Powerscourt Paddock

2019 Ecological Survey

Final Report

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1. Introduction

A baseline habitat condition and ecological survey and habitat management plan was prepared for the Powerscourt Paddock upland farm in 2018[1] and the measures within same underwent screening for Appropriate Assessment[2].

The implementation of the management prescriptions in the plan began in 2019. The management prescriptions in the SUAS plan for this upland farm set out to address the impacts highlighted in that report so progress is made towards attaining **Favourable status** for the Annex I habitats present on the site – principally **4010 Northern Atlantic Wet Heaths with *Erica tetralix* , 4030 Dry Heath** and **4060 Alpine and Boreal Heath**. The major impacts to the habitats in this upland farm arise predominantly from under grazing (and historical overgrazing in the valley areas), lack of movement of sheep across the hill resulting in under-grazing in many areas, lack of burning, vegetation management of dry heath through flailing (which has been successful in some parts but not in others), and recreational access resulting in localised peat erosion.

The extent of habitats present within the Powerscourt Paddock upland farm and their affinities to either Fossitt (Level 3) or Annex I habitats were mapped as presented on **Figures 1** and **2** (See **Appendix 1**) and their conservation status was assessed and mapped as shown on **Figure 3** (See **Appendix 1**). A series of management prescriptions were drawn up for the Powerscourt Paddock upland farm as detailed in **Table 1** and mapped on **Figure 4** (See **Appendix 1**).

2. SUAS Vegetation Management Measures

The proposed management measures for the Powerscourt Paddock upland farm under SUAS are as follows:

Year 1 (2019)

1. Control burn a number of small sections in area 8. Cut up to a maximum of 13ha, in sections of approx. 2-3ha in size. These areas should be dispersed around area 8, and away from previously cut areas to encourage sheep to spread out more over this area. Fire control lines, at least 3m wide shall be cut around each section, either by tractor mounted machine or by hand, to ensure these controlled burning areas are contained. This controlled burning will help build up experience among the farmers and in future years they may be able to work with much smaller control lines. Controlled burning may be carried out either in the spring or the autumn (or both) so long as it is within the legal burning season and has the approval of NPWS.
2. Spray Bracken in area 4. A number of small areas, totalling up to 1-2ha, to be trialled in 2019. As this area is not suitable for tractors, control will involve the application of asulox herbicide, by means of knapsack sprayer, hand lance or such other handheld device as is

[1] Wilson, F. (2019). Ecological Baseline Survey prepared for Powerscourt Paddock upland farm as part of the Commonage Management Plan for SUAS. 27th January 2019. Unpublished report for SUAS EIP.

[2] Wilson, F. (2019). Report for Screening for Appropriate Assessment for a Commonage Management Plan at Powerscourt Paddock, Roundwood, Co. Wicklow in accordance with the requirements of Article 6(3) of the EU Habitats Directive. 11th February 2019. Unpublished report for SUAS EIP.

licenced for this product. The use of asulox is subject to emergency licence granting of full licence approval for this product in 2019.

3. Mulch up some of the brash left in the previously cut sections in area 8. This can be done using tractor mounted flail cutter is a number of sections and then the brash removed from part of these areas. It is planned to burn some of this brash in at least one of the cut areas to see how this affects recovery of heath vegetation.

Year 2 (2020)

1. Control burn a number of small sections in area 8. Cut up to a maximum of 13ha in 2020, in sections of approx. 2-3ha in size. These areas should be dispersed around area 8, and away from previously burnt/cut areas to encourage sheep to spread out more over this area.
2. Spray further sections in area 4, up to 5ha for bracken during 2020.

Year 3 (2021)

1. Control burn a number of small sections in area 8. Cut up to a maximum of 13ha in 2021, in sections of approx. 2-3ha in size. These areas should be dispersed around area 8, and away from previously burnt/cut areas to encourage sheep to spread out more over this area.
2. Spray further sections in area 4, up to 5ha for bracken during 2021.

Year 4 (2022)

1. Control burn a number of small sections in area 8. Cut up to a maximum of 13ha in 2022, in sections of approx. 2-3ha in size. These areas should be dispersed around area 8, and away from previously burnt/cut areas to encourage sheep to spread out more over this area.
2. Spray further sections in area 4, up to 5ha for bracken during 2022.

Shepherding

Average time per shepherding: 6 Hours

No of times sheep are to be shepherded: 2-3 Times per week from 1st May to 30th November.

Identified objective of the shepherding;

- Sheep are to be kept from straying off the commonage onto surrounding areas.
- Move off sheep from other commonages.
- Monitor sheep health for signs of tick diseases.
- Count numbers of deer grazing the commonage and areas they are grazing.

Other works to be carried out for entire commonage

Use feed buckets to encourage more sheep grazing the commonage in the Jan/Feb and the April/May period.

Use the feed buckets to move grazing pressure to overgrown areas in Jan/Feb time.

Details of sheep stocking rates proposed

Accurate sheep numbers will be obtained in year 1 and over the remaining 3 years, they will be increased gradually up to GLAS stocking rates.

Ecological Assessment

The commonage was surveyed in November 2019 by Faith Wilson to examine and review the implementation of the proposed measures and make any recommendations regarding same. The observations and recommendations from this visit are set out below.

3. 2019 Walkover Survey

The following observations, comments on same and recommendations on the works completed in 2019 are presented.

Bracken control
There has been some bracken control implemented in Area 4, which is great to see as this is one of the main challenges in many upland sites. This was done on 5th September 2019 using knapsack sprayers. A rate of 11 litres of asulox per ha was applied and an area of 2 ha was treated. The results of this will not be clear until the growing season begins in 2020.

Plate 1. Bracken control in Area 4.

Observations/Challenges
It was planned to do the spraying earlier, but the first contractors lined up to do it fell through and getting suitable weather conditions when the second contractor was available was difficult.

We picked an easier area to trial the spraying in year 1 to see if it was possible with knapsack sprayers and whether it is practical or not. If successful, it is planned to move out from here into more difficult areas next year.

Getting water on to the site was an issue, as the contractors wouldn't use water from the stream (from experience small bits of debris in the water keeps blocking up the sprayers). Quite a lot of water was required to dilute the asulox and to keep refilling the knapsack sprayers.

It is great to see a good dense area of bracken had been sprayed. If possible it would be good in 2020 to attempt to target those areas of bracken which are encroaching on or invading dry heath as this is compromising the favourable condition of this Annex I habitat.

Firebreaks for controlled burning
A number of new firebreaks for controlled burning were created on the 12th and 14th February 2019 on the hillside using a flail mulcher behind a tractor. These can be seen in the Bing Maps imagery of the commonage as presented on **Figure 1** below. The older flailed areas near the forestry can also be seen.

Figure 1. Old flailed areas and new firebreaks cut on Powerscourt Paddock (Bing Maps).

The prepared control burning areas were located up towards the top of the commonage to encourage the sheep up away from the old flailed areas and the hill ditch near the lower enclosed fields. The areas prepared varied in size from 1 to 2ha. No burning was done on Powerscourt Paddock in these areas in 2019 as Brian Mulligan worked with the farmers on Glasnamullen commonage to carry out their controlled burning and there was no other suitable day to do the burning on Powerscourt.

Based on the experience next door in Glasnamullen where only one area got burnt each day, one could expect to do 2 or even 3 sections per day. If we get 2 suitable days in the year and can do 3 sections in a day that is 6 sections in a year (which is optimistic and probably wouldn't happen every year). The maximum area that should be burnt/flailed is 13 ha per year (but note that applies to areas actually requiring burning).

Observations/Challenges
The project was constrained as to where areas could be prepared for burning by where the tractor could travel, and where the contractor could access the hill from. The cut areas have avoided those

areas which were previously flailed, which is very welcome and were obviously constrained as to where the machine could safely travel and work.

In general the areas prepared for burning may possibly be too large and would allow sheep to remain grazing in them on the regrowth for a long time and possibly not move across the hill? This may not of course be the case but is an observation based on what had been seen in the large flailed areas on Powerscourt Paddock where sheep are tending to congregate (see below). It might be worth seeing if smaller patches of heather in a patchwork are prepared for burning would this encourage sheep to move on more readily as fodder within regenerated areas will be browsed out earlier and the sheep will have to find fresh forage.

Plate 2. Some flailed areas have regenerated well with ling heather.

Previously Flailed Areas

The areas previously flailed adjoining the forestry were also examined and whilst here has been some recovery here sheep are tending to congregate here as evidenced by their dunging and presence.

Some areas within the flailed areas are dominated by bilberry whilst others are dominated by ling.

There are still large areas which show little to no regeneration of vegetation. The movement of sheep back down towards the lower enclosed fields on the farm coupled with natural runoff and the slope are causing significant erosion and damaged areas of bare peat. It is recommended that gazers are excluded from this area through the erection of a temporary fence to allow the peat to stabilise and the vegetation to recover.

Plate 3. Sheep are tending to congregate within the flailed areas resulting in bare peat, dunging and poor regeneration of ling heather and bilberry.

Plate 4. Significant erosion, bare peat and damage is occurring on the slope adjoining the forestry.

Plate 5. Some of the older flailed areas remain slow to recover and regenerate.

The issue with overgrazing in the old cut areas will be tackled in 2020.

