pleanála* [2021] IEHC 16) be evaluated in terms of compliance with Article 4(1) of the WFD. Assignment of baseline water body status by the EPA addresses the fundamental issue raised in Ground 6 of the Judicial Review,

[2] Case C-461/13 *Bund für Umwelt und Naturschutz Deutschland* ECLI:EU:C:2015:433

because it allows for a legally valid evaluation of WFD compliance by the Competent Authority (In this case the Minister).

3.2.2 Affected river water bodies

In relation to §30 and §34 of *Moody et al. v MPER & AG* 2021/520 JR, it is first clarified that works proposed as part of the Bride (Blackpool) scheme directly affects two (not three) river water bodies (RWBs). These are:

- Bride (Cork City)_020 (Code: IE_SW_19B140300)
- Glennamought_Trib Bride_010 (Code: IE_SW_19G880990)

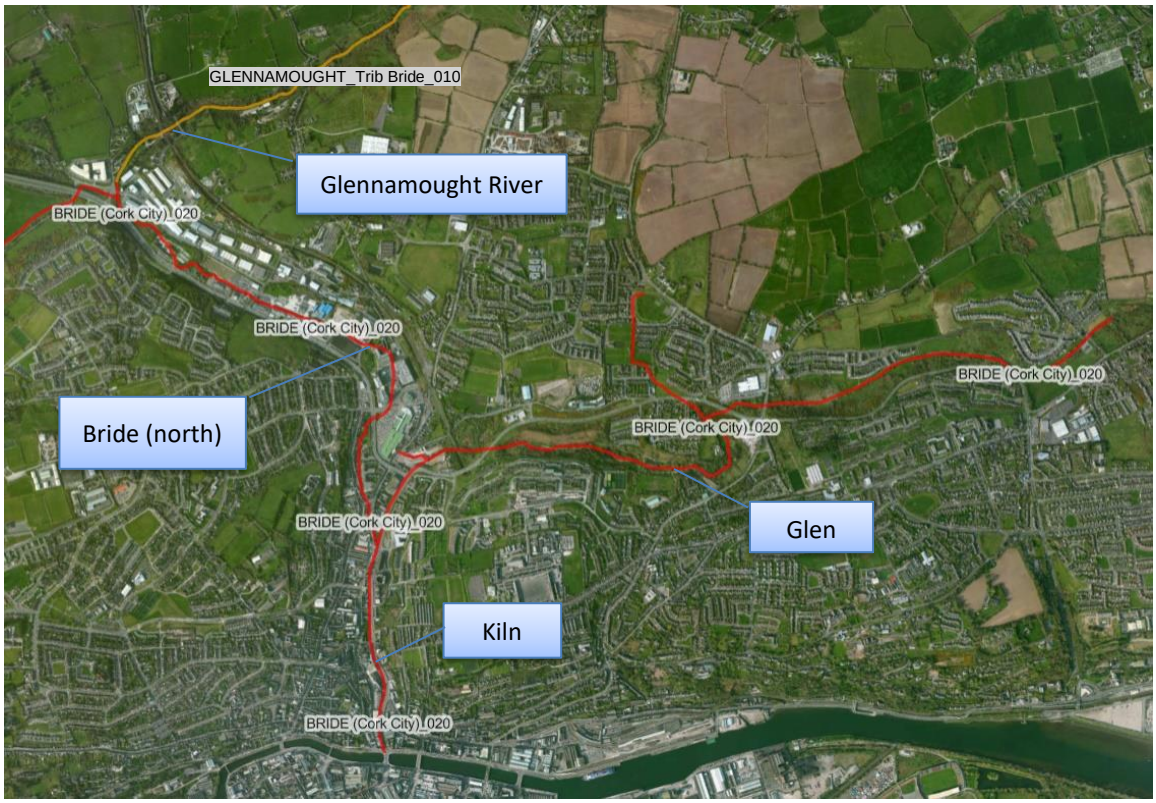

Figure 3.1 Location of RWBs – Bride (Cork City)_020 and Glennamought_Trib Bride_010 (EPA watermaps)

Bride (Cork City)_020

This EPA delineated water body includes the [3]river segments of the Bride (north) (19B14), the Glen River (19G09) and the Kiln River (19K75). The Bride (Cork City)_020 will be subject to a range of measures with associated hydromorphological alterations under the proposed scheme. The Bride (north) is subject to the majority of these new interventions with minor alterations proposed on the Glen River mainly relating to existing culvert maintenance.

Glennamought_Trib Bride_010

This EPA delineated water body encompasses the Glennamought River sub-basin, a tributary of the Bride (Blackpool) adjoining the Bride (Cork City)_020 at the Commons Road roundabout. The Glennamaought_010 will be subject to a small number of measures, affecting only a 400m reach

[3] River segment codes are derived from the EPA online water map tool: https://gis.epa.ie/EPAMaps/

upstream of the Commons Road roundabout. Approximately 2.5% of the overall water body channel length is affected by the proposal.

To inform this response, the two, directly affected RWBs are illustrated in **Figure 3.1**. The Bride (Cork City)_010 adjoins Bride (Cork City)_020. It is not directly affected by the proposal, but is examined in terms of indirect and cumulative effects on water body status objectives and WFD compliance in §3.5.

3.2.3 Status of affected river water bodies

Table 3.1 sets out the EPA classification of the three RWBs in question. Status was assigned to these previously unclassified water bodies in March 1st 2022 as part of work for the 3rd River Basin Management Plan (RBMP) cycle (2022-2027).

Table 3.1 EPA assigned status for relevant RWBs

RWB Code	RWB Name	EPA Assessment Technique	Donor RWB Code	Donor RWB Name	EPA EcoStatus 2013-2018
IE_SW_19B140300	Bride (Cork City)_020	Extrapolated	IE_SW_19B020500	BLARNEY_010	Moderate
IE_SW_19G880990	Glennamought Trib Bride_010	Expert Judgement			Moderate
IE_SW_19B140110	Bride (Cork City)_010	Extrapolated	IE_SW_19B060200	BUTLERSTOWN_010	Moderate
IE_SW_19B020500	Blarney_010	Monitored	~	~	Moderate
IE_SW_19B060200	Butlerstown_010	Monitored	~	~	Moderate

The EPA derived status by grouping the water bodies with other [4]similar, representatively monitored, water bodies and applying either the same status as the "donor" or by using "expert judgement". All three RWBs in question are 'moderate' status.

The methodology applied by the EPA is consistent with the objectives of the WFD and the Common Implementation Strategy (CIS) guidance in terms of grouping waterbodies for the purpose of monitoring and status classification. WFD CIS guidance No. 7 states that grouping of surface water bodies may be used for "*monitoring, reporting and management purposes where there is monitoring of sufficient indicative or representative water bodies that provides an acceptable level of confidence and precision in the results of monitoring, and in particular the classification of water body status* (CIS 2003b, p16). It is a matter for Members States to decide how they group water bodies, so long as each water body can be assigned to a single ecological status class with sufficient confidence and precision in line with the Directive's monitoring programmes.

It could be argued that the Bride (Cork City)_020 is quite dissimilar to the "donor" RWB Blarney_010, the former being heavily urbanized with extensive physical modifications (culverting, channelization), and the latter predominantly rural with more natural morphology. This is validated by the fact the EPA are now recommending Bride (Cork City)_020 for designation as a heavily modified water body (HMWB) (EPA, 2022), which is addressed in detail in following sections of this report.

[4] For example, in terms of type, pressures to which they are subject and sensitivity to those pressures

'Moderate' status, as extrapolated for the Bride (Cork City)_020 and Glennamought_010, does align with representative 'moderate' status as applied in the EIAR §7.3.2.1. The EIAR status was based on the biological quality element: macroinvertebrate fauna (i.e., Q3-4), along with physicochemical data from EPA sampling - all indicative of 'moderate' ecological status.

Further work was conducted in the Bride (Cork City)_020 in late 2021, to inform "representative" waterbody status in the absence of EPA assigned status (prior to March 2022). The study sampled three sites within the Bride (Cork City)_020 RWB using three quality elements: Q-value (macroinvertebrate fauna), general physico-chemical data and hydromorphology (RHAT survey). The full report forms part of baseline studies for the Lower Lee (Cork City) Flood Relief Scheme. **Table 3.2** summarises the findings.

Following WFD rules, one out, all out (OOAO) status is the poorer of the biological and chemical status. The OOAO concept also applies at the water body level - if more than one site within the RWB is monitored, the poorest site result defines overall status.

Table 3.2 Bride (Cork City)_020 OOAO status – field based and EPA extrapolated

EPA river segment name	EPA segment code	Biological (Q-value)	Physico-chemical	Hymo.	OOAO Representative Ecological Status	Field-based Waterbody Status	Current EPA Status
Glen (Cork City)	19G09	Poor	Moderate	Poor	Poor	Poor	Moderate (extrapolated by Grouping)
Bride (Cork City)	19B14	Moderate	Moderate	Poor	Moderate		
Kiln	19K75	n/a	≤Moderate	Bad	≤Moderate		

Sampling on the Bride, Kiln and Glen showed the stream segments have elevated nutrient concentrations (phosphorus, ammonia, nitrate, BOD); the Glen and Kiln segments being particularly poor. The Kiln River segment is seriously polluted, suggesting an organic input somewhere along the existing Blackpool culverts. By the time the catchment discharges to the Lee estuary at Christy Ring Bridge it is certainly at poor status or worse. Q-value sampling was not possible in the Kiln owing to extensive culverting, but the Glen was 'poor' status based on Q-value. Hydromorphology was uniformly 'poor' or 'bad' throughout the catchment, with extensive hard engineering on all three segments, plus culverting on the Kiln/Glen and an impoundment (dam) on the Glen. Hydromorphology does not define status, as explained in §3.3, below, but certainly limits biological quality condition of the water body, particularly on Kiln and Glen segments. These latter segments of the water body are not greatly affected by proposals under the Bride (Blackpool) scheme.

Note that, if the water body was actually monitored by the EPA, the Kiln/Glen segments would technically place overall water body at 'poor' status (or worse). The Kiln/Glen segments would continue to limit overall waterbody status regardless of proposed new modifications to the Bride segment upstream of Blackpool church.

3.2.4 Proxy analysis of status

The ruling of *Sweetman v An Bord Pleanála* [2021] IEHC 16 delivered in January 2021 made it clear there was an issue in Ireland surrounding the legal treatment of 'unassigned" status water bodies insofar as the EPA had the sole responsibility to assign status. "Proxy" status cannot be a legal substitute for EPA assigned status: *[§135] "Given the failure by the EPA to provide a status for [the water body], it was impossible for the Board to evaluate the proposed works by reference to the requirements of the*

WFD. The reliance… on some type of proxy evaluation referring to concepts said to stem from the WFD but which did not follow the steps identified by the WFD, does not constitute compliance with the WFD."

Of note is that Hyland J. did make special reference to the validity of the EIAR baseline studies, impact assessment and mitigation measures, noting: *[§133] "I should acknowledge that considerable effort on the part of the notice party went into carrying out the studies that I have referred to above, analysing the impact of the proposed [development] upon the [water body], and devising mitigation measures that would ensure that the [development] would not adversely impact upon it. [§134] …But I cannot evaluate the efficacy or appropriateness of those mitigation measures by reference to the WFD for the reasons set out above."*

The reasons described made it clear that it was the lack of EPA assigned status that ultimately led to the decision to quash the planning permission, and not the scientific method and analysis employed in the EIAR baseline studies and impact assessment.

The plantiff's action *(Moody v MPER & AG* 2021/520 JR) implies in §33 that the evidence-based characterisation of water body "proxy" status provided in the EIAR for the Bride (Blackpool) scheme "*could not be relied upon*", in line with the decision of *Sweetman v An Bord Pleanála* [2021] IEHC 16. As set out above, however, Hyland J. made it quite clear that the reliability and quality of the scientific and technical information underpinning "proxy" status was not in question, simply that the EPA is the only legal entity that can assign status to water bodies under the WFD.

