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Shannon International River Basin District Project

Freshwater Morphology POMS Study

Recommendations for Programmes of Measures

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SHANNON INTERNATIONAL RIVER BASIN DISTRICT PROJECT

Recommendations for Programmes of Measures

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1.0 Introduction

This report has been completed as a deliverable of the Freshwater Morphology Programmes of Measures and Standards (POMS) Study, administered through the Shannon International River Basin District Project.

The Freshwater Morphology POMS Study has produced a suite of reports all of which ultimately inform the river basin planning process at different steps along the way; ranging from classifying and risk assessing waterbodies, to identifying what needs to be done to comply with WFD, through to finally deciding on what measures should be applied and where. These reports inform Programmes of Measures by reviewing, researching and providing recommendations on measures that are available to protect or improve morphology, their technical feasibility, cost effectiveness, and the legislative mechanisms for putting them in place[1].

- Literature Reviews
- Channelisation Recovery Assessment
- Analysis of Recovery Datasets in Irish Rivers
- Best Practice Review and Toolkit
- Cost Effectiveness and Technical Feasibility of River Enhancement Schemes
- Existing legislation review

This "Recommendations for Programmes of Measures" report highlights the different steps in developing Programmes of Measures for morphology by drawing on the findings of the relevant POMS Studies reports, and makes recommendations for input to the draft River Basin Management Plans

2.0 Background

Following a process of risk assessment and classification (Freshwater Morphology POMS Study, Fieldwork, Risk Assessment and Classification Outcome Reports)[2], which identifies where problem areas are, Programmes of Measures must be developed which meet a range of objectives under WFD.

The default objectives for all surface waterbodies with respect to morphology are:

- restore waters, where necessary, to at least good status by 2015.
- achieve the objectives of protected areas
- prevent deterioration, in particular,
- maintain high and good status where they exist, and

All waterbodies, regardless of status must be managed to ensure no deterioration. High and good status must be maintained where it exists. Waterbodies within Protected Areas must meet their Favourable Condition Status requirements. In addition to this, waterbodies that are of moderate, poor, or bad ecological status, must be improved to at least Good Ecological Status (G.E.S) by 2015. If this cannot be achieved, due to

[1] Link to POMS Tracker
[2] Link to POMS Tracker

practical, technical or financial constraints, then alternative objectives must be set which can be achieved. These may be in the form of extended deadlines, less stringent objectives; new physical modifications or sustainable developments or designation as a Heavily Modified Waterbody (HMWB).

There are basic measures which must be complied with as a minimum. These are embedded within existing pre-WFD legislation that is already in place with the objective of protecting different aspects of the water environment. Therefore, many WFD-compliant measures are already being undertaken in Ireland. It is important that they are implemented fully and effectively.

However, these basic measures will not always go far enough to meet WFD requirements. More legislative control may be needed to manage certain aspects to ensure the default objectives are met.

Waters where improvement is required may need supplementary or additional measures to improve status to G.E.S by 2015. These are more specific measures with the overall objective of improvement. Risk assessment and classification of Ireland's waterbodies provides an initial screening of where these waterbodies are. A planning process is then undertaken to determine what can be undertaken both in terms of technical feasibility, recovery timescales and cost-effectiveness, and where special cases for exemptions are required.

This report makes recommendations on the application of these measures with respect to Freshwater Morphology. It also outlines the role Freshwater Morphology plays in contributing to Ecological Status, and where Morphology Measures should be applied to restore Good Ecological Status overall.

3.0 Improving Overall Ecological Status by Applying Morphology Measures

Figure 1 illustrates the role morphology plays in overall ecological status of waterbodies.

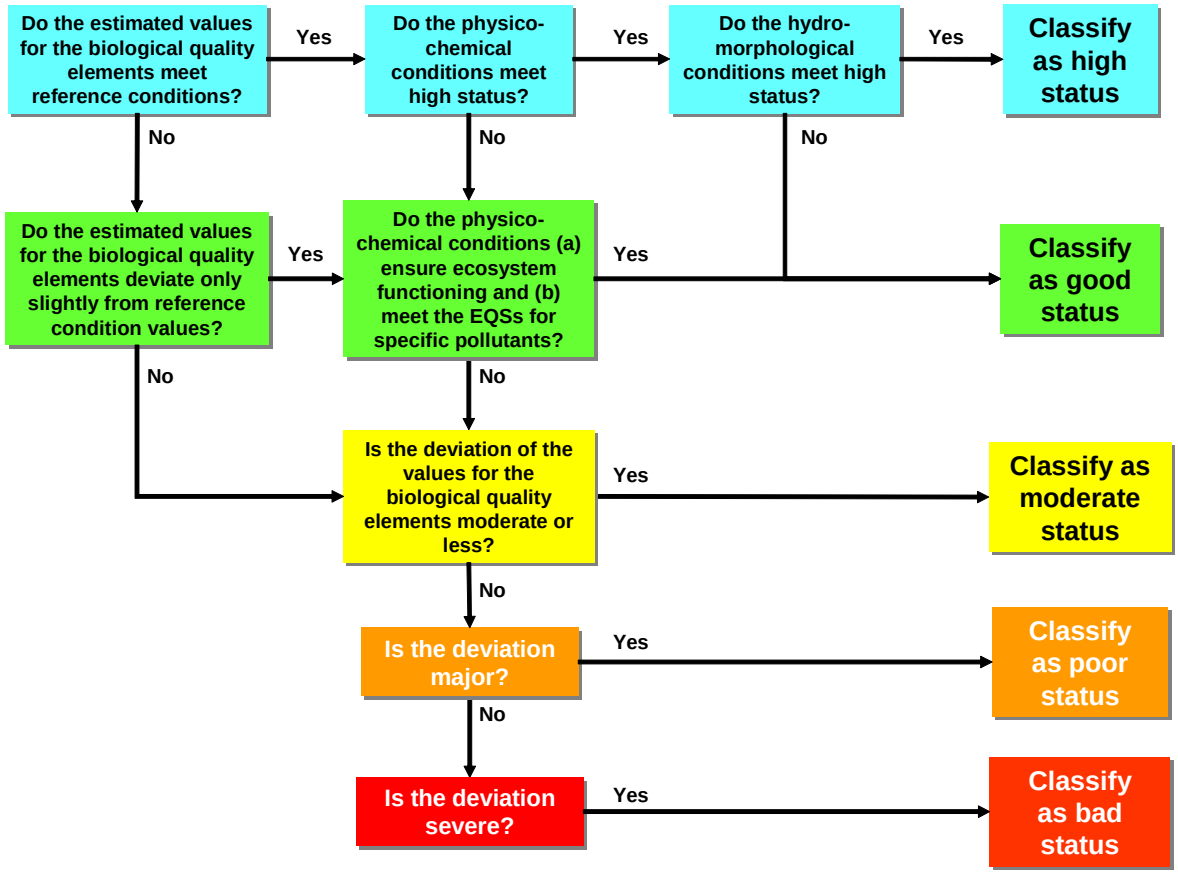

Figure 1: Role of Hydromorphology in overall Ecological Status of Waterbodies (Source, UK Technical Advisory Group)

Under the WFD, a waterbody can only be classified as High Ecological Status if biology, chemistry and hydromorphology are all of high status. If hydromorphological status is not high, then that waterbody is classified as Good Ecological Status (G.E.S). This is the key role of hydromorphology under WFD classification.