4. Appendix 1. Maps & Management Recommendations

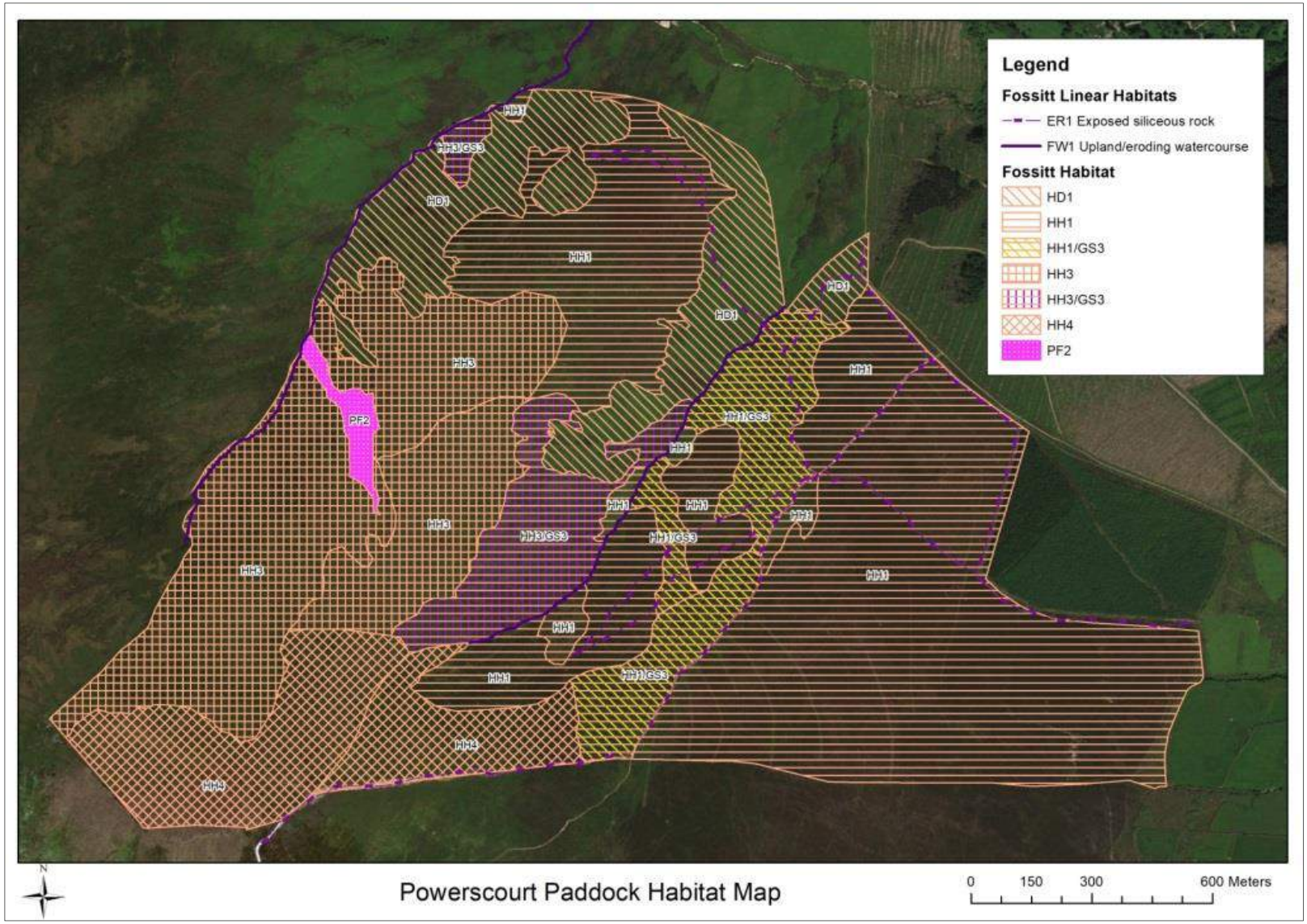


Figure 1. Habitats mapped to Level Three (Fossitt, 2000) within Powerscourt Paddock.

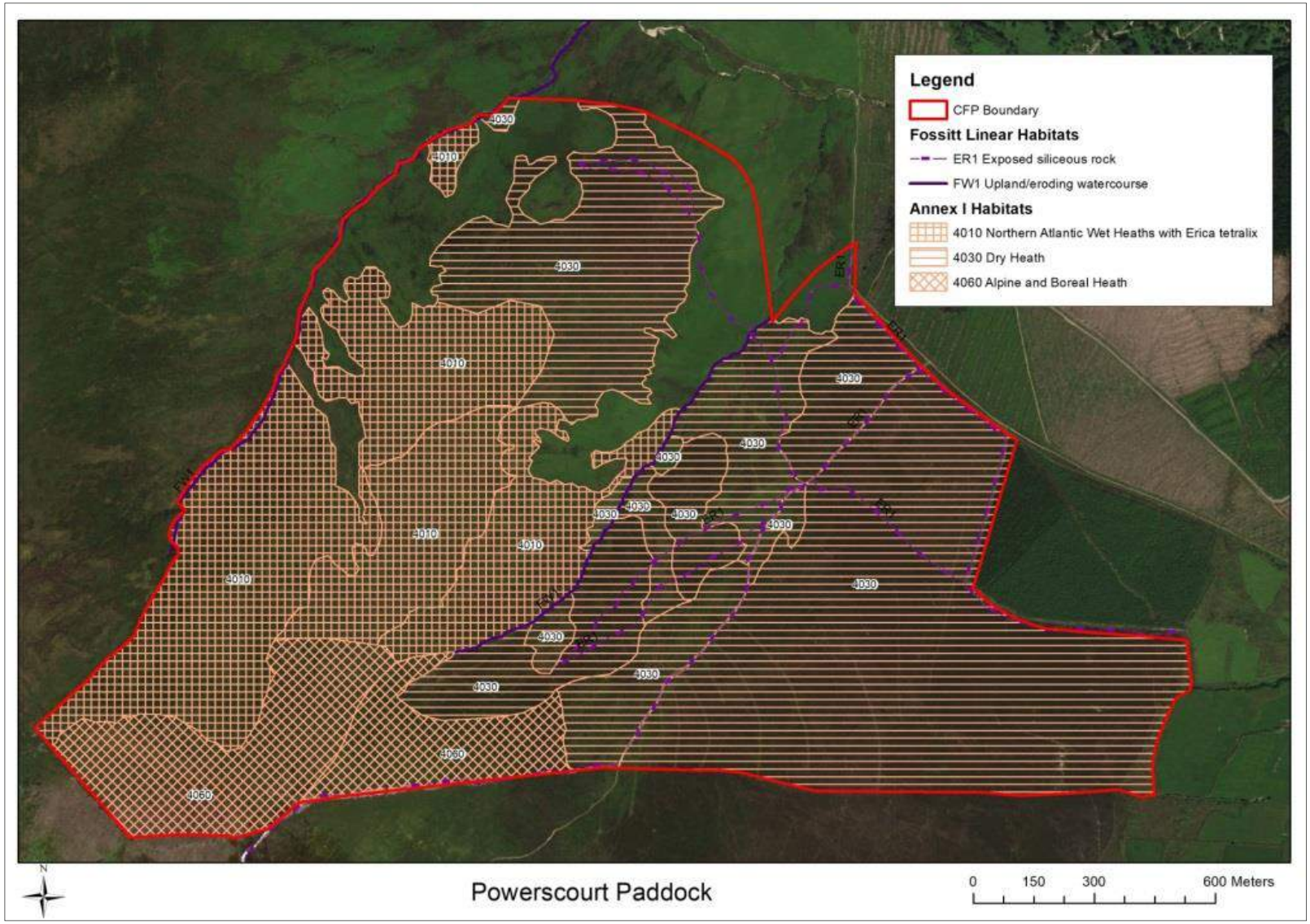


Figure 2. Habitats mapped according to their correspondence with Annex I habitats within Powerscourt Paddock.