Prior to *Sweetman v An Bord Pleanála* [2021] IEHC 16, it was (and still is) standard industry practice to collect field-based scientific data to ascribe a representative / indicative status to a water body that was not assigned status by the EPA. It continues to be standard industry practise to corroborate status on a more site-specific basis in relation to a particular project. This is because EPA data, whilst useful as a broad characterisation of river catchment condition over time, is often not site-specific enough to form an adequate baseline against which to make a well-informed, scientifically robust, ecological impact assessment in relation to a particular project.

Noted also is the EPA make water body status classifications based on a monitoring programme comprising Q-value survey every three years, plus a number of water samples per annum. This often occurs only at one fixed, representative [5]monitoring site within an entire water body. Whilst such a survey resolution fulfils the monitoring and reporting requirements of the WFD, it can fall short of providing the level of detailed, project- and site-specific baseline information required for comprehensive Ecological Impact Assessment (EcIA) required in accordance with Annex IV to the [6]EIA Directive (2011/92/EU) as amended (2014/52/EU), and the Nature Directives: Birds Directive (79/409/EEC, as amended 2009/ 147/EEC) and Habitats Directive (92/43/EEC).

Chapters 5 (Biodiversity) and 7 (Water) of the EIAR for the Bride (Blackpool) scheme provided the necessary detailed, site-specific data on which the impact assessment was based. These studies identified representative ("proxy") status of the Bride (Cork City)_020 water body as 'moderate', which is in agreement with the recently assigned EPA status of 'moderate' for this water body.

What this means is that the previous absence of EPA assigned status to the water bodies in question did make it legally impossible for WFD compliance to be evaluated, but there is no reason for the Competent Authority (in this case the Minister) to not rely upon the scientific information and analysis provided in the EIAR.

[5] In some cases there is more than one EPA monitoring station within a waterbody, in which case the poorest result of the stations defines overall RWB status, which may also not be site-specific enough for a particular project in the RWB

[6] Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment

3.2.5 Examination of donor RWB status

Table 3.3 presents EPA summary data of quality elements that feed into status classification of the donor RWB. One "operational" site is monitored by the EPA in the Blarney_010 RWB. One out , all out (OOAO) status at this site used the biological quality element (macroinvertebrate Q-value status) and general physico-chemical (GPC) status. This is consistent with WFD CIS Guidance No. 7 (CIS, 2005) whereby operational monitoring "*must use parameters indicative of the quality element or elements most sensitive to the pressure[s] to which the [water] body is subject. This means that the least number of estimated quality element values may be used in status classification*" (EC, 2005, p12). Fish status was not used in the classification the donor RWB: a point that is discussed further in §3.5.1, below.

Table 3.3 Blarney_010 "Donor" RWB - monitored quality elements and status

RWB Code	**IE_SW_19B020500**
RWB Name	**BLARNEY_010**
2010-2018 Macroinvert. - Q value Status	Good
2010-2018_Fish Status	*Not monitored*
2016-2018 Phytobenthos status- Diatoms	*Not monitored*
2016-2018 General Physicochemical Status	Moderate
2007-2018 Specific Pollutants status	*Not monitored*
2010-2018 Hydromorphology RHAT status	*Not monitored*
2013-2018 Ecological / GPC Status (combined OOAO)	Moderate
Macroinvertebrate survey year	2017
2016-2018 GPC status (No. of samples)	15
Acidification condition	Pass
Oxygenation Condition	Pass
Nutrient Condition	Moderate

3.2.6 Surface Water Regulations - Article 29

Moody v MPER & AG 2021/520 JR states in §34, that the development *"may jeopardise the attainment of good status… particularly… where the scheme will result in significant changes to the hydromorphology of the River Bride … and where these hydromorphological impacts are identified in Article 29(2)* [sic] *of the Surface Water Regulations as significantly impacting the attainment of good status"*

This interpretation of Surface Water Regulations Article 29(2) is inaccurate. Article 29(2) of [7]surface water regulations pertain to rules around designation and classification of water bodies that are artificial or heavily modified (AWBs and HMWBs) and - by definition - are not expected to attain "good status" under the WFD, but instead have the objective of "*good ecological potential"*.

To clarify, hydromorphology is mentioned in Article 29 in the context of water bodies which have existing physical modifications for specific reasons of beneficial use and sustainable development (e.g., flood protection, water supply) where it is explicitly acknowledged that "good status" may never be achieved

[7] Can only be referring to S.I. No. 272/2009 EC Environmental Objectives (Surface Waters) Regulations

because the necessary modifications prevent it. Such modifications cannot be mitigated or removed without compromising the specific beneficial use of the water body or having significant impacts on the wider environment, e.g., removal of existing culverts, thereby increasing flood risk (see §3.2.7, below).

Physical habitat conditions certainly do play a role in supporting the biological quality elements that contribute to ecological status / potential classification, but (as explained in Section 3.3 below) it is by no means a foregone conclusion that changes to hydromorphology will prevent achievement of good status, because status is defined under the WFD by the poorer of the biological and physicochemical quality elements. A waterbody can have poor hydromorphology, but still achieve good status if the biological quality elements (BQEs) and physicochemical conditions achieve good status because hydromorphology "supports" the attained biological status within the meaning of Annex V of the WFD. If good status is achieved in the BQEs then, by definition, the physical conditions are conducive to good status. There are many waterbodies of poor hydromorphology that are at good ecological status / potential on the basis of their biological elements, and hence assigned good status overall.

3.2.7 Highly Modified Water Body (HMWB) designation

Bride (Cork City)_020 RWB has recently been identified as a candidate heavily modified water body (HMWB) in the "urban" category. The category covers rivers that flow through urban catchments that have been significantly modified, e.g., by culverting, channelization, bed and bank reinforcement and other hard engineering to prevent flooding or facilitate building. The alterations often constrain the river, impacting on natural fluvial processes, and reduce instream habitat quality and riparian vegetation (EPA 2022).

HMWB designation acknowledges that the hydromorphological modifications present may prevent attainment of good ecological status (an objective that only applies to unmodified water bodies) but that the water body has been altered for a specified use that society needs to be continued.

The WFD objective for HMWBs is good ecological potential (including good chemical status) instead of good ecological status. WFD standards for other quality elements (nutrients and chemicals) must still be met, and any modifications must be mitigated as far as practicable: *"Good ecological potential represents an ecological status slightly lower than the best one that could be achieved without significant adverse effects on the specified water uses dependent on the modifications or on the wider environment"* (WFD Art. 4(3)(a)).

Bride (Cork City)_020 is a good candidate for HMWB designation owing to the nature of existing modifications, including extensive culverts and hard engineering between Blackpool and the River Lee confluence. These existing modifications need to be retained for the purpose of urban use (including flood risk reduction), but may prevent achievement of 'good' status as defined for unmodified RWBs.

For this reason, the following sections will examine the scenario whereby the (Bride (Cork City)_020: (1) remains as an unmodified waterbody (with "good ecological status" objective), or (2) receives HMWB designation (with "good ecological potential" objective).

3.2.8 Meaning of "deterioration" in ecological status/potential

The concept of "deterioration" of water body status is not defined in the WFD. The decision provided by the CJUE in *Weser*, provided the following clarifications on the way in which WFD compliance should be interpreted:

- Consent for the development must not be granted by an authorising authority where the project may cause a deterioration in the status of a body of surface water or where it compromises the attainment of good surface water status or of good ecological potential and good surface water chemical status by the date laid down in the directive, unless a derogation is granted;
- Deterioration in water body status occurs when the status of at least one of the quality elements, within the meaning of Annex V to the directive, falls by one class, even if this does not result in a fall in the overall classification of the water body.

- If the quality element is already in the lowest class (bad status), any deterioration of that element represents a deterioration of the status within the meaning of WFD Article 4(1)(a)(i).

The decision in *Weser* placed emphasis on the interpretation of the words "*protect, enhance and restore*" in Article 4(1). The objectives carry not only the obligation to prevent deterioration, but also the obligation to "enhance" (Art. 4 (1)(a)) status. That is why, when a quality element is in the lowest quality class (bad), any deterioration within that class band, challenges the Article 4 obligation of "enhancement". Hence, any degree of further deterioration within the bad status is considered a contradiction, as it drives the water body further away from achieving WFD objectives.

Examination of the *Weser* decision shows the court tested this concept of deterioration within class bands other than the lowest (bad), but it does not apply. Deterioration in high, good, moderate or poor status water bodies only occurs when at least one of the biological quality elements or the physicochemical element falls by one status class, regardless of whether that results in a fall in overall classification.

It is important to examine here the role of the quality elements in assigning status/potential, particularly hydromorphology which is a "supporting element" within the meaning of WFD Annex V and is only used to verify high status sites under Part III (36) of the surface water regulations (S.I. 272 of 2009).

3.3 Role of Hydromorphology in Status Classification

The quality elements that feed into status classification are: (1) biological elements, (2) hydromorphological elements supporting the biological elements; and (3) chemical and physicochemical elements supporting the biological elements. The poorer of the biological and physicochemical elements determines surface water status. Biological quality elements employ standard methods for calculating a metric (EQR) that equates to the status classes: high, good, poor or bad. Physicochemical elements are compared to statutory Environmental Quality Standards (EQS) published in the surface water regulations. **Figure 3.2,** illustrates the relative roles of quality elements in status classification in river water bodies.

The hydromorphology quality element is defined in the Annex V (1.1.1) as "*supporting the biological elements*". CIS guidance establishes that assignment to status classes good, moderate, poor or bad is: "*made on the basis of the monitoring results for the biological quality elements … and… physico-chemical quality elements….because if the biological quality element values relevant to good, moderate, poor or bad status are achieved, then by definition the condition of the hydromorphological quality elements must be consistent with that achievement and would not affect the classification of ecological status*".(CIS 2005, §2.5, p. 3).

The hydromorphological quality element is therefore only taken into account when assigning water bodies to the high ecological status class. For good and moderate status, hydromorphological conditions (morphology, hydrology, continuity) are by default "*consistent with the achievement of the values specified …for the biological quality elements*." (WFD Annex V (1.2.1)).

In the case of the Bride (Cork City)_020 (unmodified RWB), which is currently at 'moderate' status, a change in the hydromorphological conditions cannot alter overall status classification on its own, unless the proposed physical modifications cause the value of either the biological and/or physicochemical quality elements to decline to either 'poor' or 'bad' status.