If morphological status is good or high, then the default objective is to manage the waterbody to prevent deterioration.

If the morphological status of a waterbody is moderate, poor, or bad, there are three possible scenarios as indicated by Table 1.

Table 1: Overall Ecological Status when Morphology Status is Moderate, Poor or Bad

	Morphology Status	Other Status Elements:	Overall Ecological Status	Objectives
1	Moderate or Poor or Bad	High	Good	Manage to ensure no deterioration
2	Moderate or Poor or Bad	Good	Good	Manage to ensure no deterioration
3	Moderate or Poor or Bad	Moderate or Poor or Bad	Moderate or Poor or Bad	Improve Ecological Status to G.E.S

It is within scenario 3 that waterbodies must be identified where morphology is impacting on other status elements, and causing an impact on Ecological Status of 'less than good'. That is, G.E.S would be achieved if the morphology was improved. These are the waterbodies that will be focused on for applying improvement measures in the first RBMP.

For example, a river waterbody may have good status in terms of macroinvertebrates, plants, physico-chemical elements and other supporting elements, but have poor status in terms of fish. If the cause of poor fish status is due to morphology pressures, as the river has been physically altered by placing in-channel structures that impede migration i.e. longitudinal continuity is disrupted, then measures to improve morphological status are required so that fish status is improved, and overall G.E.S can be achieved.

There will also be waterbodies within scenario 3 that have moderate, poor or bad morphology and also have less than G.E.S, but for which other pressures are the causes of failure of the status elements, namely pollution. Based on research findings within the POMS Study[3], it is recommended that where pollution pressures are identified for waterbodies, these should be addressed first with morphology improvement measures, to follow as pollution is the direct cause of less than G.E.S.

4.0 Existing Measures

An Existing Policy and Legislation Review report[4] was completed through the Freshwater Morphology POMS Study to determine where mechanisms are already in place to protect / improve morphology, and where gaps need to be filled by new measures.

There are 11 pre-existing WFD related EU directives. These are:

- The Bathing Water Directive (76/160/EEC);

[3] Irish Fisheries Recovery Datasets Provision, CFB, Insert Link to POMS Tracker
[4] Freshwater Morphology POMS Study, Existing Legislation Review, Insert Link

- The Birds Directive (79/409/EEC) ;
- The Drinking Water Directive (80/778/EEC) as amended by Directive (98/83/EC);
- The Major Accidents (Seveso) Directive (96/82/EC);
- The Environmental Impact Assessment Directive (85/337/EEC);
- The Sewage Sludge Directive (86/278/EEC);
- The Urban Waste-water Treatment Directive (91/271/EEC);
- The Plant Protection Products Directive (91/414/EEC);
- The Nitrates Directive (91/676/EEC);
- The Habitats Directive (92/43/EEC) ;
- The Integrated Pollution Prevention Control Directive (96/61/EC).

A range of Legislative Acts and Regulations are already in place in Ireland to implement these directives including strategic plans and programmes (e.g. Water Services Investment Programme, Nitrates Action Programme). These are termed Existing Basic Measures.

The legislation review concluded that in terms of managing Freshwater Morphology the extent to which Existing Basic Measures achieve this is somewhat limited.

The areas that apply to morphology are listed below.

To ensure integration with RBMP's and effective management of morphology, alignment of existing legislation with WFD requirements may be needed. An indication of the alignment that may be necessary is also listed below. (Full details of the legislation are included in the aforementioned Existing Policy & Legislation Review).

Conservation measures (Birds Directive, Habitats Directive, Natural Habitats Regulations, Wildlife Acts)

- Ministers must ensure that conservation objectives of the Natura 2000 network are incorporated into all other plans and programmes and coordinate with RBMP's.

EIA procedure

- Local Authorities must review procedure to ensure explicit consideration of WFD objectives
- The national EIA Regulations requires amendment to ensure consideration of WFD objectives

Drainage and flood relief schemes

- The OPW must account for the Water Framework Directive requirements when implementing existing flood relief and drainage works, this may entail a review of existing activities
- Drainage legislation may require amendment to align with the new Floods Directive, though the volume of legislation would make this a big task.

The planning process

- Local Authorities must incorporate WFD objectives into all levels of the planning framework during review process
- Planning and Development Act 2000, may require amendment, to ensure explicit consideration of WFD objectives

- Local Authorities must ensure that all land use planning and development activities within and upstream of protected areas must be managed in a way consistent with the conservation objectives of the protected areas.

Key Recommendation:
It is clear that there is a legislative gap in relation to the specific control of physical modifications, therefore, in many cases; the existing measures within existing legislation will not go far enough in achieving WFD objectives. Additional measures, in the form of regulatory controls, are required.

5.0 Additional Regulation

The WFD prescribes the need for morphology control in the introduction of a pre-authorisation system for hydromorphology under Article 11 Clause 3(i).

"For any other significant impacts on the status of water under Article 5 and Annex II, in particular measures to ensure that the hydromorphological conditions of the bodies of water are consistent with the achievement of the required ecological status or good ecological potential for waters designated as artificial or heavily modified. Controls for this purpose may take the form of a requirement for prior authorisation or registration based on general binding rules where such a requirement is not otherwise provided for under Community Legislation. Such controls shall be periodically reviewed, and where necessary, updated"

Since existing legislation does not provide for prior authorisation, registration, or general binding rules, these controls require introduction in Ireland.