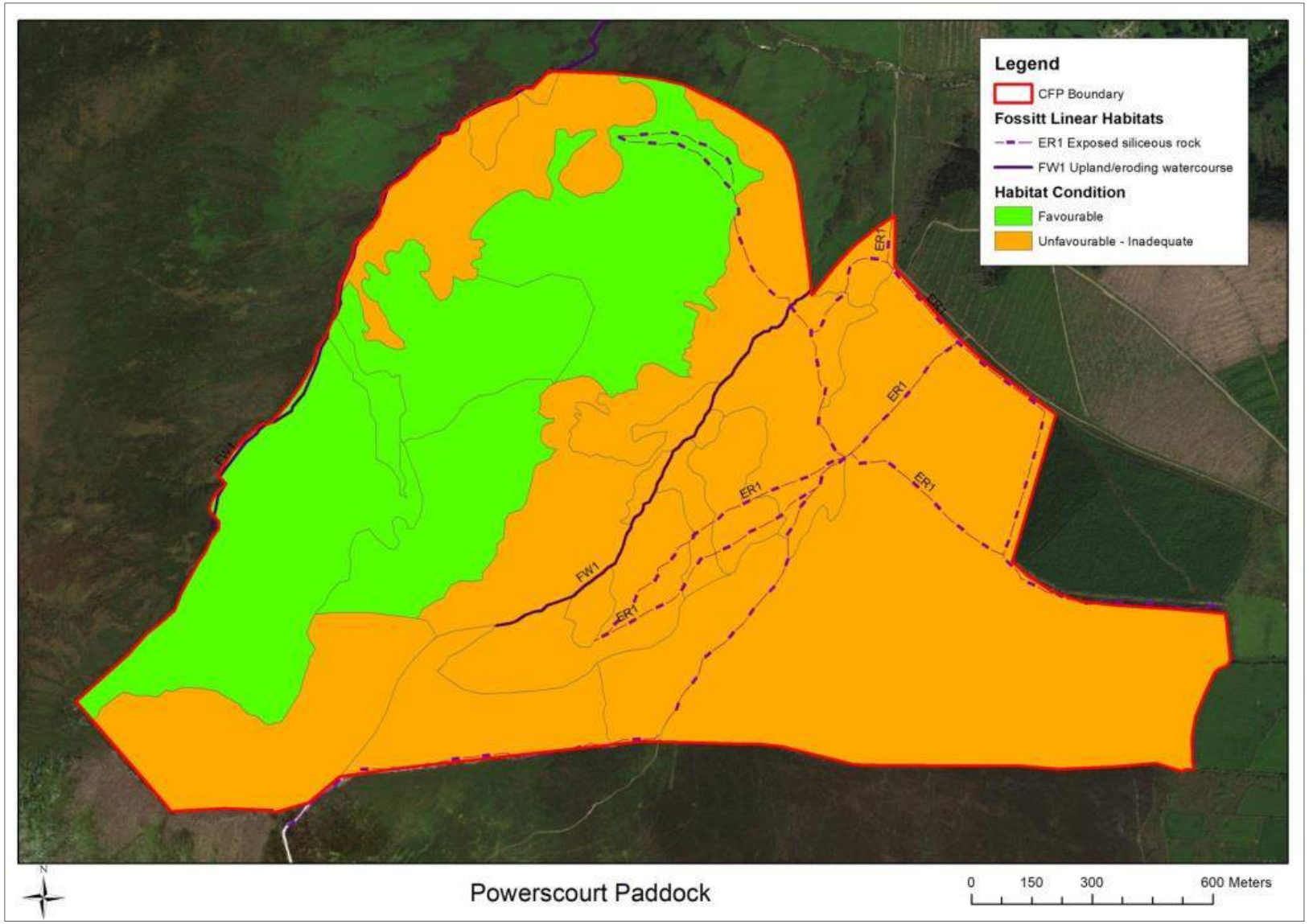


Figure 3. Habitat Condition Assessment for Powerscourt Paddock.

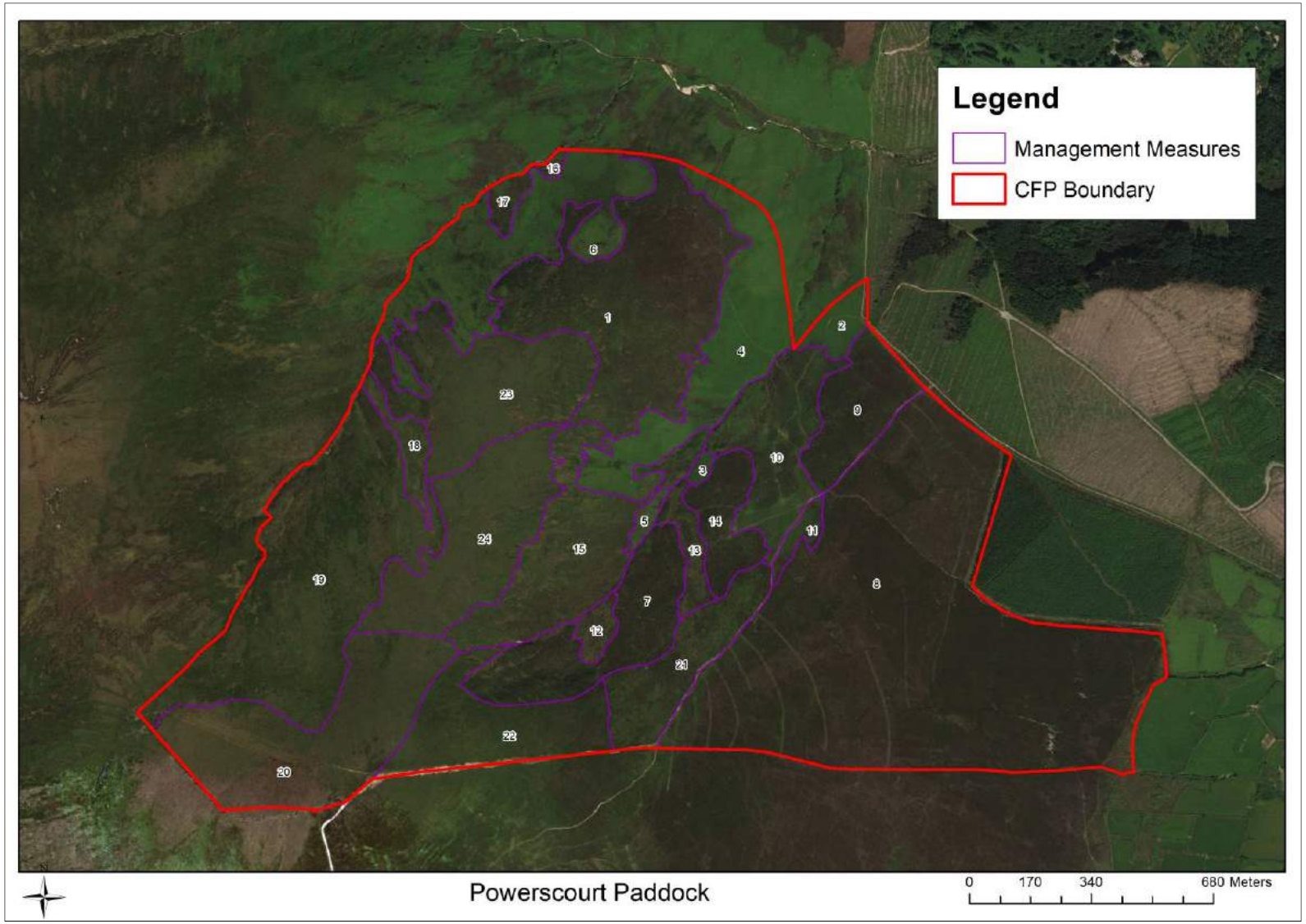


Figure 4. Management measures for Powerscourt Paddock.

Table 1. Habitats present on Powerscourt Paddock and Management Recommendations.

Id	Annex I Code	Annex I Description	Fossitt Code	Habitat	Area (m)	Area (Ha)	Conservation Status	Management Measure
1	4030	Dry Heath	HH1	Dry heath	274984	27.50	Favourable	Ensure no burning Monitor grazing and sheep movements to keep in good condition.
2			HD1	Dense Bracken	22404	2.24	Unfavourable - Inadequate	Bracken Control
3	4030	Dry Heath	HH1	Dry heath	4421	0.44	Unfavourable - Inadequate	Monitor grazing and sheep movements. Move sheep out of this area where they tend to congregate.
4			HD1	Dense Bracken	156617	15.66	Unfavourable - Inadequate	Bracken Control
5	4030	Dry Heath	HH1	Dry heath	7629	0.76	Unfavourable - Inadequate	Monitor grazing and sheep movements. Move sheep out of this area where they tend to congregate.
6			HD1	Dense bracken	168820	16.88	Unfavourable - Inadequate	
7	4030	Dry Heath	HH1	Dry heath	118500	11.85	Unfavourable - Inadequate	Monitor grazing and sheep movements. Move sheep out of this area where they tend to congregate.
8	4030	Dry Heath	HH1	Dry heath	780057	78.01	Unfavourable - Inadequate	Controlled burning of some areas of tall leggy heather further up the slopes away from the bottoms Raking/removal of vegetation from flailed areas where regeneration has failed Trial excluding sheep through fencing from some flailed areas to see what regeneration is like in the absence of grazing (provide flight diverters for grouse on any fencing used) Trial flailing using various methods – working up, down or across the direction of slope Flailing at different heights Flailing with different machines – mulching/shredding as opposed to simply cutting once Controlled burn within previously flailed area
9	4030	Dry Heath	HH1	Dry heath	75370	7.54	Unfavourable - Inadequate	Raking/removal of vegetation from flailed areas where regeneration has failed Trial excluding sheep through fencing from some flailed areas to see what regeneration is like in the absence of grazing (provide flight diverters for grouse on any fencing used)

Id	Annex I Code	Annex I Description	Fossitt Code	Habitat	Area (m)	Area (Ha)	Conservation Status	Management Measure
10	4030		HH1/GS3	Dry heath/Acid grassland Mosaic	108668	10.87	Unfavourable - Inadequate	Monitor grazing and sheep movements. Move sheep out of this area where they tend to congregate.
11	4030	Dry Heath	HH1	Dry heath	12710	1.27	Unfavourable - Inadequate	Monitor grazing and sheep movements. Move sheep out of this area where they tend to congregate.
12	4030	Dry Heath	HH1	Dry heath	14557	1.46	Unfavourable - Inadequate	Monitor grazing and sheep movements. Move sheep out of this area where they tend to congregate.
13	4030		HH1/GS3	Dry heath/Acid grassland Mosaic	25364	2.54	Unfavourable - Inadequate	Monitor grazing and sheep movements. Move sheep out of this area where they tend to congregate.
14	4030	Dry Heath	HH1	Dry heath	51253	5.13	Unfavourable - Inadequate	Monitor grazing and sheep movements. Move sheep out of this area where they tend to congregate.
15	4010	Northern Atlantic Wet Heaths with *Erica tetralix*	HH3/GS3	Wet heath/Acid grassland Mosaic	153800	15.38	Unfavourable - Inadequate	Monitor grazing and sheep movements. Move sheep out of this area where they tend to congregate.
16	4030	Dry Heath	HH1	Dry heath	3972	0.40	Unfavourable - Inadequate	Monitor bracken and control as required.
17	4010	Northern Atlantic Wet Heaths with *Erica tetralix*	HH3/GS3	Wet heath/Acid grassland Mosaic	13116	1.31	Unfavourable - Inadequate	Monitor bracken and control as required.
18			PF2	Poor fen and flush	23319	2.33	Favourable	Monitor sheep movements and ensure area remains in good condition
19	4010	Northern Atlantic Wet Heaths with *Erica tetralix*	HH3	Wet heath	323042	32.30	Favourable	Ensure no burning Monitor grazing and sheep movements to keep in good condition.
20	4060	Alpine and Boreal Heath	HH4	Montane heath	211035	21.10	Unfavourable - Inadequate	Monitor erosion along the walking track and remediate.
21	4030		HH1/GS3	Dry heath/Acid grassland Mosaic	86773	8.68	Unfavourable - Inadequate	Monitor grazing and sheep movements. Move sheep out of this area where they tend to congregate. Monitor erosion along the walking track.
22	4060	Alpine and Boreal Heath	HH4	Montane heath	117239	11.72	Unfavourable - Inadequate	Monitor erosion along the walking track and remediate.