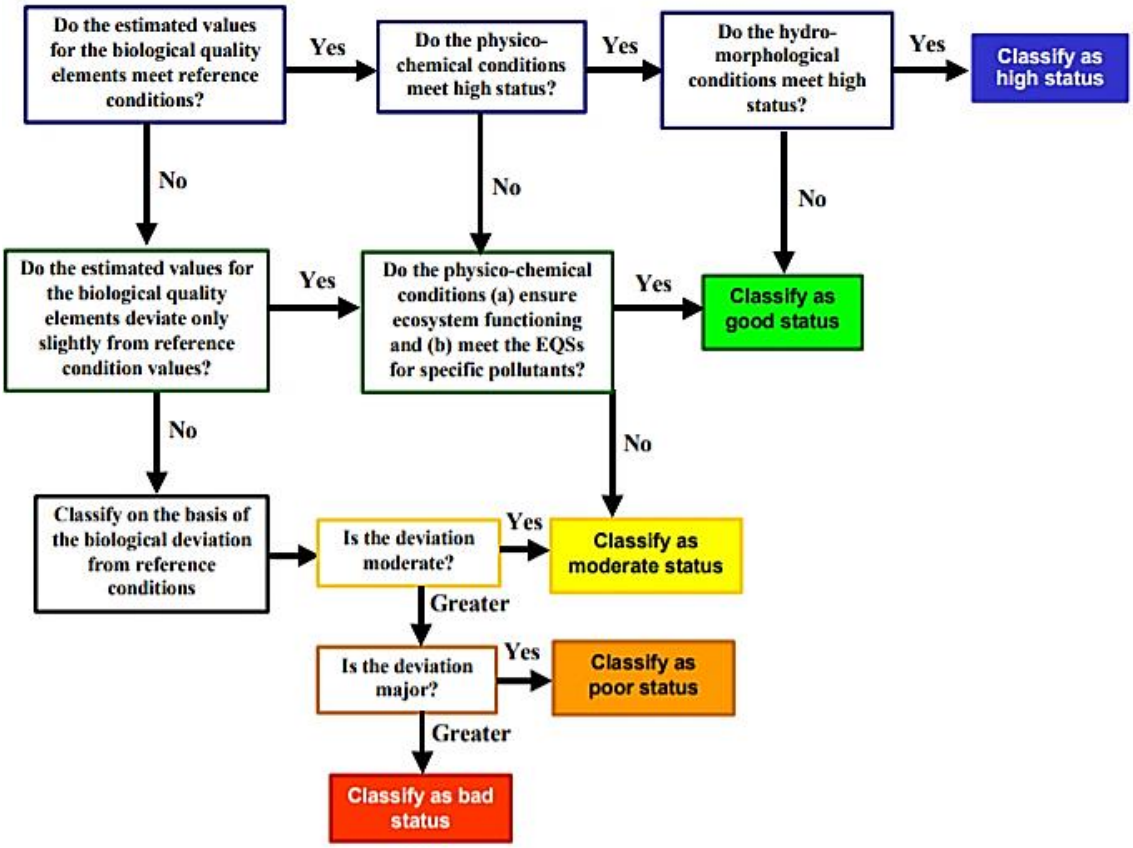

Figure 3.2 Relative roles of biological, physicochemical and hydromorphological elements in ecological status classification (from CIS Guidance EC, 2005)

3.4 Role of Quality Elements in Ecological Potential Classification

Figure 3.3, reproduced from CIS (2005), illustrates the relative roles of quality elements used for assigning ecological potential, where hydromorphology is (by definition) the primary determinant.

Site specific determination of Maximum ecological potential (MEP) must be carried out to represent reference conditions for the individual HMWB. Good ecological potential (GEP) can then be determined with reference to site-specific MEP. The MEP values for the biological quality elements (BQEs) are set on a case-by-case basis depending on the hydromorphological constraints of the particular water body.

For example, in a HMWB river with extensive culverting for specified urban and flood protection use, such a system may only ever be expected to support a fish community of reduced diversity, even after realistically achievable mitigation of hydromorphological conditions were carried out. This means that the fish community index value (FCS2 in Ireland) for the HMWB will only ever be a fraction of that expected for a natural (unmodified) water body.

Once MEP is established, GEP is the condition where expected biological community indices (e.g., macroinvertebrates, fish) only deviate slightly from the site-specific MEP, and the physicochemical conditions must be capable of supporting the defined biological community.

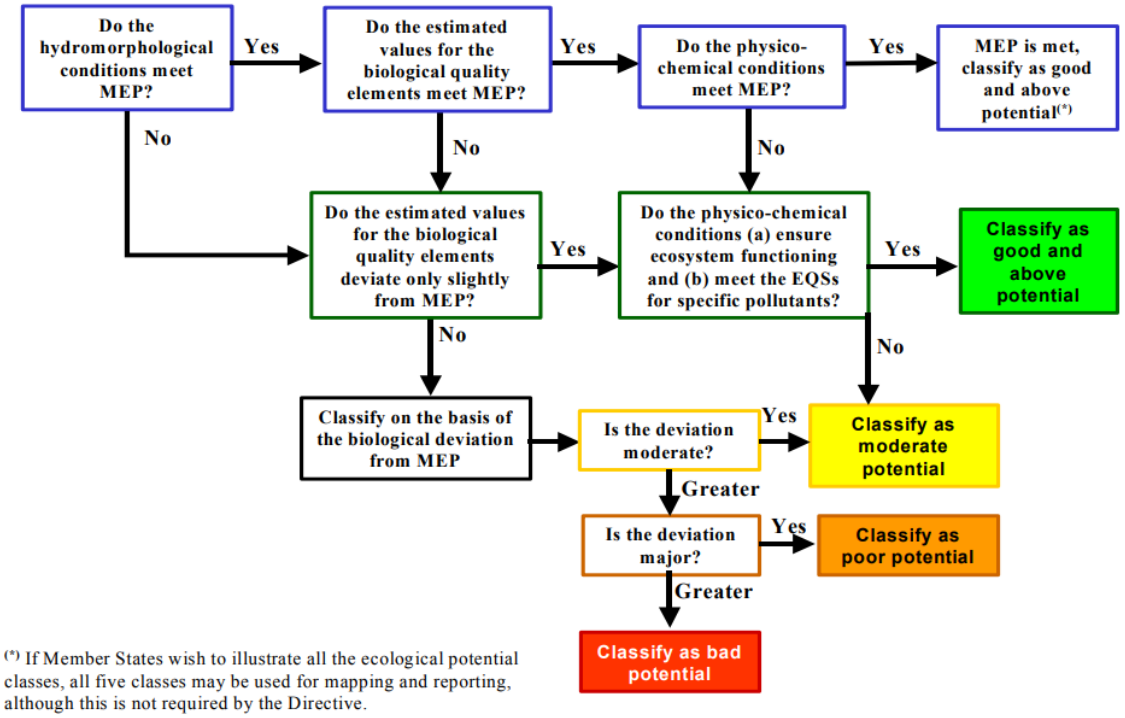

Figure 3.3 Relative roles of biological, hydromorphological and physicochemical quality elements in ecological potential classification (from CIS 2005)

3.5 Water Body Status Impact Assessments

This section examines the two key tests of WFD compliance as a result of the proposed Bride (Blackpool) scheme. The analysis of water body status impact in §3.5.3 and §3.5.4 will focus on the Bride (north) segment of the Bride (Cork City)_020 water body. This is where predicted hydromorphological impacts are principally confined. The Glen and Kiln River branches will undergo minor repair works and continuing channel maintenance (formalised as part of this scheme) but do not undergo significant new physical alterations in themselves.

The Bride (north) segment of the Bride (Cork City)_020 water body is examined in §3.5.3 and §3.5.4, respectively, for two scenarios as follows: (1) remains as an unmodified waterbody with the objective of "good ecological status"; or (2) receives HMWB designation (with "good ecological potential" objective).

WFD compliance tests in relation to proposed new modifications are applied at the water body level with reference to *Weser* and CIS guidance to answer the key questions:

1) Is there a deterioration of ecological status/potential?
2) Is attainment of good ecological status/potential jeopardised?

The examination first establishes the ecological effect of proposed hydromorphological changes on biological quality elements (§3.5.1) then establishes the relevant WFD Annex V biological quality elements to be used in the status assessments (§3.5.2).

3.5.1 Assessment of Effects of Hydromorphological Changes

The Bride (north) segment of the water body is already highly modified throughout its run from the city outskirts to the Lee, with features including realignment, channelisation, flood walls, bank engineering and culverting. A number of new modifications are proposed under the Bride (Blackpool) scheme (listed

in EIAR §1.2), including new and replacement bridges / culverts; new flood walls / earthen embankments; sedimentation trap; local ground regrading and other ancillary works.

Culvert installation and removal have potential to alter aquatic habitat the most conspicuously. In this regard, there will be 342m of new culvert through Orchard Court, plus 100m of culvert removal at Sunbeam Industrial Estate, the latter being restored to open (walled) channel.

The Orchard Court reach of the Bride was surveyed for Q-value and hydromorphology ([8]RHAT score) in October 2021. Four water sampling rounds covering a range of flow scenarios were also conducted between October and December 2021. The macroinvertebrate community metric rated the reach at 'moderate' status (Q3-4). Water sampling revealed persistently elevated phosphorus (MRP), at concentrations in excess of EQS for 'good' status; hence the rating of 'moderate' status according to surface water regulations. The calculated RHAT score was 0.38 for the survey reach, equating to 'poor' hydromorphology status. Overall the reach was rated 'moderate' status, aligning with EPA assigned status.

The reach is currently open but constrained by defences, including hard engineered banks of concrete, rock armour, gabion and set-back walls (see Images in **Appendix 1**). Instream morphology comprised glide and riffle/run flows over stony substrates: mainly cobble and gravel, but with anoxic, smelly silt deposits in slack flows. Instream vegetation comprised patches of water crowfoot (*Ranunculus* spp.), but was dominated by masses of brown filamentous diatom (60%) with pollution tolerant *Vaucheria* (2%), the latter two groups being indicative of nutrient enrichment. Dumped household rubbish was frequent on river banks and instream, with bags of rotting organic contents. Bankside vegetation was highly disturbed and extensively herbicide sprayed, with non-native tree cover (e.g., Sycamore, Buddleia) and patches of invasive Japanese knotweed. Small numbers of trout parr (1+) were observed in pool/glide habitat, attesting that the reach is foraged by young fish, although impaired water quality likely depresses fisheries potential. No valuable spawning habitat was recorded, which aligns with EIAR electrofishing surveys of 2014 that recorded small numbers of trout parr, with young-of-the-year fish (0+) being absent.

Culverting of this reach will result in loss of the above, relatively poor-quality, habitat replacing it with fully engineered concrete bed substrate and banks and precluding riparian zone inputs and light (other than at light boxes included within the design). Conversely, the Bride will regain 100m of open, restored channel upstream at the Sunbeam Industrial Estate.

To quantify the net loss in terms of fisheries habitat, the works are calculated to represent a loss of approximately 2.2% of available macroinvertebrate and trout foraging habitat in the upper Bride catchment. The estimate takes into account all fluvial habitat potentially available to fish upstream of Blackpool Church, i.e., Bride (north) segment of Bride (Cork City)_020, Glennamought_Trib Bride_010 and Bride (Cork City)_010).

To mitigate this habitat loss, fisheries enhancements, as set out in **Appendix 2,** are proposed as an integral part of this scheme. The proposed enhancements cover approximately 9.8% of the fluvial habitat potentially available to fish upstream of Blackpool Church. **Fig. 3.4** shows the location of enhancement reaches in relation to proposed culvert works.

The late Dr Martin [9]O'Grady (former IFI chief fisheries scientist) drew up the fisheries enhancement proposals (see Appendix 2), concluding in his report that the enhancements "*will significantly improve the rivers capacity to support a brown trout population and the net gain in fish stock terms will more than offset the permanent loss caused by culverting in the lower reaches of the proposed drainage scheme*".

[8] RHAT = River Hydromorphology Assessment Technique

[9] O'Grady (2016) Fisheries Enhancement Proposals, included as part of the Bride(Blackpool) EIAR.