5.1 Regulatory / Control Systems in Scotland (Controlled Activities Regulations), (C.A.R) (SEPA, 2005)

Regulation of Engineering Activities near watercourses is already being undertaken in Scotland under the Controlled Activities Regulations (C.A.R). The model used is considered for application in the Irish context since it addresses the WFD objective of preventing deterioration by controlling physical alterations to rivers and lakes. However, it is not clear if the regulations extend to morphological improvement schemes on rivers where morphological impact has been identified as the cause of failing ecological status objectives.

The Water Environment and Water Services (Scotland) Act 2003 gave Scottish ministers powers to introduce regulatory controls over activities in order to protect and improve Scotland's water environment. The water environment includes wetlands, rivers, lochs, transitional waters (estuaries), coastal waters and groundwater. These regulatory controls – the Water Environment (Controlled Activities) (Scotland) Regulations 2005 – were passed by the Scottish Parliament on 1 June 2005. The Regulations mean that it is an offence to undertake the following activities without a C.A.R authorisation:

- Discharges to all wetlands, surface waters and groundwaters
- Disposal to land
- Abstractions from all wetlands, surface waters and groundwaters;
- Impoundments (dams and weirs) of rivers, lochs, wetlands and transitional waters;
- Engineering works in inland waters and wetlands.

Regulation of Engineering Works in Inland Waters and Wetlands is the section of relevance in this context.

If any Engineering activities are already covered by the existing environmental regulatory controls, then there is no requirement for a separate authorisation under C.A.R. The legislative review in Ireland has identified that existing controls are limited.

A C.A.R authorisation is intended to control impacts on the water environment including mitigating the effects on other water users. It does not cover wider impacts which may be associated with a development such as visual impact or damage to terrestrial ecosystems. Consequently, other forms of control in addition to CAR may be required from other authorities to address these impacts, for example:

- planning permission;
- permissions associated with conservation areas or protected species.

5.1.1 Levels of Authorisation

The level of authorisation required under the C.A.R regulations depends on the type and extent of engineering activity.

Building and development in the vicinity of inland surface waters do not normally require a CAR authorisation. SEPA use its response to planning applications to achieve environmental objectives in this case.

In addition, works associated with land management practices in the vicinity of inland surface waters (e.g. intensive grazing, ploughing, forestry, etc.) do not normally require a CAR authorisation.

Only works in the vicinity of inland surface waters that have a direct and significant adverse impact, and which cannot be controlled through other means are regulated through CAR. This will include structures such as set-back embankments that affect the lateral movement of flood water.

The C.A.R Regulations provide for three levels of control:

1. General Binding Rules (GBR),
2. Registrations and
3. Water Use Licences (simple and complex)

SEPA can move activities between registration and licences and from GBR to registration or licences as it considers necessary in order to protect the water environment.

General binding rules (GBR)

GBR provide statutory controls over the following low risk activities:

- weirs less than 1metre high
- abstractions of less than 10m^3/d
- construction of boreholes
- dredging of rivers less than 1metre wide
- construction of minor bridges
- laying of pipeline or cable
- control of bank erosion covering less than 10m
- operating plan or machinery in the vicinity of water
- discharge of surface water runoff which does not cause pollution of the water environment.
- prohibition against the discharge of specified substances into a surface water drainage system.

Any person undertaking an activity which falls within the scope of the GBR do not have to contact SEPA but must abide by any rule laid out in the Regulations which relates to their activity. The full details of GBR's are included in Appendix A.

Registration

Registration is intended to cover individual low risk activities which cumulatively pose a risk to the water environment. SEPA can impose conditions associated with a registration but the policy intention is that these should only describe the activity. A registration authorises an activity and any person can then carry out that activity.

Licensing

If site-specific controls are required and in particular if constraints upon the activity are to be imposed than the activity should be authorised using a licence. A licence requires the identification of a "responsible person" who is responsible for ensuring compliance with the conditions of the licence. A licence is therefore a person-specific authorisation. A responsible person can be an individual or a corporate body. In most cases SEPA would expect a company to be named (e.g. Scottish Water).

In settling licence conditions SEPA shall also consider the impact of the activity upon other controlled activities. SEPA must also assess whether it considers that the named responsible person is capable of securing compliance with the conditions of the licence.

Collectively, the above three forms of regulation are known as authorisations.

5.1.2 Application procedures

SEPA has 30 days for determining an application for Registration and 4 months for a licence. SEPA may request more information and require the applicant to advertise the applications (where SEPA considers that the activity may have a significant adverse impact). The clock stops for information requests or advertising.

5.1.3 Determining an authorisation

In determining an authorisation SEPA must undertake the following:

- Assess the risk to the water environment;
- Assess the steps necessary to secure efficient and sustainable water use;
- Apply the requirements of the Water Framework Directive (and as a consequence other EU water legislation);
- Have regard to listed domestic legislation.

This process by which this is implemented is:

1. Has **Best Practice** been employed?

2. Does the proposed activity risk WFD objectives?

3. Does activity meet flood management objectives?

4. If application fails basic criteria – Is it eligible for exemption based on over-riding socio-economic considerations?

(Source: WFD 49(Rivers): A new impact assessment tool to support river engineering regulatory decisions (draft))

Morphological Assessment in Determining an Authorisation

This assessment of risk to WFD objectives is undertaken using the Morphological Impact Assessment System (MImAS). This is a capacity based, regulatory tool which is driven by Environmental Standards. If the tool highlights a breach in the Environmental Standards there is a risk to waterbody status in terms of morphology. Therefore if a proposed activity fails a MImAS assessment, further investigation is required. Full technical details of MImAS are included in the Freshwater Morphology POMS Study Literature Reviews 1 and 2[5]. The Environment Standards used in MImAS are outlined in Table 2.

Table 2: Environmental Standards (UK TAG)

Zone	% of the capacity used	
	High Status	Good Status
Channel	5	15
Bank and Riparian	5	15

If MImAS calculates that more than 15% of a river's capacity to accept morphological change is used up by a proposed activity, this identifies a risk to G.E.S. When this happens, the applicant is required to provide further information, so that a more detailed assessment can be undertaken.

Whilst SEPA has adopted MImAS for assessing applications, Environment Agency in England and Wales has not. However UK Technical Advisory Group (UK TAG)

[5] Link to POMS Tracker, Lit Reviews

recognises that a general approach for regulation will need to be adopted by both agencies that include the following criteria:

1. All proposals are expected to follow good practice guidelines
2. All proposals are expected to meet flood management requirements
3. Proposals affecting migratory movements of fish will be subject to a more detailed assessment
4. More detailed assessments will be required in special cases e.g. proposals causing loss of floodplain connectivity, or areas environmentally designated

If the implemented decision support tool (e.g. MImAS) identifies a high risk proposal, a more detailed assessment will be required, usually by the applicant.

