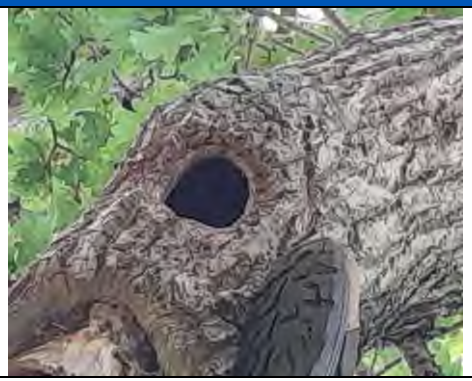
Tree Number	Feature Number	Feature Description	Feature Potential	Photograph
3 NGR: SJ21728 05475	1	Knot hole into hollowed stem on southern elevation.	High	
	2	Knot hole into hollowed stem on western elevation.	High	

Tree Number	Feature Number	Feature Description	Feature Potential	Photograph
	3	Knot hole on western elevation.	High	

4. Conclusions

4.1 Statutory Sites

The distance between this SAC and the proposed development Sites is considered great enough that no impacts to the SAC itself or bats using the SAC are anticipated.

4.2 Bats

Walls and Williams Bridges

No bat roosts were identified in the structures during the surveys and therefore the proposed works are unlikely to cause a breach in legislation at this time. However, given the presence of suitable features for crevice dwelling bats, precautionary supervision is recommended.

The structures would not typically be regarded as providing the protection from weather or provide the favourable temperature and humidity conditions required during the winter period. However, due to the uncertain nature of hibernation occurring in the *Pipistrellus* genus, unexpected incidences of hibernation could occur (Middleton, 2019).

No further survey effort is required in respect of commuting or foraging bats as no significant adverse effects are anticipated.

Wern and Red Lane

In total, 10 trees had features with potential for bats. Current proposals do not involve removal of any of these trees. The landscape is due to be changed to a wetland habitat, however, the majority of the trees are in raised areas and therefore impacts will be minimal. Should proposals change, further survey of these trees is required.

5. Recommendations

Table 3 details the recommendations that have been made following the surveys and desk study.

Table 3 Ecological Recommendations

Ecological Receptor	Recommendation
Bats	**Walls and Williams Bridges** As a precautionary measure for Williams Bridge, it is recommended that the works to the bridges avoid the core bat hibernation period (December-February, inclusive) and that demolition of the bridge is supervised by an ecologist. No further recommendations for Walls Bridge are given. **Wern and Red Lane** If any tree pruning or removal is planned to Trees with moderate or high bat potential features, further survey effort may be required, and an ecologist should be contacted to determine the approach.
Nocturnal Wildlife / Lighting	If additional lighting (temporary or permanent) is a requirement, a lighting plan should be produced and reviewed by an ecologist prior to installation to assess the potential impacts on commuting and foraging bats. The lighting should be designed in line with guidance (BCT & ILP, 2023).

This report and its conclusions are valid for a maximum period of **two years** from the survey date, unless there is a significant change to the proposed works or conditions of the trees / bridges.

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Appendix 1- Bat Legislation

In the United Kingdom (UK) all bat (*Chiroptera* spp.) species and their roosts are legally protected, by national legislation. This protection is detailed in the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2019 (as amended).

Together these pieces of legislation make it a criminal offence to:

- Deliberately take, injure or kill a wild bat;
- Intentionally or recklessly disturb a bat in its roost or deliberately disturb a group of bats;
- Damage or destroy a place used by bats for breeding or resting (roosts) (even if bats are not occupying the roost at the time);
- Possess or advertise/ sell/ exchange a bat of a species found in the wild (dead or alive) or any part of a bat; and,
- Intentionally or recklessly, obstruct access to a bat roost.

Seven species of bat (barbastelle (*Barbastella barbastellus),* Bechstein's (*Myotis bechsteinii)*, noctule (*Nyctalus noctula),* soprano pipistrelle (*Pipistrellus pygmaeus),* brown long-eared, greater horseshoe (*Rhinolophus ferrumequinum)* and lesser horseshoe (*Rhinolophus hipposideros*)) are also identified as Priority Species under Section 7 of the Environment Wales Act 2016. This places a strengthened biodiversity duty on public authorities, which includes water and sewerage undertakers to "conserve and enhance biodiversity" in the exercise of functions in relation to Wales.

Appendix G: White Clawed Crayfish eDNA Results

SureScreen Scientifics

Folio No: E18087
Report No: 1
Purchase Order: 12185
Client: APEM Ltd
Contact: Michael Underwood

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA SAMPLES FOR THE DETECTION OF CRAYFISH SPECIES AND CRAYFISH PLAGUE

SUMMARY

All organisms continuously release small amounts of environmental DNA (eDNA) into their habitat. By collecting and analysing this eDNA from water samples from lakes, ponds or rivers we can detect the presence or absence of crayfish species including: the white-clawed crayfish (Austropotamobius pallipes), signal crayfish (*Pacifastacus leniusculus*), the marbled crayfish (*Procambarus virginalis*) and the crayfish plague (*Aphanomyces astaci*).

RESULTS

Date sample received at Laboratory: 16/06/2023
Date Reported: 22/06/2023
Matters Affecting Results: None

Lab Sample ID.	Site Name	O/S Reference	Species	Result	SIC	DC	IC	Positive Replicates
FK1273	Williams Bridge	SJ 25359 19849	*White-Clawed Crayfish*	Negative	Pass	Pass	Pass	0
			Signal Crayfish	Positive	Pass	Pass	Pass	5
			Crayfish Plague	Negative	Pass	Pass	Pass	0
FK1274	Walls Bridge	SJ 26270 20814	*White-Clawed Crayfish*	Negative	Pass	Pass	Pass	0
			Signal Crayfish	Negative	Pass	Pass	Pass	0
			Crayfish Plague	Negative	Pass	Pass	Pass	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Chris Troth **Approved by:** Jennifer Higginbottom

METHODOLOGY

The analysis is conducted in two phases. The sample first goes through an extraction process where the filter is incubated in order to obtain any DNA within the sample. The extracted sample is then tested via real time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species: white-clawed crayfish, signal crayfish and crayfish plague, ensuring no DNA from any other species present in the water is amplified.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security. These methods have been extensively tested since 2015 in a number of different environments, habitats, conditions and ecological situations in order to successfully enable the full application of eDNA for the detection of crayfish species and the crayfish plague.

RESULTS INTERPRETATION

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of eDNA** [Positive/Negative/Inconclusive]
Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.
Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive. 0/12 indicates negative species presence.
Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.
Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

Appendix H: Plant Survey (Montgomery Canal)

Montgomery Canal Aquatic Plants Survey

Canal and River Trust

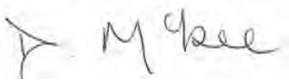
DRAFT FINAL November 2023

HABITAT WORKS

Habitat Works Ltd

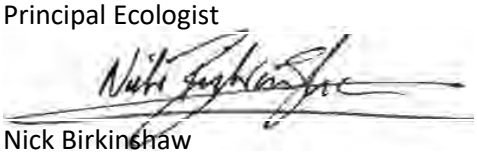
Report to:	Canal and River Trust
Report Title:	Montgomery Canal Aquatic Plants Surveys
Revision:	DRAFT FINAL
Issue Date:	30/11/2023
Document Ref:	0353/Montgomery Canal Aquatic Plants

Originated By:



Dermot McKee
Principal Ecologist Date: 24/11/2023

Reviewed By:



Nick Birkinshaw
Managing Director Date: 27/11/2023

Approved By:

Stuart Silver
Director Date: 28/11/2023

Prepared by:
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Westleigh House
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Huddersfield
HD8 8QJ

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1. Introduction

1.1 Background

1.1.1 The Montgomery canal is located in north-west Shropshire (England) and eastern Powys (Wales). It was built just over 200 years ago and was used primarily to transport lime for agricultural purposes. However, after a breach in 1936, it fell out of use and was officially abandoned in 1944. Although certain sections of the canal subsequently dried out, others remained filled because they were used for local drainage and water management and, as a result, the canal became an important site for aquatic plants and invertebrates. Today, half the canal has been restored and the majority of its length is designated for nature conservation by a Special Area of Conservation (SAC) and two Sites of Special Scientific Interest (SSSI).

1.1.2 The English section of the canal runs for approximately 12.4 km from the junction with the Llangollen canal at Lower Frankton to Pryces overbridge near Llnclys (and also for approximately 0.5 km to the east of the A483 road in Llanymynech). This includes Aston Locks - Keeper's Bridge SSSI (approximately 4.1 km (7.28 ha); SJ 35149 28717 to SJ 32862 25696). **Table 1** shows the description and reasons for notification of the SSSI. There are also a number of reserves although all of them, except Rednal Basin, are outside the SSSI.

1.1.3 Note that only plant common names are used in the main body of this report. A full plant species list, including scientific names, is given in **Appendix 1**.

Table 1. Aston Locks – Keeper's Bridge SSSI: description and reasons for notification.

Aston Locks – Keeper's Bridge SSSI
A disused length of canal which is among the best localities for aquatic plants in Shropshire. The site is also of importance in demonstrating aspects of the succession from open water to reed-swamp and fen. The Shropshire length of the canal is considered to be complementary to a section in Powys. This section of the canal is also considered to be a complementary site to the Meres of North Shropshire. It is richer in submerged and floating aquatic plants and contains some species which were formerly recorded in the meres but are no longer found in them. There are extensive areas of open water, with a range of submerged aquatic plants, including fan-leaved water-crowfoot and six species of pondweeds (curled pondweed, red pondweed, perfoliate pondweed, small pondweed, grass-wrack pondweed and fennel pondweed). Water-violet is locally common, and floating water-plantain, a rare species, has been found in recent years. Considerable areas of floating aquatic plant communities occur, dominated mainly by yellow water-lily, but containing also broad-leaved pondweed, frogbit, great duckweed and unbranched bur-reed. There are extensive areas of fringing reed-swamp, composed of reed sweet-grass, branched bur-reed, greater and lesser pond-sedge and yellow iris. Common reed is rare and confined to one area. Flowering-rush occurs in the reed-swamp. Adjacent to the canal are extensive areas of scrub and rough grassland which add to the diversity of the site.

1.1.4 The last condition assessment of Aston Locks – Keeper's Bridge was in 2013 and found both units of the SSSI to be in 'unfavourable – no change condition' (see https://designatedsites.naturalengland.org.uk). Reasons suggested for the adverse condition of the SSSI were fish stocking and public access and disturbance (presumably movement of boats).

1.1.5 The Welsh section of the canal runs for approximately 37.6 km from Llanymynech to north of Newtown. Here, the entire canal is the Montgomery SAC and SSSI (55.9 ha). An eastern section of the Guilsfield Arm is also included within the SAC/SSSI, as are several off-line reserves. **Table 2** shows the description and reasons for notification of the SAC/SSSI.

Table 2. Montgomery SAC/SSSI: description and reasons for notification.

Montgomery Canal SAC/SSSI
SAC Designated to conserve floating water-plantain, which is a European Protected Species listed on Schedule 5 of the Conservation of Habitats and Species Regulations 2017 (as amended). SSSI The Montgomery Canal is of special interest because it supports aquatic, emergent and marginal plant communities of exceptional richness, including a large population of the internationally rare and threatened floating water-plantain and several other rare and scarce water plants. An important aquatic invertebrate assemblage is also present. The aquatic plant communities of the canal are unusually species rich. The submerged vegetation is characterised by pondweeds, including perfoliate pondweed and lesser pondweed and the nationally scarce grass-wrack pondweed. Other notable aquatic plant species include autumnal water-starwort, flat-stalked pondweed and long-stalked pondweed, which are rare in mid-Wales. Floating plants are prominent locally, including yellow water-lily and various species of duckweed. The locally rare greater duckweed occurs in places and floating water-plantain is found along the entire length of the SSSI. The emergent and marginal vegetation is also diverse and well-developed. Dominant marginal species include reed sweet-grass, bullrush and branched bur-reed, with a wide range of associated species, including yellow iris and the locally rare flowering-rush, sweet-flag and tubular water-dropwort. The canal supports a wide range of dragonfly and damselfly species, including the nationally scarce club-tailed dragonfly *Gomphus vulgatissimus* as well as the white-legged damselfly *Platycnemis pennipes* and red-eyed damselfly *Erythromma najas*, which are uncommon species in Wales. Willow and alder carr have developed in association with former borrow pits alongside Wern embankment and these provide habitat for species such as kingfisher *Alcedo atthis* and grass snake *Natrix natrix*. Otters *Lutra lutra* frequently use the canal for feeding purposes particularly where close to major rivers.

1.1.6 The last condition assessment of the Montgomery Canal SSSI found it to be in 'unfavourable – no change' condition (Ecus, 2014).

1.2 Restoration

1.2.1 There are plans to restore the entire Montgomery Canal (Montgomery Canal Partnership 2005, 2016). The first phase of the project is to link the navigable length of canal at Welshpool through to the southern section of the English length at Gronwen Wharf, with the southern terminus of the canal being taken to Berriew. Currently, dredging is scheduled for 2023/2024 along the 7 km length of canal between Llanymynech and Arddleen. The aim will be to create a channel suitable for navigation and to restore ecological conditions suitable for key submerged aquatic plants.

1.3 Brief

1.3.1 Habitat Works was commissioned by the Canal & River Trust in June 2022 to carry out an aquatic plants survey of the Montgomery Canal. The survey aimed to achieve the following objectives:

- identify and map aquatic plants throughout the canal
- assess the current condition of the canal SSSIs and SAC.

1.3.2 The survey results will be used to inform restoration plans for the canal. In particular, they will be used for Habitats Regulations Assessment. They will also provide important information for any required mitigation and/or compensation works including the potential translocation of plants between different areas of the canal.

2. Methodology

2.1 Common Standards Monitoring

2.1.1 The condition of SSSIs and SACs in England and Wales is primarily assessed using Common Standards Monitoring guidance. The guidance for canals was used here (JNCC, 2005). A suite of attributes and associated targets was employed to evaluate the features of the canal and associated reserves. For consistency this was done for every section of the canal and every reserve.

2.1.2 Surveys were carried out in August (22nd, 23rd, 24th, 25th) and September (1st, 2nd, 6th, 9th) 2022 by Nick Birkinshaw (ACIEEM) and Dermot McKee (ACIEEM; Natural England floating water-plantain survey licence holder: 2022-62537-SCI-SCI; accredited under Natural Resources Wales floating water-plantain survey licence number S091401/1). Weather conditions were good throughout and there were no limitations with regard to access.

Section and Site Locations

2.1.3 The canal was divided into fifty survey sections, each of approximately one kilometre length. Within each section a representative site of 150 m length was chosen for more detailed examination. The locations of the sections and sites are shown in **Figures 1 and 2a-c**, with grid references given in **Appendix 2**[1]. Photographs of each site are shown in **Appendix 3**.

Section Survey

2.1.4 Each section was slowly walked using binoculars to view the off-side where necessary. All aquatic plants were noted and identified to species level where possible. A grapnel was used to retrieve samples for identification, mindful of the possible presence of floating water-plantain and other rare plants (Clarke, 2009). An estimate of the abundance of two vegetation categories, emergent and floating-leaved/submerged, was made using a modified version of the DAFOR scale:

D = dominant (>70% cover)

A = abundant (30-70% cover)

F = frequent (10-30% cover)

O = occasional (3-10% cover)

R = rare (<3% cover).

VR = very rare (present but extremely low cover).

2.1.5 Other variables recorded were:

water availability

Secchi disk depth

cover of filamentous algae and *Lemna*/*Azolla* sp.

amount of shading

presence of invasive non-native species

[1] Briggs (1988) divided the canal into 56 one-kilometre sections from north to south to include the entire historic route. We only considered those parts of the canal containing water. Our sections correspond well with those of Briggs (1988) for the English part of the canal. However, in Wales, they diverge. This is shown in Appendix 2.

bank type

channel profile

recreational use

fish biomass

sediment type and quantity.

Site Survey

2.1.6 Within each site, ten grapnel throws were additionally used to provide further investigation of submerged plants. The throws were made at approximately equal intervals over the 150 m length of the site.

2.2 Reserves Survey

2.2.1 The reserves were surveyed using common standards methodology as described above. The locations of the reserves are shown in **Figures 1 and 2a-c**, with grid references given in **Appendix 2** and photographs in **Appendix 3**.

2.3 Floating Water-Plantain Key Populations

2.3.1 Following survey of the entire canal in 2022, seven key populations of floating water-plantain were identified. These populations were mapped in greater detail in July 2023 (11th, 12th) by Nick Birkinshaw (ACIEEM) and Dermot McKee (ACIEEM; Natural England floating water-plantain survey licence holder: 2022-62537-SCI-SCI; accredited under Natural Resources Wales floating water-plantain survey licence number S091401/1). Weather conditions were good throughout and there were no limitations with regard to access.

2.3.2 Mapping involved making a sketch of the distribution of all readily visible plants within a chosen section of the canal. A hand-held Garmin GPS unit and a 30 m bankside measuring tape were used to give accuracy to the field maps. These maps were then digitised to provide a georeferenced record for future monitoring and assessment.

2.4 Limitations

2.4.1 The survey was carried out during the optimal season for detecting aquatic plant species. Weather conditions were good and water clarity was good. We are therefore confident that an accurate assessment of the composition and abundance of the aquatic plant community has been made. However, it is possible that small individuals and/or very rare species may have been missed, particularly where the channel was choked with emergent vegetation or other floating or submerged species e.g. species of duckweed, Nuttall's waterweed and filamentous green algae.

3. Results

3.1 General Observations

3.1.1 Full survey data for all sections, sites and reserves are shown in **Appendix 4a-d**. A summary is presented below.

Floating Water-Plantain

3.1.2 Floating water-plantain was not recorded in England. The citation for Aston Locks – Keeper's Bridge SSSI says that the species was found 'in recent years', but this statement dates from 1986 and it would seem that, now, the population either does not exist or consists of so few individual plants that it is routinely undetectable.

3.1.3 Across the SAC in Wales, floating water-plantain was widespread and locally abundant in places. It was recorded in twenty-five of the thirty-seven sections (**Figure 3a-c**; **Appendix 5**).