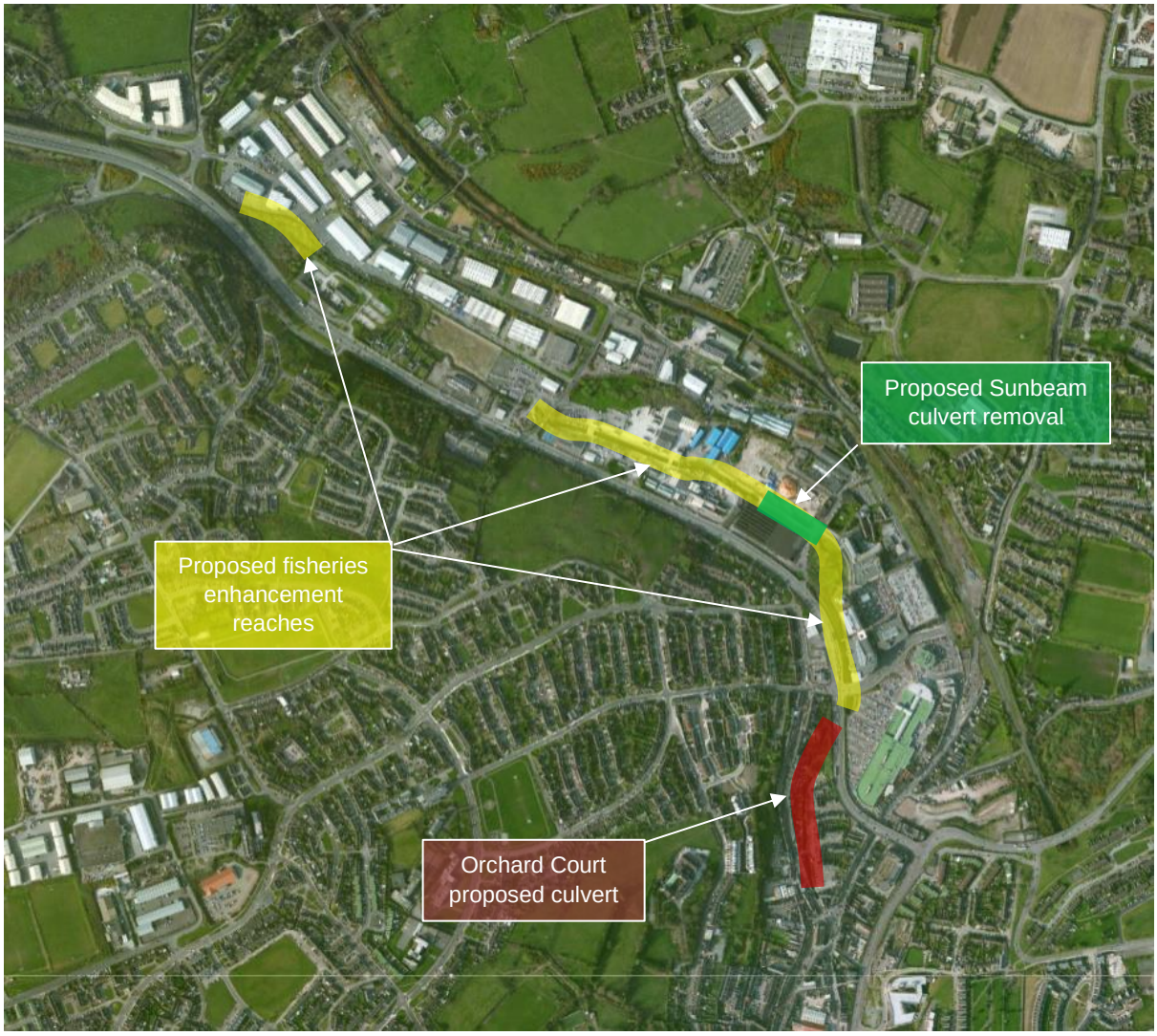

Figure 3.4 Location of Bride (North) fisheries enhancement reaches as part of the proposed scheme

3.5.2 Discussion on Fish as Biological Quality Element

Background

The EPA assigned 'moderate' status to the Bride (Cork City)_020 on the basis of representative monitoring carried out on the nearby Blarney_010 RWB using one biological quality element (BQE) namely - macroinvertebrate status (Q-value), along with supporting physicochemical conditions. Fish community status was not included in the classification.

Should fish BQE be included in RWB status assessment for the Bride?

Because fish are one of the primary ecological receptors potentially affected by the scheme, it would seem appropriate to include fish status in the assessment of impact on overall water body status. This is because of the specific emphasis in Annex V of the WFD on links between hydromorphology and the biological quality elements. In addition, WFD monitoring programmes "*must use parameters indicative of the quality element or elements most sensitive to the pressure[s] to which the [water] body is subject*" (CIS, 2005).

Alternatively, it could be argued that the fish BQE would never apply to the Bride (Cork City)_020 and therefore not affect water body status classification because:

1) Fish status is not a monitored BQE on the Blarney_010 donor waterbody, does not feed into the donor status and therefore would not apply to the Bride, and/or;
2) Fish status is not a routinely monitored BQE on small monitored water bodies as part of the EPA's WFD monitoring programme.

WFD fish surveys are conducted by IFI on some channels (primarily main stem rivers), but it is an uncommon BQE within the national monitoring programme. Fish status was used in overall status classification of just 10.8% of Irish water bodies (266 out of 2454) for the 2013-2018 WFD reporting period ([10]EPA RWB data). However, in the interests of thoroughness, and taking into account that fish are one of the WFD Annex V biological quality elements affected by hydromorphology pressures, the following water body status assessment will include fish as a BQE.

Extrapolation of current fish status for Bride (Cork City)_020

Where fish status is used as a BQE, the Fisheries Classification Scheme 2 (FCS2 – Ireland) produces a metric that will fall into a WFD class bands of high, good, moderate, poor or bad. FCS2 uses probability-based comparisons of observed fish counts with expected (predicted) fish counts under reference (un-impacted) conditions (Kelly & Harrison, 2016). The model accounts for environmental, geographical and pressure variables, including natural impassable barriers (e.g., waterfalls). Conversely, artificial barriers (dams, impassable culverts) are interpreted as pressures. The FCS2 tool is used only by IFI fisheries scientists, however, Kelly & Harrison (2016) sets out that a site at 'good' status under the FCS2 would have ~80% of the expected fish species present, plus at least one of the type-specific disturbance-sensitive species and the catch is 80% of the expected total catch. For 'moderate' fish status sites, assume 55% of expected species are present (the most likely) and for these the catch equals 55% of the expected total catch.

In terms of water quality in Ireland, it has been identified, that brown trout are the dominant species at 'moderate' (Q3) through to 'high' (Q5) status sites, with salmon mainly at 'good' and 'high' status. There is known to be a shift at the Good-Moderate status boundary, whereby the trout dominated community shifts to a more tolerant fish community (e.g., 3-spined stickle-back, minnow). Salmonids are absent at 'poor' (Q2/2-3) and 'bad' (Q1) status sites (Kelly & Harrison, 2016).

With the above in mind, it is noted that fish sampling was conducted by IFI immediately downstream of the Blarney_010 donor waterbody sampling site at Horgan's Bridge in 2018 (RS19B020500). The result was 'moderate' status using the FCS2 tool (Matson et al. 2019). Fish species composition was somewhat similar to that recorded in EIAR studies (2014) on the Bride (north), i.e., brown trout dominant; salmon absent; presence of lamprey; no coarse fish species and no stickleback. The Blarney site had higher trout abundance compared to the Bride, with a good size/age class representation (0+ n=70; 1+ n=10; 2+ n=20). In contrast, the Bride showed lower overall abundance and very few young-of-the-year (0+) trout, indicating little (if any) localised spawning. This points to the Bride (north), upstream of existing Blackpool culverts, being a low-quality nursery habitat, lacking spawning habitat itself, but supporting slightly older trout (≥1+ age class) that are dropping down from the better spawning habitats of the upstream Glennamought River (as evidenced from 2014 EIAR electrofishing).

IFI were consulted on the availability of the FCS2 tool, and the possible sensitivity of the tool to presence/absence of certain species. The tool is not publicly available and requires numerous inputs based on site-specific conditions and expectation of community type devised by IFI scientists and only usable by IFI. However, on the basis of: (1) fish data provided in the EIAR, (2) criteria set out in Kelly and Harrison (2016) and (3) IFI consultation, the inferred fish status on the Bride (Cork City)_020 is 'moderate' status; likely in the low range of the 'moderate' band. Supporting evidence that fits with

[10] Online data download from https://gis.epa.ie/GetData/Download (accessed March 2022)

'moderate' status is: (1) biological water quality of Q3-4, (2) low total fish abundance; (3) few 0+ trout, but still salmonid (trout) dominated; (4) no pollution-tolerant fish species recorded.

With regards to how presence or absence of lamprey and eels might alter fish status within the FCS2, it was suggested by IFI that small numbers of these groups won't necessarily impact fish status on the river further because it is primarily the presence of brown trout that would be expected to keep the river within the "moderate" classification.

The current barrier to salmon migration presented by the existing Blackpool culverts will continue to prevent "good" fish status from being achieved in this RWB, as has been the case historically. Salmon have not been recorded in the Bride sub-catchment and are unlikely to have been present for many years given the level of historical modification on the lower reaches of the Bride system. First edition [11]OSI 6-inch maps (1829-1841) clearly show culverting of the Kiln River segment up to Blackpool occurred prior to the mapping period, meaning salmon migration is likely to have been precluded in the Bride (Blackpool) catchment for at least ~200 years, meaning 'good' fish status (in FCS2 terms) would have been impossible all that time.

Noted also are studies which demonstrate that even where fish in modified waterbodies are impacted by hydromorphological effects of a specified water use, the established fish populations and their metrics still tend to reflect the intensity of water quality impairment (Blabolil, 2016). In this regard, EPA water sampling data ([12]online and presented in the EIAR) demonstrates that physicochemical conditions of the Bride (Cork City)_020 are persistently impaired and not meeting 'good' status criteria. Water quality pressures include agricultural inputs in the upper catchment areas of Glen and Glennamought rivers, as well as municipal, industrial and urban stormwater inputs. The proposed Bride (Blackpool) scheme will have no significant impact on the existing, persistantly impaired physicochemical conditions, which are largely determined by upstream pressures and poor-quality discharges along urban reaches of the river.

Unless pre-existing background pollution sources are remedied, the Bride (Cork City)_020 RWB will not attain good status/potential on the basis of physicochemical quality elements, nor fish status, regardless of whether the proposed Bride (Blackpool) scheme goes ahead or not.

3.5.3 RWB Status Assessment - Bride (Cork City)_020

The proposed modifications occur overwhelming on the Bride (north) segment of the RWB, hence potential impacts affecting status also occur on the Bride (north).

Field sampling results in the EIAR, plus more recent studies for the LLFRS (sampled in 2021), align with EPA assigned 'moderate' status (extrapolated) for the Bride (north) segment of Bride (Cork City)_020 RWB. 'Moderate' ecological status is therefore a scientifically valid baseline against which to assess: (1) potential impact on (unmodified) water body status; and, (2) tests of WFD compliance.

Examples of how to carry out the assessment are in §3.4.1 of CIS guidance No. 36 (CIS 2017), published with cognisance of the decisions in *Weser* on what constitutes "deterioration". **Table 3.4**, based on CIS (2017), examines how the proposed project is expected to affect the WFD objectives of the affected Bride (Cork City)_020 water body.

[11] Geohive maps available online at: https://www.geohive.ie/ (Accessed April 2022)

[12] Available to download at www.catchments.ie for the Kiln sub-catchment

Table 3.4 Bride (Cork City)_020 – water body status impact assessment

Starting point: EPA assigned status is 'moderate'. Overall ecological status is confirmed (on the basis of field and extrapolated data) by biological & physicochemical quality element in worst condition (in this case moderate)							
Effect of modification (proposed scheme): Overall ecological status is maintained because BQEs do not deteriorate - morphology changes are net zero as a result of fisheries enhancements integral to the scheme. Fish status will remain at moderate, with potential for improved capacity (O'Grady, 2016). Q-value will not change, which is largely governed by failure of physicochemical elements to reach good status as a result of existing upstream catchment pressures.							
Quality elements	**Biological quality elements (BQEs)**		**Hydromorphological quality elements supporting the BQEs**			**General physicochem. elements supporting the BQEs**	**Overall ecological status**
	Macroinverts (Q-value)	Fish fauna	Hydrology	Morphology	Continuity		
Starting point	3 (Q3-4)	3	≤3*	≤3*	≤3*	3	3
Effect owing to modification	3 (Q3-4)	3	≤3*	<3*↓↑	<3*	3	3
Ecological Status Classes - 1: High; 2: Good; 3: Moderate; 4: Poor; 5: Bad							
** "supporting conditions" are by definition equal to, or poorer than, highest BQE value*							

Table 3.4 shows that overall status does not decline from 'moderate'. There is no fall in status class in any of the quality elements.

