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## A487 New Dyfi Bridge

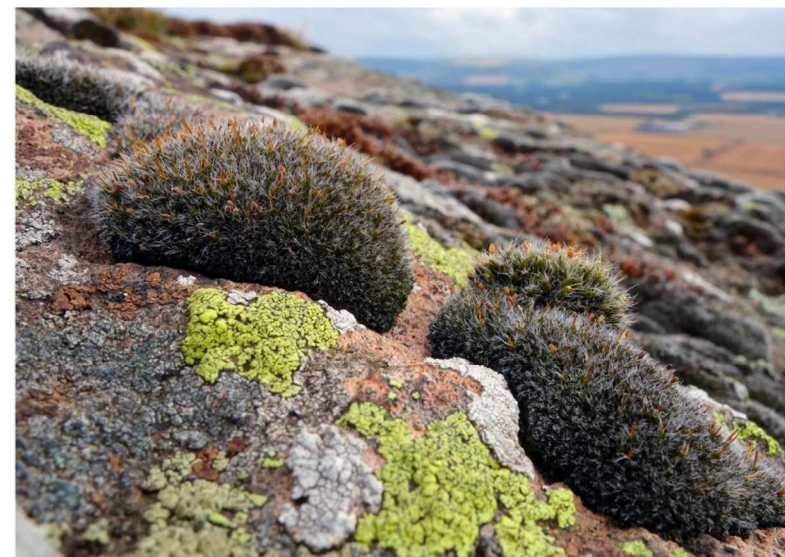
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Bryophyte Survey Reports

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**A487 New Dyfi Bridge:  
Bryophyte Survey and Assessment**





**Authored by:** Dr Des Callaghan

**Date:** 02 February 2016

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# INTRODUCTION

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## Objectives

The author was requested by Arup to undertake a bryophyte survey within the zone of influence of the proposed new bridge over the Afon Dyfi, Machynlleth. The objectives are to: (i) compile an inventory of the bryophyte species present; (ii) accurately document the locations of any species of conservation concern; (iii) assess the possible effects of the proposed scheme on any species of interest; and (iv) propose possible mitigation and compensation measures as needed.

## Previous bryophyte surveys

Within the national records database of The British Bryological Society, the hectad within which the survey area is located (SH70) is associated with 1733 bryophyte records, the product of casual recording by bryologists such as Bates (2015). Only one of these can be localised to the present survey area, which is not of conservation significance (*Epipterygium tozeri*). *Fissidens polyphyllus*, a scarce oceanic, has been mentioned in the context of the present development proposal, of which the closest known populations are in small freshwater streams 4 km north, near Esgairgeiliog. There are no previous professional bryophyte surveys of the study location.

## Nomenclature

Nomenclature follows Blockeel *et al.* (2014).

## METHOD

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### Species of conservation concern

The present survey and assessment is focused on the detection of species of conservation concern within the survey area. These are considered to be any of the following:

- Species listed on Annex II of Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora ('The Habitats Directive').
- Species listed on Schedule 8 of the Wildlife and Countryside Act 1981 (as amended).
- Species listed on Section 42 of The Natural Environment and Rural Communities (NERC) Act 2006 (as amended).
- Species listed on the IUCN World Red List (IUCN, 2015)
- Species included on the UK Red List (Hodgetts, 2011).
- Species included on the Welsh Red List (Bosanquet and Dines, 2011).
- Nationally rare species, recorded from  $\leq 15$  hectads (10 km grid squares) in Britain  $\geq 1970$  (Preston, in prep.).
- Nationally scarce species, recorded from 16-100 hectads (10 km grid squares) in Britain  $\geq 1970$  (Preston, in prep.).
- Uncommon oceanic species – Oceanic species (Hill and Preston, 1998) that are scarce in Wales.

### Field survey

Fieldwork was undertaken on 23 January 2016. Survey conditions were very good and the river level was about average for the time of year, and not too high for survey. The survey area was walked across and a search ('look-see' survey) of the most promising habitat for bryophytes was made, during which an inventory of species found was compiled. The route followed is shown in Figure 1. Most species were identifiable in the field with a 20x lens, but samples of critical taxa were collected for microscopic determination. Geographic locations of notable species were collected with a hand-held GPS unit (Garmin GPSMAP 62, Garmin Ltd, Schaffhausen, Switzerland) that was connected to the European Geostationary Navigation Overlay Service (EGNOS), providing a typical accuracy of about 3 m.