SSSI Notable Species

3.1.4 No notable species mentioned in the citation for Aston Locks - Keeper's Bridge SSSI were recorded within the SSSI. However, grass-wrack pondweed was found in ponds 3 and 4 of the adjacent Aston Locks (Old) reserve, where it was rare and frequent respectively; and in pond 2 of Aston Locks (New) reserve where it was locally abundant. Water violet occurred in pond 3 of Aston Locks (New) reserve where it was locally abundant. In addition, the nationally endangered long-stalked pondweed occurred as very rare in section 8, at the southern end of the SSSI (**Figure 4a**; **Appendix 5**). Red pondweed has been recorded both in 2021 when it was collected for propagation and again in 2022 as part of other survey activity (Spelling. J. *pers comms*) and it is considered likely to be still present but at very low density and undetected during the 2022 CSM survey. The locations of the red pondweed recorded by J. Spelling was between locks 2 and 3 and opposite the Lock Keepers Cottage at Aston. Floating water-plantain was not recorded and considered likely be absent.

3.1.5 Of the five species of pondweed mentioned in the citation for Montgomery SSSI, grass-wrack pondweed, flat-stalked pondweed and long-stalked pondweed were present, being recorded as rare to very rare (**Figure 4b-c**; **Appendix 5**). At least one water-starwort was recorded but following current best taxanomic practice it was not possible to accurately identify material to species level due to the lack of fruiting bodies. Although most specimens were almost certainly common water-starwort *Callitriche stagnalis*, it is considered likely from the plant material recorded that autumnal water-starwort *C. autumnalis* and intermediate water-starwort *C. hamulata* were present. Greater duckweed was recorded once, in section 16, where it was rare. Tubular water-dropwort was not recorded.

Floating-leaved/Submerged Plant Community

3.1.6 Cover of floating-leaved/submerged plant communities was rare to occasional in all English sections of the canal except section 13, where it was abundant. With the exception of section 13 this length of canal is subject to boating activity. At least sixteen species were recorded (see **Appendix 1** for list). Frogbit, yellow water-lily and broad-leaved pondweed occurred relatively frequently throughout but all other species were infrequent.

3.1.7 In the English reserves floating-leaved/submerged plant communities were prominent, and cover was generally high, ranging from frequent to dominant. Nuttall's waterweed was found everywhere except the Weston Arm and Aston Locks (New) pond 3, and frogbit was also widespread. Other species, however, were infrequent.

3.1.8 In Wales, floating-leaved/submerged cover was frequent to dominant in most sections of the

canal. At least twenty-three species were recorded (see **Appendix 1** for list). Nuttall's waterweed occurred in all sections and in the Wern and Brithdir reserves. Frogbit was prominent in reserves and in the canal up to section 40, after which it was not recorded. Other species, including duckweed species and yellow water-lily, were patchily distributed throughout the length of the canal. The pondweed community was most diverse towards the northern end of the canal but was nowhere frequent. Towards the southern end it almost disappeared. In contrast, water-starwort spp. were almost absent towards the northern end but became relatively more prominent in the south. Floating water-plantain was not found in any of the reserves but was widespread in the canal in Wales.

Filamentous Algae/Lemna

3.1.9 Cover of filamentous algae and duckweed species was so low it was recorded as absent or negligible in the first eleven English sections of the canal. It was notably higher in section 12 at approximately 20% cover and then became much lower again at approximately 2% cover in section 13. In the English reserves common duckweed was prominent in the Weston Arm (100% cover) and least duckweed/ivy-leaved duckweed were prominent in Rednal Basin (90% cover in combination with filamentous algae). In the other reserves duckweeds were generally absent and, apart from Aston Locks (New) pond 3, filamentous algae cover was relatively low.

3.1.10 In the Welsh sections of the canal cover of filamentous algae and duckweed species was often much greater, particularly towards the southern end of the canal. In seventeen of thirty-seven sections there was 50 – 80% cover. This may reflect significantly reduced water flow in the Welsh sections of the canal, in combination with greater nutrient input and/or nutrient retention in the water column and sediment. In the reserves cover was also high, at 50-70% (in Guilsfield Arm and the Welshpool in channel reserve there was very little water but what was there was all more or less covered in duckweed).

Emergent Plant Community

3.1.11 In English sections of the canal the emergent community was generally abundant and rather uniform. Twenty species were recorded (see **Appendix 1** for list). Reed sweet-grass, hemlock water-dropwort and reed canary-grass were ubiquitous and greater tussock-sedge, yellow iris, water mint, and water dock were present in almost all sections and reserves.

3.1.12 The emergent community in the Welsh sections of the canal was similar to the community in England, with a cover that was frequently abundant to dominant (reflecting absence of boat movement and dredging of the channel). Twenty-two species were recorded (see **Appendix 1** for list). Reed sweet-grass was ubiquitous and hemlock water-dropwort was present in almost all sections and reserves. Unlike in England, lesser water-parsnip was found almost everywhere but reed canary-grass was not prominent. Other relatively widespread species included yellow iris, water mint and unbranched and branched bur-reed.

Invasive Non-Native Species

3.1.13 Two aquatic plant species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) were recorded. These were Canadian waterweed and Nuttall's waterweed.

3.1.14 Canadian waterweed was not recorded in England and Nuttall's waterweed was only recorded in sections 12 and 13. However, in these two sections it was abundant. Canadian waterweed was recorded in two sections (18 and 19) in Wales, where it was occasional. In contrast, Nuttall's waterweed was recorded in every Welsh section and was typically frequent to abundant.

3.1.15 Three terrestrial plant species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) were recorded in bankside vegetation. These were Japanese knotweed, Himalayan balsam and giant hogweed.

3.1.16 Japanese knotweed was recorded only in section 10 in England and giant hogweed only in sections 47 and 48 in Wales. Himalayan balsam was more widespread and was recorded in five English sections (8, 9, 10, 11, 12) and ten Welsh sections (14, 23, 24, 29, 45, 46, 47, 48, 49, 50).

3.2 Section Summaries

3.2.1 Full survey data for all sections, sites and reserves are shown in **Appendix 4**. A summary is presented below.

Section 1 (England)

3.2.2 The submerged/floating-leaved plant community was rare and was represented by a water-starwort species, amphibious bistort, broad-leaved pondweed and a fragment of a water-crowfoot species. There was no cover of filamentous algae/duckweed species.

3.2.3 The emergent community was abundant. Species present included greater tussock-sedge, greater pond-sedge, floating sweet-grass, reed sweet-grass, soft rush, water mint, hemlock water-dropwort, water dock, bittersweet, a bur-reed species and bulrush.

3.2.4 No invasive non-native species were recorded.

Section 2 (England)

3.2.5 The submerged/floating-leaved plant community was rare and was represented by frogbit, yellow water-lily and amphibious bistort. There was no cover of filamentous algae/duckweed species.

3.2.6 The emergent community was dominant. Species present included greater tussock-sedge, greater pond-sedge, reed sweet-grass, yellow iris, soft rush, water mint, water forget-me-not, hemlock water-dropwort, canary sweet-grass, water dock, bittersweet, a bur-reed species and bulrush.

3.2.7 No invasive non-native species were recorded.

Section 3 (England)

3.2.8 The submerged/floating-leaved plant community was rare and was represented by frogbit, yellow water-lily, amphibious bistort and broad-leaved pondweed. There was no cover of filamentous algae/duckweed species.

3.2.9 The emergent community was abundant. Species present included greater tussock-sedge, greater pond-sedge, floating sweet-grass, reed sweet-grass, yellow iris, soft rush, water mint, water forget-me-not, hemlock water-dropwort, reed canary-grass, water dock, bittersweet, a bur-reed species and bulrush.

3.2.10 No invasive non-native species were recorded.

Section 4 (England)

3.2.11 The submerged/floating-leaved plant community was rare and was represented by frogbit, yellow water-lily and amphibious bistort. There was no cover of filamentous algae/duckweed species.

3.2.12 The emergent community was frequent. Species present included water-plantain, fool's water-cress, greater tussock-sedge, greater pond-sedge, reed sweet-grass, soft rush, water mint, hemlock water-dropwort, reed canary-grass, water dock and bulrush.

3.2.13 No invasive non-native species were recorded.

Section 5 (England; Aston Locks - Keeper's Bridge SSSI)

3.2.14 The submerged/floating-leaved plant community was occasional and was represented by frogbit, yellow water-lily and broad-leaved pondweed. There was no cover of filamentous algae/duckweed species.

3.2.15 The emergent community was abundant. Species present included water-plantain, greater tussock-sedge, greater pond-sedge, floating sweet-grass, reed sweet-grass, yellow iris, soft rush, water mint, water forget-me-not, hemlock water-dropwort and reed canary-grass.

3.2.16 No invasive non-native species were recorded.

Section 6 (England; Aston Locks - Keeper's Bridge SSSI)

3.2.17 The submerged/floating-leaved plant community was occasional and was represented by frogbit, yellow water-lily, amphibious bistort and broad-leaved pondweed. There was no cover of filamentous algae/duckweed species.

3.2.18 The emergent community was abundant. Species present included water-plantain, greater tussock-sedge, reed sweet-grass, yellow iris, water mint, hemlock water-dropwort, reed canary-grass, unbranched bur-reed, a bur-reed species and bulrush.

3.2.19 No invasive non-native species were recorded.

Section 7 (England; Aston Locks - Keeper's Bridge SSSI)

3.2.20 The submerged/floating-leaved plant community was occasional and was represented by frogbit, common duckweed, yellow water-lily, amphibious bistort and broad-leaved pondweed. There was negligible cover of filamentous algae/duckweed species.

3.2.21 The emergent community was abundant. Species present included water-plantain, lesser water-parsnip, greater tussock-sedge, greater pond-sedge, water horsetail, reed sweet-grass, yellow iris, water mint, hemlock water-dropwort, reed canary-grass, water dock, unbranched bur-reed and bulrush.

3.2.22 No invasive non-native species were recorded.

Section 8 (England; Aston Locks - Keeper's Bridge SSSI)

3.2.23 The submerged/floating-leaved plant community was rare and was represented by frogbit, yellow water-lily, amphibious bistort and long-stalked pondweed. There was no cover of filamentous algae/duckweed species.

3.2.24 The emergent community was abundant. Species present included water-plantain, greater tussock-sedge, reed sweet-grass, yellow iris, water mint, hemlock water-dropwort, reed canary-grass, common reed, water dock, unbranched bur-reed and bulrush.

3.2.25 The invasive non-native species Himalayan balsam was present.

Section 9 (England)

3.2.26 The submerged/floating-leaved plant community was rare and was represented by frogbit, yellow water-lily and amphibious bistort. There was no cover of filamentous algae/duckweed species.

3.2.27 The emergent community was abundant. Species present included greater tussock-sedge, greater pond-sedge, reed sweet-grass, yellow iris, water mint, hemlock water-dropwort, reed canary-grass, water dock and unbranched bur-reed.

3.2.28 The invasive non-native species Himalayan balsam was present.

Section 10 (England)

3.2.29 The submerged/floating-leaved plant community was rare and was represented by frogbit,

yellow water-lily, broad-leaved pondweed and arrowhead. There was no cover of filamentous algae/duckweed species.

3.2.30 The emergent community was abundant. Species present included water-plantain, lesser water-parsnip, greater tussock-sedge, reed sweet-grass, yellow iris, water mint, hemlock water-dropwort, reed canary-grass, common reed, water dock and a bur-reed species.

3.2.31 The invasive non-native species Japanese knotweed and Himalayan balsam were present.

Section 11 (England)

3.2.32 The submerged/floating-leaved plant community was rare and was represented by spiked water-milfoil, yellow water-lily and broad-leaved pondweed. There was no cover of filamentous algae/duckweed species.

3.2.33 The emergent community was frequent. Species present included greater tussock-sedge, water horsetail, reed sweet-grass, yellow iris, hemlock water-dropwort, reed canary-grass, water dock and bulrush.

3.2.34 The invasive non-native species Himalayan balsam was present.

Section 12 (England)

3.2.35 The submerged/floating-leaved plant community was occasional and was represented by rigid hornwort, Nuttall's waterweed, frogbit, common duckweed, spiked water-milfoil, yellow water-lily, amphibious bistort and broad-leaved pondweed. There was approximately 20% cover of filamentous algae/duckweed species.

3.2.36 The emergent community was abundant. Species present included greater tussock-sedge, reed sweet-grass, soft rush, water mint, water forget-me-not, hemlock water-dropwort, reed canary-grass, water dock, bittersweet, branched bur-reed, a bur-reed species and bulrush.

3.2.37 The invasive non-native species Nuttall's waterweed and Himalayan balsam were present.

Section 13 (England)

3.2.38 This was a short section of approximately 400 m. Upstream of overbridge 84 the canal was dry.

3.2.39 The submerged/floating-leaved plant community was abundant and was represented by Nuttall's waterweed, frogbit, common duckweed, least duckweed and ivy-leaved duckweed. There was approximately 2% cover of filamentous algae/duckweed species.

3.2.40 The emergent community was occasional. Species present included floating sweet-grass, reed sweet-grass, yellow iris, soft rush, hemlock water-dropwort, reed canary-grass and water dock.

3.2.41 The invasive non-native species Nuttall's waterweed was present.

Section 14 (England and Wales; Montgomery SAC/SSSI)

3.2.42 The submerged/floating-leaved plant community was occasional and was represented by rigid hornwort, Nuttall's waterweed, frogbit, common duckweed, spiked water-milfoil, flat-stalked pondweed, broad-leaved pondweed and water soldier. There was approximately 15% cover of filamentous algae/duckweed species.

3.2.43 The emergent community was dominant. Species present included greater tussock-sedge, reed sweet-grass, yellow iris, water mint, hemlock water-dropwort, reed canary-grass, branched bur-reed and bulrush.

3.2.44 The invasive non-native species Nuttall's waterweed and Himalayan balsam were present.

Section 15 (Wales; Montgomery SAC/SSSI)

3.2.45 The submerged/floating-leaved plant community was rare and was represented by rigid hornwort, Nuttall's waterweed, frogbit, common duckweed, least duckweed, ivy-leaved duckweed, amphibious bistort, flat-stalked pondweed and water soldier. There was approximately 50% cover of filamentous algae/duckweed species.

3.2.46 The emergent community was dominant. Species present included water-plantain, lesser water-parsnip, greater tussock-sedge, reed sweet-grass, water mint, water forget-me-not, hemlock water-dropwort, reed canary-grass, water dock, bittersweet and bulrush.

3.2.47 The invasive non-native species Nuttall's waterweed was present.

Section 16 (Wales; Montgomery SAC/SSSI)

3.2.48 The submerged/floating-leaved plant community was dominant and was represented by Nuttall's waterweed, frogbit, common duckweed, floating water-plantain, yellow water-lily, fringed water-lily, grass-wrack pondweed, broad-leaved pondweed, long-stalked pondweed, greater duckweed and water soldier. There was approximately 4% cover of filamentous algae/duckweed species.

3.2.49 The emergent community was abundant. Species present included fool's water-cress, lesser water-parsnip, water horsetail, reed sweet-grass, yellow iris, soft rush, water mint, water forget-me-not, hemlock water-dropwort, water dock and branched bur-reed.

3.2.50 The invasive non-native species Nuttall's waterweed was present.

Section 17 (Wales; Montgomery SAC/SSSI)

3.2.51 The submerged/floating-leaved plant community was dominant and was represented by Nuttall's waterweed, frogbit, common duckweed, least duckweed, ivy-leaved duckweed, floating water-plantain, yellow water-lily, amphibious bistort and broad-leaved pondweed. There was approximately 50% cover of filamentous algae/duckweed species.

3.2.52 The emergent community was abundant. Species present included lesser water-parsnip, greater tussock-sedge, floating sweet-grass, reed sweet-grass, water mint, water forget-me-not, hemlock water-dropwort and bulrush.

3.2.53 The invasive non-native species Nuttall's waterweed was present.

Section 18 (Wales; Montgomery SAC/SSSI)

3.2.54 The submerged/floating-leaved plant community was dominant and was represented by Canadian waterweed, Nuttall's waterweed, frogbit, common duckweed, least duckweed, ivy-leaved duckweed, yellow water-lily, fringed water-lily, grass-wrack pondweed and broad-leaved pondweed. There was approximately 75% cover of filamentous algae/duckweed species.

3.2.55 The emergent community was abundant. Species present included water-plantain, lesser water-parsnip, greater tussock-sedge, water horsetail, reed sweet-grass, water mint, hemlock water-dropwort, water dock and bittersweet.

3.2.56 The invasive non-native species Canadian waterweed and Nuttall's waterweed were present.

Section 19 (Wales; Montgomery SAC/SSSI)

3.2.57 The submerged/floating-leaved plant community was dominant and was represented by Canadian waterweed, Nuttall's waterweed, frogbit, common duckweed, ivy-leaved duckweed, floating water-plantain, yellow water-lily and broad-leaved pondweed. There was approximately 80% cover of filamentous algae/duckweed species.

3.2.58 The emergent community was frequent. Species present included lesser water-parsnip, greater tussock-sedge, water horsetail, reed sweet-grass, soft rush, hemlock water-dropwort, reed canary-grass and bulrush.

3.2.59 The invasive non-native species Canadian waterweed and Nuttall's waterweed were present.

Section 20 (Wales; Montgomery SAC/SSSI)

3.2.60 The submerged/floating-leaved plant community was dominant and was represented by Nuttall's waterweed, frogbit, common duckweed, ivy-leaved duckweed, grass-wrack pondweed, broad-leaved pondweed and water soldier. There was <2% cover of filamentous algae/duckweed species.

3.2.61 The emergent community was abundant. Species present included sweet-flag, lesser water-parsnip, greater tussock-sedge, common spike-rush, water horsetail, reed sweet-grass, yellow iris, hemlock water-dropwort, water dock, bittersweet and bulrush.

3.2.62 The invasive non-native species Nuttall's waterweed was present.

Section 21 (Wales; Montgomery SAC/SSSI)

3.2.63 The submerged/floating-leaved plant community was frequent and was represented by Nuttall's waterweed, frogbit, common duckweed, ivy-leaved duckweed, yellow water-lily, and water soldier. There was <1% cover of filamentous algae/duckweed species.