5.2 Northern Ireland – The Water Abstraction & Impoundment (Licensing) Regulations (NI) 2006

In Northern Ireland, the Water Abstraction & Impoundment (Licensing) Regulations (NI) 2006 came into operation on 1st February 2007. They provide a single and consistent environmental risk based approach that covers all abstraction and impoundment operations, including all associated structures. The Regulations are enforced by Northern Ireland Environment Agency (NIEA; formerly Environment and Heritage Service).

Abstraction licences are required by anyone who abstracts from surface waters, coastal waters within 3 nautical miles of land, transitional water or water in underground strata. A licence is not required where a person holds a licence under Article 10(1) (a) of the Electricity (NI) Order 1992 (b) or where water is abstracted, diverted and used for hydroelectric generating stations.

The regulations do not apply where water is used for extinguishing fires, protecting life and property in the event of fire, or when used in testing or training apparatus used for either of these purposes. Abstraction by machinery or apparatus installed on a vessel, where the water is abstracted for use on that vessel, or any other vessel, is exempt from requiring a licence.

5.2.1 Levels of Authorisation

There are two levels of authorisation:

- Licenses apply to activities, which are likely to pose a greater risk;
- Permitted Controlled Activities (PCA) is for small-scale activities, which present minimal risk.

PCAs have a number of conditions, which include a means of demonstrating the volume of water abstracted, keeping water leakage to a minimum, no contamination of pollution of the water, and other uses such as hydraulic tests on aquifers.

The scale of the abstraction and the environmental impact of the activity determine the type of authorization granted. Abstractions of less than $10m^3$ per day are granted subject to activities complying with PCA conditions and no contact with the Department

is required. Where the abstraction is between $10m^3$ and $20m^3$ per day authorization is granted subject to the notification of the Department and compliance with PCA conditions. Simple licences are granted subject to the submission of an application when the abstraction is between $20m^3$ and $100m^3$ per day. Complex licences are issued to abstractions greater than $100m^3$ subject to the submission of an application. Conditions may apply to the both the simple and complex licences.

A licence issued may be reviewed, modified or revoked at the request of the licence holder or if the department considers it is necessary to prevent significant or serious damage to the natural environment. There are rights of appeal against any decision made by the Department.

5.3 Recommendations for Application in Ireland

Key Recommendation:
It is recommended that the C.A.R model for regulating engineering activities is applied in Ireland and that the aforementioned criteria for regulation are followed. However, activities related to abstractions should be regulated under the proposed Abstraction Regulations for which recommendations will emerge through the Eastern River Basin District Abstraction POMS Study.

5.3.1 Levels of Authorisation

The levels of authorisation for different engineering activities stipulated under SEPA's C.A.R regulations are outlined in Appendix A. Activities requiring registration or licence application largely depend on the size of river being worked on, or the extent of modification being proposed. A similar model should be adopted in Ireland, although this will be subject to consultation with all relevant stakeholders.

General Binding Rules / Codes of Practice
A Best Practice Measures Toolkit has been developed through the Freshwater Morphology POMS Study.[6] (Further details on the Best Practice Measures Toolkit are provided in Chapter 6.0). This identifies the available measures that can be implemented to address a range of morphological pressures and sub pressures. In the context of regulation, it can be utilised as a code of practice equivalent to General Binding Rules, particularly in relation smaller activities of low frequency.

Registrations and Notification
This should cover low risk or repetitive activities.

Whilst watercourse maintenance has been demonstrated to have morphological impact if not undertaken in a sensitive manner, it is nonetheless a necessary activity in flood risk management. OPW will be placed under statutory obligation to follow the Codes of Practice and provide notification of their Watercourse Maintenance Programme to the regulator. The toolkit incorporates best practice measures, already being implemented

[6] Best Practice Measures Toolkit – Link to POMS Tracker

by OPW when working near rivers, new regulatory controls should place a statutory obligation on the implementation of these (refer to Section 6.1).

In Northern Ireland, the equivalent flood management body, DARD Rivers Agency provide notification to stakeholders and have developed Service Level Agreements with NIEA in relation to watercourse maintenance. These are agreed with NIEA when works are proposed in environmentally sensitive areas. The agreement stipulates the limit of works that Rivers Agency can carry out without needing NIEA approval.

This approach should be adopted in Ireland between OPW and the regulator for waterbodies deemed at risk in terms of morphological status. Service Level Agreements should be drawn up that allows OPW to undertake their rolling maintenance programme whilst stipulating the statutory binding rules that ensure best practices are undertaken.

Licensing
Licensing should cover higher risk activities based on morphological assessment of the impact of the proposed engineering activity. It is recommended that the thresholds applied in the C.A.R regulations are applied (refer to Appendix A), however this would be subject to stakeholder consultation.

5.3.2 Morphological Assessment

The Freshwater Morphology POMS Study has undertaken various assessments of the applicability of MImAS in Ireland, both as a field based survey method, a classification tool, and a regulatory tool.

A second tool, the Rapid Assessment Technique (R.AT) was also assessed through the POMS Study in terms of its usability for classification and/or regulation purposes.

The analyses made and the associated recommendations are outlined in Table 3:

Table 3: Analysis of Morphological Assessment Techniques through Freshwater Morphology POMS Study

Analysis	Conclusions / Recommendations
Trials of MImAS and Rapid Assessment Technique to identity an appropriate morphology classification tool	R.A.T to be used for classification. EPA / NIEA to modify R.A.T as deemed appropriate to ensure consistency, repeatability and to facilitate recording of pressure-based information
Comparison of MImAS field data with pressure data to assess the applicability of thresholds for regulation purposes – in relation to Channelisation Pressures only Pilot Study of approx 60 sites	Recommended that the capacity thresholds used as trigger levels in the MImAS regulatory approach is used for regulation in Ireland. This is in keeping with the UK Environmental Standards published by the UK Technical Advisory Group in 2007 and ensures a consistent approach with Ireland's Eco Region Neighbours. The 50% channelisation threshold, as for risk

	assessment, is also recommended in the context of regulation.
Feasibility of MImAS in context of Remote Sensing	Elements of MImAS can be calculated solely using aerial imagery, GIS layers and identification of pressures; however a field survey is often necessary since many features are not readily identifiable. R.A.T scores can also be generated remotely to facilitate a rapid identification of status which can be used to inform a more detailed field survey or within a regulatory process.