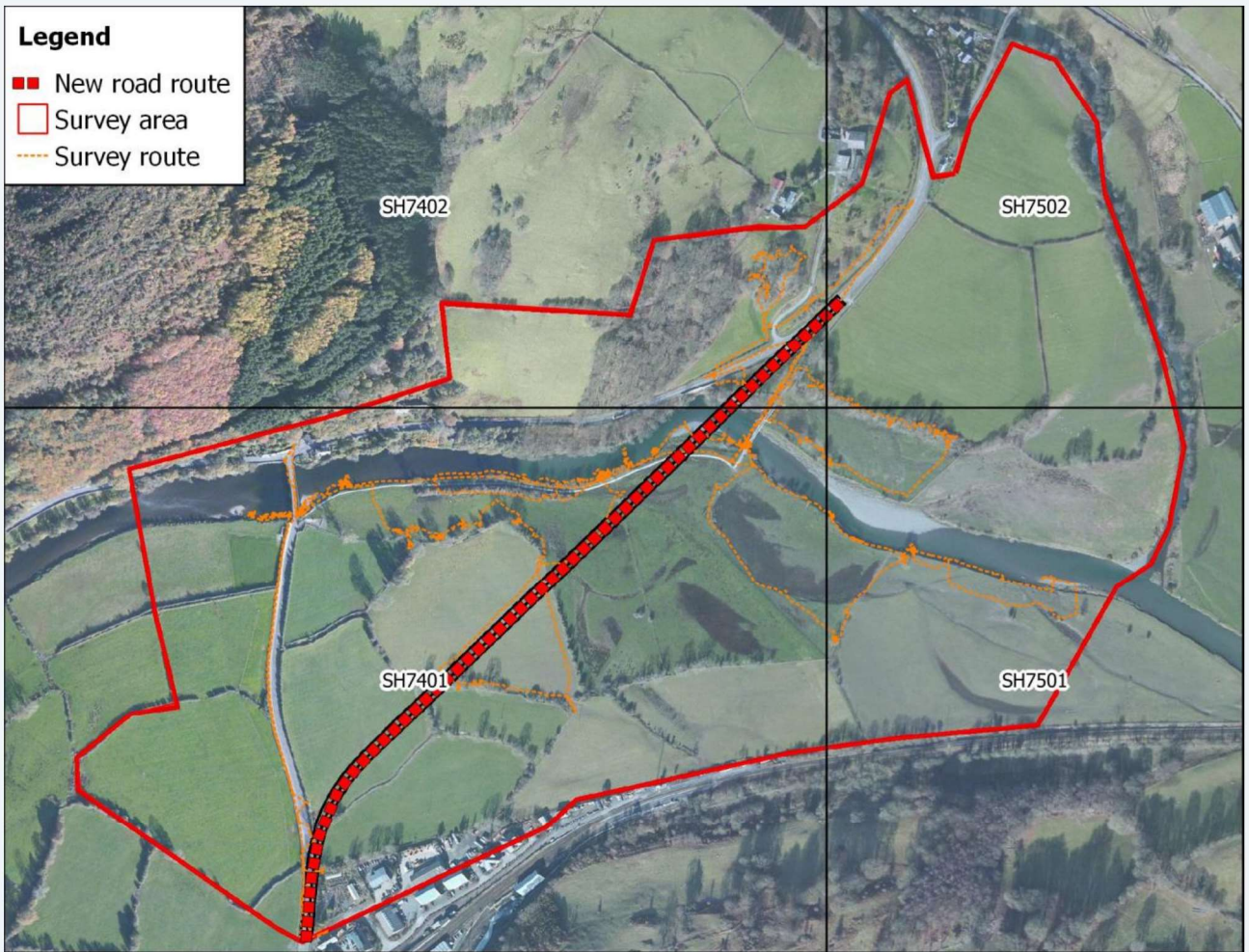


Figure 1. Survey route.

## RESULTS AND DISCUSSION

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### Survey coverage

Much of the survey area is very poor for bryophytes, comprising improved and intensively managed agricultural grassland. A large proportion of the most promising habitat, mostly along the river corridor, was accessed and searched carefully.

### Species inventory

A total of 109 mosses and liverworts were recorded within the survey area (Appendix 1). One of these, *Dicranella crispera*, is of conservation concern, the remainder being of no significant interest.