3.2.64 The emergent community was dominant. Species present included sweet-flag, lesser water-parsnip, greater tussock-sedge, water horsetail, reed sweet-grass, water mint, hemlock water-dropwort, water dock and bulrush.

3.2.65 The invasive non-native species Nuttall's waterweed was present.

Section 22 (Wales; Montgomery SAC/SSSI)

3.2.66 The submerged/floating-leaved plant community was dominant and was represented by Nuttall's waterweed, frogbit, common duckweed, yellow water-lily and water soldier. There was <1% cover of filamentous algae/duckweed species.

3.2.67 The emergent community was occasional. Species present included sweet-flag, lesser water-parsnip, greater tussock-sedge, reed sweet-grass, hemlock water-dropwort, water dock and bulrush.

3.2.68 The invasive non-native species Nuttall's waterweed was present.

Section 23 (Wales; Montgomery SAC/SSSI)

3.2.69 The submerged/floating-leaved plant community was dominant and was represented by rigid hornwort, needle spike-rush, Canadian waterweed, Nuttall's waterweed, frogbit, common duckweed, ivy-leaved duckweed, fringed water-lily, blunt-leaved pondweed and water soldier. There was approximately 3% cover of filamentous algae/duckweed species.

3.2.70 The emergent community was frequent. Species present included lesser water-parsnip, greater tussock-sedge, water horsetail, reed sweet-grass and water mint.

3.2.71 The invasive non-native species Nuttall's waterweed and Himalayan balsam were present.

Section 24 (Wales; Montgomery SAC/SSSI)

3.2.72 The submerged/floating-leaved plant community was dominant and was represented by Nuttall's waterweed, frogbit, common duckweed, ivy-leaved duckweed, floating water-plantain, amphibious bistort, blunt-leaved pondweed and water soldier. There was approximately 2% cover of filamentous algae/duckweed species.

3.2.73 The emergent community was frequent. Species present included lesser water-parsnip, water horsetail, reed sweet-grass, yellow iris, water mint, water forget-me-not, hemlock water-dropwort, water dock, bittersweet, branched bur-reed and bulrush.

3.2.74 The invasive non-native species Nuttall's waterweed and Himalayan balsam were present.

Section 25 (Wales; Montgomery SAC/SSSI)

3.2.75 The submerged/floating-leaved plant community was occasional and was represented by Nuttall's waterweed, frogbit, common duckweed, ivy-leaved duckweed, blunt-leaved pondweed and water soldier. There was approximately 5% cover of filamentous algae/duckweed species.

3.2.76 The emergent community was occasional. Species present included lesser water-parsnip, reed sweet-grass, soft rush, water mint, hemlock water-dropwort, bittersweet, branched bur-reed, and a bur-reed species.

3.2.77 The invasive non-native species Nuttall's waterweed was present.

Section 26 (Wales; Montgomery SAC/SSSI)

3.2.78 The submerged/floating-leaved plant community was frequent and was represented by a water-starwort species, Nuttall's waterweed, frogbit, common duckweed, floating water-plantain, yellow water-lily, broad-leaved pondweed and water soldier. There was approximately 15% cover of filamentous algae/duckweed species.

3.2.79 The emergent community was frequent. Species present included lesser water-parsnip, reed sweet-grass, soft rush, hemlock water-dropwort, reed canary-grass, water dock and a bur-reed species.

3.2.80 The invasive non-native species Nuttall's waterweed was present.

Section 27 (Wales; Montgomery SAC/SSSI)

3.2.81 The submerged/floating-leaved plant community was abundant and was represented by Nuttall's waterweed, frogbit, common duckweed, least duckweed, floating water-plantain, yellow water-lily, broad-leaved pondweed, blunt-leaved pondweed and water soldier. There was approximately 70% cover of filamentous algae/duckweed species.

3.2.82 The emergent community was frequent. Species present included fool's water-cress, lesser water-parsnip, floating sweet-grass, reed sweet-grass, water mint, hemlock water-dropwort and branched bur-reed.

3.2.83 The invasive non-native species Nuttall's waterweed was present.

Section 28 (Wales; Montgomery SAC/SSSI)

3.2.84 The submerged/floating-leaved plant community was occasional and was represented by rigid hornwort, Nuttall's waterweed, frogbit, common duckweed, least duckweed, floating water-plantain, yellow water-lily, amphibious bistort, broad-leaved pondweed and blunt-leaved pondweed. There was approximately 40% cover of filamentous algae/duckweed species.

3.2.85 The emergent community was occasional. Species present included lesser water-parsnip, reed sweet-grass, water mint, hemlock water-dropwort, a bur-reed species and bulrush.

3.2.86 The invasive non-native species Nuttall's waterweed was present.

Section 29 (Wales; Montgomery SAC/SSSI)

3.2.87 The submerged/floating-leaved plant community was occasional and was represented by needle spike-rush, Canadian waterweed, Nuttall's waterweed, frogbit, common duckweed, floating water-plantain, yellow water-lily and broad-leaved pondweed. There was <1% cover

of filamentous algae/duckweed species.

3.2.88 The emergent community was occasional. Species present included lesser water-parsnip, reed sweet-grass, hemlock water-dropwort and a bur-reed species.

3.2.89 The invasive non-native species Nuttall's waterweed and Himalayan balsam were present.

Section 30 (Wales; Montgomery SAC/SSSI)

3.2.90 The submerged/floating-leaved plant community was occasional and was represented by rigid hornwort, needle spike-rush, Nuttall's waterweed, frogbit, floating water-plantain, yellow water-lily and water soldier. There was negligible cover of filamentous algae/duckweed species.

3.2.91 The emergent community was frequent. Species present included sweet-flag, water-plantain, lesser water-parsnip, reed sweet-grass, water mint, hemlock water-dropwort and branched bur-reed.

3.2.92 The invasive non-native species Nuttall's waterweed was present.

Section 31 (Wales; Montgomery SAC/SSSI)

3.2.93 The submerged/floating-leaved plant community was rare and was represented by Nuttall's waterweed, frogbit, floating water-plantain, spiked water-milfoil, yellow water-lily, broad-leaved pondweed and blunt-leaved pondweed. There was <5% cover of filamentous algae/duckweed species.

3.2.94 The emergent community was abundant. Species present included sweet-flag, fool's water-cress, common spike-rush, reed sweet-grass, water mint, water forget-me-not, hemlock water-dropwort, unbranched bur-reed and bulrush.

3.2.95 The invasive non-native species Nuttall's waterweed was present.

Section 32 (Wales; Montgomery SAC/SSSI)

3.2.96 The submerged/floating-leaved plant community was frequent and was represented by Nuttall's waterweed, frogbit, least duckweed, floating water-plantain, spiked water-milfoil, yellow water-lily, grass-wrack pondweed, broad-leaved pondweed and blunt-leaved pondweed. There was approximately 20% cover of filamentous algae/duckweed species.

3.2.97 The emergent community was abundant. Species present included reed sweet-grass, hemlock water-dropwort, water dock, unbranched bur-reed and branched bur-reed.

3.2.98 The invasive non-native species Nuttall's waterweed was present.

Section 33 (Wales; Montgomery SAC/SSSI)

3.2.99 The submerged/floating-leaved plant community was frequent and was represented by Nuttall's waterweed, frogbit, least duckweed, ivy-leaved duckweed, floating water-plantain, spiked water-milfoil, yellow water-lily, broad-leaved pondweed, blunt-leaved pondweed and water soldier. There was approximately 20% cover of filamentous algae/duckweed species.

3.2.100 The emergent community was abundant. Species present included sweet-flag, lesser water-parsnip, reed sweet-grass, water mint, water forget-me-not, hemlock water-dropwort and water dock.

3.2.101 The invasive non-native species Nuttall's waterweed was present.

Section 34 (Wales; Montgomery SAC/SSSI)

3.2.102 The submerged/floating-leaved plant community was frequent and was represented by a water-starwort species, Nuttall's waterweed, frogbit, least duckweed, floating water-

plantain, broad-leaved pondweed, blunt-leaved pondweed and water soldier. There was approximately 10% cover of filamentous algae/duckweed species.

3.2.103 The emergent community was abundant. Species present included lesser water-parsnip, reed sweet-grass, water mint, water forget-me-not, hemlock water-dropwort, water dock, unbranched bur-reed, branched bur-reed and bulrush.

3.2.104 The invasive non-native species Nuttall's waterweed was present.

Section 35 (Wales; Montgomery SAC/SSSI)

3.2.105 The submerged/floating-leaved plant community was frequent and was represented by Nuttall's waterweed, least duckweed, floating water-plantain, yellow water-lily and water soldier. There was approximately 10% cover of filamentous algae/duckweed species.

3.2.106 The emergent community was abundant. Species present included sweet-flag, water-plantain, fool's water-cress, lesser water-parsnip, common spike-rush, water horsetail, floating sweet-grass, reed sweet-grass, yellow iris, soft rush, water mint, water forget-me-not, hemlock water-dropwort, reed canary-grass, common reed, water-cress, water dock, unbranched bur-reed, branched bur-reed, bulrush.

3.2.107 The invasive non-native species Nuttall's waterweed was present.

Section 36 (Wales; Montgomery SAC/SSSI)

3.2.108 The submerged/floating-leaved plant community was abundant and was represented by Nuttall's waterweed, frogbit, least duckweed, floating water-plantain, yellow water-lily, broad-leaved pondweed and water soldier. There was approximately 10% cover of filamentous algae/duckweed species.

3.2.109 The emergent community was abundant. Species present included lesser water-parsnip, water horsetail, reed sweet-grass, soft rush, water mint, hemlock water-dropwort and reed canary-grass.

3.2.110 The invasive non-native species Nuttall's waterweed was present.

Section 37 (Wales; Montgomery SAC/SSSI)

3.2.111 The submerged/floating-leaved plant community was abundant and was represented by Nuttall's waterweed, frogbit, least duckweed, floating water-plantain, yellow water-lily, broad-leaved pondweed and water soldier. There was approximately 40% cover of filamentous algae/duckweed species.

3.2.112 The emergent community was abundant. Species present included lesser water-parsnip, water horsetail, reed sweet-grass, water dock and unbranched bur-reed.

3.2.113 The invasive non-native species Nuttall's waterweed was present.

Section 38 (Wales; Montgomery SAC/SSSI)

3.2.114 The submerged/floating-leaved plant community was frequent and was represented by a water-starwort species, Nuttall's waterweed, frogbit, least duckweed, floating water-plantain, yellow water-lily and broad-leaved pondweed. There was approximately 60% cover of filamentous algae/duckweed species.

3.2.115 The emergent community was abundant. Species present included lesser water-parsnip, water horsetail, reed sweet-grass, hemlock water-dropwort, unbranched bur-reed and branched bur-reed.

3.2.116 The invasive non-native species Nuttall's waterweed was present.

Section 39 (Wales; Montgomery SAC/SSSI)

3.2.117 The submerged/floating-leaved plant community was frequent and was represented by a water-starwort species, Nuttall's waterweed, frogbit, least duckweed, floating water-plantain, yellow water-lily, fringed water-lily and broad-leaved pondweed. There was approximately 75% cover of filamentous algae/duckweed species.

3.2.118 The emergent community was abundant. Species present included lesser water-parsnip, reed sweet-grass, yellow iris, soft rush, water forget-me-not, hemlock water-dropwort and water dock.

3.2.119 The invasive non-native species Nuttall's waterweed was present.

Section 40 (Wales; Montgomery SAC/SSSI)

3.2.120 The submerged/floating-leaved plant community was frequent and was represented by a water-starwort species, Nuttall's waterweed, least duckweed, floating water-plantain, yellow water-lily, fringed water-lily and water soldier. There was approximately 60% cover of filamentous algae/duckweed species.

3.2.121 The emergent community was dominant. Species present included sweet-flag, lesser water-parsnip, water horsetail, floating sweet-grass, reed sweet-grass, yellow iris, water mint, water forget-me-not, hemlock water-dropwort and water dock.

3.2.122 The invasive non-native species Nuttall's waterweed was present.

Section 41 (Wales; Montgomery SAC/SSSI)

3.2.123 The submerged/floating-leaved plant community was frequent and was represented by a water-starwort species, Nuttall's waterweed, least duckweed, floating water-plantain and fringed water-lily. There was approximately 80% cover of filamentous algae/duckweed species.

3.2.124 The emergent community was abundant. Species present included lesser water-parsnip, water horsetail, reed sweet-grass, soft rush, hemlock water-dropwort, water dock and bulrush.

3.2.125 The invasive non-native species Nuttall's waterweed was present.

Section 42 (Wales; Montgomery SAC/SSSI)

3.2.126 The submerged/floating-leaved plant community was abundant and was represented by Nuttall's waterweed, least duckweed and yellow water-lily. There was approximately 80% cover of filamentous algae/duckweed species.

3.2.127 The emergent community was abundant. Species present included lesser water-parsnip, water horsetail, reed sweet-grass, yellow iris, water forget-me-not, hemlock water-dropwort, water dock, unbranched bur-reed, branched bur-reed, bulrush.

3.2.128 The invasive non-native species Nuttall's waterweed was present.

Section 43 (Wales; Montgomery SAC/SSSI)

3.2.129 The submerged/floating-leaved plant community was rare and was represented by a water-starwort species, Nuttall's waterweed, least duckweed, yellow water-lily and blunt-leaved pondweed. There was approximately 10% cover of filamentous algae/duckweed species.

3.2.130 The emergent community was dominant. Species present included lesser water-parsnip, reed sweet-grass, yellow iris, water forget-me-not, hemlock water-dropwort, water dock, unbranched bur-reed, branched bur-reed, bulrush.

3.2.131 The invasive non-native species Nuttall's waterweed was present.

Section 44 (Wales; Montgomery SAC/SSSI)

3.2.132 The submerged/floating-leaved plant community was frequent and was represented by a water-starwort species, Nuttall's waterweed, least duckweed, floating water-plantain, yellow water-lily, broad-leaved pondweed and a charophyte species. There was approximately 80% cover of filamentous algae/duckweed species.

3.2.133 The emergent community was abundant. Species present included fool's water-cress, lesser water-parsnip, floating sweet-grass, reed sweet-grass, soft rush, water forget-me-not, water dock and unbranched bur-reed.

3.2.134 The invasive non-native species Nuttall's waterweed was present.

Section 45 (Wales; Montgomery SAC/SSSI)

3.2.135 The submerged/floating-leaved plant community was abundant and was represented by a water-starwort species, Nuttall's waterweed, least duckweed, ivy-leaved duckweed, floating water-plantain and yellow water-lily. There was approximately 80% cover of filamentous algae/duckweed species.

3.2.136 The emergent community was occasional. Species present included lesser water-parsnip, reed sweet-grass, water forget-me-not and unbranched bur-reed.

3.2.137 The invasive non-native species Nuttall's waterweed and Himalayan balsam were present.

Section 46 (Wales; Montgomery SAC/SSSI)

3.2.138 The submerged/floating-leaved plant community was frequent and was represented by a water-starwort species, Nuttall's waterweed, least duckweed, floating water-plantain and yellow water-lily. There was approximately 80% cover of filamentous algae/duckweed species.

3.2.139 The emergent community was dominant. Species present included lesser water-parsnip, water horsetail, reed sweet-grass, water forget-me-not, hemlock water-dropwort, water dock and unbranched bur-reed.

3.2.140 The invasive non-native species Nuttall's waterweed and Himalayan balsam were present.

Section 47 (Wales; Montgomery SAC/SSSI)

3.2.141 The submerged/floating-leaved plant community was frequent and was represented by a water-starwort species, Nuttall's waterweed, least duckweed and floating water-plantain. There was approximately 80% cover of filamentous algae/duckweed species.

3.2.142 The emergent community was frequent. Species present included fool's water-cress, lesser water-parsnip, reed sweet-grass, yellow iris, soft rush and water-cress.

3.2.143 The invasive non-native species Nuttall's waterweed, giant hogweed and Himalayan balsam was present.

Section 48 (Wales; Montgomery SAC/SSSI)

3.2.144 The submerged/floating-leaved plant community was frequent and was represented by a water-starwort species, Nuttall's waterweed, least duckweed, floating water-plantain, and yellow water-lily. There was approximately 80% cover of filamentous algae/duckweed species.

3.2.145 The emergent community was frequent. Species present included reed sweet-grass, hemlock water-dropwort, common reed and branched bur-reed.

3.2.146 The invasive non-native species Nuttall's waterweed, giant hogweed and Himalayan

balsam was present.

Section 49 (Wales; Montgomery SAC/SSSI)

3.2.147 The submerged/floating-leaved plant community was occasional and was represented by a water-starwort species, Nuttall's waterweed, least duckweed and yellow water-lily. There was approximately 80% cover of filamentous algae/duckweed species.

3.2.148 The emergent community was frequent. Species present included water horsetail, reed sweet-grass, soft rush, water mint, water forget-me-not, hemlock water-dropwort and bulrush.

3.2.149 The invasive non-native species Nuttall's waterweed and Himalayan balsam were present.

Section 50 (Wales; Montgomery SAC/SSSI)

3.2.150 The submerged / floating-leaved plant community was occasional and was represented by a water-starwort species, Nuttall's waterweed and least duckweed. There was approximately 80% cover of filamentous algae/duckweed species.

3.2.151 The emergent community was frequent. Species present included reed sweet-grass, water forget-me-not, hemlock water-dropwort, unbranched bur-reed and bulrush.

3.2.152 The invasive non-native species Nuttall's waterweed and Himalayan balsam were present.

3.3 Reserve Summaries

Weston Arm (England)

3.3.1 The submerged/floating-leaved plant community was abundant and was represented by common duckweed and broad-leaved pondweed. There was approximately 100% cover of filamentous algae/duckweed species.

3.3.2 The emergent community was frequent. Species present included greater pond-sedge, reed sweet-grass and bulrush.

3.3.3 No invasive non-native species were recorded.

Rednal Basin (England; Aston Locks - Keeper's Bridge SSSI)

3.3.4 The submerged / floating-leaved plant community was dominant and was represented by rigid hornwort, Nuttall's waterweed, frogbit, least duckweed, ivy-leaved duckweed, yellow water-lily, broad-leaved pondweed and blunt-leaved pondweed. There was approximately 90% cover of filamentous algae/duckweed species.