Whilst R.A.T has been adopted for classification purposes, and is now in use by both NIEA and EPA, a tool for regulation has not yet been adopted. The recommendations from the POMS Study are that the thresholds used by MImAS (Table 2) are suitable for application in Ireland. MImAS consists of a field survey and an Excel based tool, which calculates a capacity based score using quantitative information from the field survey.

The MImAS field survey may not be required to make assessments on authorisation of a proposed engineering activity in Ireland. This is due to more recent developments in R.A.T that have been undertaken by NIEA and EPA independently of, but in consultation with the POMS Study staff and the Tool Developer (Dr Keith Richards, Cambridge University, NS SHARE project). Whilst primarily a classification tool the R.A.T survey now includes a sheet that quantitatively records 'Anthropogenic Impacts' or pressures. It is considered by EPA and NIEA, that this may be sufficient to complete a MImAS based calculation of capacity to enable decisions on new applications to be made.

However, since R.A.T is the adopted methodology for determining morphological status in Ireland, it is likely that the use of this, in conjunction with GIS based risk assessment as the method for quantifying the additional pressure from a proposed activity (requiring a license), would present a neater solution for regulation in Ireland. A suggested process is illustrated by Figure 2:

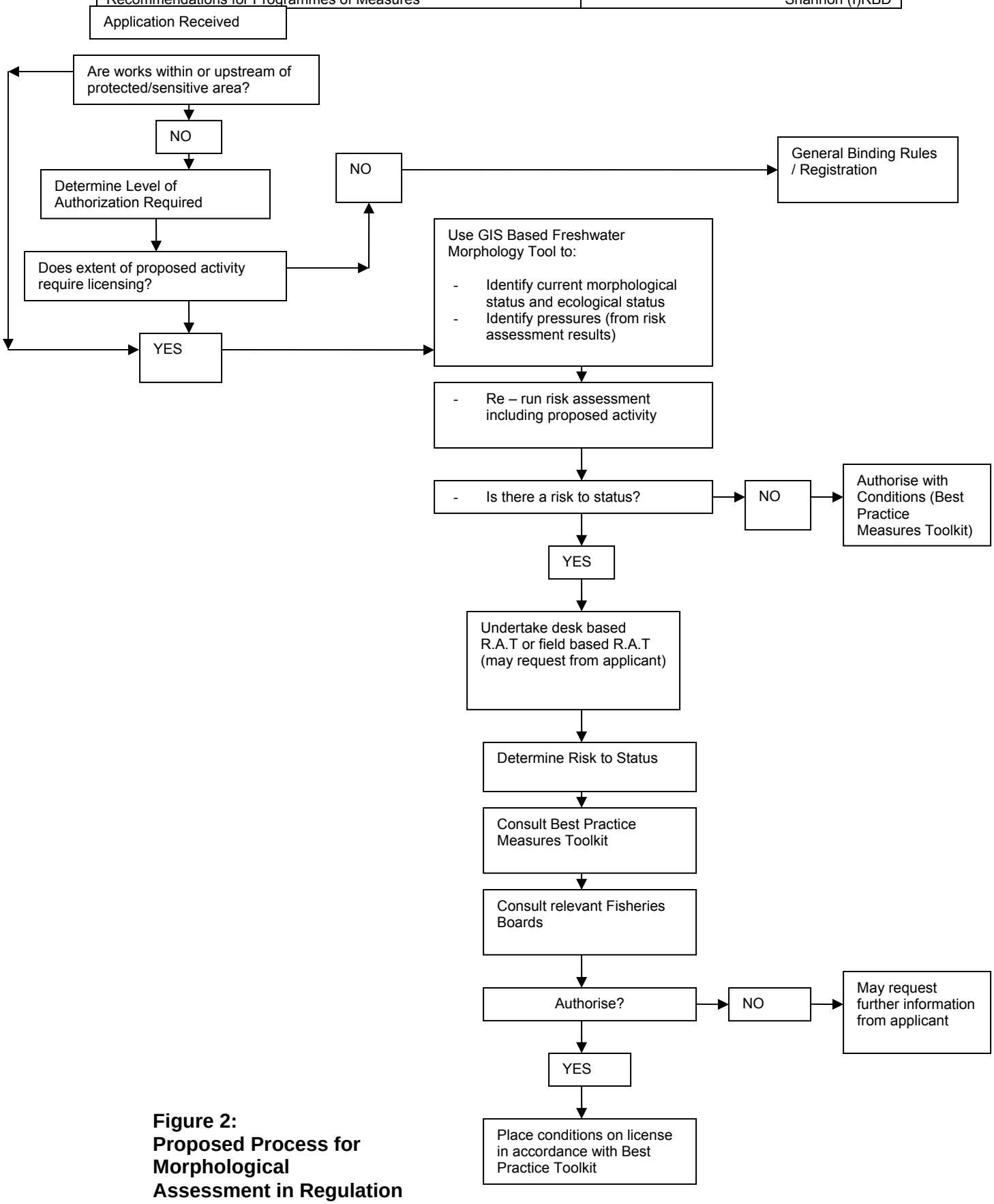

Figure 2:
Proposed Process for Morphological Assessment in Regulation

This approach would not require the use of the MImAS tool (field survey or tool for calculating capacity). The risk assessment thresholds for each morphological pressure and the scoring system for R.A.T would be used in parallel, to determine risk in the first instance, as a screening method, then to investigate further in terms of morphological status.

The development of a comprehensive morphological alterations database is paramount to the effectiveness of this approach to regulation and is being developed through the Freshwater Morphology POMS Study[7].

5.3.3 Responsible Authority for Regulation

The enabling legislation of the Fisheries Boards, the OPW and the EPA has been examined to determine the scope provided within this existing legislation for taking on the new functions. [8]

Fisheries Boards

Fisheries (Consolidation) Act, 1959
Fisheries (Amendment) Act, 1999 (S.I. No. 35 of 1999)

Fisheries legislation relates to the efficient and effective management, conservation, protection, development and improvement of fisheries, hatcheries and fish farms. The bodies responsible for their implementation are the Fisheries Boards. They must ensure the suitability of fish habitats, including taking consideration of the conservation of biodiversity in water ecosystems. The legislation does not allow barriers to migration or the obstruction of the passage of fair or the impairment of the usefulness of the bed and soil of any waters as spawning grounds or their capacity to produce the food of fish.

