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OPW

Oifig na nOibreacha Poiblí

The Office of Public Works

Environmental Guidance: Drainage Maintenance & Construction

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Contents

Introduction

OPW Drainage Maintenance and Construction's primary function is drainage and flood relief, but the conveyance of water is not the only focus. The OPW is an important participant in maintaining healthy catchments and by taking an environmentally led approach, can yield successful outcomes for many stakeholders. Environmental compliance is an important component in the delivery of successful drainage and flood relief projects. Drainage Maintenance work processes have evolved environmental measures that promote awareness and are designed to reduce impact on nature. OPW construction works comply with all relevant legislation and measures to avoid or reduce impacts are carried out when required. This guidance through the Procedures contained, are instructions that help OPW staff to achieve a balanced approach to drainage and construction works and through training, knowledge and skills have the competence to carry out their duties in support of good environmental management.

Impacts due to reduced drainage and flooding affect both individuals and communities, and have social, economic and environmental consequences. The social and economic implications of drainage and flood relief are wide-ranging and important to the population. The delivery of flood relief functions by OPW protects people from flooding in many towns, villages and cities and through OPW Catchment Management Plans, many additional communities will benefit in the future. Through OPW Drainage Maintenance Schemes lands are more arable providing livelihoods and national food resources. Impacts from reduced drainage and increased flooding include loss of human life, damage to property, destruction of crops, loss of livestock, and deterioration of health conditions. This Guidance aims to deliver good drainage and flood relief functions while reducing the associated environmental impacts.

Pic. I House Flooded

Pic. II Excavator working on channel

Purpose of this Guidance

Drainage Maintenance and Flood Relief (referred to as Construction throughout this Guidance) can have an impact on natural watercourses, affecting habitats and species. This guidance is a practical handbook that brings lessons learned from environmental problem solving from throughout the organisation. The intention is that it will be updated to bring new and improved work practices when encountered. The procedures and measures set out require communication to all members of staff, enabling ongoing improvements in environmental performance, based on practical environmental control. This guidance is the target standard of all drainage maintenance and construction.

The aim of this Environmental Guidance is to help OPW Drainage Maintenance staff to carry out their activities in an environmentally sensitive and sustainable manner, and where relevant implement this guidance for construction works. The Environmental Procedures (EPs) contained, are the backbone of how the risk of environmental impact is reduced. This guidance sets out Procedures designed to limit potential impacts and to improve habitats for many species, and assist all levels of staff to full-fill their environmental duties in an effective manner. Working in marine or river environments requires careful consideration of potential ecological impacts that can occur. The purpose of this guidance is to manage and substantially reduce potential impacts to the animals and plants that depend on the river corridors, estuaries, lakes, and catchments where drainage maintenance and construction works are carried out.

This guidance and the procedures contained are designed as best practice and should only be implemented where the correct environmental and ecological assessments have been carried out. The OPW progresses it's works with a framework of five year Appropriate Assessments, site specific AAs, EcIAs and CEMPs for large construction projects. These assessments should always be in place where they are required, to ensure that no works result in adverse effects on European Sites or protected habitats and species.

Through this Environmental Guidance, the OPW can achieve several objectives, not only Water Framework and Habitat Directives and other EU directives, but also biodiversity goals, fisheries improvement, ecological enhancement and flood management. Through this Guidance partnerships and collaborations can be fostered and continued.

The procedures have been written with ISO14001 in mind and follow a template that will allow them in be implemented as part of an integrated management system in the future.

What is a Procedure

A Procedure is a method for accomplishing a goal in a consistent and correct manner. The goal is to carry out the drainage and construction functions of the organisation without causing unnecessary damage to the environment. An effective Procedure should communicate what, why, who and how to carry out a specific task.

- **Scope** *What the procedure applies to.*
- **Purpose** *Why the procedure is required.*
- **Responsibility** *Who the procedure applies to.*
- **Relevant information** *Further information.*
- **Procedure** *Step by step instructions on how to carry out the procedure.*

These procedures circulate lessons learned from throughout the organization, making good use of staff strengths, leading to highly trained staff, who think for themselves and learn from each other. Creating a framework that retains and shares knowledge.

How to Use this Guidance

Each Procedure deals with an individual task, consult this procedure when it becomes relevant to your works. The step-by-step procedures contained are practical guidelines that inform on how best to proceed with the work while minimising impact to the environment. The procedures contained within this guidance are divided in sections that are relevant for drainage maintenance management and operational staff and also for construction staff.

Section 1A Drainage Maintenance Planning Procedures: relates to methods used to manage the delivery of the works, this influences how works proceed but does not directly describe how to carry out works. The section describes systems like the Annual Programme that sets out the type and amount of work. This section is primarily for managers but should be referred to by all members of staff.

Section 1B, Drainage Maintenance Implementation Procedures: relates directly to the practical delivery of works and should be referred to by management and operational staff. Some procedures in this section are generally taken from the older “Red Book” with some additional new procedures. The earlier “Red Book” programmes such as Environmental Drainage Maintenance (EDM) and Environmental River Enhancement Programme (EREP) are retained, nevertheless with some changes to EREP and new environmental procedures on how to use mapping information and how to manage trees, silt, bank protection, barriers and embankments are included. This is relevant to all drainage maintenance staff and is useful in understanding how to deliver environmentally sensitive systems of work that will underpin how works are assessed around protected SACs and SPAs.

Section 2 Construction Procedures: relates to the practical delivery of construction works both at a planning and implementation level. These are less relevant to maintenance but should be referred to when applicable. Procedures relating to silt, culvert construction and water pollution can be used as environmental mitigation to allow the delivery of construction works. The environmental management procedure describes the planning processes for the delivery of construction works and the on-site environmental roles and responsibilities.

Section 3 Invasive Species Procedures: relates to methodologies for dealing with invasive species on site. This is a significant risk to all drainage maintenance and construction related works, but given the spatially dispersed nature of drainage maintenance, this requires careful implementation of the procedures outlined. The section discusses both Standard Biosecurity relating to invasive plants and High Biosecurity relating to water borne larvae and pathogens with a particular focus on crayfish plague. This section is relevant to all staff.

Section 4 Animal and Plant Procedures: relates to wildlife typically encountered in drainage and construction related works. Some wildlife are legally protected and require methods to prevent impact. These procedures generally contain many of the same elements that are comprised within the older "Red Book" with some additions relating to badgers, bats and rare plants.

Section 5 Habitat Procedures: relates to important habitats, typically encountered in drainage and construction works and the procedures within are designed to try to reduce some of these impacts. This section is relevant to all staff.

Training on the requirements of this guidance is an important element going forward, to assist implementation and enabling staff achieve a high level of environmental competence.

Pic. III Fisheries enhancement on channel

Section 1A – Drainage Maintenance Procedures

Relevant to Management Staff

EP1 Annual Programme

Scope

This procedure relates to all drainage maintenance programmed regional works.

Purpose

To ensure that maintenance of channels, embankments and structures are programmed within the correct environmental windows and protected areas identified while ensuring required stakeholder consultation.

Responsibilities

The responsibility lies with the Regional Management Staff and Environment Section.

Related Documentation

5 year Appropriate Assessments (AAs), Foreman's Bridge Inspection Report and Environmental Risk Assessment (ERA).

Procedure

1. Complete the Annual Programme by December at the latest every year.
2. Fill in Foreman's Bridge Inspection Reports for all programmed bridges.
3. Ensure there is a relevant 5-year AAs in place for the proposed programme.
4. Determine maintenance requirements for each channel and schedule the channel for summer or winter.

Typically, channels where winter maintenance can occur are minor channels that are not particularly gravelly, where salmonid fish spawning is less likely to occur.

5. Check whether programmed channels excluded from the 5yr NISs, consult with Environment Section, a site specific AA maybe required.
6. Check whether protected areas highlighted with the SAC/SPA code.
7. Comply with EP 2 (ERA).
8. Once the Annual Programme has been completed, Environment Section will send to the Development Applications Unit of NPWS and IFI.
9. Meet regularly with NPWS and IFI to discuss the Annual Programme.

Good annual programming ensures resources are used efficiently while streamlining environmental performance. Overproduction by carrying out maintenance too frequently has an unnecessary impact on the environment.

Summary of Procedure EP1

September can be a productive month to programme works, fish spawning has not yet begun and bird nesting is no longer happening. During this month, you can both cut trees and carryout instream works.

Fig 1.1

Example of Programme Input Form

Tree cutting programmed for winter, outside nesting season.

Main channel works programme for summer, within the non salmonid spawning window.

Protected areas

Scheme **SES Maigue Outfall** *Machine/ Gang* *5/198* *Short Reach*

ID	CHANNEL	Section	From	To	A	B	C	D	E	F	Timing of works	SAC	NHA	SPA	Remarks	Last Mtce
1130	C1		0	19300	✓	✓	✓				S	2165	435	4077	Channel maintenance 0-900 incl Fisheries Enh	15/06/08
1130	C1		0	19300					✓		W	2165	435	4077	Tree cutting 0-900	15/06/08
11315	C1/4/2		0	2000	✓			✓	✓		ANY				Channel maintenance	17/05/14
11317	E1		0	5300				✓		✓	W				Mulching embankment	30/08/14

May require a twin season approach on main channels with tree cutting in winter and bank protection, instream maintenance or enhancement works carried out in summer.

Programme heavy vegetation removal from embankments for the winter due to nesting birds. Lighter embankment maintenance can occur in the summer

Minor channel, less gravelly, with less potential for spawning: is appropriate for winter silt and veg management

Table 1.2

Drainage Maintenance Subcategories	
A	Silt and vegetation management
B	Aquatic vegetation cutting
C	Bank Protection
D	Brush cutting / branch trimming
E	Tree cutting
F	**Other** Mulching embankment Mowing embankment Gate installation Sluice maintenance Bridge maintenance Spraying with herbicide

Table 1.3

Drainage Maintenance Subcategories		
Channel Maintenance	Silt and vegetation management	A
	Aquatic vegetation cutting	B
	Bank Protection	C
	Brush cutting / branch trimming	D
	Tree cutting	E
	Other	F
Embankment Maintenance	Brush cutting / branch trimming	D
	Tree cutting	E
	Spraying with herbicide	F
	Mulching	F
	Mowing	F
	Gate installation	F
Structural Maintenance	Sluice maintenance	F
	Bridge maintenance	F
	Spraying with herbicide	F
	Bank Protection	C
	Brush cutting / branch trimming	D
	Tree cutting	E

Table 1.4

EP 2 Environmental Risk Assessment

Scope

This procedure relates to all drainage maintenance and construction works proposed in the Annual Programme and all un-programmed works.

Purpose

To ensure the identification of sensitive sites that require further assessment in addition to the 5 year AA framework.

Responsibilities

The responsibility lies with the Regional Management Staff and Environment Section.

Related Documentation

5 year Appropriate Assessments, Annual Programme, Environmental Risk Assessment Form.

Procedure

1. Undertake the Environmental Risk Assessment, answer the questions as described on the ERA form.
2. Forward completed ERA with as much information as possible, include maps showing work location and access points, photos of the site and description of works.
3. Environment Section will progress a site specific AA if required. Please refer to the ERA register on Alfresco.

The ERA uses three criteria as a condition to trigger the process, as described in the section “To be completed where the following conditions are met”. Works outside the scope of these criteria should not be considered risk free. The criteria are to identify higher risk works that warrant specific consideration or further assessments, but if you judge that other works merit consideration, fill in the ERA and the risk can be further assessed by Environment Section.

OPW Arterial Drainage

Environmental Risk Assessment

Reset

To be completed where the following conditions are met	
Works within an SAC or SPA	Yes
Works on a major channel (i.e. base width greater than 3m)	Yes
More than 10 years since maintenance on the Channel (>3m) or Embankment.	Yes

General Site Details

Start Date: Est Completion Date:

Site Location: Scheme:

Channel No./Ref.: Bridge No.:

GPS coordinates: Road Number:

Nature of Works: Programmed ☐ Non-Programmed ☐ Emergency ☐

Description

If Yes is answered to any of the following questions, please forward to Environment Section		
Does the work entail heavy tree or vegetation removal on a channel, embankment or machine access corridor?	Yes	No
Does the works entail embankment refurbishment works not classified as general maintenance?	Yes	No
Does the works entail more than 40m of bank protection or other structural work on a channel?	Yes	No
Are the nature of the works or location of the works outside the scope of the associated arterial drainage maintenance five year Appropriate Assessments?	Yes	No
Additional Information		
From the GIS records, is this a Freshwater Pearl Mussel location?	Yes	No
Have particular sensitivities been flagged by other stakeholders such as IFI or NPWS?	Yes	No
Is there a requirement to carry out the works outside the appropriate environmental window?	Yes	No

Signed: Date:

What does a 5yr Appropriate Assessment cover?