3.3.5 The emergent community was frequent. Species present included reed sweet-grass and bulrush.

3.3.6 The invasive non-native species Nuttall's waterweed was present.

Aston Locks (Old) Pond 1 (England)

3.3.7 The submerged / floating-leaved plant community was dominant and was represented by rigid hornwort, Nuttall's waterweed, frogbit and yellow water-lily. There was <1% cover of filamentous algae/duckweed species.

3.3.8 The emergent community was frequent. Species present included water-plantain, fool's water-cress, lesser water-parsnip, water horsetail, reed sweet-grass, soft rush, water mint, water forget-me-not, reed canary-grass, water dock, unbranched bur-reed, a bur-reed species

and bulrush.

3.3.9 The invasive non-native species Nuttall's waterweed was present.

Aston Locks (Old) Pond 2 (England)

3.3.10 The submerged / floating-leaved plant community was dominant and was represented by rigid hornwort, Nuttall's waterweed and frogbit. There was <5% cover of filamentous algae/duckweed species.

3.3.11 The emergent community was frequent. Species present included fool's water-cress, lesser water-parsnip, reed sweet-grass, water forget-me-not, water dock and bulrush.

3.3.12 The invasive non-native species Nuttall's waterweed was present.

Aston Locks (Old) Pond 3 (England)

3.3.13 The submerged / floating-leaved plant community was abundant and was represented by a water-starwort species, Nuttall's waterweed, frogbit, common duckweed and grass-wrack pondweed. There was <5% cover of filamentous algae/duckweed species.

3.3.14 The emergent community was abundant. Species present included water-plantain, reed sweet-grass, water dock and a bur-reed species.

3.3.15 The invasive non-native species Nuttall's waterweed was present.

Aston Locks (Old) Pond 4 (England)

3.3.16 The submerged/floating-leaved plant community was frequent and was represented by Nuttall's waterweed, frogbit and grass-wrack pondweed. There was <1% cover of filamentous algae/duckweed species.

3.3.17 The emergent community was frequent. Species present included water-plantain, fool's water-cress, reed sweet-grass, soft rush, water mint, bittersweet, unbranched bur-reed and bulrush.

3.3.18 The invasive non-native species Nuttall's waterweed and Himalayan balsam were present.

Aston Locks (Old) Pond 5 (England)

3.3.19 The submerged/floating-leaved plant community was frequent and was represented by Nuttall's waterweed, frogbit, least duckweed and yellow water-lily. There was approximately 20% cover of filamentous algae/duckweed species.

3.3.20 The emergent community was frequent. Species present included fool's water-cress, lesser water-parsnip, greater tussock-sedge, reed sweet-grass, water mint, water forget-me-not, common reed, unbranched bur-reed and bulrush.

3.3.21 The invasive non-native species Nuttall's waterweed and Himalayan balsam were present.

Aston Locks (New) Pond 1 (England)

3.3.22 The submerged/floating-leaved plant community was abundant and was represented by Nuttall's waterweed and spiked water-milfoil. There was approximately 50% cover of filamentous algae/duckweed species.

3.3.23 The emergent community was occasional. Species present included reed sweet-grass, yellow iris, soft rush and bulrush.

3.3.24 The invasive non-native species Nuttall's waterweed was present.

Aston Locks (New) Pond 2 (England)

3.3.25 The submerged/floating-leaved plant community was abundant and was represented by

Nuttall's waterweed, spiked water-milfoil and grass-wrack pondweed. There was approximately <5% cover of filamentous algae/duckweed species.

3.3.26 The emergent community was frequent. Species present included reed sweet-grass, yellow iris, soft rush, bulrush and brooklime.

3.3.27 The invasive non-native species Nuttall's waterweed was present.

Aston Locks (New) Pond 3 (England)

3.3.28 The submerged/floating-leaved plant community was abundant and was represented by rigid hornwort, water violet, frogbit and broad-leaved pondweed. There was approximately 80% cover of filamentous algae/duckweed species.

3.3.29 The emergent community was frequent. Species present included greater tussock-sedge, greater pond-sedge, reed sweet-grass, yellow iris, hemlock water-dropwort, branched bur-reed and bulrush.

3.3.30 No invasive non-native species were recorded.

Guilsfield Arm (Wales; Montgomery Canal SAC/SSSI)

3.3.31 The submerged/floating-leaved plant community was rare and was represented by frogbit, common duckweed and least duckweed. There was approximately 2% cover of filamentous algae/duckweed species.

3.3.32 The emergent community was dominant. Species present included lesser water-parsnip, reed sweet-grass, yellow iris, water forget-me-not, hemlock water-dropwort and bulrush.

3.3.33 No invasive non-native species were recorded.

Wern (Wales; Montgomery Canal SAC/SSSI)

3.3.34 The submerged/floating-leaved plant community was abundant and was represented by a Nuttall's waterweed, frogbit, least duckweed and blunt-leaved pondweed. There was approximately 50% cover of filamentous algae/duckweed species.

3.3.35 The emergent community was frequent. Species present included greater tussock-sedge, reed sweet-grass, yellow iris, reed canary-grass, branched bur-reed and bulrush.

3.3.36 The invasive non-native species Nuttall's waterweed was present.

Whitehouse (Wales; Montgomery Canal SAC/SSSI)

3.3.37 The submerged/floating-leaved plant community was dominant and was represented by rigid hornwort, frogbit, least duckweed, yellow water-lily and water soldier. There was approximately 60% cover of filamentous algae/duckweed species.

3.3.38 The emergent community was occasional. Species present included sweet-flag, greater tussock-sedge, reed sweet-grass, yellow iris, water forget-me-not, hemlock water-dropwort and branched bur-reed.

3.3.39 No invasive non-native species were recorded.

Welshpool in Channel (Wales; Montgomery Canal SAC/SSSI)

3.3.40 The submerged/floating-leaved plant community was rare and was represented only by least duckweed. There was approximately 5% cover of filamentous algae/duckweed species.

3.3.41 The emergent community was dominant. Species present included lesser water-parsnip, greater tussock-sedge, reed sweet-grass, hemlock water-dropwort, water dock and bulrush.

3.3.42 No invasive non-native species were recorded.

Brithdir Pond 1 (Wales; Montgomery Canal SAC/SSSI)

3.3.43 The submerged/floating-leaved plant community was dominant and was represented by Nuttall's waterweed, frogbit, yellow water-lily and water soldier. There was approximately 70% cover of filamentous algae/duckweed species.

3.3.44 The emergent community was frequent. Species present included lesser water-parsnip, reed sweet-grass, hemlock water-dropwort and bittersweet.

3.3.45 The invasive non-native species Nuttall's waterweed was present.

Brithdir Pond 2 (Wales; Montgomery Canal SAC/SSSI)

3.3.46 The submerged/floating-leaved plant community was dominant and was represented by Nuttall's waterweed, frogbit, common duckweed and water soldier. There was approximately 70% cover of filamentous algae/duckweed species.

3.3.47 The emergent community was occasional. Species present included reed sweet-grass and hemlock water-dropwort.

3.3.48 The invasive non-native species Nuttall's waterweed was present.

3.4 Supporting Variables

3.4.1 Water availability was normal in all thirteen English sections of the canal and in the English reserves with the exception of Aston Locks (New) pond 1, where there was exposed sediment. In Wales, however, the water level in the canal was low in seven sections (14, 23, 39, 40, 42, 43, 50) and very low, with much exposed sediment, in another eight sections (15, 16, 17, 18, 19, 20, 21, 22). The majority length of the Guilsfield Arm reserve was dry, but the other Welsh reserves had normal water levels.

3.4.2 Water was relatively turbid in the first twelve English sections of the canal, presumably because of suspended sediment due to boat movement. Only in section 13, where there was no boat movement, did clarity become >1 m. In those sections of the Welsh part of the canal where water availability was normal, water clarity was generally >1 m. Where water levels were low or very low, clarity was still good and mainly to the bottom. In all reserves, water clarity was reasonably good and >1m.

3.4.3 Shading to the water surface exceeded 5% of the area in the majority of sections in both England and Wales. This was almost entirely due to bankside vegetation and trees in particular.

3.4.4 Sediment depth was shallow across all English sections of the canal and was moderate in the reserves. In Wales, it tended to have a moderate depth and was occasionally deeper. Disturbance of sediment associated with feeding benthic fish was not especially noted and evidence for unusually high fish biomass was not apparent. Nevertheless, without more detailed fisheries information fish biomass in all sections of the canal and in all reserves was scored as unknown.

3.4.5 There were no apparent recent modifications to the channel profile in any of the sections.

3.4.6 Sections 1 to 12 were open to boat traffic in England. In Wales, an isolated short length of canal is open to boat traffic on the northern outskirts of Welshpool. The towpath was used throughout by pedestrians, runners and cyclists and several anglers were present.

3.5 Attributes, Targets and Condition Assessment

3.5.1 The common standards monitoring process assigns a feature to one of the following standard

conditions:

- favourable – the objectives for the feature are being met
- unfavourable – the state of the feature is currently unsatisfactory
- destroyed (partially or completely) – the feature is no longer present and there is no prospect of being able to restore it.

3.5.2 Where the feature is unfavourable a further assessment is made as to whether the state of the feature is:

- recovering (i.e. moving towards the desired state)
- declining (i.e. moving away from the desired state)
- no-change (i.e. neither improving nor declining).

3.5.3 The ten attributes and associated targets used to assess the condition of the SSSI features are shown in **Appendix 6**. The failure of any one attribute to meet its target condition generally dictates that the condition of the whole canal feature should be classified as unfavourable (JNCC, 2005).

3.6 Floating Water-Plantain Key Populations

3.6.1 The locations supporting key populations of floating water-plantain are listed in **Table 3** and shown in **Figure 5**.

Table 3. Locations of key floating water-plantain populations.

Site	Grid Reference		Site Length	Survey Date
	Start	Finish		
1. North of Bridge 147 (Abermule)	SO 16196 95189	SO 16208 95252	60 m	13/07/2023
2. South of Bridge 143 (Abermule)	SO 16757 96504	SO 16788 96556	60 m	12/07/2023
3. North of Bridge 143 (Abermule)	SO 16793 96556	SO 17271 97060	720 m	12/07/2023
4. North of Bridge 128 (Berriew)	SJ 19248 01047	SJ 19343 01249	210 m	11/07/2023
5. South of Bridge 124 (Brithdir)	SJ2024802846	SJ2031102953	120 m	12/07/2023
6. South of Bridge 123 (Llwynderw)	SJ 20652 03618	SJ 20687 03745	130 m	11/07/2023
7. North of Bridge 120 (Whitehouse)	SJ 22318 06154	SJ2233906223	75 m	12/07/2023

3.6.2 Other characteristics of each location are shown in **Table 4**. There was a moderately deep layer of fine sediment throughout all areas of all the locations and the bottom was readily visible at all the locations (i.e. Secchi depth was greater than the water depth).

Table 4. Characteristics of key population locations.

Site	Water Depth	Towpath	Water Clarity	Shading
1.	0.6 m	towpath side = earth offside = earth	good	Southern half of site heavily shaded from offside (1/3 of width of canal directly shaded). Northern half of site very little shading from two offside willow only.
2.	0.8 m	towpath side = sheet-piling offside = earth/stone/sheet-piling	good	One tree on offside, negligible shading to water surface area overall.
3.	0.7 m	towpath side = sheet-piling offside = earth/concrete	ok	Very heavy shading throughout, mainly from offside. Up to 95% of water surface area directly shaded for significant lengths.

4.	0.8 m	towpath side = sheet-piling offside = earth/stone	good	Shading mainly from the offside where tree canopy directly covered, on average, approximately 1/4 width of the canal water surface area.
5.	1.0 m	towpath side = sheet-piling offside = earth	good	Shading mainly from offside where up to 1/2 width of canal directly shaded in places.
6.	0.7 m	towpath side = sheet-piling offside = earth	good	For most of site overhanging tree vegetation causing direct shading to up to 90% of surface area from both towpath and offside.
7.	0.7 m	towpath side = sheet-piling offside = concrete/earth	ok	Shading mainly from offside where overhanging tree vegetation causing direct shading to 1/6 width of canal water surface area.

3.6.3 The aquatic plant communities at each location are mapped in **Figures 6** to **12** respectively.

4. Discussion

4.1 Condition of SSSIs/SAC

4.1.1 The current condition of Aston Locks – Keeper's Bridge SSSI is 'unfavourable – no change'. The overall cover of aquatic vegetation is very low and rarer species of submerged/floating-leaved plants have generally been lost. The species richness target for at least 7 species of submerged/floating-leaved species to be present, on average, is not met, although species richness of emergent plants is good. It is likely that a combination of variables are contributing to this condition including reduced water quality from elevated nutrient levels and turbidity likely caused by boat movement, and excessive shading from bankside trees.

4.1.2 The current condition of Montgomery Canal SSSI/SAC is also 'unfavourable – no change'. Aquatic plant communities are reduced in extent and species richness targets for both submerged/floating-leaved plants and emergent plants are not met in the canal and reserves combined. However, populations of various rare species and other species characteristic of high-quality canal systems are persisting, with floating water-plantain maintaining a good foothold within the canal (but not in the reserves). Excessive sedimentation is clearly an issue across large sections of the canal and in the reserves, although water transparency is generally good. Water levels in many sections of the canal were low; there was virtually no water at all in the Guilsfield Arm reserve.

4.1.3 A number of key populations of floating water-plantain have been identified. These may potentially be used as donor populations for reestablishment of the species in other areas of the canal, for example after dredging has been undertaken. It would be beneficial for conservation records to regularly monitor these key populations.

4.2 Conservation Objectives

4.2.1 Conservation objectives for the canal, in line with plans for restoration, are described by the Montgomery Canal Partnership (2005; 2016). We examine three of the core objectives for aquatic plants here, namely local distinctiveness, maintenance and enhancement of the distribution of floating water-plantain and maintenance and enhancement of the distribution of grass-wrack pondweed. It should be noted that the baseline data used to inform these objectives came principally from British Waterways surveys from the 1980s and 1997 for the English section of the canal (Briggs, 1988; British Waterways, 1999), and from the surveys by Newbold (2001; 2003) for the Welsh section of the canal[2].

Local Distinctiveness

4.2.2 The list of plants shown in **Table 5** represents the noteworthy assemblage of aquatic plants found in the canal and reserves under baseline conditions. The management of the canal aims to maintain these species close to their 2001 range (present or absent in England; number of km lengths in which the species should be found in Wales). Note that construction of Ashton Locks (New) reserve was only finished in 2017/2018. Restoration to higher levels will be targeted, and as and when such higher levels are both attained and shown to be sustainable, the standard for favourable condition will be raised.

[2] See Montgomery Canal Partnership (2005). Page 100.

Table 5. Local distinctiveness conservation objectives and the current situation.

	England		Wales	
Species Baseline	**Objective: should be found in Aston Locks (New) reserve**	**Pass/Fail (2022)**	**Objective: number of km lengths in which the species should be found**	**Pass/Fail (2022)**
Water-plantain	Yes	Fail	2	Pass
Flowering rush	Yes	Fail	1	Fail
Intermediate water-starwort	No	N/A	7	Unknown[3]
Autumnal water-starwort	Yes	Fail	1	Unknown[4]
Lesser pond-sedge	Yes	Fail	2	Fail
Water violet	Yes	Pass	0	N/A
Frogbit	Yes	Pass	0	N/A
Alternate water-milfoil	No	N/A	10	Fail
Red pondweed	Yes	Fail	0	N/A
Curled pondweed	Yes	Fail	6	Fail
Flat-stalked pondweed	Yes	Fail	1	Pass
Blunt-leaved pondweed	Yes	Fail	23	Fail
Perfoliate pondweed	No	N/A	4	Fail
Long-stalked pondweed	No	N/A	2	Fail
Greater duckweed	Yes	Fail	2	Fail

4.2.3 The Aston Locks (New) reserve in England fails nine of its eleven conservation objectives with regard to local distinctiveness, with only water violet and frogbit being present. The situation is only slightly better in Wales. The canal only meets its conservation objectives for water-plantain and flat-stalked pondweed and may possibly do so for intermediate and autumnal water-starwort.

Floating Water-plantain

4.2.4 Conservation objectives for floating water-plantain only currently apply to Wales and are shown in **Table 6**.

Table 6. Floating water-plantain conservation objectives and the current situation.

Location	Objective	Current situation (2022)
Boated channel[5]	Present in 21 km lengths; one positive recorded presence per km is sufficient.	Found in 18 km lengths.
In-channel reserves	Present in in-channel reserves in at least 21 km lengths; present in 30% of samples.	Not present in the in-channel reserves downstream of Welshpool.
Off-line reserves	Present in all off-line reserves; present in 40% of samples.	Not found in any of the off-line reserves.
Non-navigable channel	Present in all non-navigable channel kms where it was found in 2001 (i.e. 19-23, 46, 47, 49-53); present in 75% of samples and 75% of the mapped area in 2001 in Vyrnwy aqueduct.	Found in 9 km sections but these do not all correspond with where it was found by Newbold (2001). Only a few plants were found just downstream of the aqueduct (section 16).

[3] A water-starwort species was found in 14 sections. This could potentially have included specimens of intermediate water-starwort.
[4] A water-starwort species was found in 14 sections. This could potentially have included specimens of autumnal water-starwort.
[5] The boated channel is currently considered to be bridge 103 at Arddleen (SJ 26073 15829) to bridge 129 at Refail (SJ 19249 00084). This corresponds to sections 21 to 40 (kilometre sections 25 to 45 Briggs (1988)).

4.2.5 In the present survey, floating water-plantain was found in 27 sections of the canal but was not found in any of the reserves. The conservation objectives for the canal are not strictly being met. Clearly, the conservation objectives for the reserves are being completely failed.

Grass-Wrack Pondweed

4.2.6 The conservation objectives for grass-wrack pondweed currently only apply to Wales and are shown in **Table 7**.

Table 7. Grass-wrack pondweed conservation objectives and the current situation.