Section 4 of the Fisheries (Consolidation) Act gives to the Minister for Agriculture, Fisheries and Food, powers to make **regulations** in relation to any matter referred to in the Act.

Section 9 of the Act gives to the Minister, powers to make **bye-laws** in relation to any matter referred to in the Act as well as any such bye-laws as are, in the opinion of the Minister, expedient to the more effectual government, management, protection and improvement of the fisheries of the State.

Part VIII, Chapters IV and V of the Act relate to weirs, dams and natural obstructions. These chapters provide, by means of notice from the Minister, for the alteration and removal of abandoned and disused weirs and dams and the alteration and removal of natural obstructions to allow free migration of fish.

Part XII, Chapter IV of the Act allows the Minister to acquire compulsorily or by agreement, any land or premises for the purpose of the Act.

[7] Ref Compass Report when complete
[8] Ref Policy and Leg Review, POMS Tracker

This legislation does not readily lend itself to enabling the Fisheries Boards to operate the required new freshwater morphology licensing and registration system. New legislation, or amendments to the existing legislation, would have to be undertaken. However, the powers provided in relation to the alteration and removal of artificial and natural barriers could facilitate some of the measures which will be included in the RBMPs.

OPW

Arterial Drainage Act, 1945 (S.I. No. 3 of 1995)
Arterial Drainage (Amendment) Act, 1995 (S.I. No. 14 of 1995)

Arterial drainage legislation relates to the management, operation, modification, relocation and maintenance of new and existing drainage works, existing embankments, weirs, bridges and land acquisition and compensation.

Section 2 of the Arterial Drainage (Amendment) Act gives to the Minister power to make **regulations** in relation to any matter referred to in the Acts.

Section 53 of the Arterial Drainage Act provides powers to make such **bye-laws** as necessary in relation to any matter referred to in the Act.

Section 10 of the Arterial Drainage Act requires compliance with the Fisheries Acts.

Section 14 of the Arterial Drainage Act allows the Minister to **acquire** compulsorily or by agreement, any land or premises for the purpose of the Act.

Section 47 of the Arterial Drainage Act states that the erection or alteration of weirs, where flooding might ensue, is subject to orders from the Minister in some instances.

This legislation does not readily lend itself to enabling the OPW to operate the required new freshwater morphology licensing and registration system. New legislation, or amendments to the existing legislation, would have to be undertaken.

Amendment to the Arterial Drainage Acts may be required to allow for a potential rationalisation of current activity and alignment with the Floods Directive which will be transposed into Irish law in November 2009.

EPA

EPA Act, 1992 (S.I. No. 7 of 1992)

EPA legislation provides broad-ranging powers and responsibilities to the EPA in relation to environmental protection and pollution control. These include licensing, regulation and control of activities, monitoring, support and advisory services and promotion and coordination of environmental research.

Section 6 of the EPA Act provides to the Minister for the Environment, Heritage and Local Government, powers to make **regulations** prescribing any matter referred to in the Act.

Section 53 of the Act provides to the Minister, powers to make **regulations** which assign to the Agency **additional functions**, or modify existing functions, in relation to environmental protection. These Regulations may relate to functions considered appropriate by the Minister or functions necessary for the implementation of any EU or international legislation, convention or agreement to which the State is, or becomes, a party. Section 53 is quoted below.

53.—*(1) Assignment of Additional Functions*
The Minister may, following consultation with the Agency and any other Minister of the Government who in the opinion of the Minister is concerned, by regulations assign to the Agency such additional functions and, consequentially, modify any existing function in relation to environmental protection as from time to time he considers appropriate.

(2) Without prejudice to the generality of subsection (1), regulations under this section may assign to the Agency any function which relates to environmental protection and which arises from, or is necessary for, the implementation of any provision of the treaties governing the European Communities or any act adopted by the institutions of those Communities or other international convention or agreement to which the State is, or becomes, a party.

(3) Any regulations made pursuant to this section may provide for the assignment to the Agency of such ancillary, incidental and supplementary functions as, in the opinion of the Minister, are necessary for, or in connection with, the implementation of any provision of the treaties governing the European Communities or any act adopted by the institutions of those Communities or other international convention or agreement to which the State is, or becomes, a party.

(4) (a) A charge may be made by the Agency, subject to regulations under this section, in connection with, incidental to, or for the purposes of, the effective performance of any function assigned to it under this section.

(b) The Agency may recover, as a simple contract debt in any court of competent jurisdiction, from any such person any amount due and owing to it under paragraph (a).

Section 54 of the Act provides to the Minister, powers to make **regulations** in relation to the **transfer** of environmental protection functions from other bodies to the Agency.

Section 76 of the Act provides for the preparation of **codes of practice** by the Agency in relation to any matter referred to in the Act.

Section 79 of the Act provides to the Minister, powers to give **general directives** in writing to the Agency in relation to policy on environmental protection.

Section 53 of the Act provides for the assignment of additional environmental protection functions to the Agency. This could facilitate the development of new Regulations and the assignment of responsibility to the EPA in relation to the control of physical modifications. In addition, section 54 of the Act could transfer related and appropriate functions that are currently carried out by other bodies to the Agency, for example, Fisheries Boards powers in relation to the alteration and removal of artificial and natural barriers.

These provisions together could facilitate establishment of the comprehensive system necessary for the required new freshwater morphology licensing and registration system to ensure the effective protection of the physical conditions of surface waters. Codes of practice, developed under section 76 of the Act, should be informed by the best practice toolkit developed through the Freshwater Morphology POMS Study.

Key Recommendation:
Section 53 and 54 of the EPA Act, 1992 could facilitate establishment of new regulations to control morphology, thereby it is recommended that EPA are the appropriate regulatory authority.

Splitting responsibility between Local Authorities for low risk activities and EPA for higher risk activities is also an option. Morphology is a relatively new area, and expertise may be restricted amongst Local Authorities.

A full Regulatory Impact Assessment will investigate the options in more detail. It is recommended that the conclusions of the Regulatory Impact Assessment are used to inform the final decision on who should be responsible for regulation.

6.0 Other Measures

Basic measures (existing legislation and new regulatory controls) essentially look after all surface waterbodies, but in cases where improvement is needed to restore G.E.S to a waterbody, further supplementary or additional measures could be required.