Id	Annex I Code	Annex I Description	Fossitt Code	Habitat	Area (m)	Area (Ha)	Conservation Status	Management Measure
23	4010	Northern Atlantic Wet Heaths with *Erica tetralix*	HH3	Wet heath	166822	16.68	Favourable	Ensure no burning Monitor grazing and sheep movements to keep in good condition.
24	4010	Northern Atlantic Wet Heaths with *Erica tetralix*	HH3	Wet heath	159313	15.93	Favourable	Ensure no burning Monitor grazing and sheep movements to keep in good condition.

5. Water Quality

Water samples were taken on the Glen River and the unnamed tributary of the River Dargle in February 2019 at four sampling locations as shown on **Figure 5** below. The water samples were assessed by Carl Dixon. The upstream section of the Glen River (PP1) was assessed as a stream at risk of not achieving 'Good' water quality status, whereas the downstream sampling station (PP4) was assessed as 'Indeterminate – may be at risk of not achieving 'Good' water quality status '.

The upstream section of the unnamed tributary of the River Dargle (PP2) was assessed as 'Indeterminate – may be at risk of not achieving 'Good' water quality status ', whereas the downstream sampling station (PP3) was assessed as a stream at risk of not achieving 'Good' water quality status.

The Small Streams Risk Score (SSRS) is a biological risk assessment system for identifying rivers that are definitely 'at risk' of failing to achieve the 'good' water quality status goals of the Water Framework Directive (WFD). It was developed by the Environmental Protection Agency (EPA) in association with the Western River Basin District (WRBD) in 2006. The main aim of the SSRS is to support the programme of measures for the WFD, which has its main objective to achieve 'good' water quality status in all water bodies by 2020.

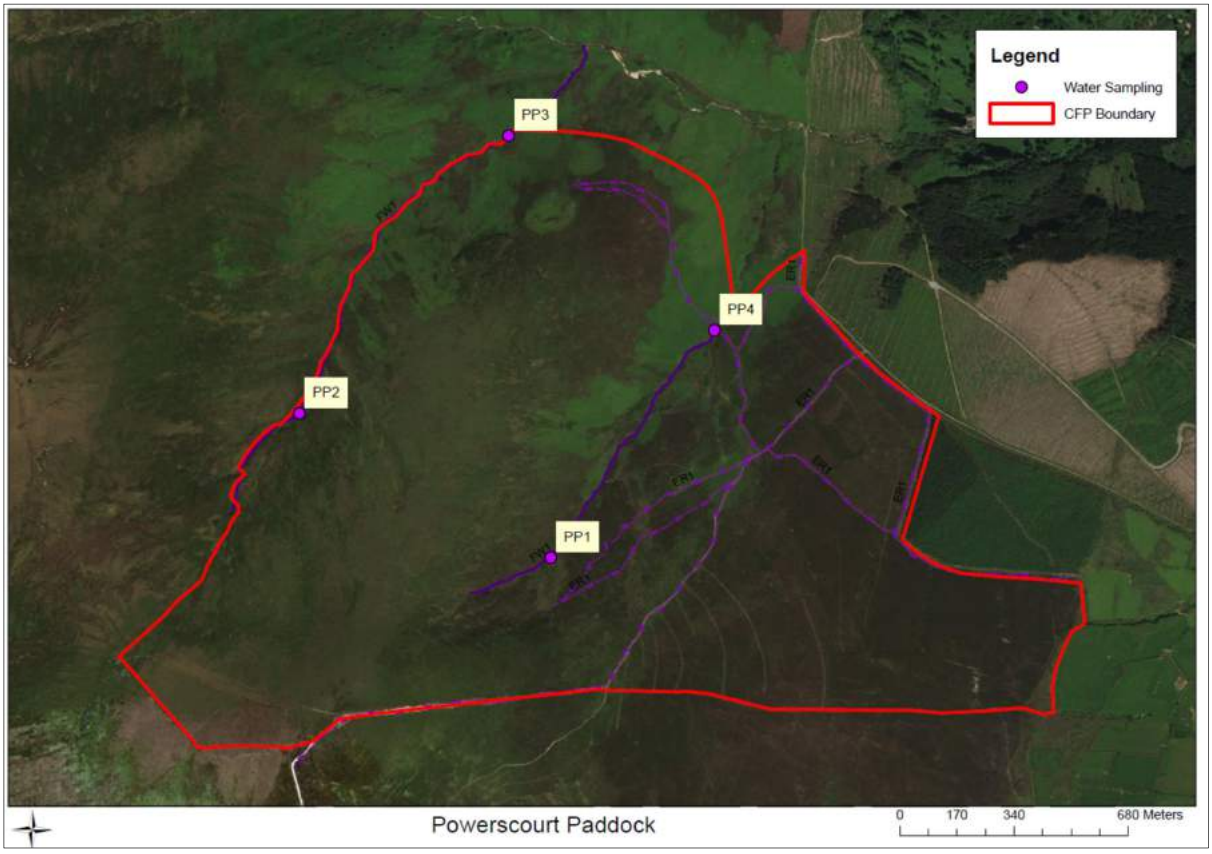


Figure 5. Water quality sample locations at Powerscourt Paddock.

SUAS Water Quality Sampling – Glen River

River:	Code:	Date:	Sample Taken By:
Glen River	IE_EA_10D010010	22/02/2019	Faith Wilson
Sample Number:	**Location:**	**Stream Order:**	**Grid Reference:**
PP1	Powerscourt paddock Commonage – just below Djouce Mountain	1st order	O 18478 10816
Velocity:	**Clarity:**	**Colour:**	**Discharge:**
Torrential	Very clear	None	Flood
Fast	**Clear**	**Slight**	**Normal**
Moderate	Slightly turbid	Moderate	Low
Slow	Highly turbid	High	Very low
Very Slow			Dry
			Recent flood
Modifications: Y/N	**Dominant Types:**	**Slope:**	**Geology:**
Canalised	**Bedrock**	Low	Calcareous
Widened	Boulder (>128mm)	**Medium**	**Siliceous**
Bank erosion	Cobble (32 - 128mm)	High	Mixed
Arterial drainage	**Gravel (8 – 32mm)**	Very high	
	Fine gravel (2 - 8mm)		
	Sand (0.25mm – 2mm)		
	Silt (<0.25mm)		
Substratum Condition:	**Substratum:**	**Degree of Siltation:**	**Depth of Mud:**
Compacted	**Stoney bottom**	**Clean**	**None**
Loose	**Muddy bottom (peat)**	Slight	<1cm
Normal	Mud over stones	Moderate	1-5cm
		Heavy	5-10cm
			>10cm
Litter:	**Filamentous Algae:**	**Stream Flow:**	**Shading:**
None	**None**	**Riffle**	High
Present	Present	**Riffle/glide**	Moderate
Moderate	Moderate	Slow flow	Low
Abundant	Abundant		**None**
Stock Access:	**Sewage Fungus:**	**Sample Type (Mins):**	**Main Land Use Adjacent/Upstream:**
Sheep	**None**	**Kick sample - 3**	Pasture
Deer	Present	Stone washing	**Bog**
	Moderate	Weed sweep	Forestry
	Abundant		Tillage
			Urban
			Other

Plate 1. Photographic record of sampling location.

River:	Code:	Date:	Sample Taken By:
Glen River	IE_EA_10D010010	22/02/2019	Faith Wilson
Sample Number:	**Location:**	**Stream Order:**	**Grid Reference:**
PP4	Powerscourt paddock Commonage – just above where path crosses the stream	1st order	O 18965 11493
Velocity:	**Clarity:**	**Colour:**	**Discharge:**
Torrential	Very clear	None	Flood
Fast	**Clear**	**Slight**	**Normal**
Moderate	Slightly turbid	Moderate	Low
Slow	Highly turbid	High	Very low
Very Slow			Dry

			Recent flood
Modifications: Y/N	**Dominant Types:**	**Slope:**	**Geology:**
Canalised	**Bedrock**	Low	Calcareous
Widened	**Boulder (>128mm)**	**Medium**	**Siliceous**
Bank erosion	**Cobble (32 - 128mm)**	High	Mixed
Arterial drainage	**Gravel (8 – 32mm)**	Very high	
	Fine gravel (2 - 8mm)		
	Sand (0.25mm – 2mm)		
	Silt (<0.25mm)		
Substratum Condition:	**Substratum:**	**Degree of Siltation:**	**Depth of Mud:**
Compacted	**Stoney bottom**	**Clean**	**None**
Loose	Muddy bottom (peat)	Slight	<1cm
Normal	Mud over stones	Moderate	1-5cm
		Heavy	5-10cm
			>10cm
Litter:	**Filamentous Algae:**	**Stream Flow:**	**Shading:**
None	None	**Riffle**	High
Present	**Present**	Riffle/glide	Moderate
Moderate	Moderate	Slow flow	Low
Abundant	Abundant		**None**
Stock Access:	**Sewage Fungus:**	**Sample Type (Mins):**	**Main Land Use Adjacent/Upstream:**
Sheep	**None**	**Kick sample - 3**	**Pasture – Upland Grassland**
Deer	Present	Stone washing	**Bog**
	Moderate	Weed sweep	Forestry
	Abundant		Tillage
			Urban
			Other

Plate 1. Photographic record of sampling location.