Location	Objective	Current situation (2022)
Boated channel[6]	Present in minimum 5 km (25%) lengths.	Found in section 32.
In-channel reserves	Present within reserves in minimum of 70% of navigable lengths (approximate return to best historic data) AND present in at least 20% of monitoring events per km.	Not present in the in-channel reserves downstream of Welshpool.
Off-line reserves	Present within all the off-line reserves AND at least two separate populations (each > 10 stems, or patch size > 1 m, with a separation of > 5 m) per 0.5 ha of reserve or per reserve AND any agreed sustained restoration to be maintained within natural fluctuations.	Not found in any of the off-line reserves.
Non-navigable channel	Present in similar range to the late 1980s, which is approximately 70% of non-navigable km-lengths AND present in 50% of monitoring events per km. For Vyrnwy aqueduct length at least 75% of the 2001 mapped area maintained.	Found in sections 16, 18 and 20. Vyrnwy aqueduct is in section 16. Grass-wrack pondweed was very rare within this section with only a handful of individual plants noted (located just downstream of Carreghofa lock and just downstream of the aqueduct).

4.2.7 In the present survey, grass-wrack pondweed was found in 4 sections of the canal but was not found in any of the reserves. Clearly, the majority of the conservation objectives for grass-wrack pondweed are currently being failed.

4.3 Historic Data Review: Canal

Previous Surveys

4.3.1 A number of previous studies have surveyed the whole length of the canal for aquatic plants, confirming the importance of the canal for conservation. These are listed in **Table 8** with a short summary of the methodology used and results obtained.

Table 8. Previous aquatic plant surveys of the whole canal.

Study	Summary
Briggs (1988)	Reports results of aquatic plant surveys carried out across the whole length of the canal in 1985, 1986 and 1987. Also provides a compilation of survey results for selected plant species in the canal prior to 1985[7].

[6] The boated channel is currently considered to be bridge 103 at Arddleen (SJ 26073 15829) to bridge 129 at Refail (SJ 19249 00084). This corresponds to sections 21 to 40 (kilometre sections 25 to 45 Briggs (1988)).

[7] A large number of published and unpublished references are quoted dating between 1936 and 1985.

	This was the first survey to cover the entire length of the canal. A total of 56 km sections were marked, and sampling sites were the length of canal for 20 m either side of each km marker. Within each site all aquatic vegetation was identified, and an estimate of relative species abundance made using the DAFOR scale. Within the rest of the km section species presence/absence data was collected. Used to set the baseline for conservation objectives. *Local Distinctiveness* Water-plantain was present in 6 one-kilometre survey lengths in England and 25 in Wales. Flowering rush was present in 4 one-kilometre survey length in England and 18 in Wales. Intermediate water-starwort was present in 3 one-kilometre survey lengths in England and 30 in Wales. Autumnal water-starwort was present in 0 one-kilometre survey lengths in England and 11 in Wales. Lesser pond-sedge was present in 2 one-kilometre survey lengths in England and 1 in Wales. Alternate water-milfoil was present in 1 one-kilometre survey lengths in England and 10 in Wales. Curled pondweed was present in 4 one-kilometre survey lengths in England and 22 in Wales. Flat-stalked pondweed was present in 2 one-kilometre survey length in England and 5 in Wales. Blunt-leaved pondweed was present in 0 one-kilometre survey lengths in England and 33 in Wales. Perfoliate pondweed was present in 0 one-kilometre survey lengths in England and 6 in Wales. Long-stalked pondweed was present in 0 one-kilometre survey lengths in England and 4 in Wales. Greater duckweed was present in 3 one-kilometre survey lengths in England and 0 in Wales. *Floating water-plantain* Not found in the English part of the canal. Present in 31 one-kilometre survey lengths in Wales. *Grass-wrack Pondweed* Present in 1 one-kilometre survey length in England and 30 in Wales.
British Waterways (2000)	Reports results of aquatic plant surveys carried out across the whole length of the canal in 1997. Within each kilometre section laid out by Briggs (1988) all aquatic plant species were recorded using BSBI Atlas 2000 recording cards. Only presence/absence data is presented. Vegetation maps are provided but these are difficult to interpret. Used to set the baseline for conservation objectives. *Local Distinctiveness* Water-plantain was present in 10 one-kilometre survey lengths in England and 8 in Wales. Flowering rush was present in 2 one-kilometre survey lengths in England and 6 in Wales. Intermediate water-starwort was present in 0 one-kilometre survey lengths in England and 17 in Wales. Autumnal water-starwort was present in 0 one-kilometre survey lengths in England and 2 in Wales. Lesser pond-sedge was present in 4 one-kilometre survey lengths in England and 1 in Wales. Alternate water-milfoil was present in 0 one-kilometre survey lengths in England and 8 in Wales. Curled pondweed was present in 3 one-kilometre survey length in England and 8 in Wales. Flat-stalked pondweed was present in 1 one-kilometre survey lengths in England and 8 in Wales.

	Blunt-leaved pondweed was present in 3 one-kilometre survey lengths in England and 21 in Wales. Perfoliate pondweed was present in 0 one-kilometre survey lengths in England and 7 in Wales. Long-stalked pondweed was present in 0 one-kilometre survey lengths in England and 2 in Wales. Greater duckweed was present in 4 one-kilometre survey lengths in England and 0 in Wales. *Floating water-plantain* Not found in the English part of the canal. Present in 25 one-kilometre survey lengths in Wales. *Grass-wrack Pondweed* Not found in the English part of the canal. Present in 13 one-kilometre survey lengths in Wales.
Newbold (2001)	Reports results of aquatic plant surveys carried out across the whole length of the canal in September 2001. The bankside flora and the visible vegetation within the channel were mapped using the DAFOR scale in the kilometre sections laid out by Briggs (2008). The channel vegetation was sampled using a double-sided rake every 50 m. All species collected were identified and recorded and the abundance noted using the DAFOR scale. Used to set the baseline for conservation objectives. *Local Distinctiveness* Water-plantain was present in 4 one-kilometre survey lengths in England and 3 in Wales. Flowering rush was present in 0 one-kilometre survey lengths in England and 1 in Wales. Intermediate water-starwort was present in 0 one-kilometre survey lengths in England and 7 in Wales. Autumnal water-starwort was present in 2 one-kilometre survey lengths in England and 3 in Wales. Lesser pond-sedge was present in 7 one-kilometre survey lengths in England and 2 in Wales. Alternate water-milfoil was present in 0 one-kilometre survey lengths in England and 10 in Wales. Curled pondweed was present in 0 one-kilometre survey lengths in England and 6 in Wales. Flat-stalked pondweed was present in 1 one-kilometre survey length in England and 1 in Wales. Blunt-leaved pondweed was present in 1 one-kilometre survey lengths in England and 23 in Wales. Perfoliate pondweed was present in 0 one-kilometre survey lengths in England and 4 in Wales. Long-stalked pondweed was present in 0 one-kilometre survey lengths in England and 2 in Wales. Greater duckweed was present in 0 one-kilometre survey lengths in England and 2 in Wales. *Floating water-plantain* Not found in the English part of the canal. Present in 27 one-kilometre survey lengths in Wales. *Grass-wrack Pondweed* Present in a single one-kilometre survey length in England and six in Wales.
Ecus (2014)	Reports results of Common Standards Monitoring at eleven locations along the canal (4 sites in England and 7 sites in Wales) and survey for floating water-plantain across the whole length of the Welsh part of the canal in September/October 2014. *Local Distinctiveness* Water-plantain was present at 2 CSM sites in England and 0 in Wales. Flowering rush was present at 0 CSM sites in England and 1 in Wales. Intermediate water-starwort was present at 0 CSM sites in England and 1 in Wales.

	Autumnal water-starwort was present at 0 CSM sites in England and 1 in Wales. Lesser pond-sedge was present at 4 CSM sites in England and 2 in Wales. Alternate water-milfoil was present at 0 CSM sites in England and 1 in Wales. Curled pondweed was present at 0 CSM sites in England and 1 in Wales. Flat-stalked pondweed was present at 0 CSM sites in England and 0 in Wales. Blunt-leaved pondweed was present at 0 CSM sites in England and 3 in Wales. Perfoliate pondweed was present at 0 CSM sites in England and 0 in Wales. Long-stalked pondweed was present at 0 CSM sites in England and 1 in Wales. Greater duckweed was present at 0 CSM sites in England and 3 in Wales. *Floating water-plantain* Not found in the English part of the canal. Present in 27 one-kilometre survey lengths in Wales. *Grass-wrack Pondweed* Not found in England or in Wales.

Local Distinctiveness

4.3.2 **Figures 13** to **24** show data taken from the studies in **Table 8**, as well as the present survey data, for species contributing to local distinctiveness. It is clear that, almost without exception, these species are now absent in England and are absent or very greatly reduced in distribution in Wales.

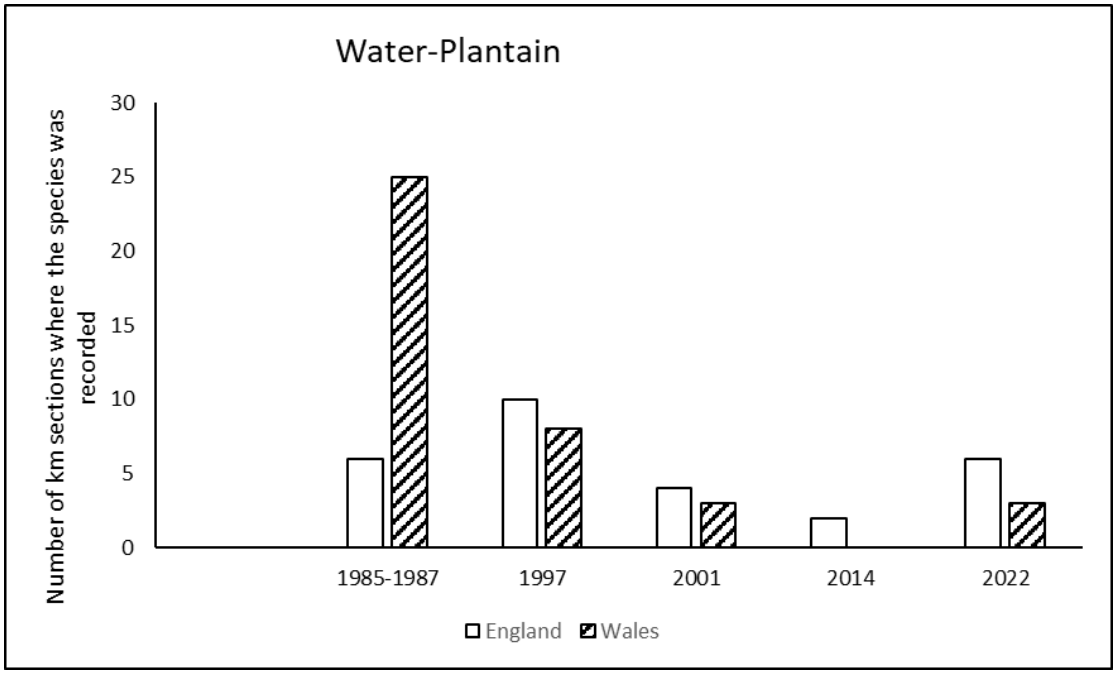

Figure 13. Distribution of water-plantain: number of kilometre sections where the species has been recorded.

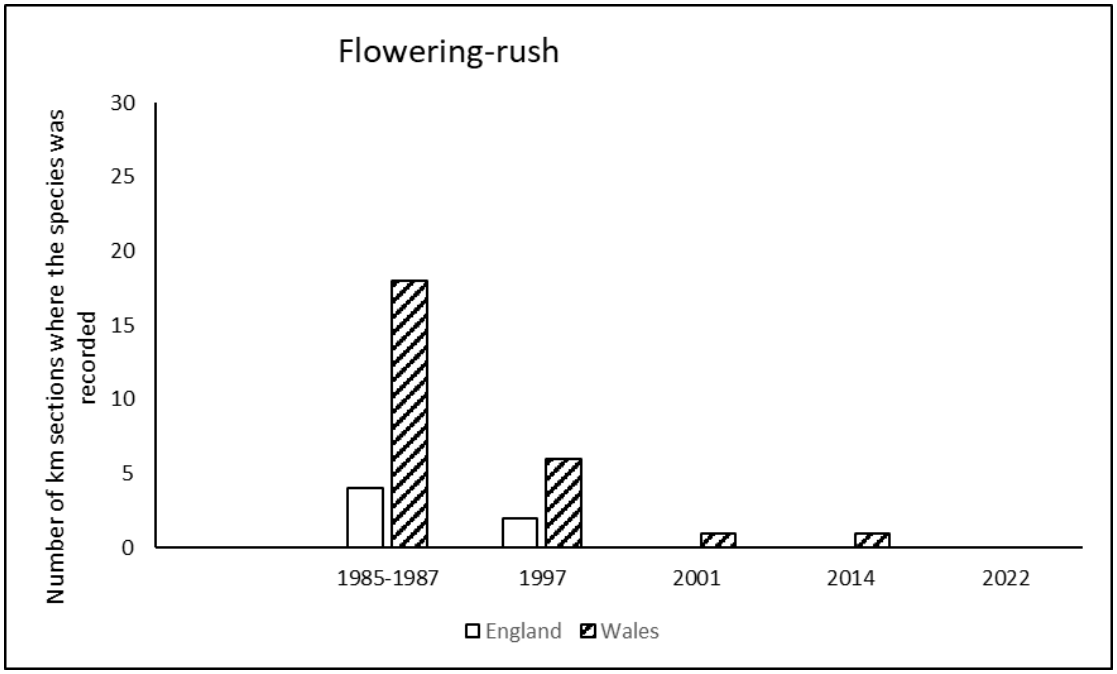

Figure 14. Distribution of flowering-rush: number of kilometre sections where the species has been recorded.

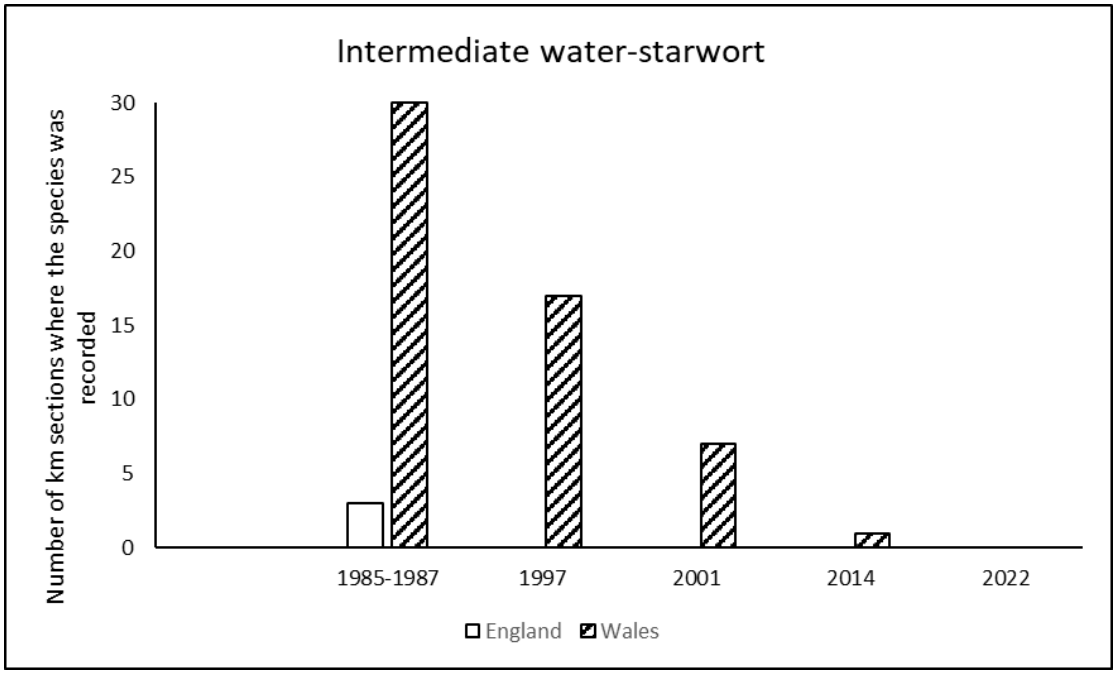

Figure 15. Distribution of intermediate water-starwort: number of kilometre sections where the species has been recorded (note that *Callitriche sp*. was recorded in 1 section in England and 14 sections in Wales – it is possible that this included intermediate water-starwort).

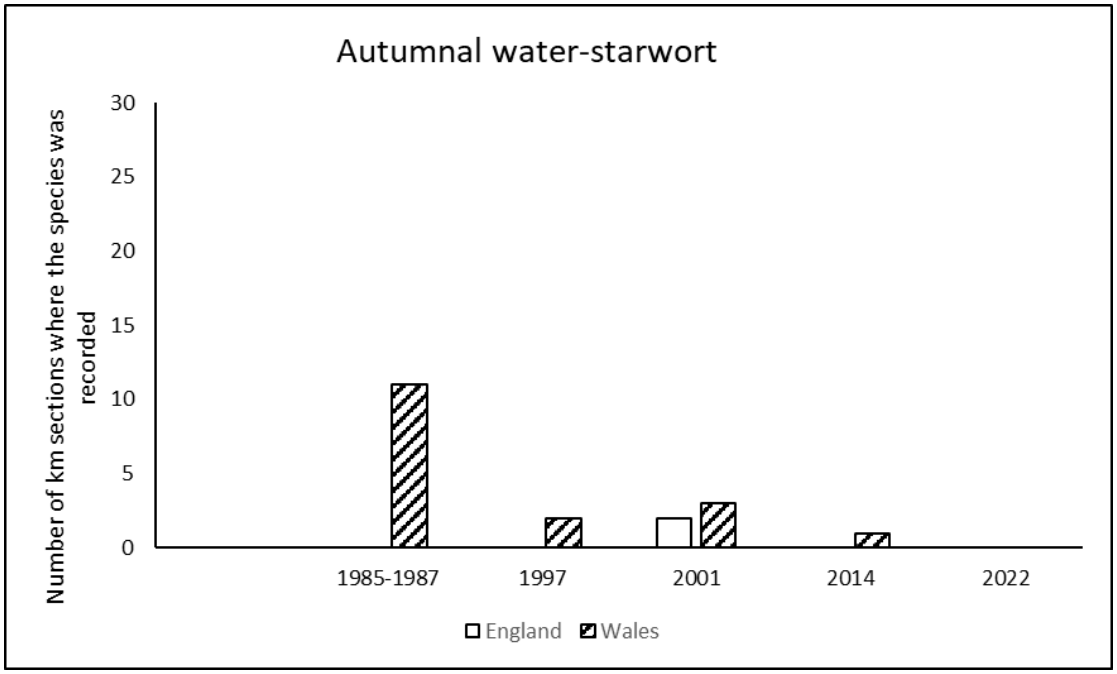

Figure 16. Distribution of autumnal water-starwort: number of kilometre sections where the species has been recorded (note that *Callitriche sp*. was recorded in 1 section in England and 14 sections in Wales – it is possible that this included autumnal water-starwort).