Fish status would remain at 'moderate' in the channel as a whole owing to incorporation of fisheries habitat enhancements. Brown trout will continue to drop down from the spawning habitats of the Glennamought River (as is currently the case) to forage and occupy areas of improved nursery habitat in the Bride (north). Post-scheme, the reach through Orchard Court will no longer be valuable to fish, but the fisheries enhancement reaches and the Sunbeam culvert removal reach are predicted to show an overall increase in trout numbers.

Table 3.5 summarises that as a result of the proposed new modifications: (1) water body status will not deteriorate, and (2) attainment of 'good' status will not be prevented any further than it currently is owing to existing modifications and pre-existing poor water quality. The project could theoretically be authorised as it does not compromise WFD objectives.

Table 3.5 Summary of WFD compliance tests - Bride (Cork City)_020 unmodified waterbody

Bride (Cork City)_020 unmodified waterbody (Code IE_SW_19B020500)	Note - it is considered unlikely this water body will remain categorised as unmodified, given the extensive nature of existing physical modifications and the fact that these existing modifications need to be retained for the specified urban use (including flood protection).
WFD RWB Objective	Good Status (good ecological status + good physicochemical status)
Is there a deterioration of water body status as a result of the proposal?	No - fish status will remain within the 'moderate' status class band, with a trout dominant community. Morphology changes are considered net zero owing to inclusion of fisheries enhancements. No significant change to existing continuity issues, which are imposed by existing Blackpool culverts.
Does the proposal prevent attainment of good status?	No – new modifications do not change the fact that the quality elements are limited to moderate (or poor, as in the Glen). The best that could be achieved would be 'moderate' status, as the fish community will never reach good status owing to existing barrier effects of downstream Blackpool culverts which prevent upstream migration of salmon (likely for at least the past ~200 years).

Recommendation	The tests of "non-deterioration" and "not jeopardizing attainment of good status" both pass. The project could be authorised as it does not compromise WFD objectives.

3.5.4 HMWB Ecological Potential Assessment - Bride (Cork City)_020

The assessment of impact on ecological potential follows the examples set out in §3.4.1 of CIS guidance No. 36 (CIS 2017), published with cognisance of the decisions in *Weser* on what constitutes "deterioration". First, it is necessary to establish a theoretical description of what could constitute Good Ecological Potential (GEP) for this [13]*HMWB. This requires estimation of maximum ecological potential (MEP) against which the values for GEP can be predicted.

MEP / GEP for theoretical Bride (Cork City)_020 HMWB

Technical guidance and case studies attest that determination of MEP/GEP for a particular HMWB is not an easy task (AMBER, 2019; Bussettini et al. 2018; CIS 2006; CIS 2019). The work of establishing MEP and GEP would legally need to be carried out by the EPA with input from IFI (for an Irish HMWB), but is approached for the purpose of this examination with the support of WFD technical guidance (**Fig 3.5**).

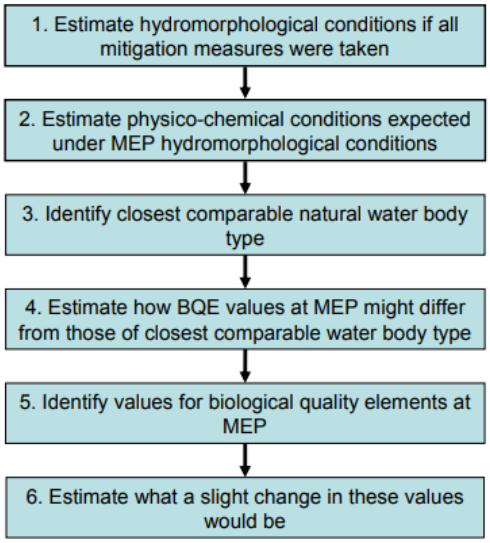

Figure 3.5 Steps in defining GEP as described in CIS Guidance Document No. 4 (from CIS 2006, p. 27)

According to WFD Annex V 1.2.5, MEP is a state where quality elements correspond totally, or almost totally, to the undisturbed conditions associated with the surface water body type most closely comparable to the HMWB concerned. GEP is then defined as an ecological state in which "*there are slight changes in the values of the relevant biological quality elements as compared to the values found at [MEP]*" (WFD Annex V 1.2.5).

MEP effectively reflects the best achievable value for the biological quality element(s) whilst taking into account the physical conditions imposed by the heavily modified characteristics of the water body. It is also a requirement that MEP reflect the value of biological quality elements once all "technically feasible" mitigations are employed, particularly with regard to ensuring the best approximation of the ecological

[13] * Denotes theoretical HMWB – the water body is a candidate HMWB, but is not yet designated (EPA 2022)

continuum (CIS, 2019). In this regard, the WFD allows, under strict conditions set out in Articles 4(5) and 4(7) that certain potential mitigation measures may be ruled out on the basis of "technically infeasibility" and/or "disproportionate costs". The mitigation measures for MEP must also not compromise the specified use and/or on the wider environment.

In the case of the Bride (Cork City)_020 *HMWB, the existing hydomorphological impacts directly connected with urban use (and consequent flood protection) are summarised, with biological effects described, in **Table 3.6**.

Table 3.6 Existing hydromorphological features and potential mitigation used in MEP estimation

Hydromorphological feature	Biological effects	Is mitigation possible within context of specified urban use?
Long culverts on the Kiln segment (Brewery Branch and Back Watercourse Branch (~980m)) and Glen segment (Back Watercourse Branch and Spring Branch (~1050m) which control and carry water beneath the highly urbanised area between Blackpool and the River Lee outfall.	Habitat fragmentation, reduces continuity between upstream and downstream habitats; interrupts and/or excludes fish passage. Habitat loss – culvert footprints are largely unusable by instream biota, especially with regards to spawning and nursery.	**No** - removal of the culverts and restoration of natural continuity would severely compromise urban use and flood protection. It is not possible to install fish passage mitigations as any internal roughness in the culverts can trap debris and severely compromise urban use and flood protection. (i.e., "technically infeasible")
Culvert maintenance – periodic removal of accumulated sediment and debris from within culverts to avoid blockages that would compromise flow and risk increasing flooding.	Removal of sediments can decrease incidental hydraulic refugia and "roughness" that some fish may take advantage of to migrate up the culverts (e.g., eel, lamprey); reduction in downstream sediment transport.	**No** – if sediment and debris were allowed to accumulate within culverts the resulting blockages would severely compromise urban use and flood risk and could lead to significant consequences on the wider environment (people/assets) (i.e., "technically infeasible")
Hard engineered river walls (concrete and/or gabion), mainly on the Bride (north) segment, to control and convey water through the Commons Road and Orchard Court reaches upstream of Blackpool Church.	Constricted river flow reduces lateral connectivity, leading to high instream water velocities and changes in sediment transport / settlement; diminished habitat suitability for instream biota especially spawning and nursery.	**No** – could use more environmentally friendly methods such as 2-stage / overflow channels, or set-back green embankments with natural bank vegetation, but this is likely to be "technically infeasible" and/or "disproportionately costly" in terms of land availability / acquisition in a densely urbanised area.

To approximate MEP, the closest comparable natural (unmodified) water body to one with indispensable (for specific reasons) artificial hydromorphological features described in **Table 3.6**, would be a small-to-moderate sized river with a natural fish barrier such as an impassable waterfall, subterranean section or long, fast rapid of sheet flow over smooth bedrock. The fish community in a natural Irish water body with these types of natural fish passage barriers would be dominated by non-migratory salmonid species indicative of good water quality, i.e., brown trout, in a range of size/age cohorts (0+, 1+ and older). Salmon would be absent because of the natural migration barrier. Other species could include brook lamprey and occasional eel (the latter being a good climber of natural features).

The best achievable fish population upstream of a natural barrier in an unmodified water body is therefore brown trout dominated and lacks salmon. At such sites, the FCS2 tool output can be 'good' status because of the way the FCS2 model accounts for the natural barrier that excludes migratory fish, i.e., salmon are not "expected". In contrast, a brown trout dominated system with impassable artificial barriers (which are not accounted for in FCS) would only ever reach a maximum of 'moderate' status under FCS2 because the artificial barrier prevents migration and the absence of migratory species is not expected.

Taking into account the hydromorphological characteristics of the water body that need to be retained for the specified urban (and flood protection) purpose, the best achievable values (MEP) for biological and physicochemical quality elements on the Bride (Cork City)_020 are realistically considered to be:

- 'High' macroinvertebrate EQR (0.9-1.0) (Q4-5, Q5), and;
- FCS2 value equivalent to 'High' fish status assuming a natural impassable barrier, i.e., trout dominated with expected catch numbers for high quality waters;
- Physicochemical conditions meet EQS for 'high' status as set out in [14]surface water regulations

GEP would therefore be conditions that deviate slightly from the above MEP as follows:

- 'Good' macroinvertebrate EQR (0.8) (Q4), and;
- FCS2 value equivalent to 'good' fish status assuming a natural impassable barrier, i.e., trout dominated with ~80% expected species composition and 80% expected total catch;
- Physicochemical conditions meet EQS for 'good' status as set out in surface water regulations

As for all WFD biological quality metrics, the assignment to ecological potential class involves a comparison between what is expected and what is observed, then calculating an Environmental Quality Metric (EQR) that translates to maximum, good, moderate, poor or bad ecological potential.

Impact of proposed project on ecological potential

Table 3.7 Bride (Cork City)_020 – *HMWB ecological potential impact assessment

Starting point: The *HMWB would not reach GEP owing to low fish abundance (even when existing hydromorophology conditions are taken into account) and is considered to be at moderate ecological potential under the definition in Annex V 1.2.5, based on biological & physicochemical quality element in worst condition (in this case moderate)

Effect of modification (proposed scheme): Overall ecological potential is maintained because the BQEs do not deteriorate - morphology changes are net zero as a result of fisheries enhancements integral to the scheme. Fish potential will remain at moderate, with potential for improved capacity (O'Grady, 2016). Q-value will not change, which is largely governed by failure of physicochemical elements to reach good status as a result of existing upstream catchment pressures.

Quality elements	Biological quality elements (BQEs)		Hydromorphological quality elements supporting the BQEs			General physicochem. elements supporting the BQEs	Overall ecological potential
	Macroinverts (Q-value)	Fish fauna	Hydrology	Morphology	Continuity		
Starting point	3 (Q3-4)	3	≤3*	≤3*	≤3*	3	3
Effect owing to modification	3 (Q3-4)	3	≤3*	<3*↓↑	<3*	3	3

Ecological Potential Classes - 1: High; 2: Good; 3: Moderate; 4: Poor; 5: Bad

** "supporting conditions" are by definition equal to, or poorer than, highest BQE value*

Table 3.7, based on CIS (2017) examines how the proposed project is expected to affect the environmental objectives of the affected Bride (Cork City)_020 if it was a designated heavily modified water body (HMWB). Note that the HMWB would currently be at 'moderate ecological potential' according to the definition in WFD Annex V 1.2.5 *"There are moderate changes in the values of the*

[14] S.I 272 of 2009, as amended by S.I. 77 of 2019

relevant biological quality elements as compared to the values found at maximum ecological potential. These values are significantly more distorted than those found under good quality." Physicochemical elements supporting the biological elements are also 'moderate', as they currently (based on EPA data) do not meet criteria for good status (EQS) according to surface water regulations.

Notional 'moderate ecological potential' is therefore a valid baseline against which to evaluate WFD objectives for this hypothetical HMWB.

There is no deterioration of ecological potential from 'moderate' as a result of the scheme. There is no fall in ecological potential class in any of the quality elements.

Fish potential will remain at 'moderate' in the channel as a whole owing to incorporation of fisheries habitat enhancements. Brown trout will continue to drop down from the spawning habitats of the Glennamought River (as is currently the case) to forage and occupy areas of improved nursery habitat in the Bride (north). Post-scheme, the reach through Orchard Court will no longer be valuable to fish, but the fisheries enhancement reaches and the Sunbeam culvert removal reach are predicted to show an overall increase in trout numbers.