Glen River

P A I

River:	Code:	Date:	Time:
Station no.	Location:		Grid (6 figure):
	Stream Order:		Stream flow: Riffle / Riffle/Glide / Slow flow

Field Chemistry	
DO%	
DO mg/l	
Temp (°C)	
Conductivity	
pH	
Bank width (cm)	
Wet width (cm)	
Avg Depth (cm)	
Staff gauge	

Velocity	Colour
Torrential	None
Fast	Slight
Moderate	Moderate
Slow	High
Very slow	

Clarity	Discharge
Very clear	Flood
Clear	Normal
Slightly turbid	Low
Highly turbid	Very Low
	Dry
	Recent Flood

Modifications: Y/N Canalised-widened-bank erosion-arterial drainage

Dominant Types:
Bedrock
Boulder (>128mm)
Cobble (32-128mm)
Gravel (8-32mm)
Fine Gravel (2-8mm)
Sand (0.25-2mm)
Silt (<0.25mm)

Slope: Low – Medium – High – Very High

Geology: Calcareous-Siliceous-Mixed

Substratum Condition: Calcareous-Compacted-Loose - Normal

Substratum:
Stoney bottom-Muddy bottom-Mud over stones

Degree of siltation: Clean-Slight-Moderate-Heavy

Depth of mud: None: <1cm: 1-5cm: 5-10cm: >10cm

Litter: None – Present – Moderate - Abundant

Shading: High – Moderate – Low - None

Cattle access Y: upstream – downstream or N

Photo: Y / N

Filamentous Algae:
None – Present – Moderate - Abundant

Sewage Fungus:
None – Present – Moderate - Abundant

Main land use u/s:
Pasture, Urban, Bog, Tillage, Forestry, Other

Sample retained: Y / N

Sampled in Minutes:
Pond net x
Stone wash x
Weed sweep x

General Comments:

Macroinvertebrate Composition

The macroinvertebrates are divided into the following 5 specific groups:

- Group 1 = Ephemeroptera (3-tails) – note that tails may be damaged during sampling
- Group 2 = Plecoptera (2-tails) - note that tails may be damaged during sampling
- Group 3 = Trichoptera
- Group 4 = G.OL.D (Gastropoda, Oligochaeta and Diptera)
- Group 5 = *Asellus*
- Calculate the total number of taxa and relative abundance of each macroinvertebrate group below: (Abundance – Ab)

Relative Abundance	
1-5	1
6-20	2
21-50	3
51-100	4
101+	5

Ephemeroptera:		Plecoptera:	
Ecdyonurus Ab	1	*Leuctra* Ab	1
Rhithrogena Ab		*Isoperla* Ab	
Heptagenia Ab		*Protonemura* Ab	
Ephemerella Ab		*Amphinemura* Ab	
Caenis Ab		*Perla* Ab	
Paraleptophlebia Ab		*Dinocras* Ab	
Ephemera danica Ab		Other Plecop Ab	
Other Ephem Ab		Other Plecop Ab	
Total no. of taxa: 1	Total Relative Abundance: 1	Total no. of Taxa: 1	Total Relative Abundance: 1

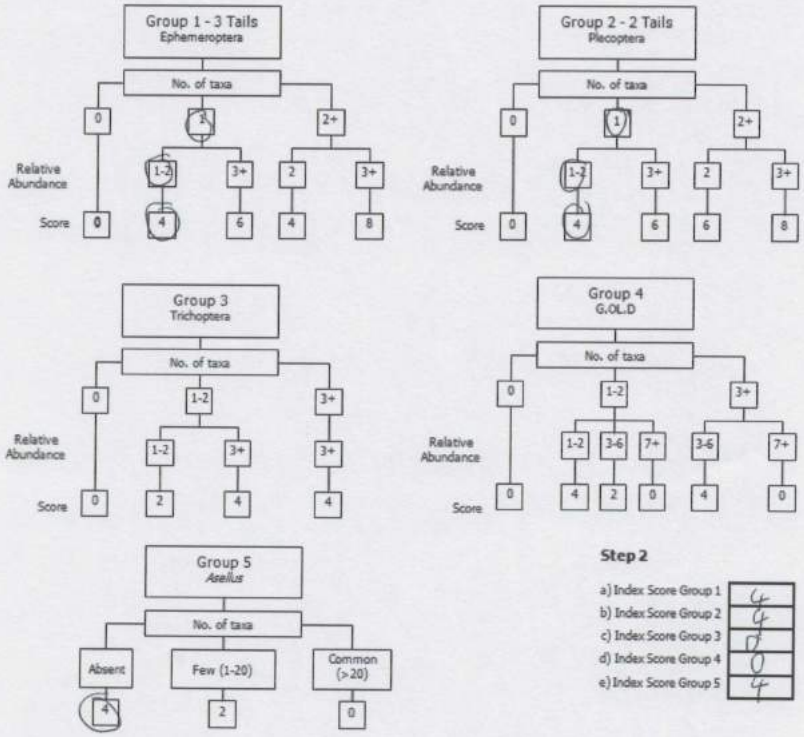
Trichoptera:		G.OL.D:			*Asellus*:
Hydropsychidae Ab		*Lymnaea* (G) Ab		*Chironomidae* (D) Ab	
Polycentropodidae Ab		*Potamopyrgus* (G) Ab		*Chironomus* (D) Ab	Absent 0
Rhyacophila Ab		*Planorbis* (G) Ab		*Simuliidae* (D) Ab	Few (1-20)
Philopotamidae Ab		*Ancylus* (G) Ab		*Dixa spp* (D) Ab	Common (>20)
Limnephilidae Ab		*Physa* (G) Ab		*Tipulidae* (D) Ab	
Sericostomatidae Ab		*Lumbriculus* (Oli) Ab		*Ceratopogonidae* (D) Ab	
Glossosomatidae Ab		*Eiseniella* (Oli) Ab		Other GOLD Ab	
Leptoceridae Ab		Tubificidae (Oli) Ab			
Other Trichoptera Ab					
Total no. of Taxa: 0	Total Relative Abundance: 0	Total no. of Taxa: 0		Total Relative Abundance: 0	

NOTE *Baetis* is an Ephemeropteran and is the most commonly occurring invertebrate genus in streams in Ireland. It is vital that *Baetis* is not counted in SSRS. See Appendix B for more details on how to identify *Baetis*.

NOTE: *Asellus* must be recorded as absent if none are found

p p 1

Step 1. Calculate the Index Score by circling the appropriate box representing the total number of taxa and the total abundance calculated from ***each macroinvertebrate group*** calculated from page 1 of the recording sheet and enter in to the boxes in Step 2.



Step 2

a) Index Score Group 1	4
b) Index Score Group 2	4
c) Index Score Group 3	0
d) Index Score Group 4	0
e) Index Score Group 5	4

Step 3. Calculate the Total Index Score, the Average Index Score and the SSR Score using the boxes below

Total Index Score (TIS) sum (a+b+c+d+e)	Average Index Score (AIS) TIS/5 (5 for 5 groups)	**SSR Score** (AIS x 2)
12	2.4	4.

Step 4. Assess the stream by comparing the final SSR score with the categories below and tick the appropriate box

> 7.25 Probably not at risk	> 6.5 – 7.25 Indeterminate Stream may be at risk	<6.5 Stream at risk
		✓

Surveyor (signed): CARL DIXON Name (print): _____ Date: ____/____/____

PP 4

River:	Code:	Date:	Time:
Station no.	Location:		Grid (6 figure):
	Stream Order:		Stream flow: Riffle / Riffle/Glide / Slow flow

Field Chemistry	
DO%	
DO mg/l	
Temp (°C)	
Conductivity	
pH	
Bank width (cm)	
Wet width (cm)	
Avg Depth (cm)	
Staff gauge	
Velocity	**Colour**
Torrential	None
Fast	Slight
Moderate	Moderate
Slow	High
Very slow	
Clarity	**Discharge**
Very clear	Flood
Clear	Normal
Slightly turbid	Low
Highly turbid	Very Low
	Dry
	Recent Flood

Modifications: Y/N Canalised-widened-bank erosion-arterial drainage

Dominant Types:
Bedrock
Boulder (>128mm)
Cobble (32-128mm)
Gravel (8-32mm)
Fine Gravel (2-8mm)
Sand (0.25-2mm)
Silt (<0.25mm)