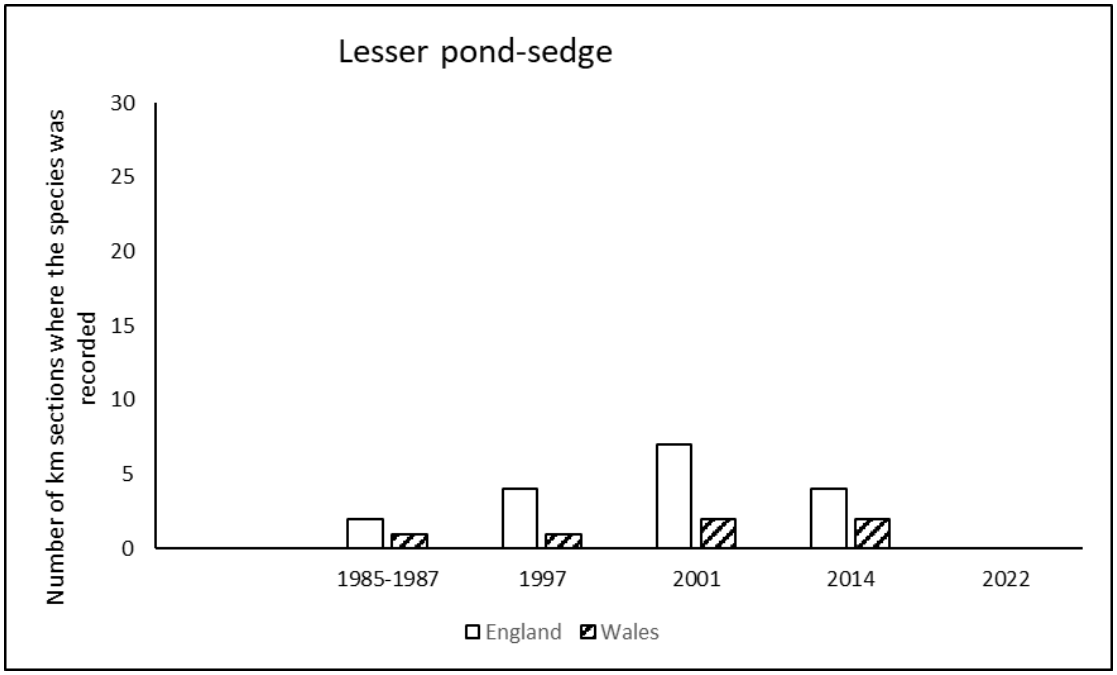

Figure 17. Distribution of lesser pond-sedge: number of kilometre sections where the species has been recorded.

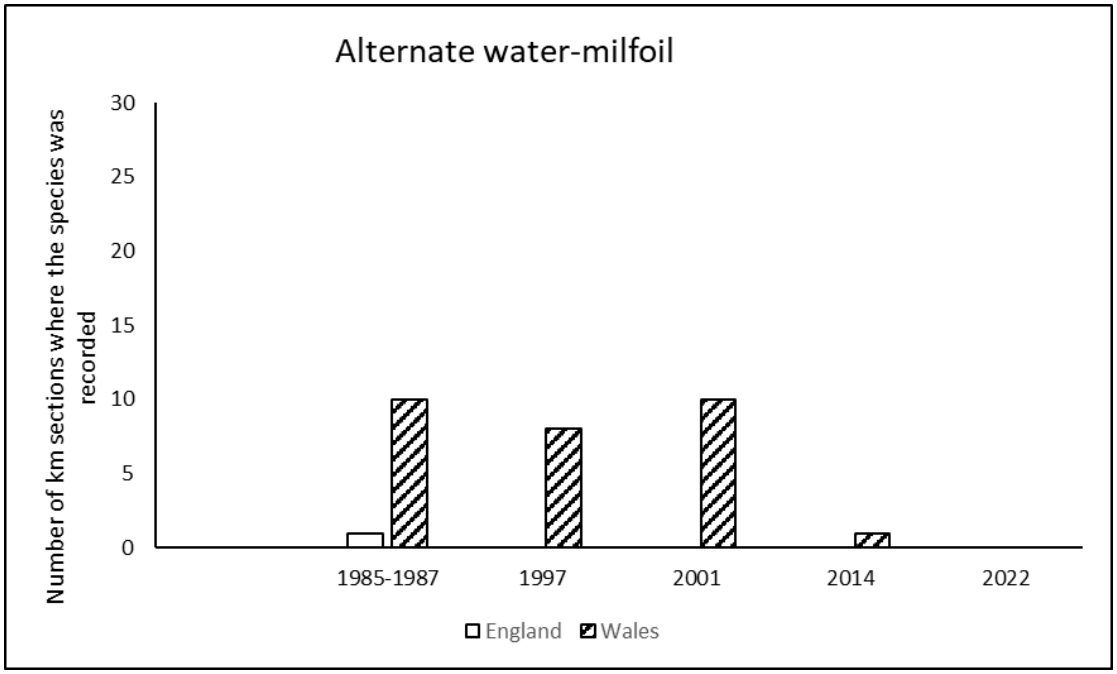

Figure 18. Distribution of alternate water-milfoil: number of kilometre sections where the species has been recorded.

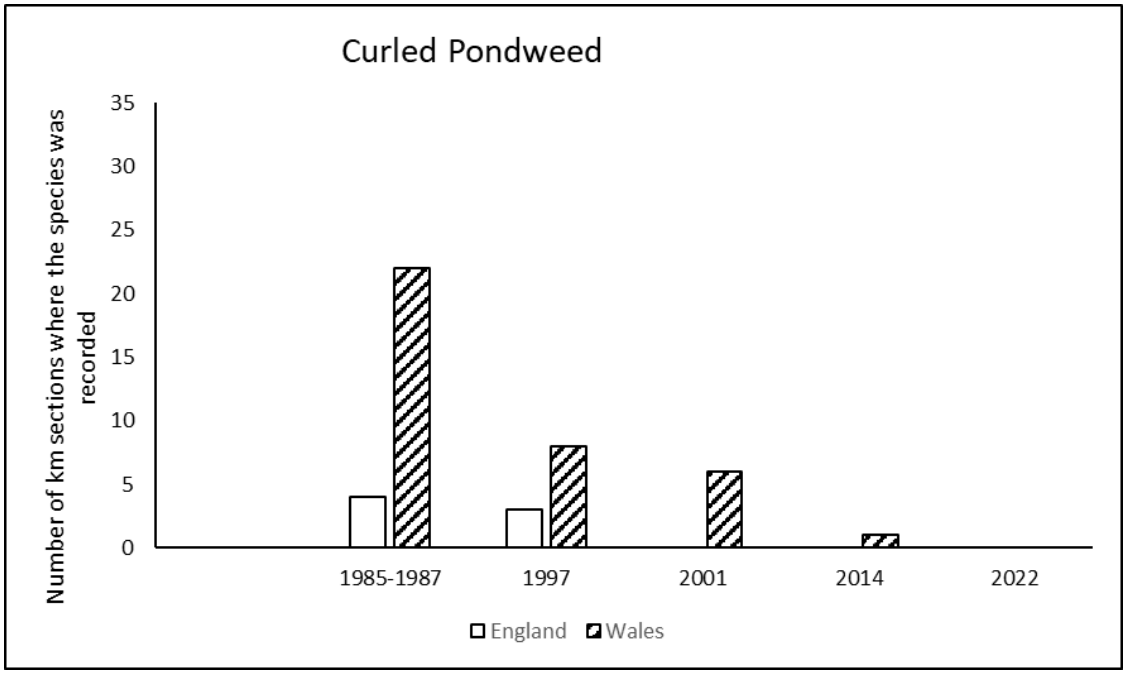

Figure 19. Distribution of curled pondweed: number of kilometre sections where the species has been recorded.

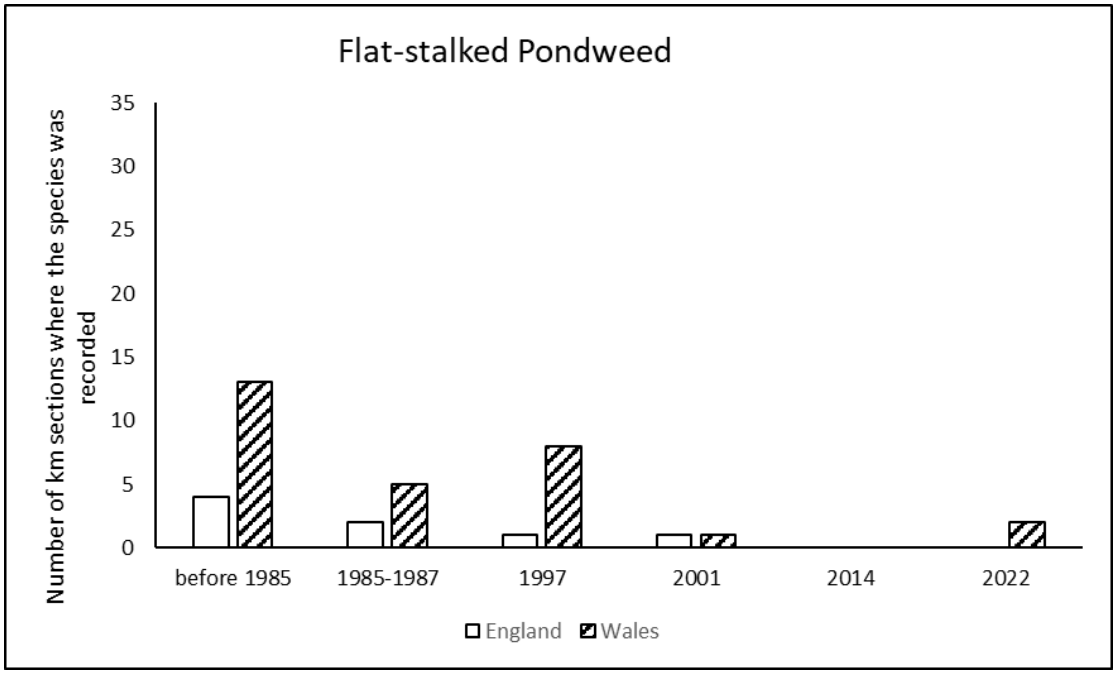

Figure 20. Distribution of flat-stalked pondweed: number of kilometre sections where the species has been recorded.

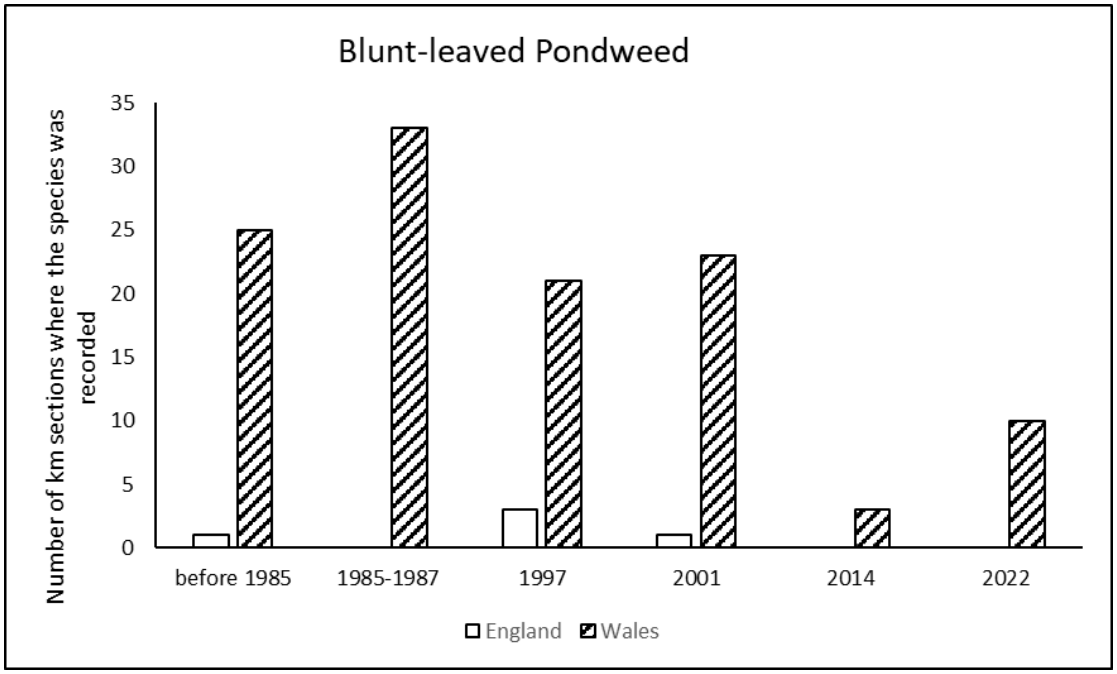

Figure 21. Distribution of blunt-leaved pondweed: number of kilometre sections where the species has been recorded.

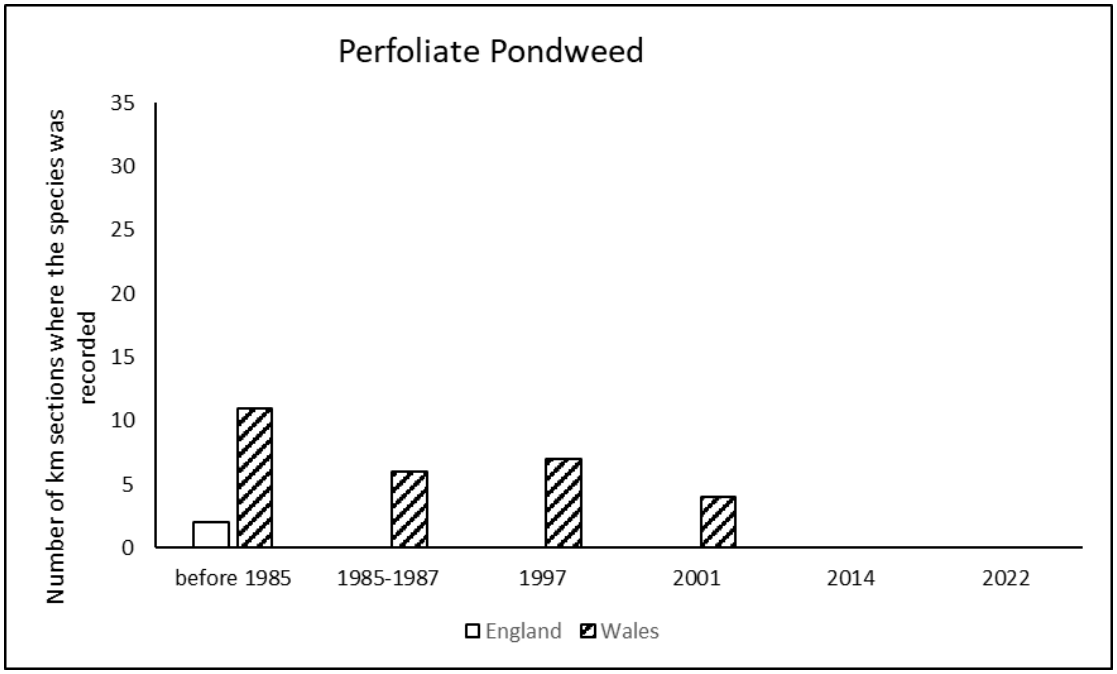

Figure 22. Distribution of perfoliate pondweed: number of kilometre sections where the species has been recorded.

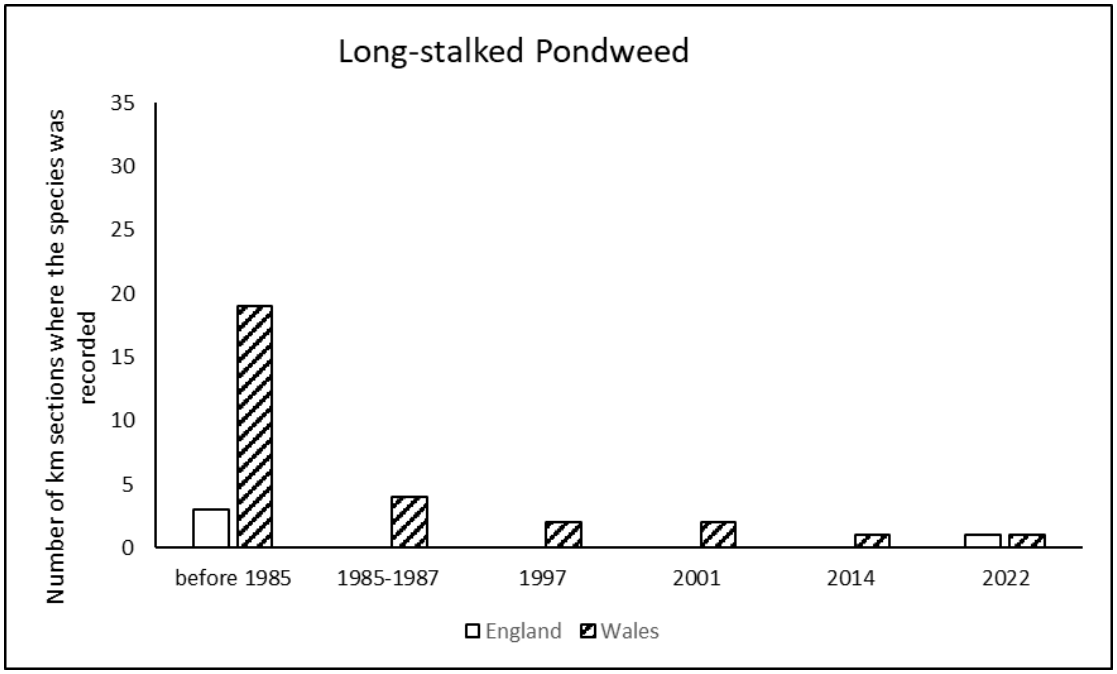

Figure 23. Distribution of long-stalked pondweed: number of kilometre sections where the species has been recorded.