### Species of conservation concern

*Dicranella crispera* (Curl-leaved Forklet-moss)

A rare colonist of bare ground in a variety of open habitats, *Dicranella crispera* appears to have undergone a significant decline in Britain and in recent years has been recorded very rarely (Blockeel *et al.*, 2014). It has been recorded in Wales only twice, in 1911 at Morfa Dyffryn (Merionethshire) and in 2009 at Tylcau Hill (Radnorshire), and is included on the Welsh Red List as 'Endangered' (Bosanquet & Dines, 2011). Morfa Dyffryn has been surveyed many times by competent bryologists since 1911 and *D. crispera* has never been seen again, suggesting it has become extinct. The discovery of a new Welsh population within the present survey area is therefore of significant conservation interest.

*Dicranella crispera* is a species unknown to British bryologists due to its extreme rarity. When it was found in the field during the present survey, it was presumed to be the commoner look-alike species, *D. subulata*. A small sample was collected and inspected under the microscope, which suggested it was in fact *D. crispera*. The sample was sent to the National Moss Recorder of The British Bryological Society (T.L. Blockeel), who agreed with the identification. The material was collected from an eroding bank of the river, close to the current road bridge (Figure 1). The only other surviving Welsh colony, at Tylcau Hill, was noted from similar habitat ("on soil on streambank"). Almost certainly, it will be present at other locations within the survey area and there is a reasonable likelihood that it is present on river banks within the area where the proposed new bridge will cross the Afon Dyfi. Notable bryophytes are normally mapped in detail during the course of the main bryophyte survey, but in exceptional circumstances, such as presently, it is not reasonably possible.





Figure 2. Eroding soil bank beside the Afon Dyfi at the location where *Dicranella crispa* was found (SH7447501916).

#### *Fissidens polyphyllus* (Many-leaved Pocket-moss)

This scarce oceanic has been mentioned in the context of the current development proposal and was one of the target species during the survey. It is a large moss that is easily detected in the field and was not seen during the present survey. Colonies are most often seen on rocks by streams and waterfalls in oceanic woodland, habitat that is absent from the survey area. The nearest known colonies are 4 km north, near Esgairgeiliog. There is no reasonable likelihood of the plant occurring within the present survey area.

#### Impact assessment

There is no reasonable likelihood of any significant impact on any bryophyte species of conservation concern, with the possible exception of *Dicranella crispa*.

#### Mitigation

Mitigation measures may be needed with regards to *Dicranella crispa*, though at present insufficient information is available.

#### Recommendations

1. *Dicranella crispa* survey

Within the area where the proposed bridge would cross the Afon Dyfi, there is potential habitat for *Dicranella crispa*. A detailed species-specific survey of *Dicranella crispa* should

be undertaken, to include an accurate map of its distribution using GPS coordinates of colonies and a clear description of its occupied niche. The results should be used to consider possible impacts upon the population from the scheme and, if needed, mitigation proposals.



## ACKNOWLEDGEMENTS

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Many thanks to Angharad Owen (Arup) for managing the contract.

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## APPENDIX 1 – SPECIES INVENTORY

The below provides an inventory of the bryophytes seen within the survey area. Overall abundance is estimated as follows: R – Rare; O – Occasional; LF – Locally Frequent; F – Frequent; LA – Locally Abundant; A – Abundant.