Slope: Low – Medium – High – Very High

Geology: Calcareous-Siliceous-Mixed

Substratum Condition: Calcareous-Compacted-Loose - Normal

Substratum:
Stoney bottom-Muddy bottom-Mud over stones

Degree of siltation: Clean-Slight-Moderate-Heavy

Depth of mud: None: <1cm: 1-5cm: 5-10cm: >10cm

Litter: None – Present – Moderate - Abundant

Filamentous Algae:
None – Present – Moderate - Abundant

Main land use u/s:
Pasture, Urban, Bog, Tillage, Forestry, Other

Sample retained: Y / N

Shading: High – Moderate – Low - None

Cattle access Y: upstream – downstream or N

Photo: Y / N

Sewage Fungus:
None – Present – Moderate - Abundant

Sampled in Minutes:
Pond net x
Stone wash x
Weed sweep x

General Comments:

Macroinvertebrate Composition

The macroinvertebrates are divided into the following 5 specific groups

- Group 1 = Ephemeroptera (3-tails) – note that tails may be damaged during sampling
- Group 2 = Plecoptera (2-tails) - note that tails may be damaged during sampling
- Group 3 = Trichoptera
- Group 4 = G.O.L.D (Gastropoda, Oligochaeta and Diptera)
- Group 5 = *Asellus*
- Calculate the total number of taxa and relative abundance of each macroinvertebrate group below: (Abundance – Ab)

Relative Abundance	
1-5	1
6-20	2
21-50	3
51-100	4
101+	5

Ephemeroptera:		Plecoptera:	
Ecdyonurus Ab	1	*Leuctra* Ab	1
Rhithrogena Ab		*Isoperla* Ab	1
Heptagenia Ab		*Protonemura* Ab	1
Ephemerella Ab		*Amphinemura* Ab	1
Caenis Ab		*Perla* Ab	
Paraleptophlebia Ab		*Diamesa* Ab	
Ephemera danica Ab		Other Plecop Ab	1
Other Ephem Ab		Other Plecop Ab	
Total no. of taxa: 1	Total Relative Abundance: 1	Total no. of Taxa: 3	Total Relative Abundance: 4

Trichoptera:		G.O.L.D:			
Hydropsychidae Ab		Lymnaea (G) Ab		Chironomidae (D) Ab	
Polycentropodidae Ab		*Potamopyrgus* (G) Ab		*Chironomus* (D) Ab	
Rhyacophila Ab		*Bleaodes* (G) Ab		Simuliidae (D) Ab	1
Philopotamidae Ab		*Ancylus* (G) Ab		*Dicranota* (D) Ab	
Limnephilidae Ab		*Physa* (G) Ab		Tipulidae (D) Ab	
Sericostomatidae Ab		*Lumbriculus* (Ol) Ab		Ceratopogonidae (D) Ab	
Glossosomatidae Ab		*Eiseniella* (Ol) Ab		Other GOLD Ab	
Lepidostomatidae Ab		*Tubificidae* (Ol) Ab			
Other Trichoptera Ab					
Total no. of Taxa: 0	Total Relative Abundance: 0	Total no. of Taxa: 1	Total Relative Abundance: 1		

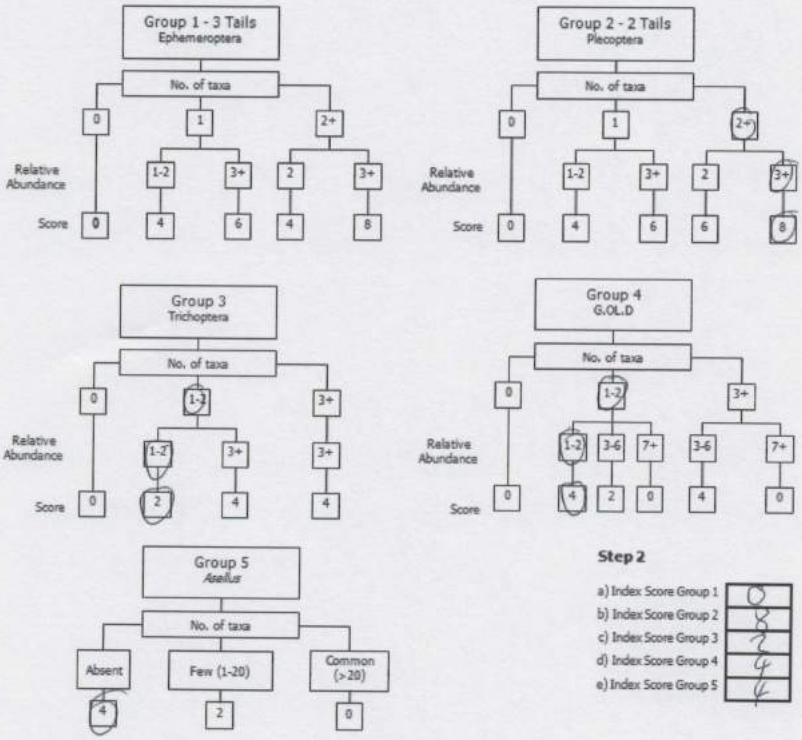
Asellus:
Absent 0
Few (1-20)
Common (>20)

NOTE: *Asellus* must be recorded as absent if none are found

NOTE *Baetis* is an Ephemeropteran and is the most commonly occurring invertebrate genus in streams in Ireland. It is vital that *Baetis* is not counted in SSRS. See Appendix B for more details on how to identify *Baetis*.

PP4

Step 1. Calculate the Index Score by circling the appropriate box representing the total number of taxa and the total abundance calculated from ***each macroinvertebrate group*** calculated from page 1 of the recording sheet and enter in to the boxes in Step 2.



Step 2

a) Index Score Group 1	0
b) Index Score Group 2	8
c) Index Score Group 3	2
d) Index Score Group 4	4
e) Index Score Group 5	4

Step 3. Calculate the Total Index Score, the Average Index Score and the SSR Score using the boxes below

Total Index Score (TIS) sum (a+b+c+d+e)	Average Index Score (AIS) TIS/5 (5 for 5 groups)	SSR Score (AIS x 2)
18	3.6	7.2

Step 4. Assess the stream by comparing the final SSR score with the categories below and tick the appropriate box

> 7.25 Probably not at risk	> 6.5 – 7.25 Indeterminate Stream may be at risk	<6.5 Stream at risk
	✓	

Surveyor (signed): _____ Name (print): Carl Dixon Date: ___/___/___

SUAS Water Quality Sampling – Unnamed watercourse – tributary River Dargle

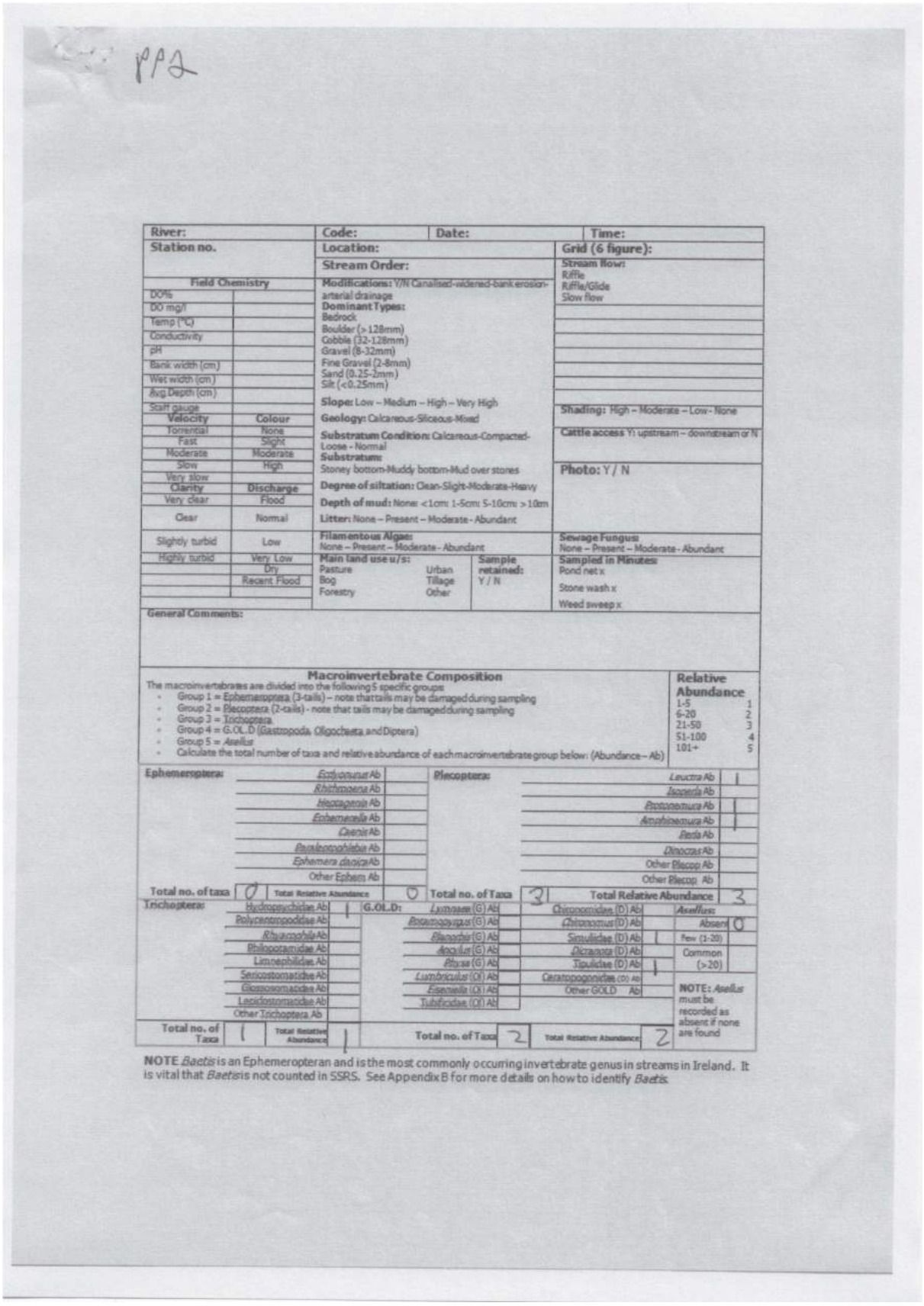
River:	Code:	Date:	Sample Taken By:
Unnamed watercourse – tributary River Dargle	IE_EA_10D010010	22/02/2019	Faith Wilson
Sample Number:	**Location:**	**Stream Order:**	**Grid Reference:**
PP2	Powerscourt Paddock Commonage – north of Middle Hill, upper reaches, above oak trees	1st order	O 17731 11245
Velocity:	**Clarity:**	**Colour:**	**Discharge:**
Torrential	Very clear	None	Flood
Fast	**Clear**	**Slight**	**Normal**
Moderate	Slightly turbid	Moderate	Low
Slow	Highly turbid	High	Very low
Very Slow			Dry
			Recent flood
Modifications: Y/N	**Dominant Types:**	**Slope:**	**Geology:**
Canalised	**Bedrock**	Low	Calcareous
Widened	Boulder (>128mm)	**Medium**	**Siliceous**
Bank erosion	Cobble (32 - 128mm)	High	Mixed
Arterial drainage	Gravel (8 – 32mm)	Very high	
	Fine gravel (2 - 8mm)		
	Sand (0.25mm – 2mm)		
	Silt (<0.25mm)		
Substratum Condition:	**Substratum:**	**Degree of Siltation:**	**Depth of Mud:**
Compacted	**Stoney bottom**	**Clean**	**None**
Loose	Muddy bottom (peat)	Slight	<1cm
Normal	Mud over stones	Moderate	1-5cm
		Heavy	5-10cm
			>10cm
Litter:	**Filamentous Algae:**	**Stream Flow:**	**Shading:**
None	**None**	**Riffle**	High
Present	Present	Riffle/glide	Moderate
Moderate	Moderate	Slow flow	Low
Abundant	Abundant		**None**
Stock Access:	**Sewage Fungus:**	**Sample Type (Mins):**	**Main Land Use Adjacent/Upstream:**
Sheep	**None**	**Kick sample - 3**	Pasture
Deer	Present	Stone washing	**Bog**
	Moderate	Weed sweep	Forestry
	Abundant		Tillage
			Urban
			Other