Tables 3.8 summarises that as a result of the proposed new modifications: (1) water body ecological potential will not deteriorate, and (2) attainment of good ecological potential will not be prevented any further than it currently is owing to existing modifications and pre-existing poor water quality. The project could theoretically be authorised as it does not compromise WFD objectives.

Table 3.8 Summary of WFD compliance tests - Bride (Cork City)_020 as *HMWB

Bride (Cork City)_020 heavily modified waterbody (*HMWB)	It is considered very likely this water body will become a designated HMWB, given the extensive nature of existing physical modification and the fact that existing modifications need to be retained for the specified urban use (including flood protection).
WFD *HMWB Objective	Good Ecological Potential (GEP + good chemical status)
Is there a deterioration of *HMWB ecological potential as a result of the proposal?	No - fish status would remain within the 'moderate' ecological potential class band as a result of net zero morphology changes (modifications + fisheries enhancements) and no significant change to existing continuity issues (existing Blackpool culverts).
Does the proposal prevent attainment of good ecological potential?	No – if background water quality improved (unrelated to this project) higher densities of trout may in time occupy available channel sections, including spawning in the fisheries enhancement area upstream of Commons Inn Hotel, with greater carrying capacity for juvenile fish that drop down from the Glennamought. If supporting water quality conditions were improved there is no reason why this *HMWB could not reach GEP based on sampling of suitable riffle areas in the fisheries enhancement areas, i.e., GEP can be attained for fish, macroinvertebrates and physicochemical elements.
Recommendation	The tests of "non-deterioration" and "not jeopardizing attainment of good ecological potential" both pass. The project could be authorised as it does not compromise WFD objectives.

**denotes theoretical HMWB – the water body is currently a candidate HMWB, but is not yet designated*

3.5.5 Glennamought_Trib. Bride_010 (RWB)

Field sampling results for the EIAR align with [15]EPA assigned 'moderate' status for the Glennamought_Trib. Bride_010 RWB. Field sampling showed "good" macroinvertebrate status and "moderate" physicochemical status, hence moderate status overall. "Moderate" fish status is inferred from data in the EIAR that showed a healthy trout population with a range of size/age cohorts (0+, 1+ and above). This helps confirm that 'moderate' ecological status is a scientifically valid baseline against which to assess: (i) potential impact on water body status, and (ii) tests of WFD compliance.

Table 3.9, based on the examples of §3.4.1 of CIS guidance No. 36 (CIS 2017), examines how the proposed project is expected to affect the environmental objectives of the Glennamought_Trib. Bride_010 water body. **Table 3.10** summarises the implications for WFD compliance.

Table 3.9 Glennamought_Trib. Bride_010 – water body status impact assessment

Starting point: EPA assigned status is 'moderate'. Overall ecological status is determined (on the basis of field data) by biological & physicochemical quality element in worst condition (in this case moderate).							
Effect of modification (proposed scheme): Overall ecological status is maintained, with no measureable deterioration as a result of morphology and continuity impacts in this water body							
Quality elements	**Biological quality elements (BQEs)**		**Hydromorphological quality elements supporting the BQEs**			**General physicochem. elements supporting the BQEs**	**Overall ecological status**
	Macroinverts (Q-value)	Fish fauna	Hydrology	Morphology	Continuity		
Starting point	Q4 (good)	3	≤4*	≤4*	≤4*	3	3
Effect owing to modification	Q4 (good)	3	≤4*	≤4*	≤4*	3	3
Ecological Status Classes - 1: High; 2: Good; 3: Moderate; 4: Poor; 5: Bad							
* "supporting conditions" are by definition equal to, or poorer than, highest BQE value							

Table 3.10 Summary of WFD compliance tests - Glennamought_Trib. Bride_010 waterbody

Glennamought_Trib. Bride_010 waterbody (Code IE_SW_19G880990)	Note – this water body is directly upstream of the Bride (Cork City)_020, and is examined here as part of cumulative water status impact assessment. There are no significant physical modifications to the 400m of this channel affected by the scheme.
WFD RWB Objective	Good Status (good ecological status + good physicochemical status)
Is there a deterioration of water body status as a result of the proposal?	No – there are no significant hydromorphological impacts (on morphology, continuity or hydrology) that would cause overall status to decline, with low risk of any measurable deterioration in any of the quality elements as a direct result of the proposed scheme.
Does the proposal prevent attainment of good status/potential?	No – there is no additional impact on this water body as a result of new modifications on the downstream Bride (Cork City)_020 RWB. New modifications downstream in the Bride (north) do not change the fact that the quality elements are limited to 'moderate'. The best that could be achieved would be FCS2 'moderate' status, as the fish community will never reach 'good' status owing to existing barrier effects of downstream culverts which prevent migration of salmon (for at least the past ~200 years).

[15] EPA status was assigned by EPA "expert judgement"

	Note that if the downstream Bride (Cork City)_020 was a designated HMWB, then 'good' fish status could be attained on the Glennamought_Trib Bride_010 because there would be an acknowledgement of the impassable barrier created by the existing downstream culverts and therefore no expectation (within the FCS2 tool) that migratory fish species be present in this adjoining water body.
Recommendation	The tests of "non-deterioration" and "not jeopardizing attainment of good ecological status/ potential" both pass. The project could be authorised as it does not compromise WFD objectives.

3.5.6 Bride (Cork City)_010 (RWB)

Table 3.11 Bride (Cork City)_010 – water body status impact assessment

Starting point: EPA assigned status is 'moderate'. Overall ecological status is determined by biological & physicochemical quality element in worst condition (in this case extrapolated as moderate).							
Effect of modification (proposed scheme): Overall ecological status is maintained, with no measureable deterioration as a result of morphology and continuity impacts in this water body							
Quality elements	**Biological quality elements (BQEs)**		**Hydromorphological quality elements supporting the BQEs**			**General physicochem. elements supporting the BQEs**	**Overall ecological status**
	Macroinverts (Q-value)	Fish fauna	Hydrology	Morphology	Continuity		
Starting point	Q3-4 (moderate)	3	≤3*	≤3*	≤3*	3	3
Effect owing to modification	Q3-4 (moderate)	3	≤3*	≤3*	≤3*	3	3
Ecological Status Classes - 1: High; 2: Good; 3: Moderate; 4: Poor; 5: Bad							
* "supporting conditions" are by definition equal to, or poorer than, highest BQE value							

Table 3.11, based on the examples of §3.4.1 of CIS guidance No. 36 (CIS 2017), examines how the proposed project is expected to affect the environmental objectives of the Bride (Cork City)_010 water body. **Table 3.12** summarises the implications for WFD compliance. 'Moderate' ecological status, as assigned by the EPA (extrapolated) is used as the baseline against which to: (i) assess potential impact on water body status, and (ii) conduct tests of WFD compliance.

Table 3.12 Summary of WFD compliance tests - Bride (Cork City)_010 waterbody

Bride (Cork City)_010 waterbody (Code IE_SW_19B14011)	Note – this water body is directly upstream of the Bride (Cork City)_020, and is examined here as part of cumulative water status impact assessment. There is no footprint of the Bride (Blackpool) scheme in this water body.
WFD RWB Objective	Good Status (good ecological status + good physicochemical status)
Is there a deterioration of water body status as a result of the proposal?	No – there are no significant hydromorphological impacts (on morphology, continuity or hydrology) that would cause overall status to decline, with a low risk of any measurable deterioration in any of the quality elements as a direct result of the proposed scheme.
Does the proposal prevent attainment of good status?	No – there is no additional impact on this water body as a result of new modifications on the downstream Bride (Cork City)_020 RWB. New modifications downstream in the Bride (north) do not change the fact that the quality elements are limited to 'moderate'. The best that could be achieved would be 'moderate' status, as the fish community will never reach good status

	owing to existing barrier effects of downstream culverts which prevent migration of salmon (for at least the past ~200 years). Note that if the downstream Bride (Cork City)_020 was a designated HMWB, then 'good' fish status could be attained on the Bride (Cork City)_010 because there would be an acknowledgement of the impassable barrier created by the existing downstream culverts and therefore no expectation (within the FCS2 tool) that migratory fish species would be present in this adjoining water body.
Recommendation	The tests of "non-deterioration" and "not jeopardizing attainment of good ecological status/ potential" both pass. The project could be authorised as it does not compromise WFD objectives.

3.6 Conclusions of WFD Compliance Tests

Table 3.13 summarises that the project is not expected to cause deterioration, or compromise the achievement of good status/potential in the three relevant RWBs: Bride (Cork City)_020, Glennamought_Trib. Bride_010 and Bride (Cork City)_010. This conclusion applies whether the Bride (Cork City)_020 receives HMWB designation, or not.

The following points are noted from CIS No. 36 (2017):

1) *"If a project is expected not to cause deterioration, or compromise the achievement of good status/potential (e.g., due to the application of mitigation measures which should be an inherent element of a project), then no Article 4(7) Test is required and the project can be authorised under the WFD."* (CIS, 2017; §3.1, p16)
2) *"Competent authorities may authorise a project in absence of Article 4(7) test when there is sufficient certainty that it will not cause deterioration or compromise the achievement of good status / potential. The evidence on which this decision is based should be documented."* (CIS, 2017; §3.2, p19)

On point (1) - the proposed Bride (Blackpool) drainage scheme incorporates mitigation measures (fisheries enhancements) as an inherent element of the project. On point (2) - this document provides evidence on which such a decision could be made. These points provide sufficient confidence that Article 4(7) test is not required for the proposed scheme.

Table 3.13 Summary of WFD compliance tests – all water bodies, all scenarios

Water body (scenario)	Deterioration of status/potential?	Prevention of good status/potential?	Recommendation
Bride (Cork City)_020 [unmodified]	No	No	The project can be authorised as it does not compromise WFD objectives.
Bride (Cork City)_020 heavily modified waterbody [*HMWB]	No	No	The project can be authorised as it does not compromise WFD objectives.
Glennamought_Trib. Bride_010 *[when Bride (Cork City)_020 RWB is unmodified]*	No	No	The project can be authorised as it does not compromise WFD objectives.
Glennamought_Trib. Bride_010 *[when Bride (Cork City)_020 is *HMWB]*	No	No	The project can be authorised as it does not compromise WFD objectives.

Water body (scenario)	Deterioration of status/potential?	Prevention of good status/potential?	Recommendation
Bride (Cork City)_010 *[when Bride (Cork City)_020 RWB is unmodified]*	No	No	The project can be authorised as it does not compromise WFD objectives.
Bride (Cork City)_010 *[when Bride (Cork City)_020 is *HMWB]*	No	No	The project can be authorised as it does not compromise WFD objectives.

3.7 Implication of Issues in Ground 6

In answer to the question on implications of Ground 6 of the plaintiffs' action relating to the status of the waterbodies involved and how the proposed works will impact on said waterbodies:

First Key Issue

The EPA have assigned status to the water bodies in question, meaning there is a legally valid baseline against which the competent authority can assess impact on water body status. This removes the issue with respect to the decision in *Sweetman v An Bord Pleanála* [2021] IEHC 16 whereby status changes could not be legally assessed in the absence of EPA assigned status classification.

The Minister is not precluded from granting permission for the development on the basis of this issue as asserted by the plaintiff throughout Ground 6 (§30 - §34).

Second Key Issue

The above evidence verifies the project is not expected to cause deterioration, or compromise the achievement of good status/potential in the three relevant RWBs: Bride (Cork City)_020, Glennamought_Trib. Bride_010 and Bride (Cork City)_010.

This conclusion applies regardless of whether the Bride (Cork City)_020 receives HMWB designation in the forthcoming RBMP cycle or not. The conclusions were reached by applying the WFD compliance tests established in the litigation (*Weser*) and in line with WFD Common Implementation Strategy (CIS, 2017) guidance regarding the legal interpretation of "deterioration".