Species	SH7401	SH7402	SH7501	SH7502	Frequency
<i>Amblystegium serpens</i> var. <i>serpens</i>	x				LO
<i>Atrichum undulatum</i>	x	x	x	x	F
<i>Barbilophozia barbata</i>		x			VR
<i>Barbula convoluta</i> var. <i>sardoa</i>	x				R
<i>Barbula unguiculata</i>	x			x	R
<i>Brachythecium rivulare</i>		x			R
<i>Brachythecium rutabulum</i>	x	x	x	x	F
<i>Bryum argenteum</i>	x			x	O
<i>Bryum capillare</i>	x	x	x	x	F
<i>Bryum dichotomum</i>	x	x	x	x	F
<i>Bryum pallescens</i>	x				VR
<i>Bryum rubens</i>	x				R
<i>Calliergonella cuspidata</i>	x	x	x	x	F
<i>Calliergonella lindbergii</i>		x			VR
<i>Calyptogeia muelleriana</i>			x	x	O
<i>Campylopus introflexus</i>	x	x	x		O
<i>Ceratodon purpureus</i>	x	x	x		F
<i>Cinclidotus fontinaloides</i>	x		x		LF
<i>Cirriphyllum piliferum</i>			x	x	R
<i>Cololejeunea minutissima</i>	x				R
<i>Conocephalum salebrosum</i>	x				R
<i>Cryphaea heteromalla</i>	x		x		O
<i>Dichodontium pellucidum</i>	x				O
<i>Dicranella crispa</i>	x				?
<i>Dicranella heteromalla</i>	x	x	x	x	F
<i>Dicranella rufescens</i>	x		x		LO
<i>Dicranella staphylina</i>	x				VR
<i>Dicranoweisia cirrata</i>		x			VR
<i>Dicranum scoparium</i>		x			VR
<i>Didymodon fallax</i>	x				R
<i>Didymodon insulanus</i>	x	x		x	O
<i>Didymodon nicholsonii</i>	x				VR
<i>Didymodon rigidulus</i>	x				VR
<i>Diplophyllum albicans</i>	x	x	x	x	F
<i>Epipterygium tozeri</i>	x				VR
<i>Eurhynchium striatum</i>			x	x	O
<i>Fissidens adianthoides</i>		x	x		O
<i>Fissidens bryoides</i> var. <i>bryoides</i>	x		x		LF
<i>Fissidens taxifolius</i> var. <i>taxifolius</i>	x	x	x		F
<i>Fontinalis antipyretica</i>	x				VR
<i>Fontinalis squamosa</i> var. <i>squamosa</i>			x		VR
<i>Fossombronia pusilla</i>	x		x		O
<i>Frullania dilatata</i>	x	x	x	x	F
<i>Funaria hygrometrica</i>		x			VR
<i>Grimmia pulvinata</i>	x	x			O
<i>Grimmia trichophylla</i>		x			VR
<i>Homalia trichomanoides</i>				x	VR
<i>Homalothecium sericeum</i>	x				R
<i>Hygroamblystegium fluviatile</i>	x		x		LO
<i>Hypnum andoi</i>	x				R
<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>	x	x	x		F
<i>Hypnum cupressiforme</i> var. <i>resupinatum</i>		x			R
<i>Hypnum jutlandicum</i>	x	x		x	F
<i>Isothecium alopecuroides</i>	x				R
<i>Isothecium myosuroides</i> var. <i>myosuroides</i>	x	x	x	x	F
<i>Kindbergia praelonga</i>	x	x	x	x	LA

Species	SH7401	SH7402	SH7501	SH7502	Frequency
Lejeunea lamacerina	x		x		O
Leptodictyum riparium	x				R
Leskea polycarpa	x				R
Lophocolea bidentata	x				R
Lunularia cruciata	x		x		R
Metzgeria furcata	x	x	x	x	F
Mnium hornum	x	x			O
Oligotrichum hercynicum	x				LO
Orthotrichum affine	x	x	x	x	F
Orthotrichum diaphanum			x		R
Orthotrichum lyellii	x				LO
Orthotrichum striatum	x		x		O
Orthotrichum tenellum	x		x		O
Oxyrrhynchium hians	x	x	x	x	F
Pellia epiphylla	x	x	x	x	F
Plagiochila porelloides		x			VR
Plagiomnium undulatum	x		x		O
Plagiothecium succulentum			x		R
Pogonatum aloides	x	x	x	x	LF
Pogonatum urnigerum		x			R
Pohlia annotina	x		x		LO
Pohlia camptotrachela	x				VR
Pohlia nutans	x				VR
Polytrichastrum formosum	x	x	x	x	F
Polytrichum juniperinum		x			R
Polytrichum piliferum		x			R
Pseudocrossidium hornschurchianum	x				R
Pseudoscleropodium purum		x			R
Pseudotaxiphyllum elegans		x	x		O
Ptychomitrium polyphyllum		x			VR
Racomitrium aciculare	x	x	x		LF
Racomitrium fasciculare	x	x			R
Racomitrium lanuginosum		x			VR
Rhynchostegium confertum	x		x		O
Rhytidiadelphus loreus		x			VR
Rhytidiadelphus squarrosus	x	x	x	x	LA
Scapania undulata	x				R
Schistidium crassipilum	x				R
Sciuro-hypnum plumosum	x		x		LF
Scleropodium cespitans	x				VR
Solenostoma gracillimum	x		x		LO
Syntrichia latifolia	x				VR
Syntrichia papillosa	x				VR
Thamnobryum alopecurum	x	x	x		LF
Thuidium tamariscinum	x	x			LF
Tortula muralis	x				LF
Tortula truncata	x				VR
Ulota bruchii	x		x		O
Ulota crispa	x				R
Ulota phyllantha	x	x	x		F
Weissia controversa var. controversa	x				R
Zygodon conoideus var. conoideus	x	x	x		LF
Zygodon viridissimus var. viridissimus			x		R