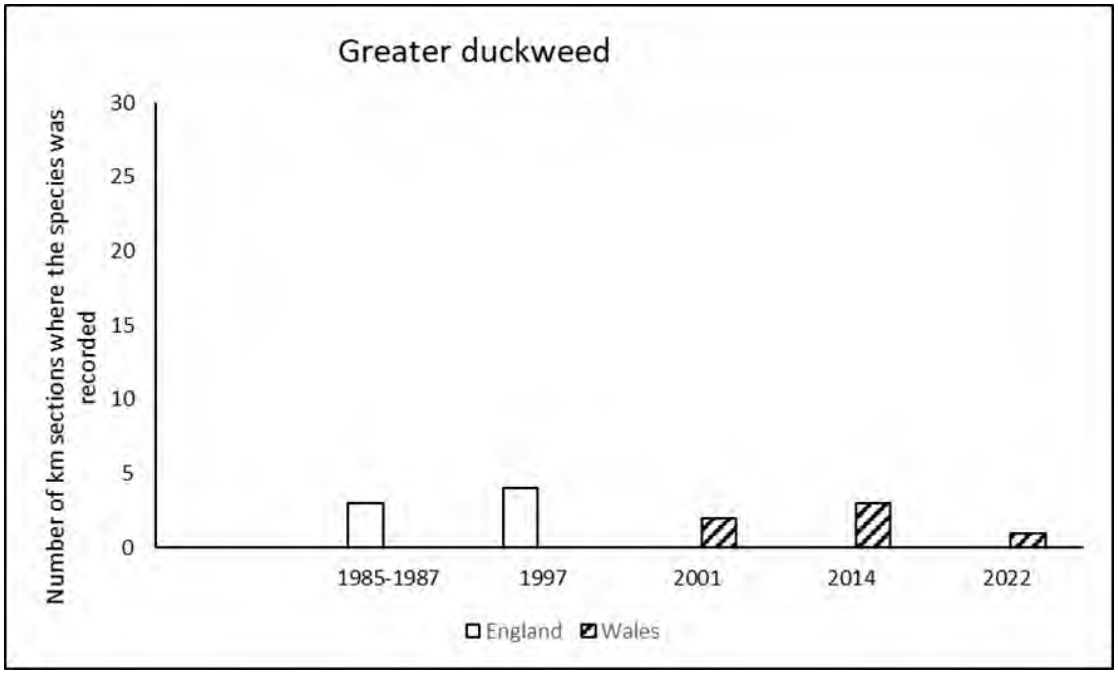

Figure 24. Distribution of greater duckweed: number of kilometre sections where the species has been recorded.

Floating Water-plantain

4.3.3 **Figure 25** shows data taken from the studies in **Table 8**, as well as the present survey data, for floating water-plantain (see also **Appendix 7**). This allows an assessment of how the broad distribution of the species has changed across the canal over the decades.

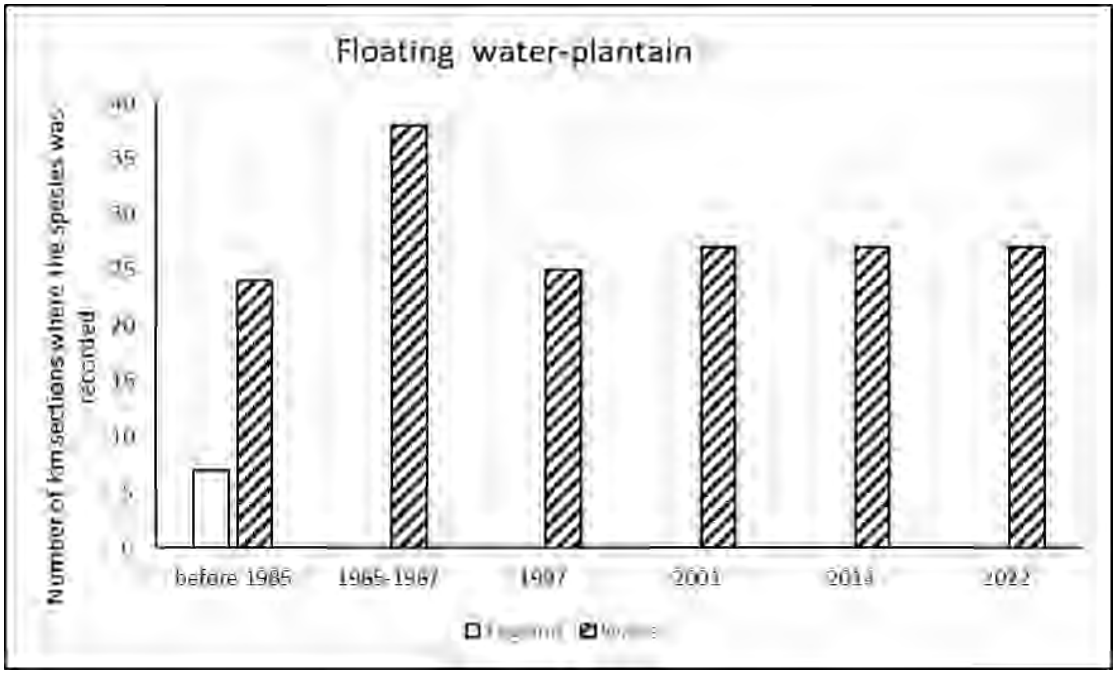

Figure 25. Distribution of floating water-plantain: number of kilometre sections where the species has been recorded.

4.3.4 Prior to 1985 floating water-plantain was found in the English part of the canal, although it is

not clear exactly where or when this was the case[8]. After 1985, it has not been recorded in England in the canal but has remained relatively stable across the Welsh part of the canal.

4.3.5 The previous Common Standards Monitoring survey (Ecus, 2014) did not cover the entire canal, but focussed on 7 one-kilometre survey lengths that had been used for previous monitoring and found floating water-plantain in all of them (we also found the species in these survey lengths[9]). However, Ecus (2014) notes the probable loss of the species from the canal immediately upstream of the Vyrnwy aqueduct and a reduction in its occurrence immediately downstream; and suggests that conservation objectives were not being met. We did not find floating water-plantain upstream of the aqueduct either but did find a very small patch in the widening of the channel just downstream of the aqueduct.

Grass-Wrack Pondweed

4.3.6 **Figure 26** shows data taken from the studies in **Table 8**, as well as the present survey data, for grass-wrack pondweed (see also **Appendix 7**). This allows an assessment of how the broad distribution of the species has changed across the canal over the decades.

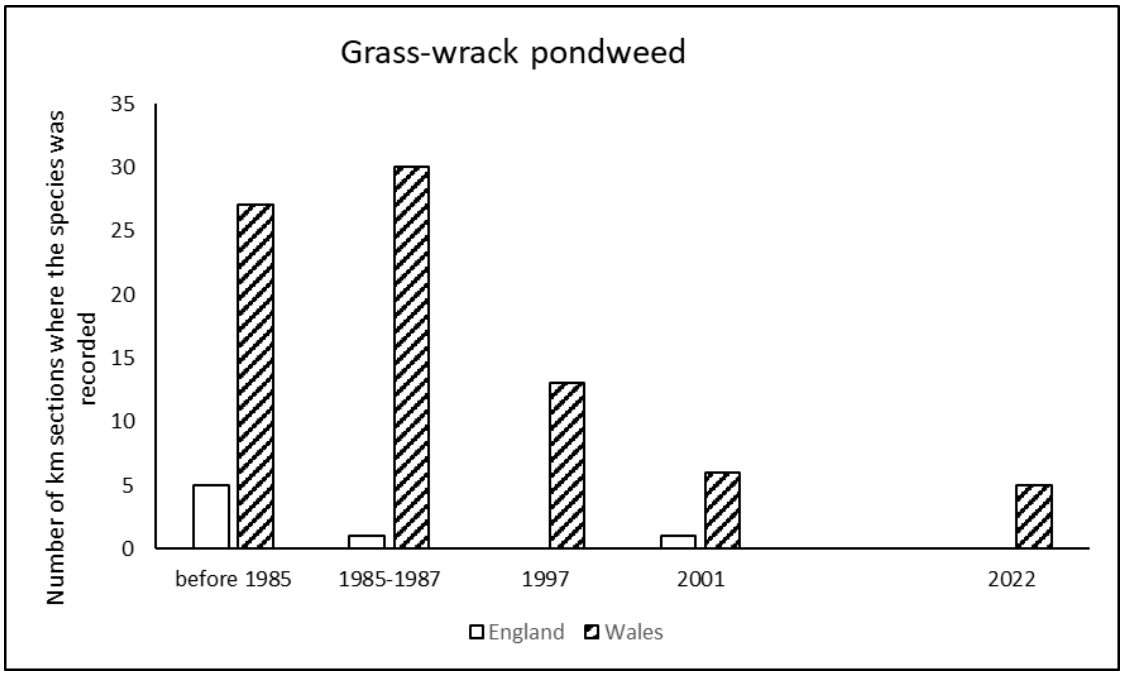

Figure 26. Distribution of grass-wrack pondweed: number of kilometre sections where the species has been recorded.

4.3.7 Grass-wrack pondweed has shown a considerable decline in distribution across the canal. It seems to have been lost from the English part of the canal and is now only found in a small number of kilometre sections in the Welsh part of the canal.

Conclusions

4.3.8 It is often difficult to understand exactly where a species was historically recorded and there is a lack of consistent reporting of abundances of species within the canal. Handheld GPS units which provide grid references accurate to within a few metres should help to improve this

[8] Twigg (1959) undertook botanical surveys at three locations along the Shropshire Union Canal: Site A at approximately SJ414339 (not part of the Montgomery canal) where floating water-plantain and grass-wrack pondweed were recorded as occasional; Site B at approximately SJ304245 (i.e. within km section 12) where floating-plantain was not recorded but grass-wrack pondweed was occasional; Site C at approximately SJ300240 (i.e. within km section 13) where neither floating water-plantain nor grass-wrack pondweed were recorded. This study is not mentioned in Briggs (1988).

[9] Survey length 5 in Ecus (2014) = section 16/17 in the present study. Similarly, survey length 6 = section 18/19; survey length 7 = section 23/24; survey length 8 = section 28/29; survey length 9 = section 32/33; survey length 10 = section 38/39; survey length 11 = section 45/46.

situation as surveys are taken forward. Nevertheless, it is worth noting the observation of Briggs (1988) who says that 'species distributions are very changeable' and that 'comparisons with older records suggest that the canal is a dynamic system with species distributions changing with management/succession.' This is an important point which is echoed throughout the other studies and means that it may be difficult to relocate small patches of vegetation or small numbers of rare plants. This seems to be particularly the case for the pondweeds.

4.4 Historic Data Review: Reserves

Previous Surveys

4.4.1 Previous surveys are: Briggs (1988), British Waterways (2000), Newbold (2003), Ecus (2015), and Ecus (2018). We have extracted information about the 1985-1987 surveys (Briggs, 1988) and the 1997 survey (British waterways, 2000) mainly from Ecus (2015) and Newbold (2003) because of incomplete copies of earlier reports. Methodologies employed are not precisely known for the earlier surveys but are likely to have been similar to those used for the main surveys of the canal.

Local Distinctiveness

4.4.2 Presence absence data for each species representative of local distinctiveness at each reserve are shown in **Tables 9-18** below.

Table 9. Weston Arm (X = presence).

Species	Weston Arm					
	1985-1987	1997	2003	2015	2018	2022
Water-plantain					X	
Flowering-rush						
Intermediate water-starwort						
Autumnal water-starwort						
Lesser pond-sedge			X	X		
Water violet						
Frogbit				X	X	
Alternate water-milfoil						
Curled pondweed						
Flat-stalked pondweed						
Blunt-leaved pondweed						
Perfoliate pondweed						
Long-stalked pondweed						
Greater duckweed				X	X	

Table 10. Rednal Basin (X = presence).

Species	Rednal Basin					
	1985-1987	1997	2003	2015	2018	2022
Water-plantain		X	X			
Flowering-rush	X	X				
Intermediate water-starwort						

Autumnal water-starwort	X					
Lesser pond-sedge						
Water violet	X					
Frogbit			X	X	X	X
Alternate water-milfoil						
Curled pondweed	X					
Flat-stalked pondweed						
Blunt-leaved pondweed			X	X	X	X
Perfoliate pondweed						
Long-stalked pondweed	X					
Greater duckweed						

Table 11. Aston Locks (old) (X = presence).

Species	Aston Locks (old)					
	1985-1987	1997	2003	2015	2018	2022
Water-plantain			X		X	X
Flowering-rush			X	X		
Intermediate water-starwort						
Autumnal water-starwort						
Lesser pond-sedge			X	X	X	
Water violet	X	X	X			
Frogbit			X	X	X	X
Alternate water-milfoil						
Curled pondweed			X	X		
Flat-stalked pondweed						
Blunt-leaved pondweed						
Perfoliate pondweed						
Long-stalked pondweed	X					
Greater duckweed				X		

Table 12. Aston Locks (new) (X = presence).

Species	Aston Locks (new)					
	1985-1987	1997	2003	2015	2018	2022
Water-plantain				X		
Flowering-rush						
Intermediate water-starwort						
Autumnal water-starwort						
Lesser pond-sedge				X		
Water violet				X	X	X
Frogbit				X	X	X
Alternate water-milfoil						
Curled pondweed						
Flat-stalked pondweed						

Blunt-leaved pondweed						
Perfoliate pondweed						
Long-stalked pondweed						
Greater duckweed						

Table 13. Guilsfield Arm (X = presence).

Species	Guilsfield Arm					
	1985-1987	1997	2003	2015	2018	2022
Water-plantain			X		X	
Flowering-rush				X		
Intermediate water-starwort						
Autumnal water-starwort						
Lesser pond-sedge						
Water violet						
Frogbit				X	X	
Alternate water-milfoil						
Curled pondweed	X	X				
Flat-stalked pondweed	X					
Blunt-leaved pondweed						
Perfoliate pondweed						
Long-stalked pondweed	X					
Greater duckweed	X					

Table 14. Wern (X = presence).

Species	Wern					
	1985-1987	1997	2003	2015	2018	2022
Water-plantain			X			
Flowering-rush				X		
Intermediate water-starwort						
Autumnal water-starwort						
Lesser pond-sedge						
Water violet						
Frogbit				X	X	
Alternate water-milfoil						
Curled pondweed	X					
Flat-stalked pondweed						
Blunt-leaved pondweed	X	X			X	
Perfoliate pondweed						
Long-stalked pondweed	X	X				
Greater duckweed				X		

Table 15. Whitehouse (X = presence).

Species	Whitehouse					
	1985-1987	1997	2003	2015	2018	2022
Water-plantain			X			

Flowering-rush						
Intermediate water-starwort						
Autumnal water-starwort			X			
Lesser pond-sedge						
Water violet						
Frogbit						
Alternate water-milfoil		X				
Curled pondweed						
Flat-stalked pondweed						
Blunt-leaved pondweed			X			
Perfoliate pondweed		X	X			
Long-stalked pondweed						
Greater duckweed						

Table 16. Brithdir (X = presence).

Species	Brithdir					
	1985-1987	1997	2003	2015	2018	2022
Water-plantain			X			
Flowering-rush						
Intermediate water-starwort						
Autumnal water-starwort						
Lesser pond-sedge						
Water violet						
Frogbit						
Alternate water-milfoil						
Curled pondweed						
Flat-stalked pondweed						
Blunt-leaved pondweed						
Perfoliate pondweed						
Long-stalked pondweed						
Greater duckweed						

Floating Water-plantain

4.4.3 Floating water-plantain has historically occurred in most of the reserves into which it was, presumably, translocated. However, for the last 20 years it has been absent from all reserves (**Table 17**).

Table 17. Occurrence of floating water-plantain at reserves (X = presence).

	1985-1987	1997	2003	2015	2018	2002
Weston Arm						
Rednal Basin	X					
Aston Locks (old)	X					
Aston Locks (new)						
Guilsfield Arm	X		X			
Wern	X		X			
Whitehouse			X			

Wern			X			

Grass-wrack Pondweed

4.4.4 Grass-wrack pondweed has fared little better than floating water-plantain in the reserves, although it was found at both the Aston reserves in 2022 (**Table 18**).

Table 18. Occurrence of floating water-plantain at reserves (X = presence).

	1985-1987	1997	2003	2015	2018	2002
Weston Arm						
Rednal Basin	X					
Aston Locks (old)	X					X
Aston Locks (new)						X
Guilsfield Arm	X					
Wern	X					
Whitehouse	X	X	X			
Wern			X			

Conclusions

4.4.5 The reserves may fulfil a function as temporary holding areas for particular species but, clearly, do not support especially diverse communities of noteworthy species as a general rule. It is likely that consistent and repeated management would be necessary to promote greater diversity and longevity of species populations within the reserves.

4.4.6 Floating water-plantain was present in 2003 at all the Welsh off-line reserves, where it was rare at Guilsfield Arm, rare at Wern, occasional at Whitehouse and occasional/frequent at Brithdir; it was not present in the English reserves (Newbold, 2003). In 1986 it was introduced into Rednal basin and possibly also into the Aston Locks (Old) ponds but in 1997 was not found at either location (Newbold, 2003)[Error! Bookmark not defined.]. It was present at Guilsfield Arm and the Wern reserve in 1986 but in 1997 was not found at either location (Newbold, 2003)[Error! Bookmark not defined.].