The Minister is not precluded from granting permission for the development on the basis of this issue as asserted by the plaintiff throughout Ground 6 (§30 - §34).

3.8 REFERENCES

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CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.

CIS (2003a) WFD Common Implementation Strategy Guidance No.4. Identification and Designation of HMWB and AWB.

CIS (2003b) WFD Common Implementation Strategy Guidance No.7. Monitoring under the Water Framework Directive.

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CIS (2009) WFD Common Implementation Strategy Guidance No.20. Guidance document on exemptions to the environmental objectives.

CIS (2017) WFD Common Implementation Strategy Guidance Document No.36 Exemptions to the Environmental Objectives according to Article 4(7) New modifications to the physical characteristics of surface water bodies, alterations to the level of groundwater, or new sustainable human development activities.

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APPENDIX 1 Images of Bride (North) Orchard Court

Image A1: Bride River – view upstream from entry bridge into Orchard Court showing boulder rip-rap, hard engineered walls and sprayed riparian zone. Natural in-stream substrates.

Image A2: Bride River – view upstream from within Orchard Court showing existing defences (concrete walls, boulder rip-rap).

APPENDIX 2 Fisheries Enhancement Proposals

Fishery Enhancement Proposals

in relation to the

Proposed River Bride (Blackpool) Certified Drainage Scheme

Professor Martin O'Grady

April, 2016.

1. Introduction.

Ryan/Hanley on behalf of OWP has requested the author to review the River Bride (Blackpool) Certified Drainage scheme proposals with a view to modifying same, where possible, for the benefit of the fish stocks without compromising the functionality of the proposed drainage scheme. This report provides specific details in relation to achieving the aforementioned objective.

2. Methodologies.

The proposals in this document were generated following; -

1. The author reviewing all of the background biological data which had been compiled in relation to this study.
2. Looking at the detail of the proposed drainage scheme as outlined in the exhibition drawings for the scheme (Smyth, 24/11/2015).
3. Meeting with Ryan/Hanley personnel, following a site visit, to clarify some of the drainage proposals.
4. Visiting and walking the appropriate channel length on two occasions' accompanied by Mr Michael McPartland (Senior Environmental Officer with Inland Fisheries Ireland) (February, 23rd and April, 13th.

3. Recommendations

The reader should note that all of the coded references in this document are those used in the Exhibition Drawings Document (Smyth, 2015).

3.1 General Issues

3.1.1 Channel Reach of Concern to Fishery Interests.

The specific length of channel, within this proposed flood relief scheme, of concern from a fishery perspective, is the section from the bridge immediately downstream of McDonalds Restaurant (C06 _B01) downstream to where it is proposed to construct a trash rack as part of the flood relief scheme (CO6_ TO2) adjacent to Blackpool Shopping Centre.

3.1.2. The Nature of Channel Substrate Post-Drainage.

Within the channel reach of concern to fisheries it would be most desirable if the substrate on the wetted width of the channel be composed of the same cobble/gravel mix evident in the channel presently – it is accepted that cobble/gravel removal from the proposed gravel trap (CO6 _ CO3) will be necessary, from time to time, as part of a drainage maintenance programme.

3.1.3. Low Flow Wetted Channel Base width.

From a fishery perspective, it is crucial that post-drainage, there should be a "two stage" channel with the wetted width in low flow regimes having the same base width as is evident to-day – the concept of a "two stage" channel is illustrated in "Channels and Challenges" (O'Grady, 2006) (see also Fig. 1 below).

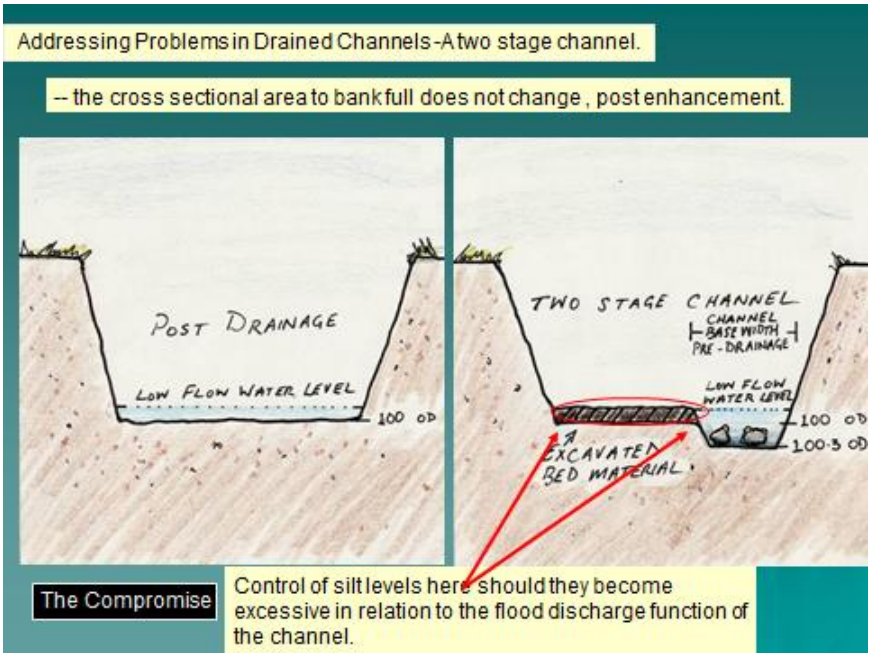

Figure 1. An illustration of the proposed "two stage" channel.

3.1.4. Channel Meander Pattern within the Low Flow Channel.

The channel reach within this programme of concern to fisheries, as defined in section 3.1.1 above, has a number of natural meanders. On each of these meanders the deposition of river silt presently illustrates the natural curvature of the channel. Essentially, post-drainage, the construction of a two-stage channel should mimic the existing pattern at a lower bed level at each meander point (see Figure 2 below by way of example).

Figure 2. Channel morphology at an existing meander bend just d/s of CO6 _ 2250.

3.1.5 Reorganisation of Channel Form, Post-Drainage, in a currently unnaturally broad shallow reach which is braided in nature (from the bridge at CO6 _ LO6 downstream to the bridge at CO6 _ L10).

Currently this artificially broad reach is braided in nature (Figure 3). Following drainage, it suggested that a meandering two stage channel be constructed with the low flow wetted area being circa 1/3 of the existing channel base width. An outline sketch of the proposal is provided in Figure 3. It is suggested that there be a total of four meander bends in the channel length between the two bridges. These should be equally spaced apart over the length of the channel in question.

The creation of a two-stage channel both in straight and meander sections of this channel will necessitate the construction of stone deflectors to function as the “higher tier” of the two bed levels. A suitable design for such a structure is illustrated in Figure 4.

Whenever maintenance of this channel is required, post drainage, the excess silt deposits which will lodge on top of the higher tier in the channel can be removed. Care needs to be taken to ensure that the original “two tiered” design remain in place following maintenance and that the bed of the wetted low flow tier is not disturbed by maintenance operations.

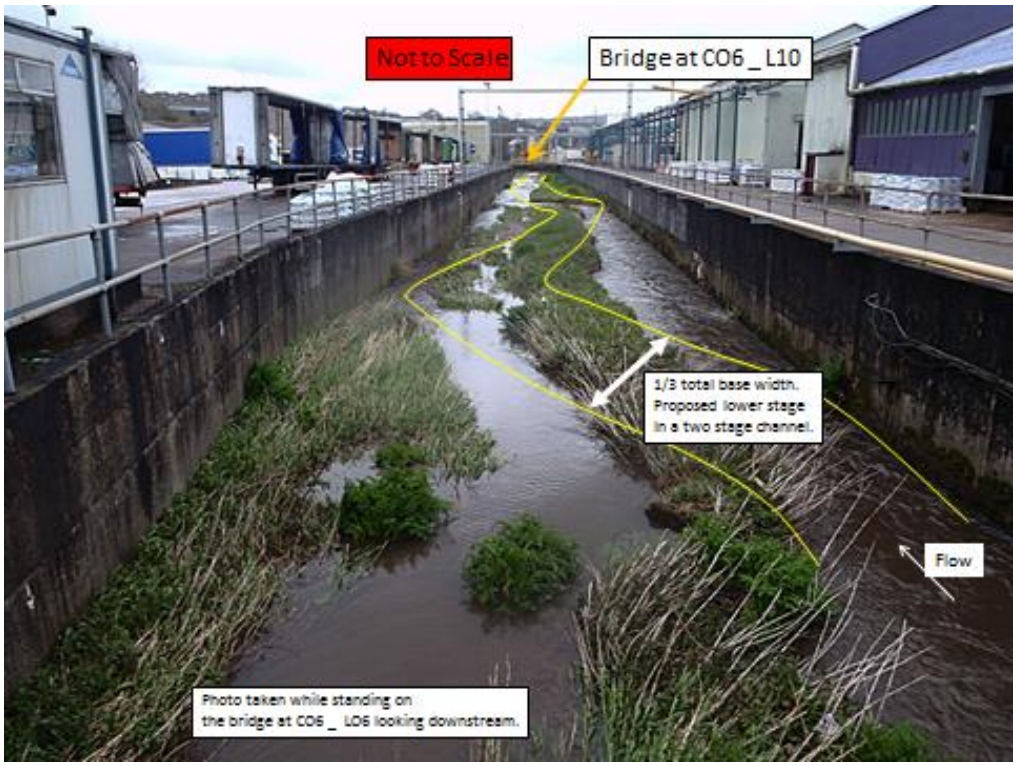

Figure 3. An outline sketch of the enhancement proposal for this reach following the implementation of the drainage programme.

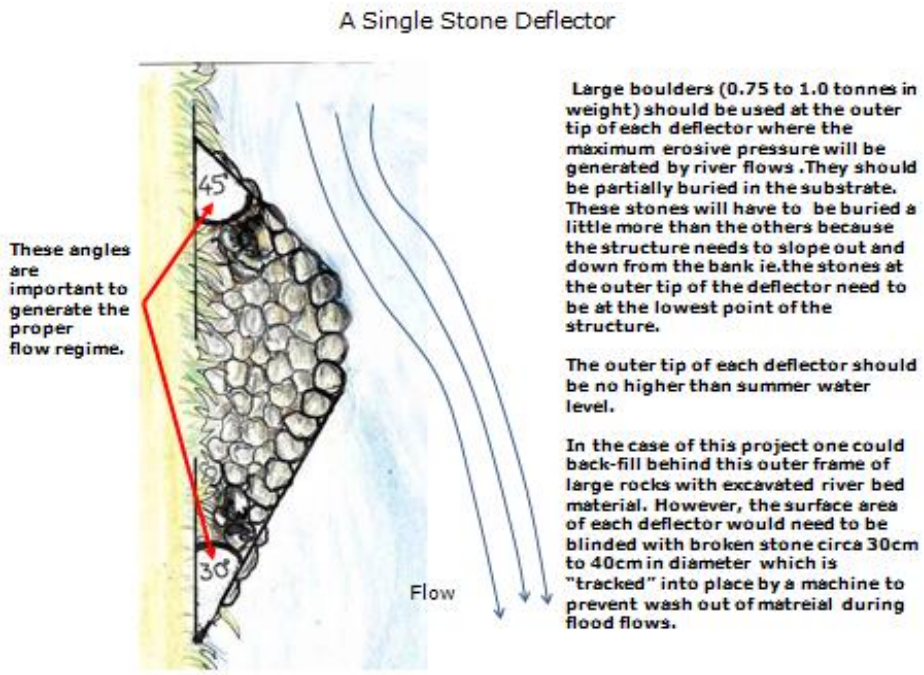

Figure 4. Construction detail in relation to the proposed" higher tier" in a two stage channel.