**A487 New Dyfi Bridge:  
Survey and Assessment of Curl-leaved Forklet-moss**





**Authored by:** Dr Des Callaghan

**Date:** 18 April 2016

**Disclaimer**

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## INTRODUCTION

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On 23 January 2016, the author undertook a bryophyte survey and assessment of an area within the zone of influence of the proposed new A487 road bridge over the Afon Dyfi, near Machynlleth (Callaghan, 2016). The rare Curl-leaved Forklet-moss (*Dicranella crispa*) was found during that survey on an eroding riverside bank close to the current road bridge. A rare colonist of bare ground in a variety of open habitats, this species appears to have undergone a significant decline in Britain and in recent years has been recorded very rarely (Blockeel *et al.*, 2014). Up until its discovery on the Afon Dyfi, it had been recorded in Wales only twice, in 1911 at Morfa Dyffryn (Merionethshire) and in 2009 at Tylcau Hill (Radnorshire), and is included on the Welsh Red List as 'Endangered' (Bosanquet & Dines, 2011). Morfa Dyffryn has been surveyed many times by competent bryologists since 1911 and *D. crispa* has never been seen again, suggesting it has become extinct. The discovery of a new Welsh population within the present survey area was therefore of significant conservation interest.

The objectives of this Phase 2 survey are to: (i) accurately document the distribution of the *Dicranella crispa* population; (ii) describe the habitat requirements of the population; (iii) assess the possible effects of the proposed scheme on the population; and (iv) propose possible mitigation and compensation measures as needed.

Nomenclature follows Blockeel *et al.* (2014).



Figure 1. View down the Afon Dyfi from the current road bridge.



## METHOD

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### Field survey

Fieldwork was undertaken on 17 April 2016. Survey conditions were very good and the river level was about average for the time of year. The survey area was searched for the species ('look-see' survey) and locations were logged with a hand-held GPS unit (Garmin GPSMAP 62, Garmin Ltd, Schaffhausen, Switzerland) that was connected to the European Geostationary Navigation Overlay Service (EGNOS), providing a typical accuracy of about 3 m. Photographs of locations were also collected.

## RESULTS AND DISCUSSION

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### Survey coverage

Whilst some lengths of the river bank were not accessible for close inspection, most could be accessed and good survey coverage was achieved.

### Habitat and distribution

*Dicranella crispera* is entirely limited within the survey area to the vertical, actively eroding river banks of the Afon Dyfi (Figure 3). The soil on which it grows is an acidic to circum-neutral clayey silt and a range of associates occur (Figure 4), the most consistent being *Dicranella heteromalla*, *Pogonatum aloides* and *Pohlia annotina*. The only other notable bryophyte found was the nationally scarce *Weissia rutilans*, seen at just one spot, the first record for Montgomeryshire.

The distribution of *Dicranella crispera* and *Weissia rutilans* within the survey area is illustrated in Figure 5. GPS coordinates are provided in Appendix 1. The largest sub-populations of *D. crispera* occur in the west (around SH74020172) and east (around SH75240185) of the survey area, where the eroding river banks are tallest and longest.



Figure 2. Typical habitat of *Dicranella crispera* within the survey area, where it is confined to the actively eroding banks of the Afon Dyfi. SH74040173.





Figure 3. Strong fruiting patch of *Dicranella crista*, together with young *Atrichum undulatum*, *Pellia epiphylla* and *Pohlia annotina*.