The 5 year AA is in place to assess standard maintenance activities for the overall scheme. It is relevant to all types of maintenance (activities A – F) and it considers the in-combination impacts of working within the entire catchment. Where the nature of the works or location of the works is particularly sensitive, a site-specific assessment is typically required.

EP 3 Site Specific Appropriate Assessment

Scope

This procedure relates to works that require a site specific Appropriate Assessment, that are not covered by the 5 year AA framework.

Purpose

To ensure compliance with legislation and to protect biodiversity.

Responsibilities

The responsibility lies with the Regional Management Staff and Environment Section.

Related Documentation

5 year Appropriate Assessments, Annual Programme, Environmental Risk Assessment Form.

OPW Series EcIA No.1 Screening Report

Environmental assessments are on the critical path for the delivery of drainage and flooding related projects. Schedule early in the works programme.

Procedure

See following page.

Site Specific Appropriate Assessment Process

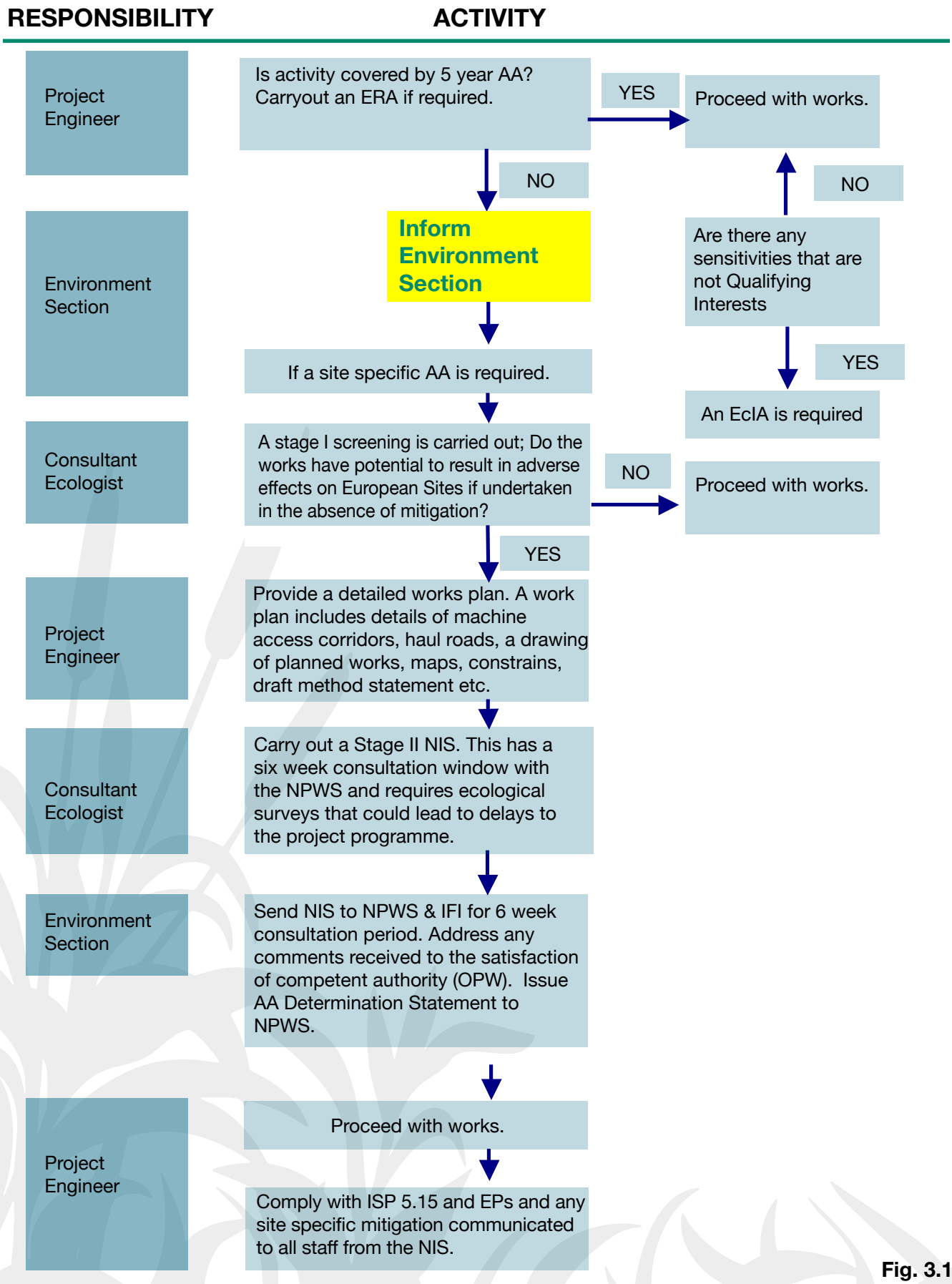


Fig. 3.1

Arterial Drainage Maintenance Activities – National Schedule
Appropriate Assessments for Schemes

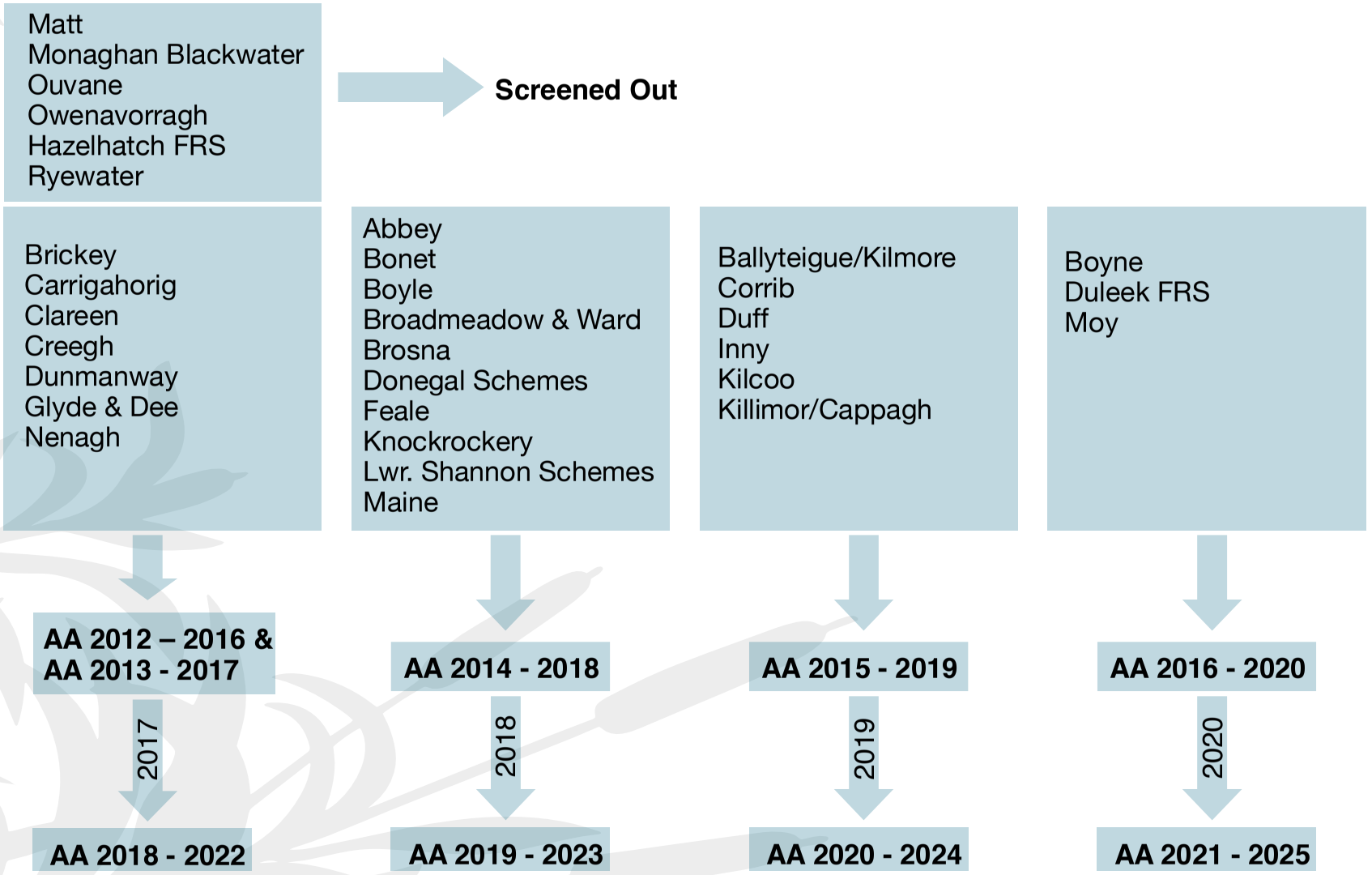


Fig. 3.2

EP 4 Foreman Bridge Inspection Form

Scope

This procedure relates to bridges where structural work is required.

Purpose

This form supports the 5 year AA process by ensuring that bridge maintenance follows an approach that identifies where ecological surveys are required. Bridge structures can be habitats for protected species such as bats, birds and otters.

Responsibilities

The responsibility lies with the regional foreman and Environment Section.

Related Documentation

Annual Programme

Procedure

1. Fill in the Foremen Bridge Inspection Form for all programmed and unprogrammed bridge maintenance works.
2. Send completed form to Environment Section where stipulated.
3. Environment Section will access form and if necessary will organise for an ecological assessment to be carried out.

The majority of drainage maintenance bridges are piped culverts or single span concrete structures. These structures will have less potential to find protected species than high stone arched bridges.

Foreman Bridge Inspection Report

Date of inspection: _____

Inspected by: _____

Maintenance required	Yes		**If yes – programme maintenance for next year and complete below**
	No		
Emergency works required	Yes		**If yes – complete below**
	No		
In-channel works required	Yes		**If yes - apply water quality mitigation measures**
	No		
Cracks present that could be used by roosting bats **For brick or stone structures only*	Yes		**If yes - refer to Environment Section with photograph as additional surveys may be required**
	No		
Dense ivy cover that could be used by bats	Yes		**If yes - refer to Environment Section with photograph as additional surveys may be required**
	No		
Ledges present that are / could be used by nesting birds	Yes		**If yes – avoid nesting season or survey for nesting birds prior to maintenance**
	No		
Dense bank-side vegetation surrounding the structure suitable for birds	Yes		**If yes – avoid nesting season or survey for nesting birds prior to maintenance**
	No		
Dense bank-side vegetation surrounding the structure suitable for otter	Yes		**If yes - check for presence of otter/badger – Refer to Environment Section with photo if found as licence may be required**
	No		
Non-native invasive species detailed in 'Invasives SOP' present	Yes		**If yes, refer to Environment Section with photograph**
	No		
Suitable for installation of bat box	Yes		**If yes – inform Environment Section once installed**
	No		
Suitable for installation of bird (dipper) box	Yes		**If yes – inform Environment Section once installed**
	No		

Remarks

_____

_____

_____

_____

_____

EP 5 Drainage Maintenance Environmental Management

Scope

This procedure relates to all drainage maintenance environmental management.

Purpose

To ensure any site specific mitigation is communicated on site.

Responsibilities

The responsibility lies with the regional staff.

Related Documentation

Site specific Appropriate Assessment, Ecological Impact Assessment, Invasive Management Plans, Environmental Method Statements and Environmental Ecological Assessments EcIAs.

Procedure

1. Where an Appropriate Assessment, ecological assessment, invasive species management plan, wildlife license or where environmental instruction outwith of these procedures defines site-specific mitigation, then the Project Engineer will communicate this mitigation through an environmental method statement (preferred method where the scale of works is significant), tool box talk or site induction.