In the context of freshwater morphology, these measures will be considered where the cause of impact on overall status is due to physical modification. Prioritisation of measures will be undertaken as follows:

1. Identify the waterbodies at risk and with impacted status due to morphology
2. Consult Best Practice Measures Toolkit to identify the available measures that can address the morphological pressure on the waterbody
3. Determine technical feasibility and most cost effective combination of measures
4. If feasible, implement measures
5. If not feasible, set alternative objectives (This is not an option within Protected Areas)

The Toolkit outlines all of the available measures and provides background on previous applications, and technical feasibility in different applications.

Consultations were held with Central Fisheries Board (CFB), and OPW to obtain information on the cost effectiveness and practical application of river enhancement schemes. This has been documented in the Freshwater Morphology POMS Study, Cost

Effectiveness and Feasibility of River Enhancement Schemes report [9] and informs the development of Programmes of Measures.

The Freshwater Morphology POMS Study also commissioned research work on the recovery of Irish rivers following channelisation, and the effectiveness of river enhancement, which has informed Programmes of Measures. [10]

6.1 Best Practice Measures Toolkit

The range of improvement / mitigation measures available to address the various morphological pressures have been reviewed and compiled into a Toolkit, which should be consulted when developing Programmes of Measures. Table 4 overleaf outlines the morphological pressures, the associated sub-pressures and the available measures that may be employed to address them. There are 23 measures in total.

The 23 measures range in scope from large scale, such as re-meandering of straightened rivers, to more operational measures such as adopting OPW's Environmental Drainage Maintenance Guidelines, to linking with more high level measures such as Rural Environmental Protection Schemes (REPS).

[9] Link to POMS Tracker
[10] Link to CFB report and Channelisation Recovery Assessment Report

Table 4: Best Practice Measures Toolkit

Pressure	Sub-pressure	Impact	No.	Measures	
Channelisation & Flood embankments	Channel alteration - straightening, deepening, widening of channel	Loss of morphological and ecological diversity	1	Re-meandering of straightened channels	
			2	Narrowing of channels	Assisted natural recovery
			3	Re-construction of pools	
			4	Substrate enhancement	
		Loss or impairment of riparian zone	5	Fencing programmes to exclude livestock	
	Flood walls and embankments	Reduced floodplain area/ loss of riparian zone and marginal habitats/ reduced connectivity with floodplain/ entrapment of sediments	6	Removal or re-location of flood banks	
	Drainage maintenance works (dredging and control of vegetation)	Loss of morphological and ecological diversity Disturbance of riverbed and banks/ mobilisation of sediments/ loss of instream and riparian vegetation	7	Application of OPW Environmental Drainage Maintenance guidelines (Refer to Best Practice Toolkit Report)	
			8	Incorporation of river restoration & fisheries enhancement projects (see Measures 2-4)	
			9	Measures to facilitate natural recovery	
	Hard protection - sheet piling, vertical walls	Loss of riparian zone and marginal habitats / loss of lateral connectivity / loss of sediment input	10	Removal of hard bank reinforcement / revetment, or replacement with soft engineering solution	
	Culverts	Loss of morphological diversity and habitat	11	Re-opening of existing culverts	

Table 4: Best Practice Measures Toolkit (Cont'd)

Pressure	Sub-pressure	Impact	No.	Measures
Impoundments & Regulation	Dams & weirs	Loss of morphological and ecological diversity in impounded reach / Reduction in productivity / Accumulation of sediment upstream / Loss of sediment input downstream	12	Removal of structure and de-silting of impounded reach
		Inadequate residual flow downstream	13	Adoption of operational protocols
Intensive land use	Over-grazing & bank trampling	Bank erosion/ over-widening of channel/ sediment deposition in watercourses Loss of riparian zone	14	Stabilisation of river banks
			15	Application of REPS special measures (Refer to Best Practice Toolkit Report)
			16	Fencing programmes to exclude livestock
	Forestry operations	Increased run-off rate through drainage systems / silt deposition in watercourses / shading effects	17	Application of best practice guidelines (Refer to Best Practice Toolkit Report)
	Peat extraction	Peat silt run-off and deposition in watercourses	18	Operation and maintenance of silt traps
			19	De-silting of affected reaches
	Hard surface run-off - urban drainage, roads etc	Run-off of silt and deposition in watercourses Increased peak flows Bank erosion	20	Incorporation of SuDS processes

Barriers to migration	Dams, weirs, bridge aprons, & culverts	Lack of continuity Obstruction to migration of fish and invertebrates	21	Removal of structures
			22	Structural modification - construction of fish passes etc
			23	Adoption of operational protocols

A full review of these measures is available in the Best Practice Review Report under the following headings:

- Outline of Measure – a brief outline of what the measure entails
- Benefits – benefits outlined which will improve morphological condition and as a consequence, ecological status
- Application – situations where measure may be applied
- Feasibility – A general description of the practical feasibility of the measure, and where it may not be feasible
- Effectiveness – description of where measure has proven effective past applications (where this information is available)
- Specification / Description – reference to further literature / documentation relating to the measure

6.2 Enhancement Schemes

River enhancement schemes have been identified as key measures in addressing channelisation and overgrazing pressures. Over recent years, Central Fisheries Board (CFB) have implemented enhancement schemes in drained rivers throughout Ireland, mainly to create habitat and spawning areas for salmonids. Analysis of data from these schemes has improved the understanding of how a river's physical condition can be improved following drainage, and have proven successful in many cases.

As a result, information relating to cost and associated environmental benefit, practical application and feasibility on the ground of these schemes can now be used in identifying where morphological enhancement measures can be effectively applied in the River Basin Management Programmes of Measures. This knowledge base has been drawn upon to highlight key points in practical feasibility and cost effectiveness of river enhancement. The key points are as follows:

- The stream gradient for enhancement must be >0.2% (2m/km) for enhancement work to be effective;
- A river steeper than 3% will not exhibit productive results in terms of fish if enhanced. It is too steep to retain gravels placed on the bed, and the energy levels are too high;
- Rivers with Biological Q value less than Q3 are unsuitable (moderately polluted or worse)
- In OPW drained rivers, a minimum flow conveyance of 1 in 3 year flood must be maintained, therefore all enhancement features must be at a low level within the river so as not to reduce channel capacity at high flows
- Enhancement programmes are not as effective in channels with catchment areas ≤ 4.5 km^2 due to low flows in summertime (O'Grady, 2007, WP2 Freshwater Morphology POMS Study)
- A pre-enhancement baseline survey is recommended as part of an enhancement scheme to verify improvement post works and to establish if the scheme is going to be cost-effective before investing in it.
- Schemes should be designed from first principles i.e. use timber and stone structures to restore the natural morphology of the channel at a lower bed level if necessary, as opposed to introducing non-natural engineering structures.