Plate 1. Photographic record of sampling location.

River:	Code:	Date:	Sample Taken By:
Unnamed watercourse – tributary River Dargle	IE_EA_10D010010	22/02/2019	Faith Wilson
Sample Number:	**Location:**	**Stream Order:**	**Grid Reference:**
PP3	Powerscourt Paddock Commonage – north of Middle Hill, lower reaches, pool below oak and birch trees	1st order	O 18353 12072
Velocity:	**Clarity:**	**Colour:**	**Discharge:**
Torrential	Very clear	None	Flood
Fast	**Clear**	**Slight**	**Normal**
Moderate	Slightly turbid	Moderate	Low
Slow	Highly turbid	High	Very low
Very Slow			Dry
			Recent flood
Modifications: Y/N	**Dominant Types:**	**Slope:**	**Geology:**
Canalised	**Bedrock**	Low	Calcareous
Widened	**Boulder (>128mm)**	**Medium**	**Siliceous**
Bank erosion	**Cobble (32 - 128mm)**	High	Mixed
Arterial drainage	**Gravel (8 – 32mm)**	Very high	
	Fine gravel (2 - 8mm)		
	Sand (0.25mm – 2mm)		
	Silt (<0.25mm)		
Substratum Condition:	**Substratum:**	**Degree of Siltation:**	**Depth of Mud:**
Compacted	**Stoney bottom**	**Clean**	**None**
Loose	Muddy bottom (peat)	Slight	<1cm
Normal	Mud over stones	Moderate	1-5cm
		Heavy	5-10cm
			>10cm
Litter:	**Filamentous Algae:**	**Stream Flow:**	**Shading:**
None	**None**	Riffle	High
Present	Present	**Riffle/glide**	**Moderate**
Moderate	Moderate	Slow flow	Low
Abundant	Abundant		None
Stock Access:	**Sewage Fungus:**	**Sample Type (Mins):**	**Main Land Use Adjacent/Upstream:**
Sheep	**None**	**Kick sample - 3**	Pasture
Deer	Present	Stone washing	**Bog**
	Moderate	Weed sweep	Forestry
	Abundant		Tillage
			Urban
			Other

Plate 1. Photographic record of sampling location.

Unnamed tributary of Dargle River



PP2

River:	Code:	Date:	Time:
Station no.	Location:		Grid (6 figure):
	Stream Order:		Stream flow: Riffle / Riffle/Glide / Slow flow

Field Chemistry	
DO%	
DO mg/l	
Temp (°C)	
Conductivity	
pH	
Bank width (cm)	
Wet width (cm)	
Avg Depth (cm)	
Staff gauge	

Velocity	Colour
Torrential	None
Fast	Slight
Moderate	Moderate
Slow	High
Very slow	

Clarity	Discharge
Very clear	Flood
Clear	Normal
Slightly turbid	Low
Highly turbid	Very Low
	Dry
	Recent Flood

Modifications: Y/N Canalised-widened-bank erosion-arterial drainage

Dominant Types:
Bedrock
Boulder (>128mm)
Cobble (32-128mm)
Gravel (8-32mm)
Fine Gravel (2-8mm)
Sand (0.25-2mm)
Silt (<0.25mm)

Slope: Low – Medium – High – Very High

Geology: Calcareous-Siliceous-Mixed

Substratum Condition: Calcareous-Compacted-Loose - Normal

Substratum:
Stoney bottom-Muddy bottom-Mud over stones

Degree of siltation: Clean-Slight-Moderate-Heavy

Depth of mud: None <1cm 1-5cm 5-10cm >10m

Litter: None – Present – Moderate - Abundant

Shading: High – Moderate – Low - None

Cattle access Y: upstream – downstream or N

Photo: Y / N

Filamentous Algae:
None – Present – Moderate - Abundant

Sewage Fungus:
None – Present – Moderate - Abundant

Main land use u/s:
Pasture, Urban, Bog, Tillage, Forestry, Other

Sample retained: Y / N

Sampled in Minutes:
Pond net x
Stone wash x
Weed sweep x

General Comments:

Macroinvertebrate Composition

The macroinvertebrates are divided into the following 5 specific groups:
- Group 1 = Ephemeroptera (3-tails) – note that tails may be damaged during sampling
- Group 2 = Plecoptera (2-tails) - note that tails may be damaged during sampling
- Group 3 = Trichoptera
- Group 4 = G.OL.D (Gastropoda, Oligochaeta and Diptera)
- Group 5 = *Asellus*
- Calculate the total number of taxa and relative abundance of each macroinvertebrate group below: (Abundance – Ab)

Relative Abundance	
1-5	1
6-20	2
21-50	3
51-100	4
101+	5

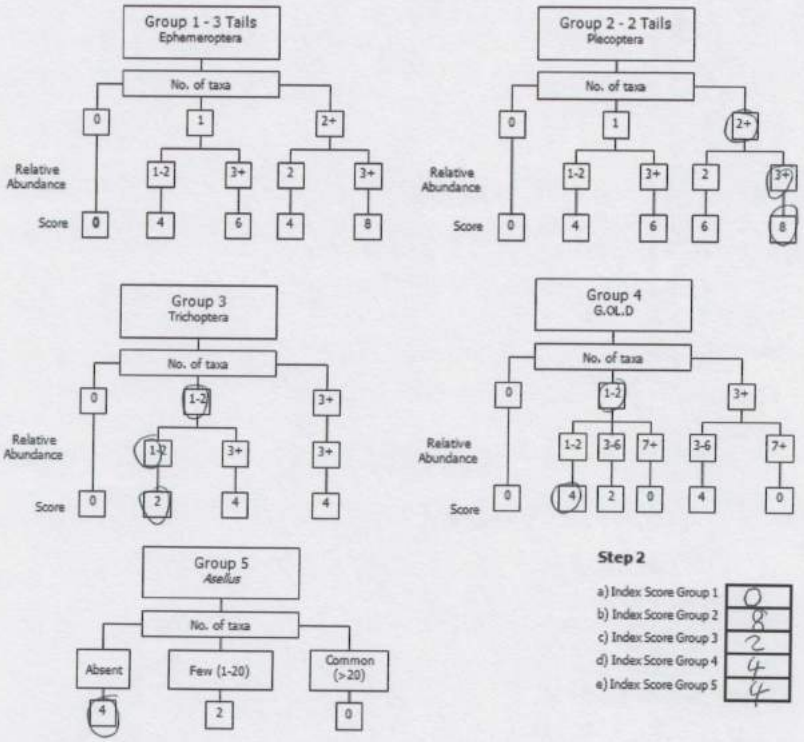
Ephemeroptera:		Plecoptera:	
Ecdyonurus Ab		*Leuctra* Ab	1
Rhithrogena Ab		*Isoperla* Ab	
Heptagenia Ab		*Protonemura* Ab	1
Ephemerella Ab		*Amphinemura* Ab	1
Caenis Ab		*Perla* Ab	
Paraleptophlebia Ab		*Dinocras* Ab	
Ephemera danica Ab		Other Plecop Ab	
Other Epher Ab		Other Plecop Ab	
Total no. of taxa: 0	Total Relative Abundance: 0	Total no. of Taxa: 3	Total Relative Abundance: 3

Trichoptera:		G.OL.D:			Asellus:	
Hydropsychidae Ab	1	*Lymnaea* (G) Ab		Chironomidae (D) Ab	Absent	0
Polycentropodidae Ab		*Potamopyrgus* (G) Ab		*Chironomus* (D) Ab	Few (1-20)	
Rhyacophila Ab		*Planorbis* (G) Ab		Simuliidae (D) Ab 1	Common (>20)	
Philopotamidae Ab		*Ancylus* (G) Ab		*Dicranota* (D) Ab		
Limnephilidae Ab		*Physa* (G) Ab		Tipulidae (D) Ab 1		
Sericostomatidae Ab		*Lumbriculus* (Ol) Ab		Ceratopogonidae (D) Ab	NOTE: *Asellus* must be recorded as absent if none are found	
Glossosomatidae Ab		*Eisenella* (Ol) Ab		Other GOLD Ab		
Lepidostomatidae Ab		Tubificidae (Ol) Ab				
Other Trichoptera Ab						
Total no. of Taxa: 1	Total Relative Abundance: 1	Total no. of Taxa: 2		Total Relative Abundance: 2		

NOTE *Baetis* is an Ephemeropteran and is the most commonly occurring invertebrate genus in streams in Ireland. It is vital that *Baetis* is not counted in SSRS. See Appendix B for more details on how to identify *Baetis*.