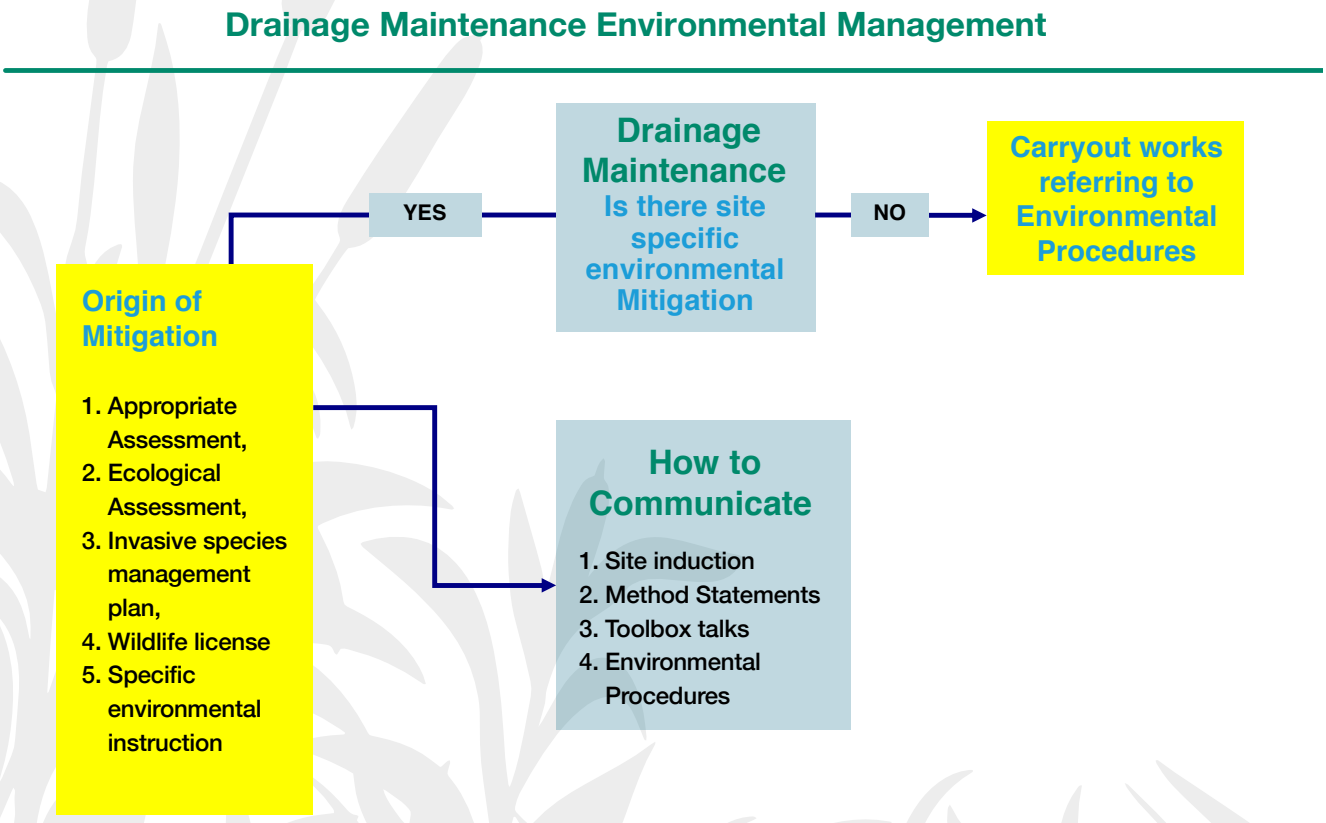


Fig. 5.1

Section 1B –
Drainage Maintenance Implementation Procedures

Relevant to all Staff

EP 6 Environmental Data and Usage

Scope

This procedure relates to drainage maintenance.

Purpose

To ensure the gathering and use of environmental information.

Responsibilities

The responsibility lies with the regional staff and Environment Section.

Related Documentation

Weekly Records Card

Procedure

How to use information

Region to produce maps for staff on-site, that includes the following:
i. Lamprey
ii. White-clawed crayfish
iii. Invasive species
iv. Key environmental data
v. River enhancement structures
vi. SAC/SPA

Weekly Records Card environmental information filled in by foremen and drivers.

Referring to Supplied Environmental Mapping, what should you the driver do?
i. Circle Y/N in "Environmental Information" section.
ii. Circle Y/N for "Shown on Map" section.

Environmental Information section asks: are there environmental issues on-site? What should you the driver consider?

Ask yourself if works are causing unforeseen damage such as, soil becoming very cutup and loose or more trees require removal than planned. You maybe the best person to flag these changes, contact your supervisor if in doubt.

How does the information Change how you the driver approaches works?

Comply with the relevant Environmental Procedure.

How do you, the driver, gather new environmental information?

If you, the driver, finds a protected species, fill in channel/embankment ref. and chainage in "Observed on Site" section.

What happens next with information?
i. Regional office staff to forward all Weekly Records Cards with "Observed on Site" information to Environment Section.
ii. Environment section updates GIS mapping. Where a consultant ecologist is supplying information, they are required to follow the OPW's prescribed format.

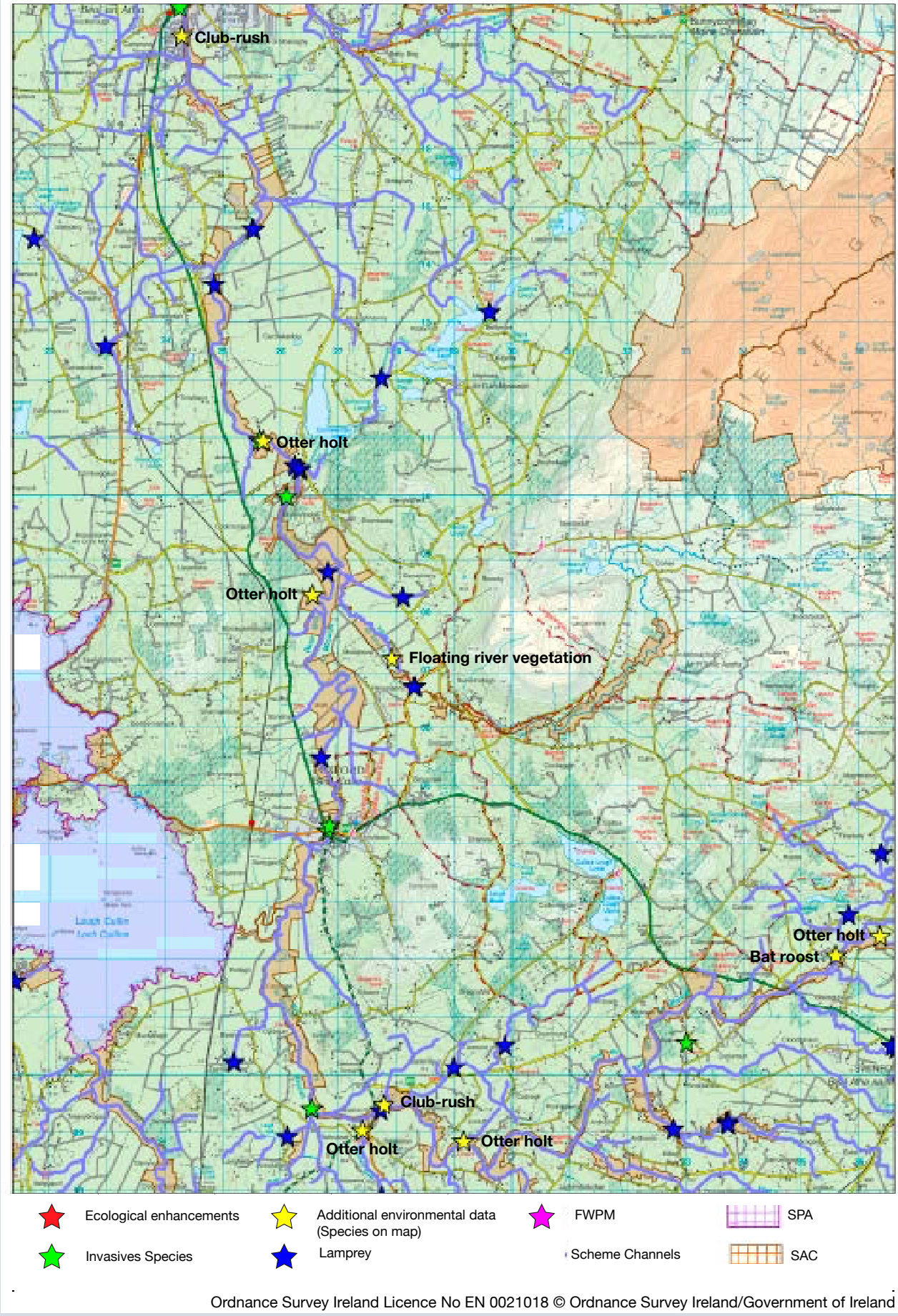


Fig 6.1 example of a map produced with required information.

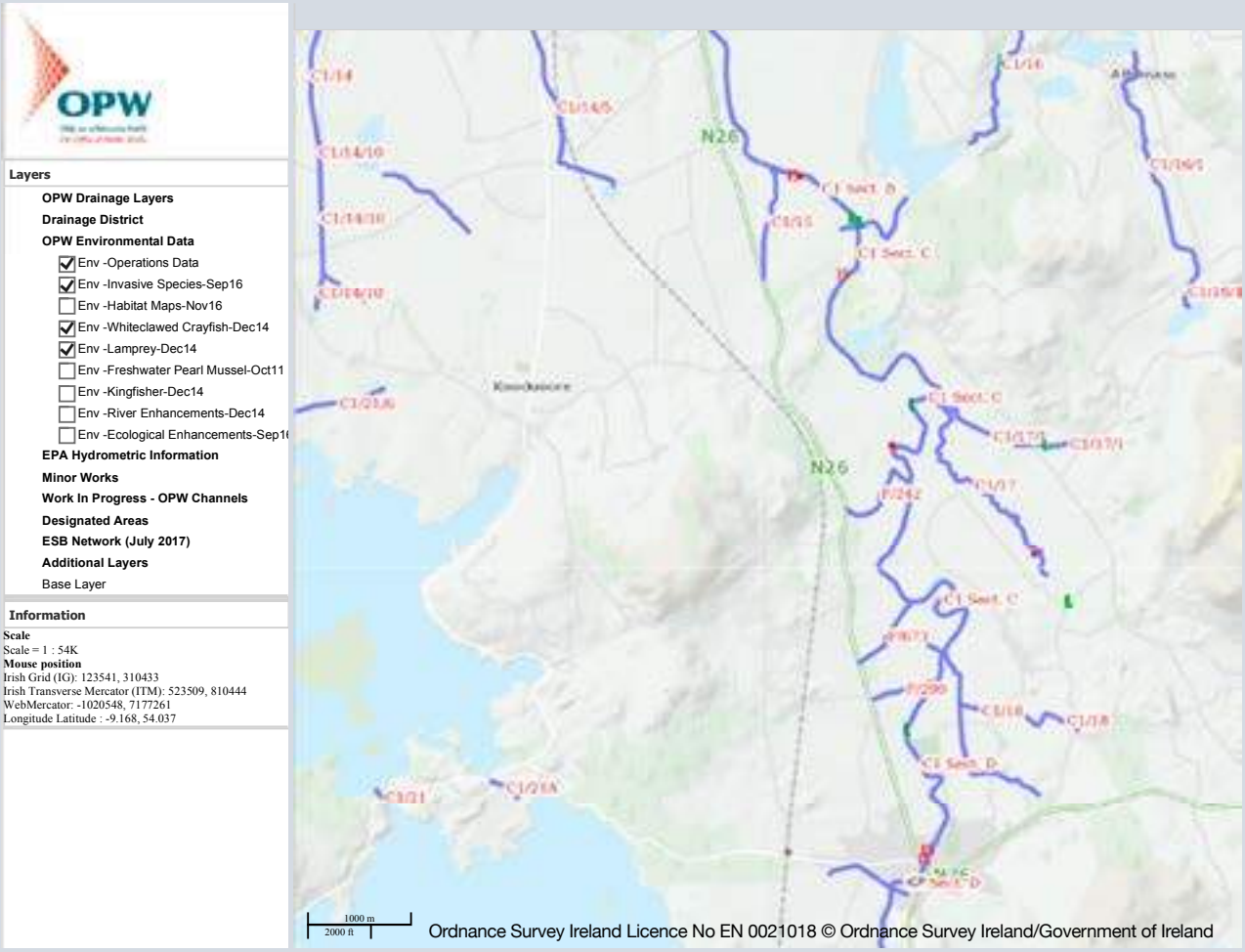


Fig 6.2 OPW map viewer. The map shows the same area as 6.1. This is a web based viewer that can be used anywhere and can be used to view relevant information, including:

Crayfish info

Lamprey info

Freshwater Pearl Mussel info

Invasives info

Key Environmental data

Ecological enhancements

Habitat Mapping

River Enhancements.