3.1.6. Introduction of boulders to the channel.

The introduction of boulders to the entire channel length of fishery interest (see Section 3.1.1.) would significantly enhance the morphology of this channel from a fishery perspective; -

- Localised hydrological alterations, caused by boulder placement, would provide resting places for trout and result in localised minor accumulations of the smaller gravels in the channel bed, downstream of individual boulders which would provide spawning opportunities for the trout.
- Stable boulders also provide an area which can be colonised by aquatic plants and invertebrates (Figure 5).

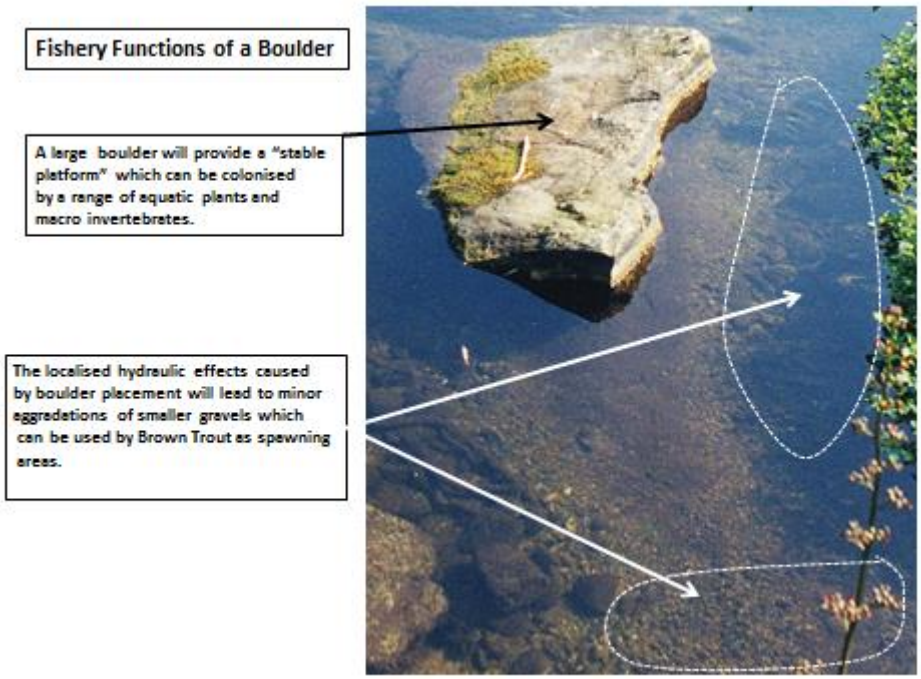

Figure 5. Visual evidence of the value of an introduced boulder.

3.1.6.1. Boulder Requirements and Distribution.

Suitable boulders for this project would be 1.0 to 1.5 tonnes in weight.

They should be at circa 10.0m centres, relative to one another, over the entire channel length in question (excluding the gravel trap area).

The distribution of all boulders should be confined solely to the low flow wetted area.

3.1.7. Providing a Riparian Zone.

The channel in question will have no vegetated riparian zone following the implementation of the proposed drainage programme. The complete absence of bankside vegetation, apart from some marginal grasses poses some severe ecological restrictions from a fishery perspective; -

- Marginal trees and shrubs partially shade channels providing camouflage for fish and help to maintain summer water temperatures beneath lethal levels for trout.
- Most aquatic insects have a short aerial phase in their life cycle during which time they mate and return to the river to lay their eggs. During their terrestrial phase they rest and shelter from storms in shrubbery adjacent to the river – in the absence of such vegetation few are likely to survive long enough to complete their life cycle thereby reducing the overall fish food supply.
- In the summer/autumn period many terrestrial insects, living in a riparian zone, fall into the watercourse. They constitute an important food source for trout during this seasonal period.

In order to counter these negative effects to some extent the author would make the following suggestion; - construct “concrete window boxes” on the upper inner face of the

flood relief walls on selected channel reaches – wherever the low flow wetted reach is adjacent to the flood protection wall (Figure 6). Given the limited growing zone within these boxes the "weeping willows" will remain dwarf in nature and not interfere with flood flows (Figure 6).

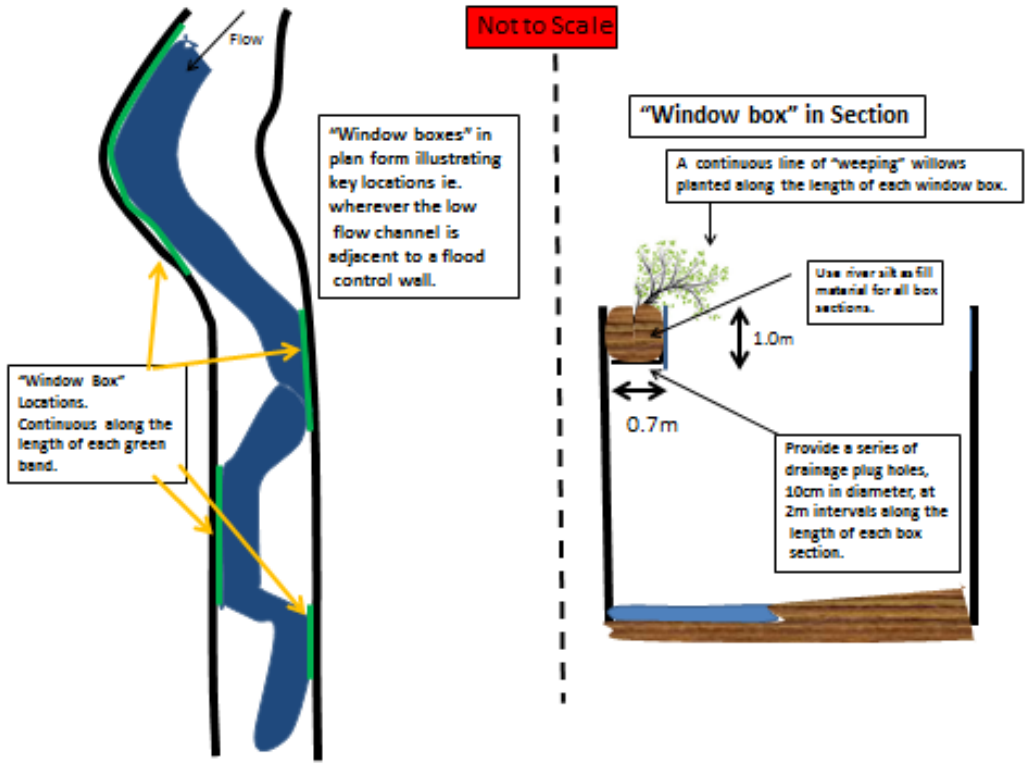

Figure 6. Detail in relation to the Willow planting proposal.

3.2. Specific Issues

There are two particular issues where minor alterations to particular aspects of the drainage proposal would help fishery interests.

3.2.1. Proposed construction of a "trash rack" at CO6 _ TO2 adjacent to Blackpool Retail Park.

It is important from a fishery perspective that trout (≤ 35.0 cm in length) have freedom of passage both upstream and downstream through the proposed "trash rack".

3.2.2. Nature of the left bank on the channel reach where the sedimentation trap is proposed (CO6 _ CO3).

A proposed new wall is proposed here subject to structural assessment (CO6 _ L12). From an ecological perspective, a grassed embankment would be preferable.

4. Summary Comment.

The relevant reach of the River Bride (Blackpool) (see Section 3.1.1) is already in a very poor morphological and ecological state prior to the implementation of this proposed drainage scheme. In the authors opinion if the recommendations outlined in this document can be incorporated into the proposed drainage design (Smyth, 2015) it will significantly improve its capacity to support a brown trout population. In the authors opinion, the net gain in fish stock terms should more than offset the permanent loss caused by culverting in the lower reaches of the proposed drainage scheme.

5. References

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6. Acknowledgements

The author is most grateful to Sinead Gavin (Ryan/Hanley) for supplying me with all relevant background information.

A special thanks is due to Michael McPartland (IFI) for sharing both his time and expertise with the author.

Additional fisheries enhancement area upstream of Commons Inn Hotel

The reach of the Bride shown in Fig A2 is taken from Public Exhibition Drawing No. RB_203 Proposed Flood Defences - Plan Layout (Sheet 3 of 10) available online in the Project Documents page of the Bride (Blackpool) scheme website.

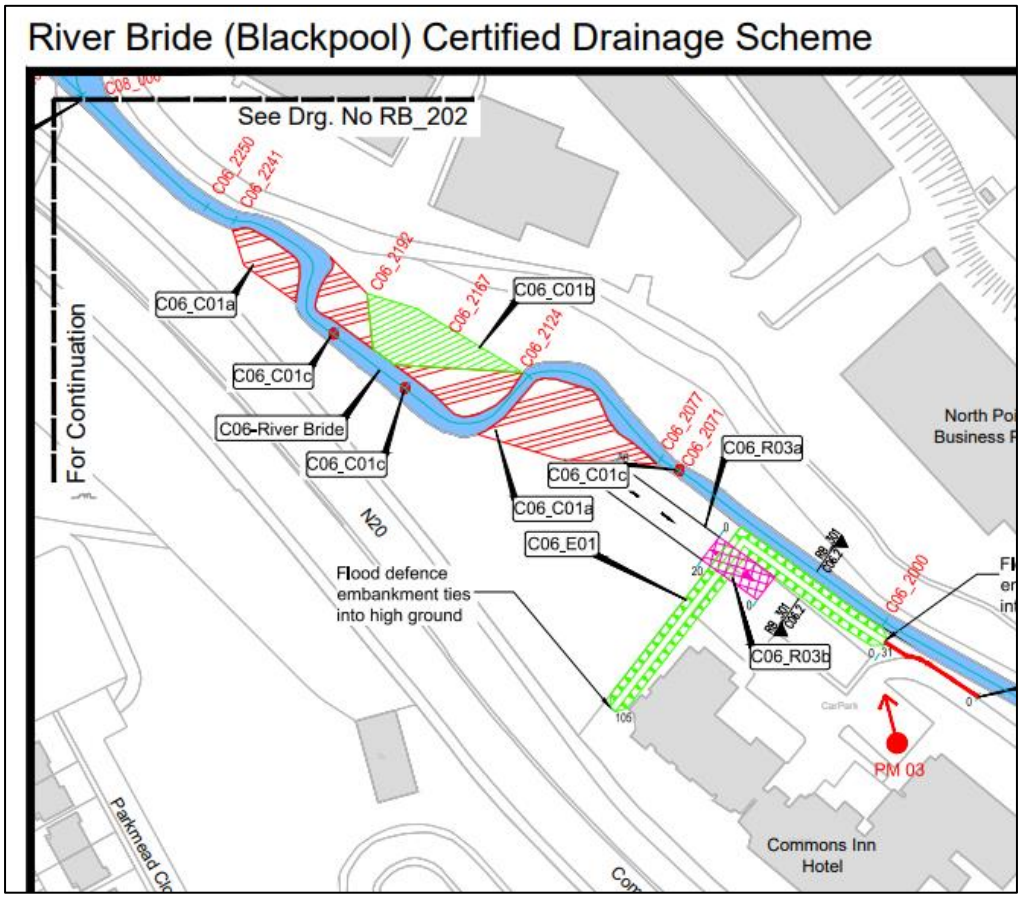

Figure A2: Fisheries enhancement area upstream Commons Inn Hotel

The elements of measures are described with reference to fisheries enhancement below:

- C06_C01a Chainage 2077 to 2241 - Proposed flood scalping and lowering on the inside channel bends to create a second stage channel to reduce velocities in lower order floods. This measure maintains the natural low flow channel, and mimics lateral connectivity in allowing overbank flow to the stage-2 level during larger flood events. The effects are instream velocity reduction and reduction of erosion/scouring in the low flow channel, which is beneficial for instream habitats and fish.
- C06_C01c 2071 to 2192 - Provisionally proposed geomorphic features, such as riffles, to be constructed within the channel. These features would improve local nursery habitats for juvenile trout that drop down from the Glennamought River.