Following identification of waterbodies where morphology measures are required their technical feasibility must be reviewed. This means the measures must ensure that waters achieve their objectives. It may not be technically feasible to solve every problem straight away, or occasionally, even within the next 20 years if:

- No technical solution is available
- It takes longer to fix the problem than there is time available
- Practical constraints prevent implementation of the solution until a certain date
- The cause of an impact is unknown; hence the solution cannot be identified.

Measures also have to be economically tested to find out which alternative is most cost effective and to ensure that they are not disproportionately expensive. That is there is high confidence that the margin by which the costs exceed the benefits should be appreciable.

For example, enhancement of wider rivers may be more cost-effective per length; however the ecological benefit in terms of fisheries and other biological indicators, as well as other pressures acting on the river such as pollution may undermine this, such considerations must play a significant role in the prioritisation process.

The average cost per kilometre of a typical enhancement scheme, based on practical experience of OPW and CFB is of the order of €34,375.00. This includes a 25% addition for life cycle costing.

Barriers to migration (in stream structures) have also been identified as a significant morphological pressure impacting on waterbody status. A protocol for risk assessment of barriers is under development; however expert knowledge in combination with waterbody status can be used to identify key barriers for removal in the 1st RBMP.

6.3 Voluntary and Education Initiatives

The Common Implementation Strategy (CIS) Working Group on WFD and Hydromorphology was set up by the European Commission in recognition of the need to develop and exchange knowledge on the subject between Member States. The Working Group is led by UK and Germany. A conference was held on 26th and 27th February, 2008 in Manchester entitled “Water Framework Directive and Flood Risk Management”. The overall aim of the workshop was to discuss ideas on how River Basin Management Plans should link to Flood Risk Management Activities.

The key message from the European Commission delivered at the Workshop was that there is a duty within the RBMP’s to promote sustainable flood management by planning and delivering measures to reduce flood risk. Measures delivering win-win solutions in terms of flood risk and status improvement should be included in RBMP’s,

Voluntary schemes that achieve natural flood management such as reinstatement of natural wetlands are also effective in protecting / improving waterbody status. Such schemes have been piloted in other Member States e.g. Inland Marsh restoration on the River Spey in Scotland where flood attenuation and improvement to water quality has been achieved. Scotland now intends to include similar pilot schemes within their RBMP’s including upland restoration and grip blocking; ditch management and floodplain wetlands; river restoration to natural dynamics and sustainable urban drainage.

Support should be provided to such schemes in Ireland where “win-win” solutions can be achieved. These should be considered on a catchment basis to ensure pilot schemes are located correctly within a catchment to deliver the most effective and lasting improvements. For example:

- Land management including upland forest management can help reduce sediment run-off and flood flows to downstream areas.
- Where floodplains and wetlands are connected to rivers in mid altitude areas of a catchment, the flood storage they can provide can reduce risk of downstream flooding whilst improving water quality by slowing down sediment transport.

The technical aims in planning and delivering measures that address both flood risk and status improvement have been listed by SEPA as follows:

Aim 1- restore longitudinal connectivity
Aim 2- mitigate catchment pressures
Aim 3- restore/manage riparian zone
Aim 4- reconnect floodplain
Aim 5- restore/enhance reaches and habitats

Education can indirectly improve waterbody status since informing the public of the pressures placed on surface waters and how they can be mitigated against, promotes more sustainable practices and attitudes. Support should be provided to education initiatives that are aimed at providing information and improving knowledge on how physical alterations impact on freshwaters.

7.0 Programmes of Measures for Morphology

The information collated and provided through the Freshwater Morphology POMS Study and summarised in this report, has been used to make recommendations on the Programme of Measures for inclusion in the first River Basin Management Plans in Ireland.

The recommendations are as follows:

1. DEHLG to establish and implement new regulations to control physical modifications including codes of practice, and varying levels of authorisation – registration / notification and licensing.

2. Based on Section 53 and 54 of the EPA Act, 1992 it is recommended that EPA become the regulating body, particularly in relation to higher risk activities since morphological assessment is relatively new and the relevant expertise may be restricted. Splitting responsibility by assigning regulation of lower risk activities to Local Authorities is also an option.

3. Morphological assessment of applications within the regulation process should make use of risk assessment information from 2008 and allow re-run of the risk assessments based on the proposed activity for a particular waterbody. This will enable assessment of the change in risk to status by increasing a particular pressure. R.A.T surveys and remote sensing techniques should also be used where the data is available. These assessments should be undertaken using a decision support tool driven by a morphological database.

4. Existing regulations / and acts should be fully enforced for all surface waters including Planning and Development Environmental Impact, Arterial Drainage, Fisheries, Agriculture and IPPC.

5. Guidelines and codes of practice as outlined in the Best Practice Toolkit should be fully implemented including guidance for local authority works, practice – guidelines for local authority works, guidelines for the crossing of watercourses for national road schemes, construction and operation of hydro-electric schemes and fisheries, REPS, SuDS, enhancing salmonid rivers, fishery rehabilitation and habitat enhancement following arterial drainage and managing salmon and trout.

6. Where morphological improvements are required to achieve overall Good Ecological Status. river enhancement schemes should be considered. If judged to be the most cost effective option they should be applied where technically feasible and not disproportionately expensive. Such measures might be used to address poor status waters resulting from channelisation and over grazing pressures.

7. Identify and remove impassible barriers. Improve risk assessment methodologies for barriers to migration.

8. Provide support to voluntary schemes and initiatives including environmental awareness and wetland projects as recommended at the European Commission in relation to WFD and Flood Risk Management.

If feasibility tests on improvement measures for waterbodies indicates that the G.ES cannot be achieved either due to technical constraints or cost; then alternative objectives need to be identified (Less Stringent Objectives, Extended Deadlines, Heavily Modified designation, New Physical Modifications or Sustainable Developments). Alternative objectives do not apply to Protected Areas.

8.0 References

All Freshwater Morphology POMS Study Reports

SEPA (2005) The Water Environment (Controlled Activities) (Scotland) Regulations 2005– A Practical Guide

SNIFFER (2005) WFD 49(Rivers) - A new impact assessment tool to support river engineering regulatory decisions (draft)