When you tick the left boxes it shows the location with an icon. The right legend (not shown) describes these icons (this will be updated to match layers already referred to).

1. Environmental Information	
Maps detailing protected areas and species provided?	Y/N
Works located in a protected area?	Y/N
Details of additional environmental mitigation measures provided?	Y/N
If there are environmental issues on-site or if in doubt - contact supervisor.	

2. Shown on Map Species		3. Observed on Site	
		Chan/Emb	Chainage
Badger Sett	Y/N		
Crayfish	Y/N		
Floating River Vegetation	Y/N		
Lamprey	Y/N		
Nesting Bank	Y/N		
Otter Holt	Y/N		
Invasives	Y/N		
Other	Y/N		

Fig 6.3 This is the environmental section of the Weekly Records Card which should be filled in by Foremen and Gangers weekly.

There are three sections

1. Environmental Information Section

These questions help manage the works.

2. Shown on Map Section

By referring to supplied maps, Circle Y if relevant species appears on map.

3. Observed on Site Section

If new sites of relevant species are encountered fill in location.

EP7 Environmental Drainage Maintenance

Scope

This procedure relates to drainage maintenance.

Purpose

To ensure OPW channels are maintained in an environmentally sensitive manner.

Responsibilities

The responsibility lies with the regional staff and Environment Section.

Related Documentation

Audit Reports

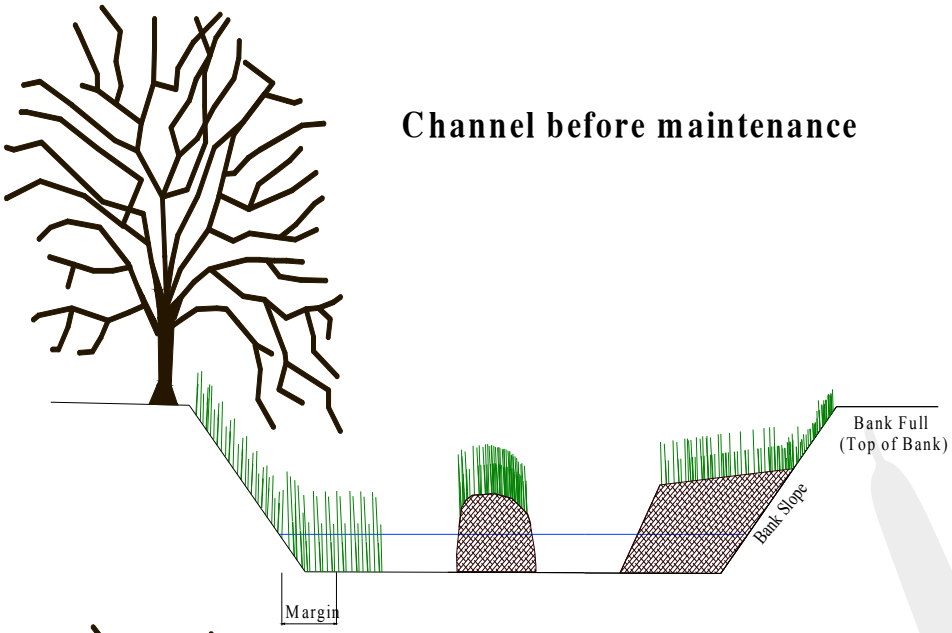
Procedure

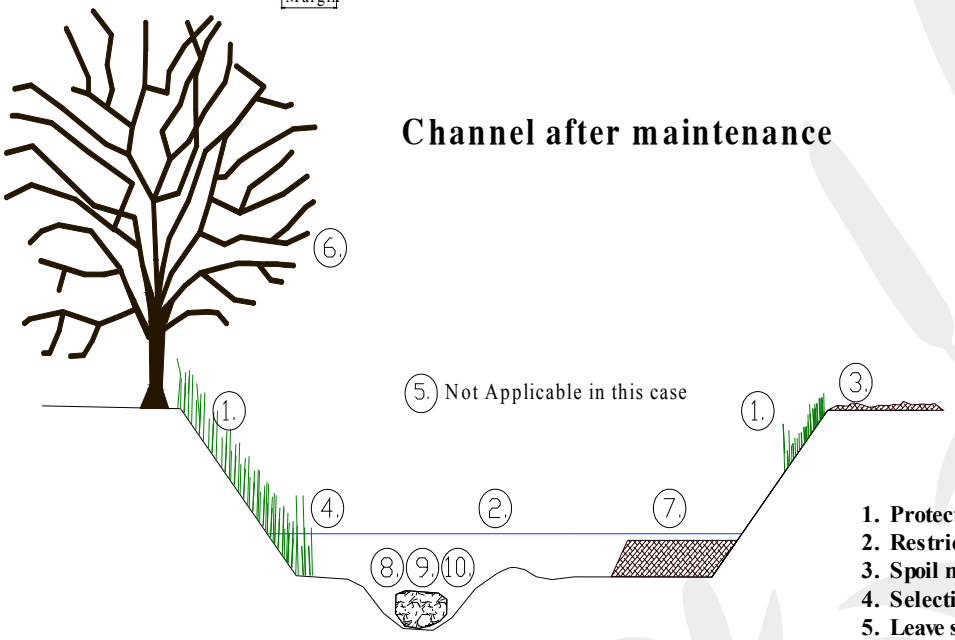
1. Carry out all drainage maintenance in compliance with the 10-point plan (on following pages 27-32).
2. Machine audits will be carried out by Environment Section and external Consultants at least once every 3 years.
3. All machine audit results will be forwarded to the relevant Engineer within two working weeks.
4. In the event of an audit showing unreasonable non-compliance, the relevant Engineer will be notified within one working day. Please refer to Audit Forms on Pg 33-35.

Pic. 7.1 Good drainage maintenance

Environmental Drainage Maintenance
Guidance Notes

10 Steps to Environmentally Friendly Maintenance





1. Protect bank slopes
2. Restrict maintenance to channel
3. Spoil management
4. Selective vegetation removal
5. Leave section untouched
6. Management of trees
7. Manage berm to form two stage channel
8. Replace stones and boulders
9. Loosen gravel beds
10. Re-profile channel bed

Iascach Intire Éireann
Inland Fisheries Ireland

Environmental Strategies for Channel Maintenance

1. Protect bank slopes

1.1 Do not disturb the non-working bank slope

1.2 Minimise any effect on working bank

1.3 Leave margin of vegetation at foot of each bank slope

2. Restrict maintenance to channel

2.1 Remove only necessary silt – **no new diggings**

2.2 Remove instream material only

2.3 Retain marginal vegetation

2.4 Allow water to drain out of bucket over the water – lets small fish, lamprey and crayfish escape.

3. Spoil Management

3.1 Maximise spoil placement on bank full line or spoil heaps - this is the preferred option.

3.2 Minimise spoil placement on bank slopes - least preferred option as spoil can wash back in.

3.3 Spread spoil as thinly as possible

3.4 Check spoil regularly - see Lamprey & Crayfish procedures.

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Inland Fisheries Ireland

Environmental Strategies for Channel Maintenance

4. Selective Vegetation Removal

4.1 Retain a band of vegetation on both sides at water's edge

4.2 Selectively manage instream vegetation

4.3 Maximise use of weed-cutting bucket

4.4 Avoid maintenance in coarse fish channels from 1st April to 1st July

4.5 Retain 1/3 to ½ of instream floating type vegetation, such as *Ranunculus* (water crowfoot) – see photo to right

5. Leave sections untouched

5.1 If channel capacity is not affected, leave section alone

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Environmental Strategies for Channel Maintenance

6. Management of Trees

6.1 Remove trees that are blocking the flow

6.2 Tree-cutting window 1st September to 28th February

6.3 Remove overhanging branches to known flood level

6.4 Use saw secateurs for removal, not excavator bucket

6.5 Manage Trees to reduce very heavy shading

6.6 Manage briars and scrub.
See Otter SOP

7. Manage berms to form two-stage channels

7.1 Retain berm where channel capacity is not affected

7.2 Remove top of berms to low flow levels

7.2 Remove vegetation and soil from gravel berms

7.3 Replace sod to the berm where feasible

7.4 Only narrow berms if 'excessively' wide for the channel (i.e. greater than a third of the channel width

8. Replace stone and boulders

8.1 Reinstate boulders and gravels as removed by maintenance operations

8.2 Reinstate suitably sized boulders into channel from spoil heaps where feasible

8.3 Boulders should be placed at or below low flow level and spaced out

9. Work in gravel bed channels

9.1 Loosen or toss bed gravels to wash out fines

9.2 Only considered between 1st July and 30th September

9.3 No work in gravel bed / spawning channels in fisheries 'closed season' ***Note:*** This varies locally check with local IFI

Environmental Strategies for Channel Maintenance

10.1 Excavate bed to form deeper pool areas and shallow riffles

10.2 Overdeepen the channel along one side and place spoil on opposite side –particularly on curves and bends

10.3 Use existing boulders to form **simple** low-level structures

10.4 Record where such works are carried out

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Inland Fisheries Ireland

Overprocessing by carrying out work to a higher standard than is required can to lead to resource waste. When carrying out drainage maintenance work: less is more. Do not over dig or over prune, just produce enough work to keep the scheme in effective maintenance and condition. By doing so, environmental impacts are minimised.

OPW Site Audit Form V.1

OPW Region:		Scheme:	
Foreman:		Channel: (name & code)	
Driver(s)		Section: (chg-chg)	
Auditor:		Date & Time:	
Site surveyed from:	LHB ☐ RHB ☐	Photographs:	
GPS Ref:		Water level:	
		Machine number:	
		Red book	present ☐ absent ☐
		Spill kit	present ☐ absent ☐

Wetted/Base width (<1m, 1-3m, 3-6m, 6-10m, 10-15m, <15m)

Velocity rating (slow, moderate, fast, flood) ☐ Weather conditions:

Bed type

200m minimum **maintained** section walked? ☐ If not, what distance walked? ☐

200m **unmaintained** section walked? ☐ If not, what distance walked? ☐

Suitable habitat in reach? **YES** **NO**	**Crayfish (in spoil)**	Abundant ☐	Common ☐	Rare ☐		
Annex spp./habitats	**Lamprey (in spoil)**	Abundant ☐	Common ☐	Rare ☐		
(Recorded on site)	Abundant (>11 individuals), Common (5 - 10 individuals), Rare (1 - 4 individuals) per 5m² of bank top					
	Floating-leaved vegetation	Abundant ☐	Common ☐	Rare ☐		
	Circle % cover in reach: Abundant (30-70% cover), Common (3-10% cover), Rare (< 3% cover)					

Invasive Species	Species Name:		
% cover in reach: Abundant (30-70% cover), Common (3-10% cover), Rare (< 3% cover)	Abundant ☐	Common ☐	Rare ☐
Exercising Due Diligence (Skipped Section) ☐			

Maintenance Constraints:	**Working Bank**	Woodland	Tillage	Fencing
	Non Working Bank	Woodland	Tillage	Fencing

Comments on Audit Findings:

Outstanding Issues:

Result:

			Compliant	Grade 1	Grade 2	Grade 3
1. PROTECTING BANK SLOPES	Applicable		✓	%	%	%
1.1: Has the non-working bank been disturbed? (slope and Bankfull)				10-15	15-30	30-100
1.2: Has the working bank slope been disturbed? (mechanically)				15-30	30-60	60-100
Re profiling ☐ Scraping ☐ Inappropriate bank protection ☐ Fine material ☐						
Other (list):						

2. CONFINING WORKS TO CHANNEL CENTRE	Applicable		✓	%	%	%
2.1: Is maintenance retaining 10-15% channel width vegetation on the working margins			**See Section 4**			
2.2: Is maintenance retaining 10-15% channel width vegetation on the non-working margins						
2.3: Is the quantity/type of spoil being removed appropriate?				10 - 20	20-30	>30
Gravel/cobble ☐ Marl/boulder clay ☐ Dragging gravel to margins ☐						
2.4: Is spoil is checked for lamprey/crayfish at least 3 times a day as per SOPs? Yes/No	**See Section 4.4 - 4.5 for Tall Reeds/Flaggers**			moderate	poor	none

3. Spoil Management	Applicable		✓	%	%	%
3.1 Is spoil being placed in the best location? Spoil heap/bank top ☐				70-50	50-30	<30
W/ bank slope ☐ NW/bank slope ☐ Inside fence ☐ Spoil spread on NW/bank slope the only option? Yes ☐ No ☐						
Is spoil visibly slipping back into channel? ☐ Restrictions:						
3.2: Is spoil spread thinly ?				moderate	poor	Bad
3.3: Is driver allowing water to drain from bucket? (*observe driver for 3 minutes; if possible*)				40-60	<40	