PP2

Step 1. Calculate the Index Score by circling the appropriate box representing the total number of taxa and the total abundance calculated from ***each macroinvertebrate group*** calculated from page 1 of the recording sheet and enter in to the boxes in Step 2.



Step 2

a) Index Score Group 1	0
b) Index Score Group 2	8
c) Index Score Group 3	2
d) Index Score Group 4	4
e) Index Score Group 5	4

Step 3. Calculate the Total Index Score, the Average Index Score and the SSR Score using the boxes below

Total Index Score (TIS) sum (a+b+c+d+e) 18

Average Index Score (AIS) TIS/5 (5 for 5 groups) 3.6

SSR Score (AIS x 2) 7.2

Step 4. Assess the stream by comparing the final SSR score with the categories below and tick the appropriate box

> 7.25 Probably not at risk	> 6.5 – 7.25 Indeterminate Stream may be at risk	<6.5 Stream at risk
	✓	

Surveyor (signed): _____ Name (print): CARL PITT Date: ____/____/____

PP3

River:	Code:	Date:	Time:
Station no.	Location:		Grid (6 figure):
	Stream Order:		Stream flow: Riffle / Riffle/Glide / Slow flow

Field Chemistry	
DO%	
DO mg/l	
Temp (°C)	
Conductivity	
pH	
Bank width (cm)	
Wet width (cm)	
Avg Depth (cm)	
Staff gauge	

Velocity	Colour
Torrential	None
Fast	Slight
Moderate	Moderate
Slow	High
Very slow	

Clarity	Discharge
Very clear	Flood
Clear	Normal
Slightly turbid	Low
Highly turbid	Very Low
	Dry
	Recent Flood

Modifications: Y/N Canalised-widened-bank erosion-arterial drainage

Dominant Types:
Bedrock
Boulder (>128mm)
Cobble (32-128mm)
Gravel (8-32mm)
Fine Gravel (2-8mm)
Sand (0.25-2mm)
Silt (<0.25mm)

Slope: Low – Medium – High – Very High

Geology: Calcareous-Siliceous-Mixed

Substratum Condition: Calcareous-Compacted-Loose - Normal

Substratum:
Stoney bottom-Muddy bottom-Mud over stones

Degree of siltation: Clean-Slight-Moderate-Heavy

Depth of mud: None: <1cm: 1-5cm: 5-10cm: >10cm

Litter: None – Present – Moderate - Abundant

Filamentous Algae:
None – Present – Moderate - Abundant

Main land use u/s:
Pasture, Urban, Bog, Tillage, Forestry, Other

Sample retained: Y / N

Shading: High – Moderate – Low - None

Cattle access Y: upstream – downstream or N

Photo: Y / N

Sewage Fungus:
None – Present – Moderate - Abundant

Sampled in Minutes:
Pond net x
Stone wash x
Weed sweep x

General Comments:

Macroinvertebrate Composition

The macroinvertebrates are divided into the following 5 specific groups:

- Group 1 = Ephemeroptera (3-tails) – note that tails may be damaged during sampling
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- Group 5 = *Asellus*
- Calculate the total number of taxa and relative abundance of each macroinvertebrate group below: (Abundance – Ab)

Relative Abundance	
1-5	1
6-20	2
21-50	3
51-100	4
101+	5

Ephemeroptera:		Plecoptera:	
Ecdyonurus Ab		*Leuctra* Ab	1
Rhithrogena Ab		*Isoperla* Ab	
Heptagenia Ab		*Protonemura* Ab	1
Ephemerella Ab		*Amphinemura* Ab	1
Caenis Ab		*Nemoura* Ab	
Paraleptophlebia Ab		*Diinocras* Ab	
Ephemera danica Ab		Other Plecop Ab	
Other Ephem Ab		Other Plecop Ab	
Total no. of taxa: 0	Total Relative Abundance	Total no. of Taxa: 3	Total Relative Abundance: 3

Trichoptera:		G.OL.D:			
Hydropsychidae Ab		*Lymnaea* (G) Ab		Chironomidae (D) Ab	1
Polycentropodidae Ab		*Potamopyrgus* (G) Ab		*Chironomus* (D) Ab	
Rhyacophila Ab		*Planorbis* (G) Ab		Simulidae (D) Ab	1
Philopotamidae Ab		*Ancylus* (G) Ab		*Dicranota* (D) Ab	
Limnephilidae Ab		*Physa* (G) Ab		Tipulidae (D) Ab	
Sericostomatidae Ab		*Lumbriculus* (Ol) Ab		Ceratopogonidae (D) Ab	
Glossosomatidae Ab		*Erpobdella* (Ol) Ab		Other GOLD Ab	
Lepidostomatidae Ab		*Tubificidae* (Ol) Ab			
Other Trichoptera Ab					
Total no. of Taxa: 0	Total Relative Abundance	Total no. of Taxa: 2	Total Relative Abundance: 2		

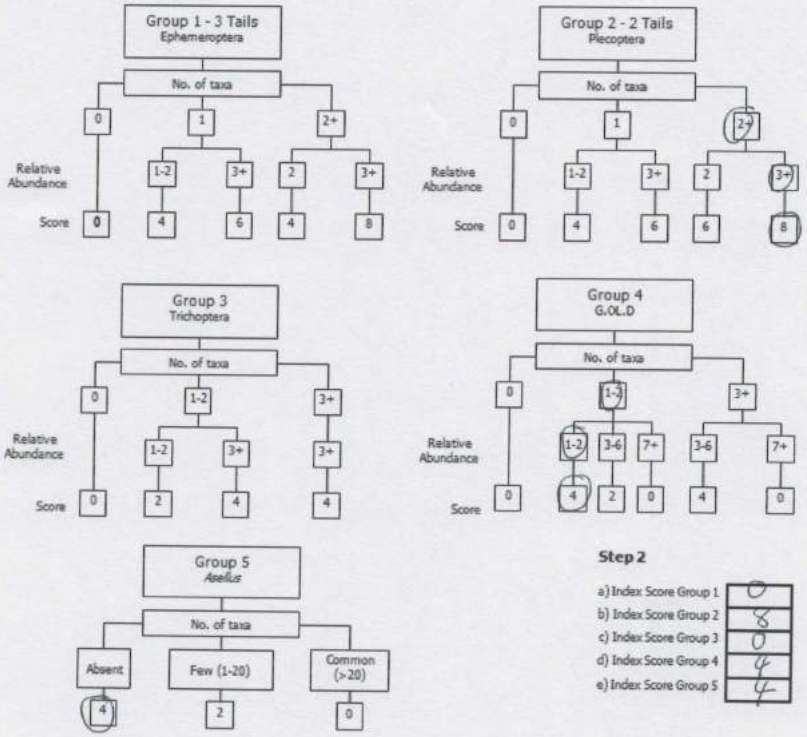
Asellus: Absent 0; Few (1-20); Common (>20)

NOTE: *Asellus* must be recorded as absent if none are found

NOTE *Baetis* is an Ephemeropteran and is the most commonly occurring invertebrate genus in streams in Ireland. It is vital that *Baetis* is not counted in SSRS. See Appendix B for more details on how to identify *Baetis*.

PP3

Step 1. Calculate the Index Score by circling the appropriate box representing the total number of taxa and the total abundance calculated from ***each macroinvertebrate group*** calculated from page 1 of the recording sheet and enter in to the boxes in Step 2.



Step 2

a) Index Score Group 1	0
b) Index Score Group 2	8
c) Index Score Group 3	0
d) Index Score Group 4	4
e) Index Score Group 5	4

Step 3. Calculate the Total Index Score, the Average Index Score and the SSR Score using the boxes below

Total Index Score (TIS) sum (a+b+c+d+e) **16**

Average Index Score (AIS) TIS/5 (5 for 5 groups) **3.2**

SSR Score (AIS x 2) **6.4**

Step 4. Assess the stream by comparing the final SSR score with the categories below and tick the appropriate box

> 7.25 Probably not at risk	> 6.5 – 7.25 Indeterminate Stream may be at risk	<6.5 Stream at risk
☐	☐	✓

Surveyor (signed): _____ Name (print): CARL DIXON Date: ____/____/____