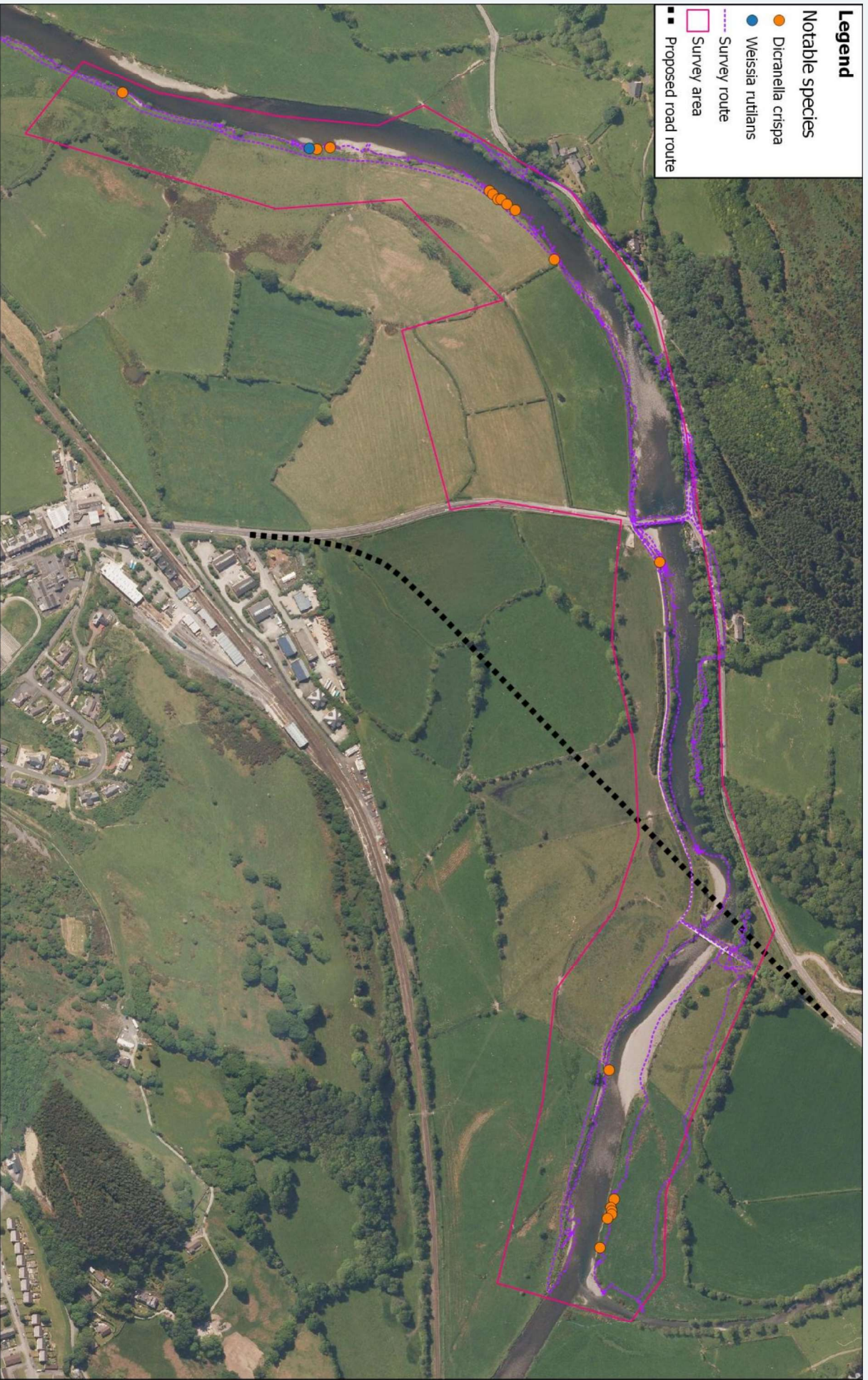


Figure 4. Distribution of *Dicranella crispera* and *Weissia rutilians* within the survey area.

### **Impact assessment**

No colonies of *Dicranella crispera* or *Weissia rutilans* occur within close vicinity to the proposed development and the development will not have any effect on the habitat of these plants. There is therefore no reasonable likelihood of any significant impact on the species from the proposed scheme.

### **Mitigation**

No mitigation measures for *Dicranella crispera* or any other bryophyte species are considered necessary.

## ACKNOWLEDGEMENTS

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Many thanks to Angharad Owen (Arup) for managing the contract.



## REFERENCES

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- Preston, C. (in prep.). A revised list of nationally rare and scarce bryophytes. *Field Bryology*.

## APPENDIX 1 – GPS COORDINATES OF NOTABLE SPECIES

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Species	Location
Dicranella crispa	SH7390001266
Dicranella crispa	SH7396601516
Dicranella crispa	SH7396801500
Dicranella crispa	SH7401801708
Dicranella crispa	SH7402201712
Dicranella crispa	SH7402801718
Dicranella crispa	SH7402801722
Dicranella crispa	SH7403401729
Dicranella crispa	SH7404101739
Dicranella crispa	SH7410101786

Species	Location
Dicranella crispa	SH7446501913
Dicranella crispa	SH7507701852
Dicranella crispa	SH7523301858
Dicranella crispa	SH7524301854
Dicranella crispa	SH7524701855
Dicranella crispa	SH7525101855
Dicranella crispa	SH7525601850
Dicranella crispa	SH7529101841
Weissia rutilans	SH7396701491