		Compliant	Grade 1	Grade 2	Grade 3
4. Vegetation Management	Applicable	✓	%	%	%
Timing					
4.1 Outside coarse fish spawning season (April 1st to July 1st) If Relevant					
Tall Reeds/Flaggers	Relevant				
4.2 Is vegetation management Interfering with nesting birds (March 1st to Aug 3 1st: Wildlife Act)		YES	NO		
4.3 Is maintenance opening the centre of the channel ONLY? (maximum open area is 75-80% of width)			80-70	70-50	<50
4.4: Where crayfish are present, are additional wider areas of vegetation being retained? (1/3 channel width retained)				20-15	<10
4.5: Where lamprey are present, are additional wider areas of vegetation being retained? (1/3 channel width retained)				20-15	<10
Floating-leaved vegetation (Annex habitat)	Relevant				
Ranunculus sp. (% cover =)	*Pondweed sp. (% cover =)*				
4.6: Is maintenance attempting to remove floating pondweed with the normal bucket?		NO	YES		
4.7: Is floating leave pondweed being skipped/retained? (Retain 50-33% of total reach)			33 - 25	25-15	<15
4.8: Is ranunculus being retained/skipped in the Channel? (Retain 50-33% of total reach)			33 - 25	25-15	<15
Water celery/cress:	Relevant				
4.9: Is the driver skimming off water celery vegetation only?	100-60		60-40	<40	
4.10: Is there an avoidance of digging the channel bed?			60-40	<40	
4.11: Is the driver trying to retain water celery on margins?	100-60		60-40	<40	
4.12: The driver is implementing enhanced maintenance in a channel with <1m base width					
Weed-cutting boat/bucket	Relevant				
4.13: Is it cutting the channel centre vegetation ONLY? (maximum open area is 75-80% of width)			70-50	50-30	<30

5. Skipping Sections (Where appropriate)	Applicable	✓			
5.1: Were appropriate sections skipped?	YES				
5.2: Reason for skipping:	Power cables ☐	Good Gradient ■	Lamprey/Crayfish present ■		
Maintenance not required ■	Gravel section ■	Otter holt ☐	Mature tree line ■		
Kingfisher/ Swan nest ☐	Wetlands - Bogs, Fens & Turloughs ■		Freshwater Pearl Mussel ☐		
Swan & Duck Mussels ■	Invasive Plants Species ■		Channel not accessible ☐		
Other (list):					

6. Tree Management	Applicable	✓	%	%	%
Timing					
6.1 Appropriate tree management is only permissible from September 1st toFebruary 28th under the Wildlife Act					
Tree cutting					
6.2 What is the purpose of the tree cutting?					
Conveyance ☐ habitat enhancement ☐ access ☐ Other (list)					
6.3 What equipment is being used?			Machine bucket		
Secateurs ☐ chain saw ☐ hand saw ☐ Tree shears ☐					
6.4 How much tree cover is being retained on the banks in the channel reach?			70-50	50-25	<25
removing fallen/low trees ☐ opening sections over riffles ☐ Selective tree cutting ☐ opening limited sections for access ☐					
Other (list):					
6.5: Is tree cutting retaining the variety of trees present/diversity?					
6.6: Is tree cutting retaining a diversity of bankside vegetation? (trees/Scrub/Shrub)					
6.7: Manage scrub - Otter & Birds SOP			80-70	70-50	
6.8: Woody habitat placed in field / bank slope/top as wildlife refuges?					
6.9: Avoidance of damage to tree cover during the closed season					

7. Berm Management	Applicable	✓	Infrastructure ☐		
7.1: Retain berms (no maintenance)					
7.2 Managed to the basic berm protocol?			80-70	70-50	<50
7.3 Berm re-sodding done where appropriate (berm width / sod character)					
Gravel Berm					
7.4: How gravel berm has been managed?			moderate	poor	bad
gravel drawn to bank toe ☐ gravel removed from channel ☐ Gravel used downstream in channel ☐					
Other (list):					

8. Replacing stone and boulders back in the channel	Applicable	✓	%	%	%
8.1: Are materials being returned to the channel (boulders/cobble/gravel) from diggings?				70-50	<50
8.2: Is readily available and appropriately sized stone from adjoining locations being placed into the channel?			60-40	<40	
8.3: Is there a reason for not placing stone material into the channel, if stone available?			No		
If Yes (List):					

9. Gravel Bed Channels	Applicable	✓	%	%	%

9.1: Is instream maintenance taking place between 1st July and 30th September, without consulation with IFI?					
9.2: Loosen or toss bed gravels to wash out fines			70-40	<40	
9.3: Are measures present to prevent sediment and silt flowing downstream between Autumn-Spring?					

		Compliant	Grade 1	Grade 2	Grade 3
10. New Excavations in the channel - *simple structures*	Applicable	✓	%	%	%
10.1: Is the bed being excavated to form deeper pool areas and shallow riffles?			70-50	<50	
10.2: Is the channel being deepened on one side and spoil placed on the opposite side?			70-50	<50	
Opportunity to use existing spoil to form simple structures?		✓	%	%	%
10.3. Alternating/ paired deflectors			70-50	<50	
Rubble mat					
Simple weir					
Random boulder array					

Count No of Applicable Steps:

Scoring for Applicable sections:	Totals:				

< 4 Steps	**Total Marks**	**Total score**
1 Yellow = -15		
1 Orange = -30		
1 Red = -70		
Total Negative Mark		
1 Green = +15%		
Total Positive Mark		

Total Score Compliance =

Between 5 - 7 Steps	**Total Marks**	**Total score**
1 Yellow = -10		
1 Orange = -25		
1 Red = -70		
Total Negative Mark		
1 Green = +10%		
Total Positive Mark		

Total Score Compliance =

Between 8 - 10 Steps	**Total Marks**	**Total score**
1 Yellow = -10		
1 Orange = -20		
1 Red = -70		
Total Negative Mark		
1 Green = +10%		
Total Positive Mark		

Total Score Compliance =

To Calculate Score: 100 - (Total Negative Mark +Total Positive Mark)
This score represents % compliance (a negative is possible)
Example: No of Sections: 6. Scores: 1 Orange, 2 yellow and 1 Green Mark
(1 orange =-25, 2 yellow = -20, 1 green = +10, ∴Total = –35
100 - 35 = 65

Ratings
0 - 50 = Bad
51 - 59 = Poor
60 - 70 = Moderate
71 - 84 = Good
85- 100 = Very good

Additional Comments:

EP8 Environmental River Enhancement

Scope

This procedure relates to channels where the construction of appropriate physical measures, that match the channels natural characteristics, will enhance the environmental quality of the channel.

Purpose

To ensure improvement of salmonoid (salmon and trout) and other aquatic species habitat.

Responsibilities

The responsibility lies with the regional staff and Environment Section.

Related Documentation

IFI Annual Reports, Enhancement GIS Layer and Fisheries enhancement drawings.

Work together to improve environmental performance. Use the results for the machine audits to inform where and how more enhancement measures can be proactively integrated with maintenance works. Data driven improvements can yield good results.

Procedure

1. Are programmed channels suitable for enhancement? Consider all main channel works.
    a) Liaise with Regional IFI to identify suitable sites.
    b) Contact Environment Section to develop a plan.
2. Is this a suitable site?
    a) Will the design have an impact on drainage or cause flooding
    b) Will landowner be agreeable?
    c) Does the river already appear natural, meandering, not canal like.
    d) Ensure prior assessment or survey of site to assess the fish status and hydromorphology status of the channel, to see if enhancement works will provide a gain.
3. Design should be produced by specialists.
    a) Meet with designer on site to discuss construction related issues.
    b) Ensure the design prescribes the location, type and volume of materials required.
    c) Check with Environment Section if site specific AA Screening completed.
    d) Maximize the use of on site materials, consider using historic spoil heaps.
    e) Consult with local landowner
    f) Meet ecologist on site where required, to consider other potential environmental constraints such as machine access corridors.
4. Angling club or River Trust may propose works.
    a) OPW can act as a contractor to construct river enhancement works on a drained channel where the angling club or river trust has carried out all consultations, attained all necessary approvals and works are approved by IFI.
5. Programme enhancement works to occur between July and October.

6. Forward plans to Environment Section for upload to Alfresco and GIS mapping.
7. Record Fisheries Enhancement production on monthly KPI.
8. Management staff to ensure as far is practical that all machine drivers have an opportunity to get experience on these projects.
9. Ensure works comply with relevant EPs. Fisheries improvement cannot be to the detriment of other species.
10. Manage staff to integrate older “Enhanced Maintenance Programme “into everyday works. Promote points 8, 9 and 10 from the 10pt plan.
11. Implement soft solutions where hydromorphologically appropriate, use root balls, create deflectors using timber and promote natural erosion and deposition by creating talwegs.
12. Refer to Ep12 for easement of barriers to fish movement and sediment transfer.
13. Promote the reconnection of meander cuts where appropriate.
14. Where relevant meet on site with ecologist to mitigate site specific risks. Machine access can result in environmental impacts if not considered sufficiently.

Integrate environmental goals into overall regional goals: for example where large-scale bank erosion works, require the importation of large quantities of rock, consider developing a river enhancement plan, in conjunction with the bank erosion project.

The details on Pg 40 - Pg 47 are not suitable in all situations and should not be prescribed as a general measure. For each site, ensure the enhancement measure is suitable and matches the channel’s own natural hydromorphology (physical form).

Good Examples of Enhancement Measures

Gravel bed channel:
Overdig and place spoil at the edges;
Use existing material

Gravel bed channel:
Constructed low berms with
Imported rock, not always in keeping with
natural characteristics

Clay bed channel:
What can I do?

Overdig pools creates natural refuge for fish

Overdig on one side, leave low natural berms in place

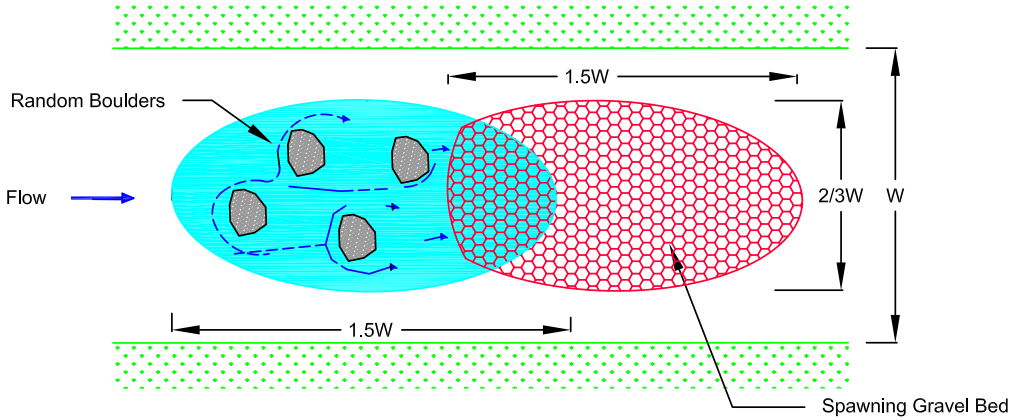
Use existing stone, form simple low-level instream structures


Place random boulders within channel or structures to promote irregular flow


Reduce uniformity: create irregular features and flow depths using existing materials

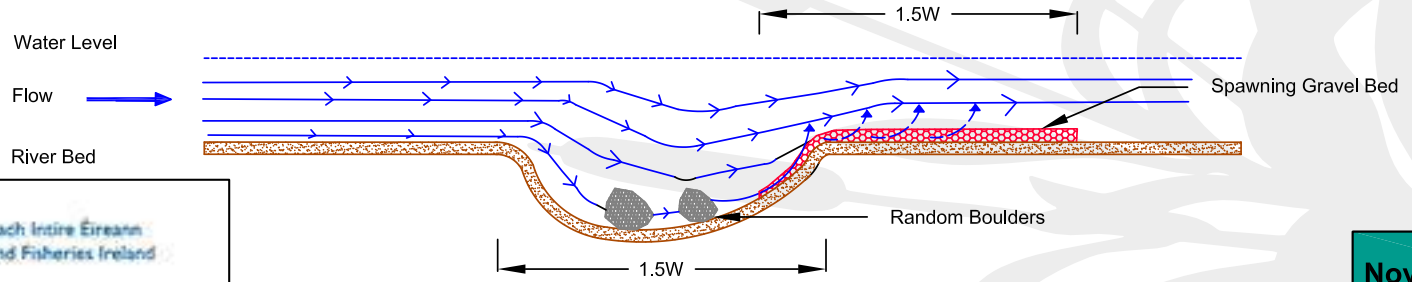

Produce low-level deflectors, creating sinuosity using existing gravels or rock

Detail 1: Centre Channel Pool with Gravel Bed



NOTES:

1. Pool length = 1.5 times channel base-width
2. Pool should be constructed in the centre of the channel with a width occupying approximately $\frac{2}{3}$ of channel base-width and should be egg-shaped
3. Gradually slope down to the deepest point in the centre and taper back up towards the tail and both sides
4. The depth of the pool varies according the size of the channel. Typically, the pool depth below low water level, ranges from 0.9m for smaller channels up to 1.5m for larger channels
5. Start to place gravel at tail of pool (downstream end)
6. Gravel bed and pool should be equal in length (1.5 times channel basewidth)
7. Gravel bed should be 350-400mm deep
8. Place a number of boulders in pool in a triangular or diamond pattern depending on the the size of channel
9. Ensure boulders are large enough to remain in place during flood flows
10. Pool spacings along the channel should be 5 to 7 times the channel base width or follow IFI design



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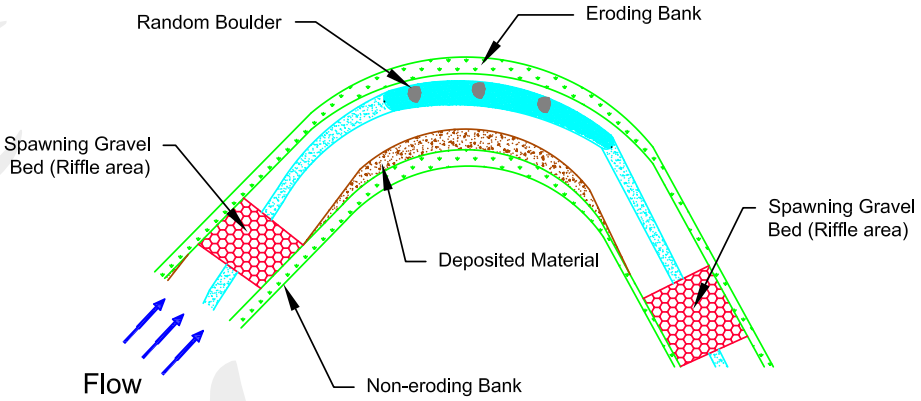
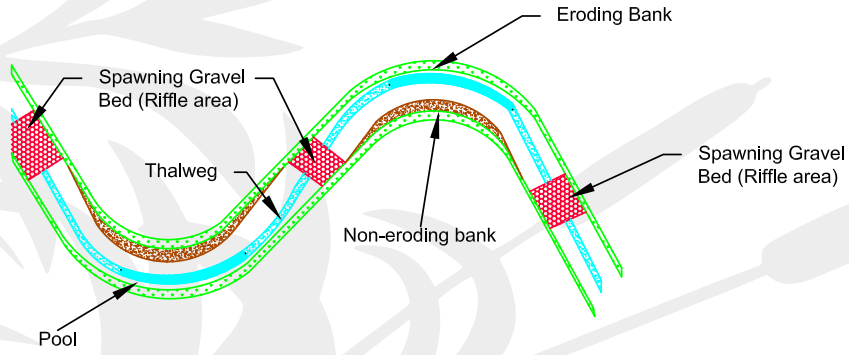
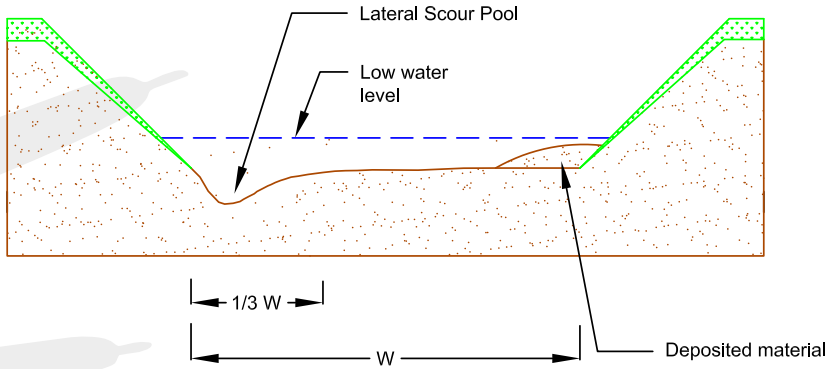
Detail 2: Lateral Scour Pool with Gravel Bed



NOTES:

1. Pool width approximately $\frac{1}{3}$ of channel base-width placed on eroding side of channel
2. Pool should be banana shaped
3. Gradually slope down to deepest point in the centre and taper back up towards the tail and both sides
4. The depth of the pool varies according to the size of the channel. Typically, the pool depth below low water level, ranges from 0.9m for smaller channels up to 1.5m for larger channels
5. Gravel bed placed on existing riffle area - See IFI Design
6. Place a number of boulders in the pool in a triangular or diamond pattern
7. Excavate thalweg to a depth of approximately 0.5m below summer water level
8. Deposit excavated material on inside of bend to form a berm if no berm present





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November - 2014

Detail 3: Gravel Bed Detail

NOTES:

- Gravel bed should be 350mm-450mm deep
- Gravel bed should occupy the full channel cross section
- Gravel should be washed rounded stones of varying particle sizes as detailed in Table 1 for trout and Table 2 for salmon
- Sample existing spawning gravels to confirm similarity with gravels as supplied by quarry supplier

Table 1: Trout

Type	Grade	% Composition
Cobble	64-190 mm	0
Very coarse gravel	32-64 mm	30
Coarse gravel	16-32 mm	35
Medium gravel	8-16 mm	35

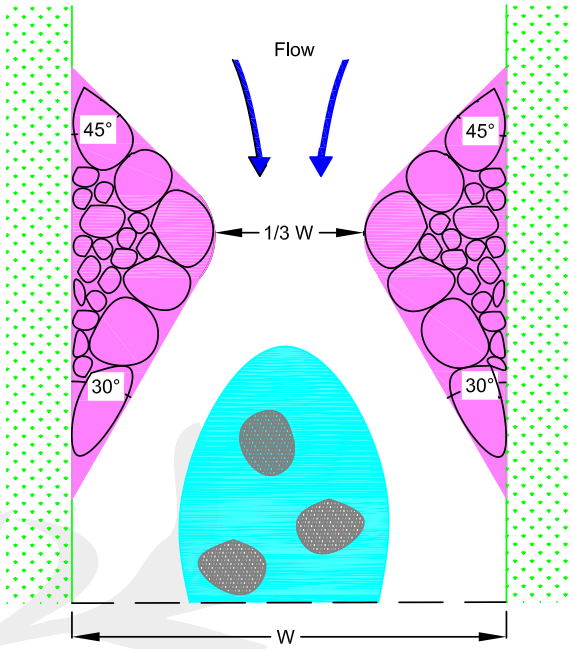
Trout: Percentage composition of gravel required

Table 2: Salmon

Type	Grade	% Composition
Cobble	64-190 mm	10
Very coarse gravel	32-64 mm	35
Coarse gravel	16-32 mm	25
Medium gravel	8-16 mm	30

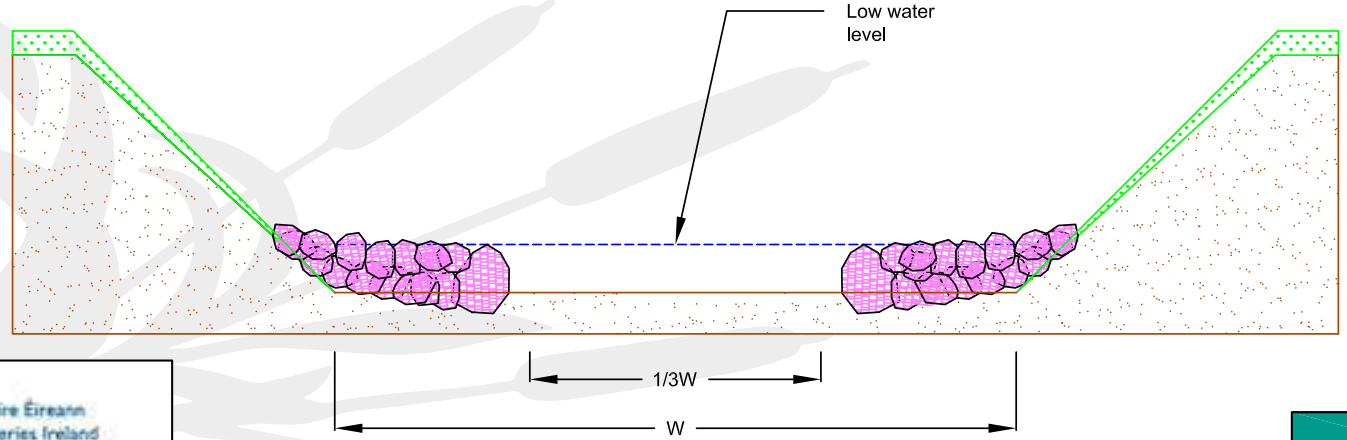
Salmon: Percentage composition of gravel required

Detail 4: Paired Stone Deflectors



NOTES:

1. 45° angle on upstream slope
2. 30° angle on downstream slope
3. Deflector should slope down from bank
4. Stones at outer tip of deflector should be partially buried and the top of the stones should not be higher than low water level
5. These boulders should be the largest available to ensure they can withstand the energy in the channel
6. Use material excavated from pool to backfill deflectors. If no excess material is on site, backfill deflectors with broken stone
7. A space of $\frac{1}{3}$ channel base-width should be left between the paired deflectors



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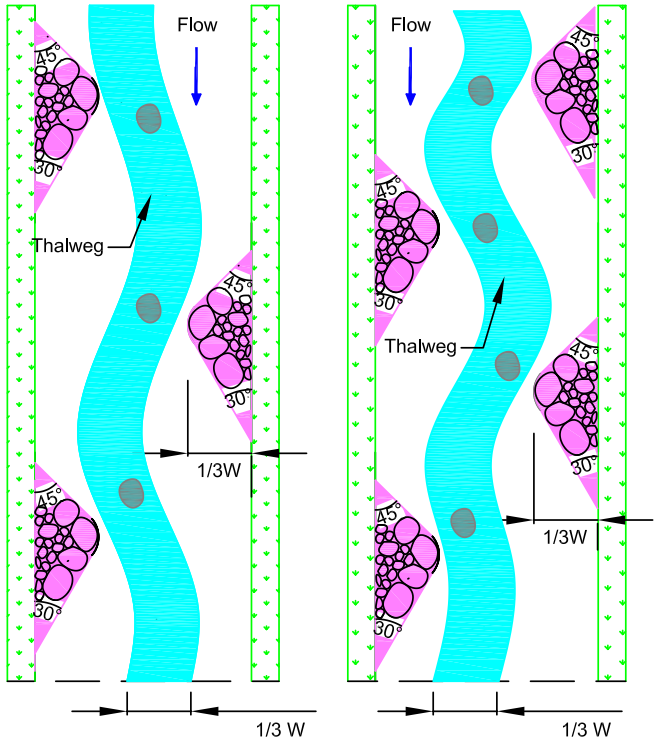
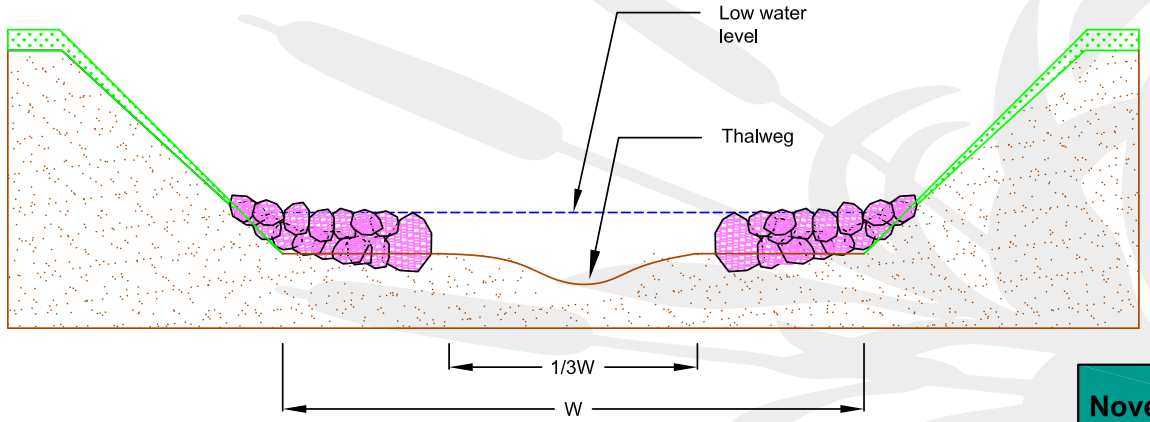
November - 2014

Detail 5: Alternating Stone Deflectors



NOTES:

1. 45° degree angle on upstream slope.
2. 30° degree angle on downstream slope.
3. Deflector should slope down from bank.
4. Stones at outer tip of deflector should be partially buried and the top of the stones should not be higher than low water level.
5. Deflector width should be $\frac{1}{3}$ of channel basewidth
6. In fast flowing rivers deflectors should not overlap
7. In slow flowing wide channels deflectors should overlap
8. Cover deflectors with scraw/vegetation where available



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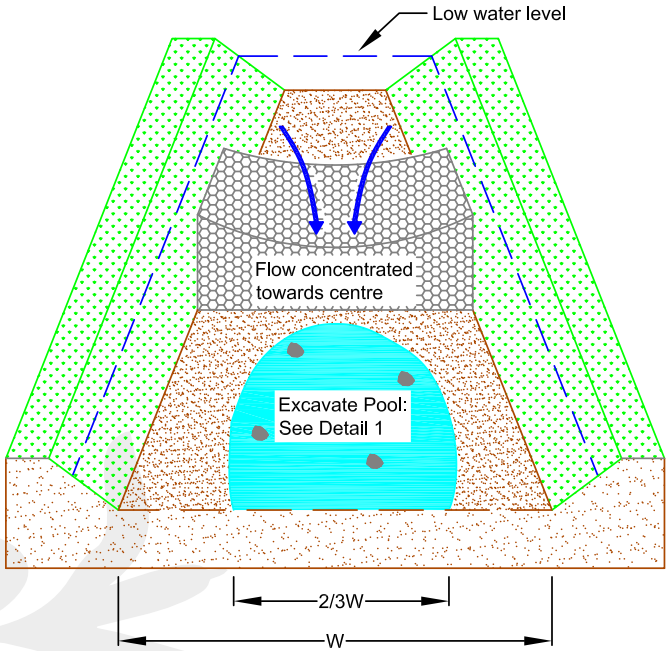
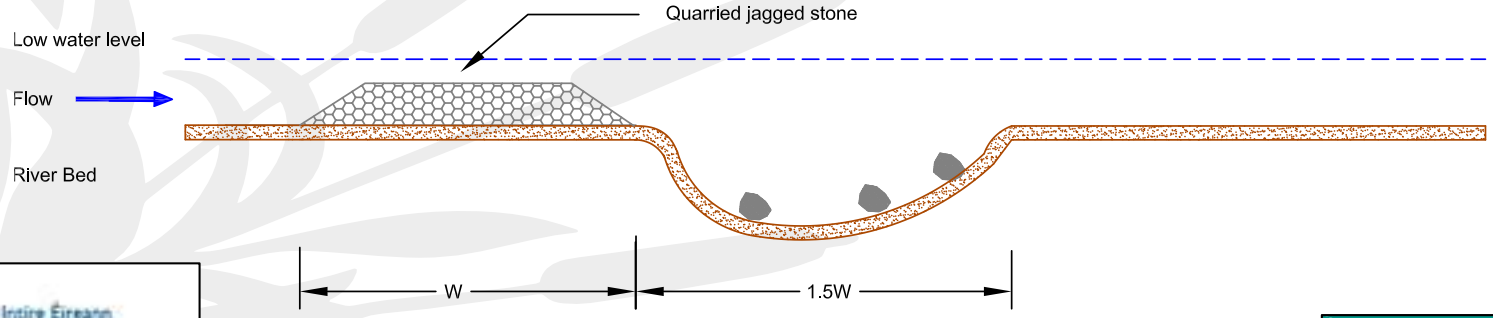
November - 2014

Detail 6: Rubble Mat



NOTES:

1. Rubble mat consists of broken quarried stone (150 - 250mm)
2. Rubble mat length equal to channel basewidth
3. Stone placed below low water level from bank to bank.
4. Gulley should be made through the rubble mat concentrating flow towards centre of channel.
5. Excavate a pool downstream of the mat (See Detail 1: Centre Channel Pool)
6. Height of rubble mat will vary according to water depth - Follow IFI Design



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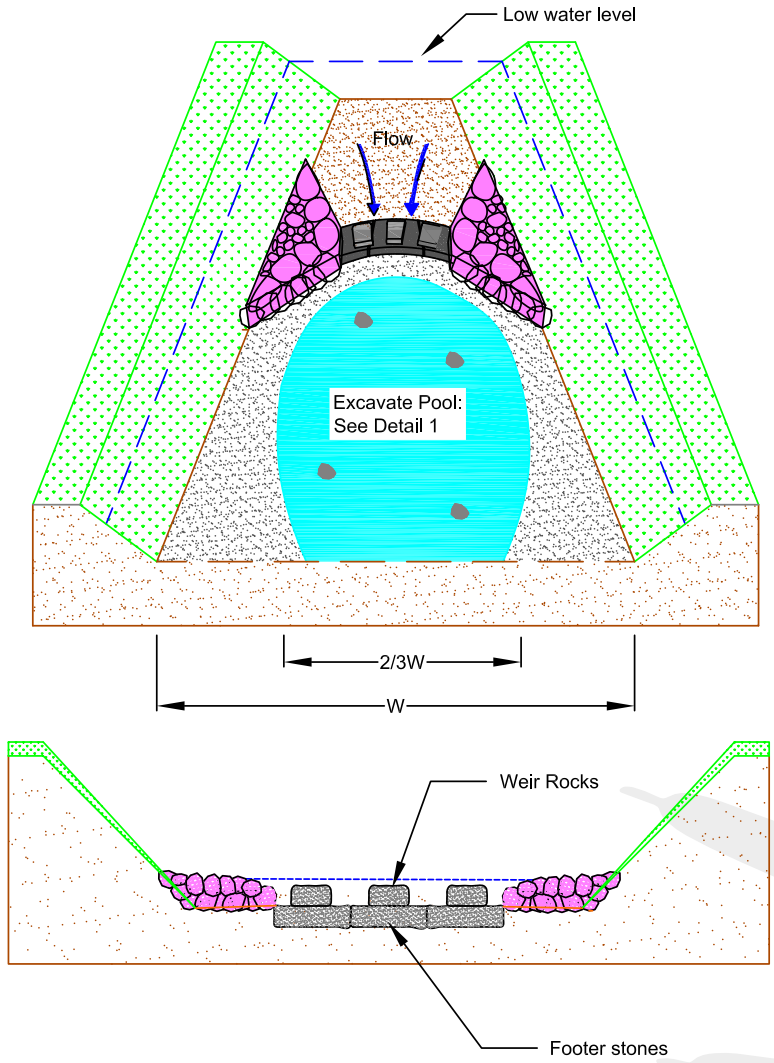
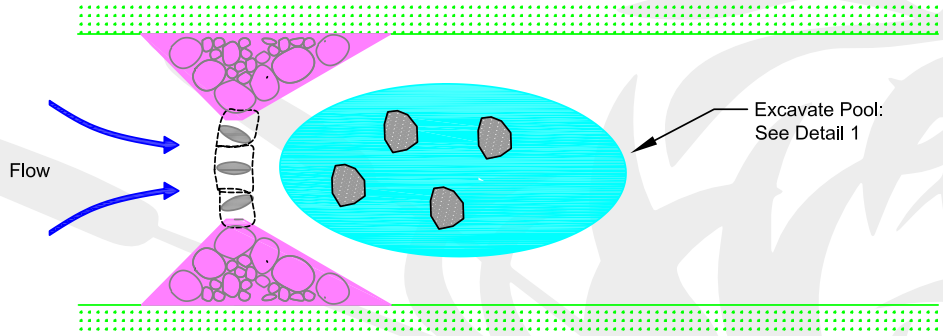
November - 2014

Detail 7: Vortex Stone Weir





NOTES:

1. Stone deflectors or a series of rocks are built into both banks to direct flow towards centre of channel
2. A line of footer stones, arched upstream are buried across the central channel area. These footer stones to be buried so the surface is flush with bed of the channel
3. Three weir rocks are placed on top of the footer stones. The tops of these rocks are exposed by a few centimeters in low flow and are fully submerged in high flow.
4. Footer stones should ideally have a flat flagstone profile, which are larger than the weir stones and form a splash apron to prevent scour
5. Excavate a pool downstream of the weir (see Detail 1: Centre Channel Pool)

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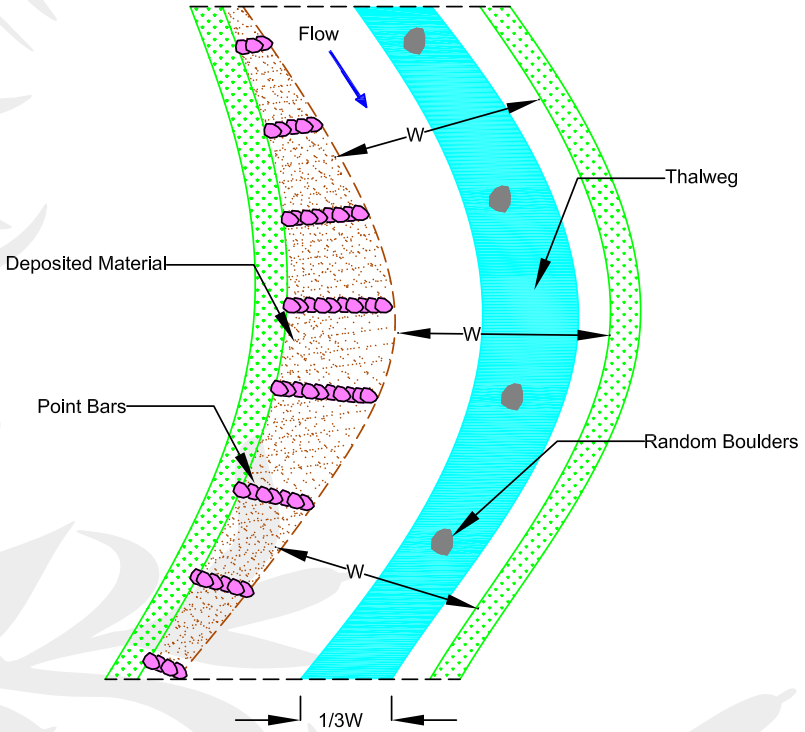
November - 2014

Detail 8: Point Bars



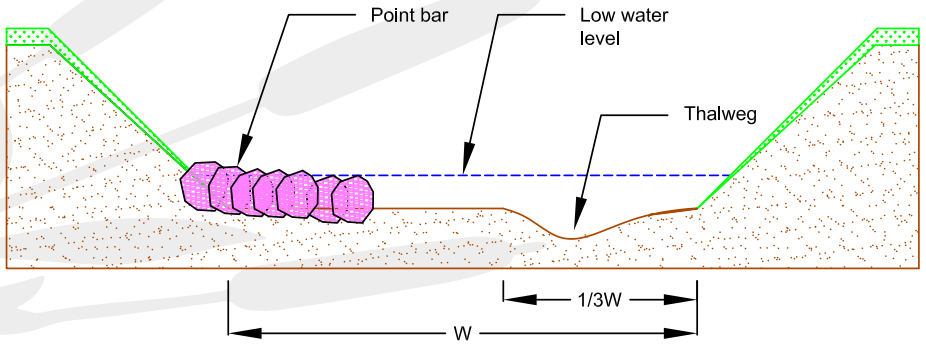
NOTES:

Deflector construction on bend:

1. Typically point bars should be constructed for approximately 1/3 channel basewidth
2. The outer tip of the point bars should form a contour which is parallel to the opposite bank
3. Typically point bars should be spaced approximately 10m apart and built at right angles to the bank (See IFI design for spacing)
4. Excavate a trench along the line of the point bars. Boulders of approximately 0.5 tonnes should be placed into the trench so that they are partially buried into the trench
5. Slope each baffle such that the boulder closest the bank protrudes slightly above low water level and the boulder at the outer edge of the point bar should protrudes slightly below low water level

Thalweg

1. Place excavated material from the thalweg between the baffles
2. Place random boulders into the thalweg



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November - 2014


Pic. 8.3


Pic. 8.4


Pic. 8.5

Pic. 8.3, Pic. 8.4 and **Pic. 8.5**

Recommended type and size of gravel for a typical channel. Pic. 8.5 this size gravel is not recommended as its too large. The appropriate gravel size will vary depending on the size and energy of the channel. It is useful to examine the type and size of the natural gravels in a channel to make a comparison. See detail 3 “Gravel bed detail”

EP 9 Tree and Vegetation Management

Scope

This procedure relates to drainage maintenance and construction works.

Purpose

To ensure trees and vegetation managed with a balanced approach to flood conveyance.

Responsibilities

The responsibility lies with the regional staff.

Related Documentation

EP 7 Environmental Drainage Maintenance Procedure.

Consider using ecoplugs where appropriate, these are glyphosphate cartridges that are hammered into tree stumps to prevent regrowth. These should only be used strategically where access is difficult and flood risk is significant, on bridge abutments for example. Consider the risk of a compromised root system and and the associated erosion risks.

Procedure

1. Programme tree cutting form the 1st of September – 28th of February to minimise nesting season impacts.
2. Devise a selective approach, straight trees retained, branches and main limbs impeding water flow removed , selectively remove trees/branches from lower levels.
3. Retain native trees over non-native trees.
4. Ensure a band of natural vegetation, left along the river to reduce soil run-off and loss of all shading.
5. Expect mammal burrows in dense undergrowth. Implement badger and otter procedure.
6. Consider if the tree has suitable bat habitat, ivy covered with knots or crevices, avoid removing these trees if possible. If felling large trees leave cut down trees for 24hrs to allow bats to vacate. Ecological supervision required for large-scale tree removal, a licence from NPWS is required if bats are present.
7. Refer to EP 18 (invasive plant management), when clearing overgrown sites, invasive colonisation of newly cleared ground may occur.
8. Manage trees to encourage new growth away from the flow area.
9. Use mechanical tree shears or chainsaw, do not use machine bucket to break branches,
10. Manage excess woody vegetation in the following in order of preference.
    - I. Reuse by landowner.
    - II. Subject to landowners agreement, stockpile to form natural cover.
    - III. Shred and spread along bank, rising floodwater may move material.
    - IV. Consider using the removed timber in bank protection/enhanced maintenance.
    - V. Avoid cutting yew trees, they are poisonous to bovines.
11. Retain as much riparian vegetation as possible.

Climate Change is likely to increase summer temperatures in many rivers. Fish can only survive within a certain temperature range. Tree cover and shading can affect this temperature range. When maintaining an overgrown riverbank, consider retaining trees on the southern bank. Also consider the type of tree retained, a tree with a full canopy will offer more shade.

Machine Access Corridor

Machine access Before:
Heavily Wooded river Bank requiring tree clearance for machine access

Trees encroaching on River Bank

Access Corridor to be Cleared

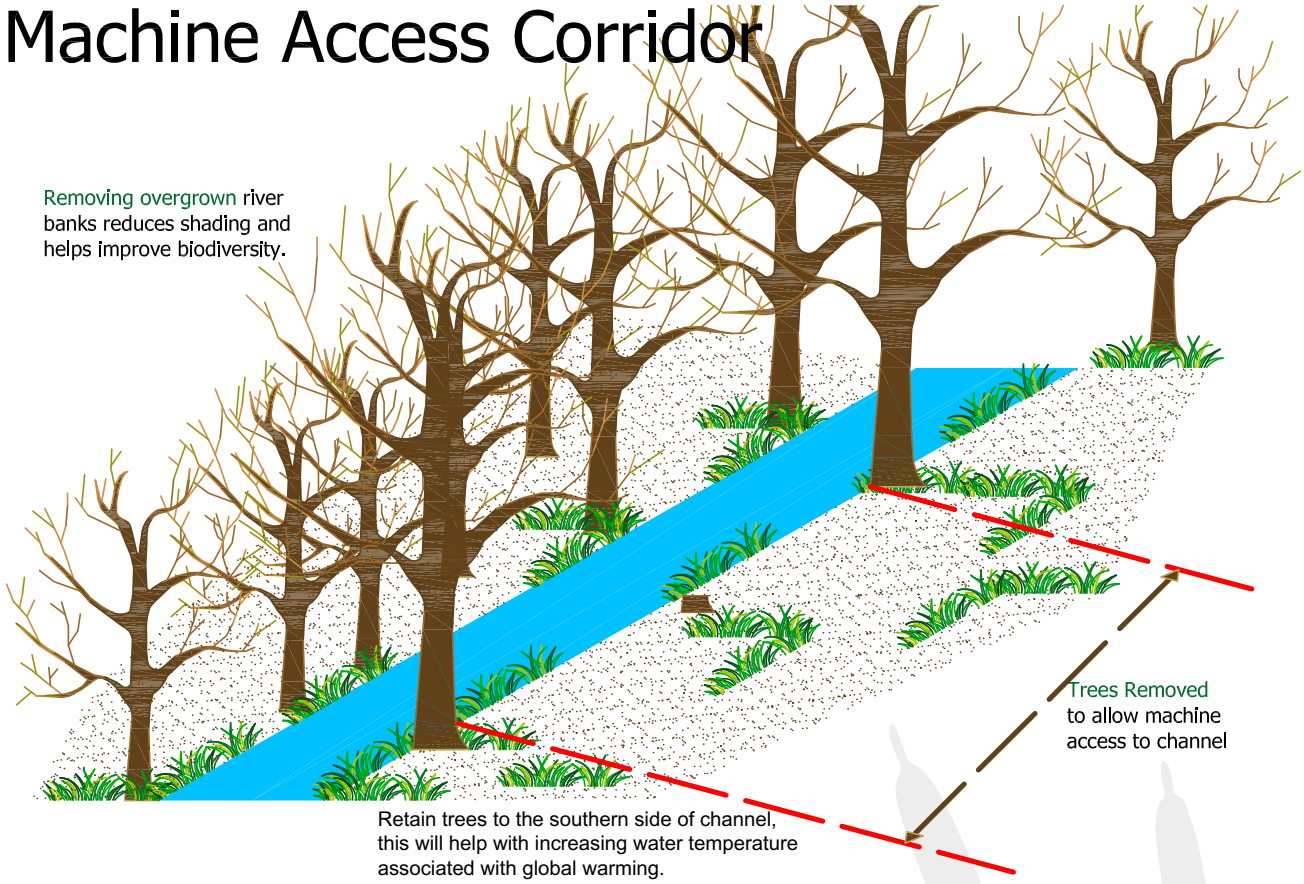
Before

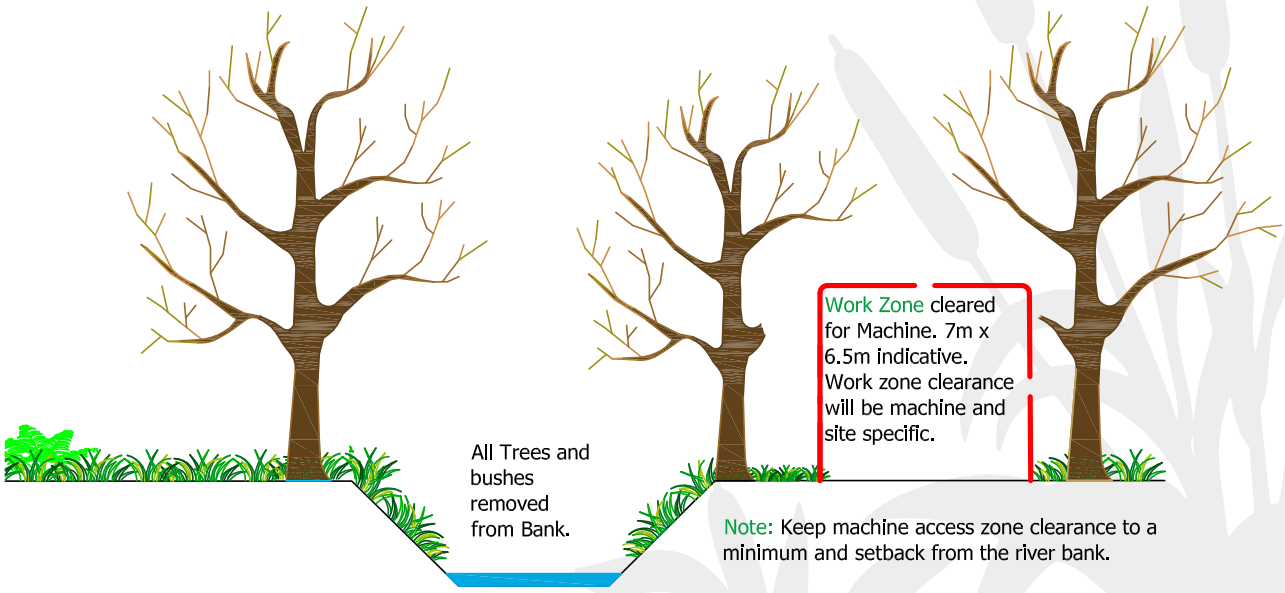
Machine access After:
Heavily Wooded river Bank Trees Removed for machine access corridor.

Selective Tree removal from Access corridor and all trees impeding river flow removed.

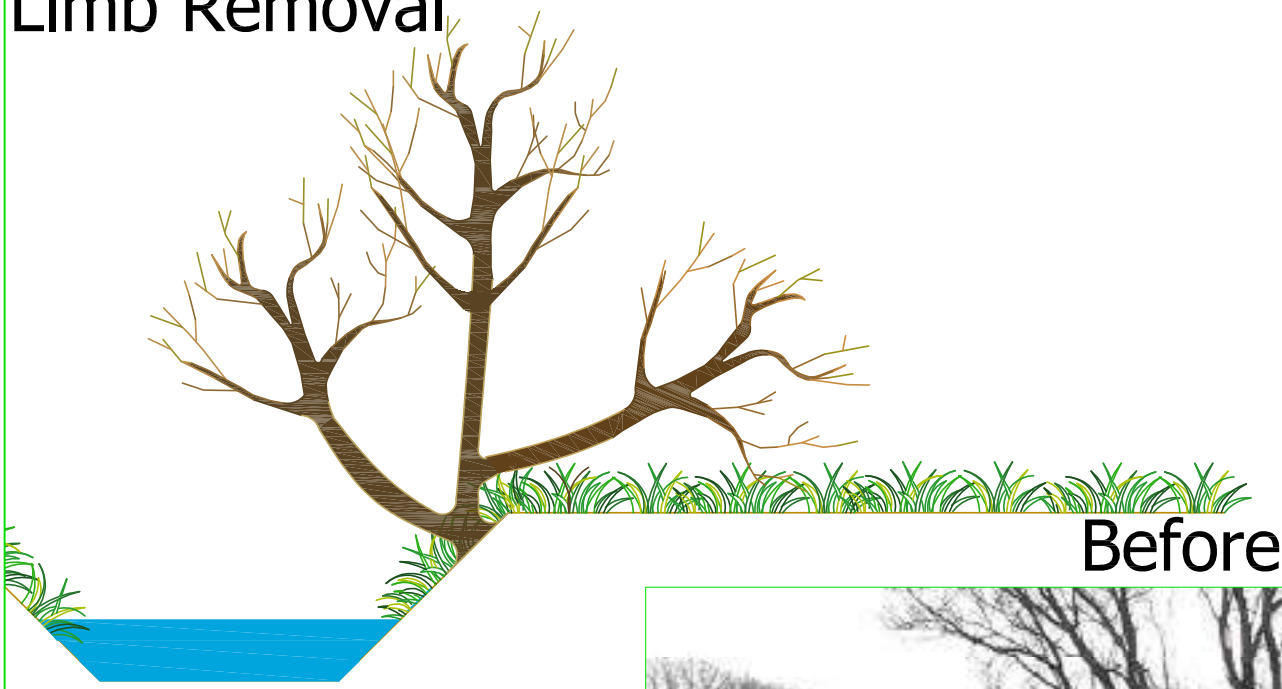
After

Machine Access Corridor





Limb Removal



Before

Channel requiring maintenance due to over hanging and skewed tree limbs. Removal of skewed limbs prevents flood debris gathering and impeding out of bank flows.

Removed limbs could be used in enhanced maintenance measures

Post maintenance over hanging tree limbs removed and banks cleared of skewed limbs. Vertical tree section left in-situ.

After