4.4.7 Reserves surveys in 2015 and 2018 (Ecus, 2015; 2018) did not find floating water-plantain. Lack of records of the species from the reserves is considered likely to due to hydrosere succession at Guilsfield Arm (where the channel is now almost completely choked with emergent vegetation), and shading/competition from floating aquatic plants at Whitehouse and Brithdir (where water soldier and filamentous algae/duckweeds cover the entire water surface areas). At Wern the situation may be more complicated, with a combination of poor water quality and shading from over-hanging trees playing a part. As Newbold (2003) notes, water quality parameters measured for all reserves were indicative of eutrophic to hyper-eutrophic conditions and over-hanging trees were creating excessive shading to the water column at Wern in 2003. These factors do not seem to have changed and, of course, in other areas such as at Whitehouse and Brithdir, excessive growth of water soldier and filamentous algae/duckweeds may simply reflect excessive nutrient input in poor quality water

4.4.8 In 2003, grass-wrack pondweed was abundant to locally dominant at the Whitehouse reserve and dominated the ponds at Brithdir reserve. According to Newbold (2003)[Error! Bookmark not defined.], it was introduced to Rednal Basin, Guilsfield Arm, the Wern reserve, and possibly the Aston Locks (Old) reserve in 1986. However, in 1997 it was not re-found at any of these four sites (Newbold, 2003)[Error! Bookmark not defined.]. It was found at the Whitehouse reserve in 1986 (not introduced?) and again in 1997 (Newbold, 2003)[Error! Bookmark not defined.]. The species was not found in any of the reserves by Ecus in 2015 or in 2018 (Ecus, 2015; 2018).

4.5 Recommendations

Water Quality

4.5.1 The key species highlighted in the conservation objectives for the canal are generally tolerant of water with a nutrient status in the mesotrophic to eutrophic range. They are not tolerant of sustained hypertrophic conditions or other pollution. This is reflected in their mid-ranging Ellenberg values for nitrogen (**Appendix 1**).

4.5.2 In 2001 Newbold (2001) suggested that species were being lost from the Montgomery canal because of pollution and Eaton *et al*. (2003) followed this by stating 'there is a general need for aquatic plant conservation purposes to minimise nutrient inputs throughout the canal. Such consequences of eutrophication as major growths of algae and lemnids, together with profuse development of waterweed species, spiked water-milfoil and rigid hornwort, are all deleterious to conservation of both the notable species *per se* and a diverse flora in general'. Two decades later, it is highly unlikely the situation has changed. In 2020 only 16% of waterbodies in England met the criteria for good ecological status and none met the criteria for good chemical status (https://environment.data.gov.uk/catchment-planning/England). Wales is almost certainly the same (for example, see NRW, 2021). As a result, feeder input, as well as direct run-off from adjacent land, is likely to be maintaining the canal in a state of advanced eutrophication, as well as introducing unknown quantities of other chemical pollutants.

4.5.3 Urgent action to improve water quality is needed. At a catchment level, it is the responsibility of government and the relevant statutory authorities to improve water quality in line with targets (i.e. according to The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (as amended)) and therefore to improve the quality of feeder water and diffuse run-off into the canal.

4.5.4 At a local level, the Canal and River Trust should identify, monitor and prevent point sources of excessive nutrient entry into the canal (and, if applicable, the reserves), including where there is significant run-off and where there are areas of cattle poaching. Dredging, with removal of sediment and plant material may help to temporarily lower nutrient levels at specific locations and, especially, in the reserves; but the overwhelming nutrient input is likely to come from the feeder water and diffuse run-off from the catchment.

Shading

4.5.5 Aquatic plants generally require high levels of light, and this is especially the case for species with a submerged growth form. It is no coincidence, therefore, that the key species highlighted in the conservation objectives all have high Ellenberg values for light (**Appendix 1**) and many are reduced in distribution or apparently lost from the canal and reserves where shading from competitive species and trees occurs.

4.5.6 The majority of canal sections suffer from excessive shading, particularly from bankside trees. This is also the case for the reserves. As Eaton *et al*. (2003) point out trees reduce 'light to aquatic plants to an extent damaging to their growth. The leaves they shed into the water create a mat which physically suppresses plant growth and sets up low oxygen conditions hostile to plant rooting. In time they also build up a very soft, organic substrate incapable of providing firm anchorage for any species of plants.'

4.5.7 In certain sections of the canal and reserves, emergent vegetation and/or floating vegetation (water soldier/duckweed/filamentous algae) is also causing excessive shading and may be contributing to organic material building up in the sediment.

4.5.8 Effort should be made to reduce shading across the canal and in the reserves. Trees should be

regularly pruned or removed. Floating vegetation should be annually removed from key locations such as the reserves. Planned dredging of certain sections of the canal will remove excessive emergent vegetation, but this situation will only be temporary unless ongoing management is implemented.

4.5.9 Anecdotally, floating water plantain is observed as being tolerant of shade and in many sections with overhanging trees few species other than floating water plantain were recorded. The 2022 CSM survey team noted that floating water plantain rarely grows beneath the canopy of overhanging trees but appeared associated with the canopy fringe. This would indicate that floating water plantain is able tolerate lower light conditions that other species cannot and can grow as a result of reduced competition. Further survey is recommended to determine accuracy of this observation and is planned for 2023.

Boating

4.5.10 The reserves are generally in poor condition. The purpose of reserves is generally to act as reservoir populations of rare species that are established to protect key populations during management works, such as dredging, on the main channel. The reserve population is maintained whilst the main channel population recovers from disturbance and if required plants can be re-introduced from the reserves to accelerate recovery of the main channel.

4.5.11 In-line reserves should be maintained and enhanced so that they remain effective refuges for sensitive species offering them protection from wash and mechanical damage in navigable parts of the canal. In this respect, greater emphasis should be put on management of the off-line reserves, especially as more of the canal is boated after restoration and the tolerance of main channel populations to disturbance is established.

Action Plans

4.5.12 The Canal and River Trust strongly recognises the negative impact of nutrient loading and pollution, shading, and boating, on canal ecosystems and has recently outlined actions to address such threats to aquatic SSSI's (see **Appendix 8**; CRT/NE, 2018). This is reflected in specific action plans for the Montgomery canal (e.g. CRT, 2022). These plans need to be regularly implemented and updated.

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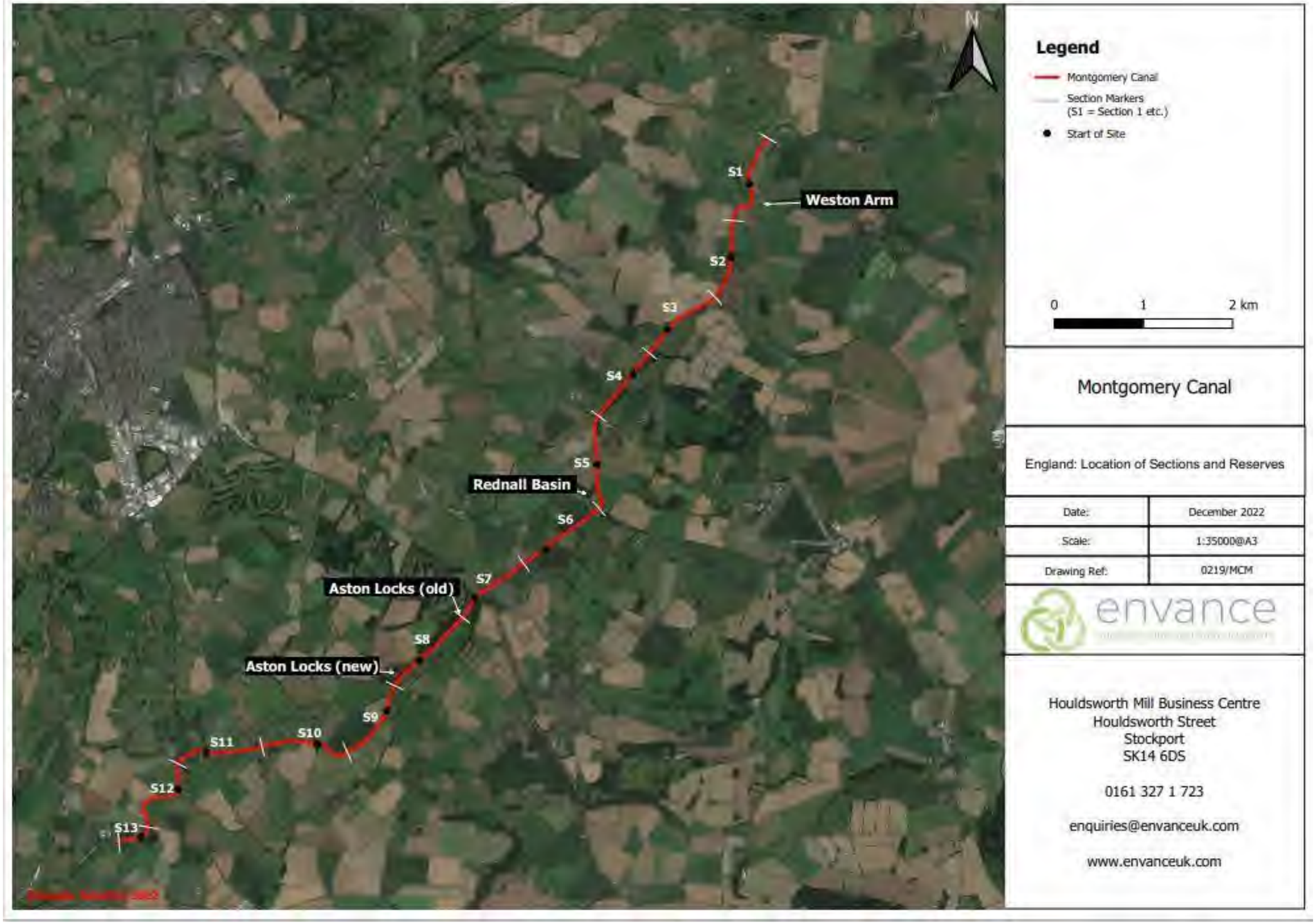
Figures


N
S1
Weston Arm
S2
S3
S4
S5
Rednall Basin
S6
S7
Aston Locks (old)
S8
Aston Locks (new)
S9
S10
S11
S12
S13
Legend
Montgomery Canal
Section Markers
(S1 = Section 1 etc.)
Start of Site
0
1
2 km
Montgomery Canal
England: Location of Sections and Reserves
Date:
December 2022
Scale:
1:35000@A3
Drawing Ref:
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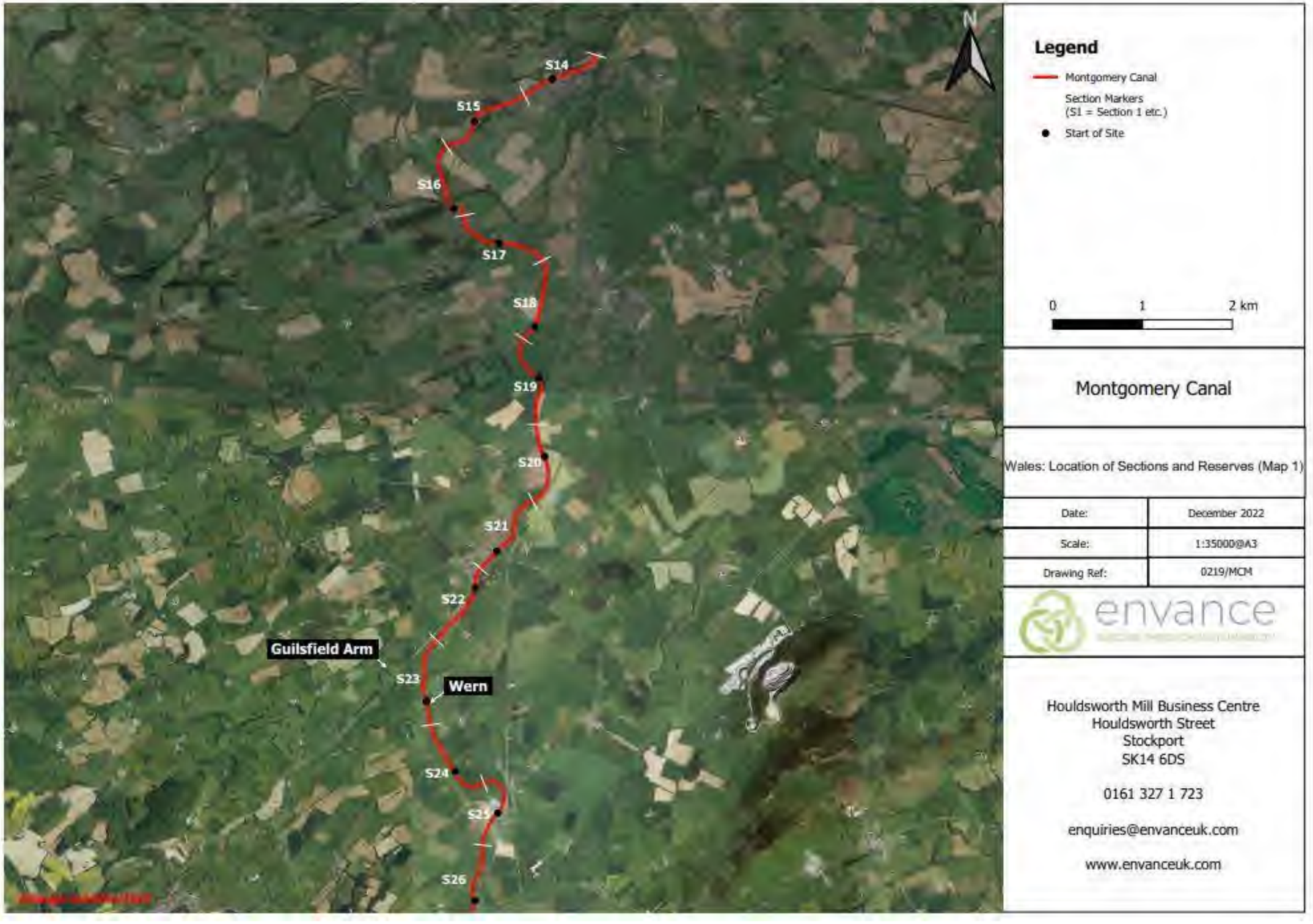
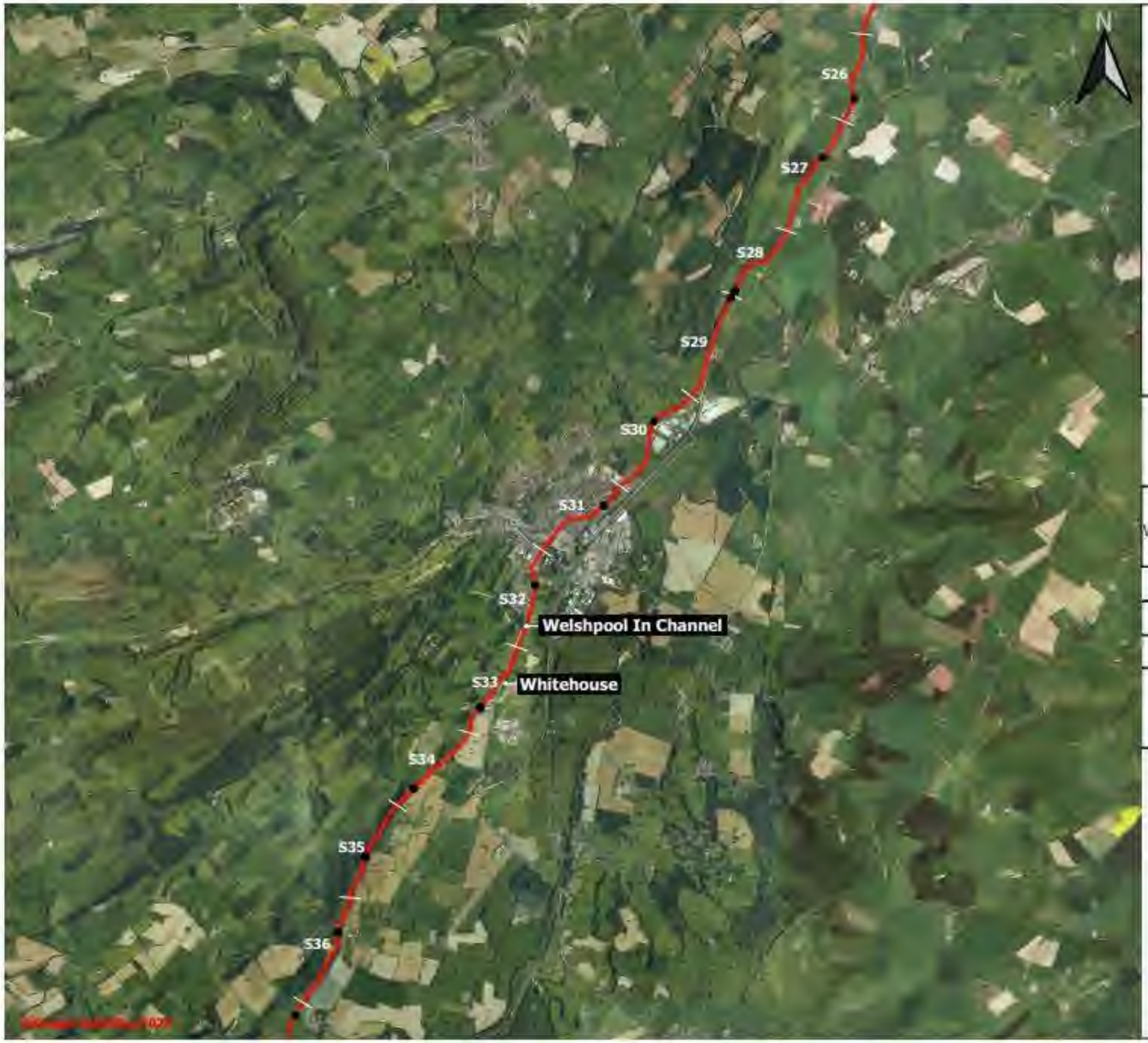
www.envanceuk.com


N
S14
S15
S16
S17
S18
S19
S20
S21
S22
Guilsfield Arm
S23
Wern
S24
S25
S26
Legend
Montgomery Canal
Section Markers
(S1 = Section 1 etc.)
Start of Site
0
1
2 km
Montgomery Canal
Wales: Location of Sections and Reserves (Map 1)
Date:
December 2022
Scale:
1:35000@A3
Drawing Ref:
0219/MCM
envance
Houldsworth Mill Business Centre
Houldsworth Street
Stockport
SK14 6DS
0161 327 1 723
enquiries@envanceuk.com
www.envanceuk.com



Legend

- Montgomery Canal
- Section Markers (S1 = Section 1 etc.)
- Start of Site

0 1 2 km

Montgomery Canal

Wales: Location of Sections and Reserves (Map 2)

Date:	December 2022
Scale:	1:35000@A3
Drawing Ref:	0219/MCM

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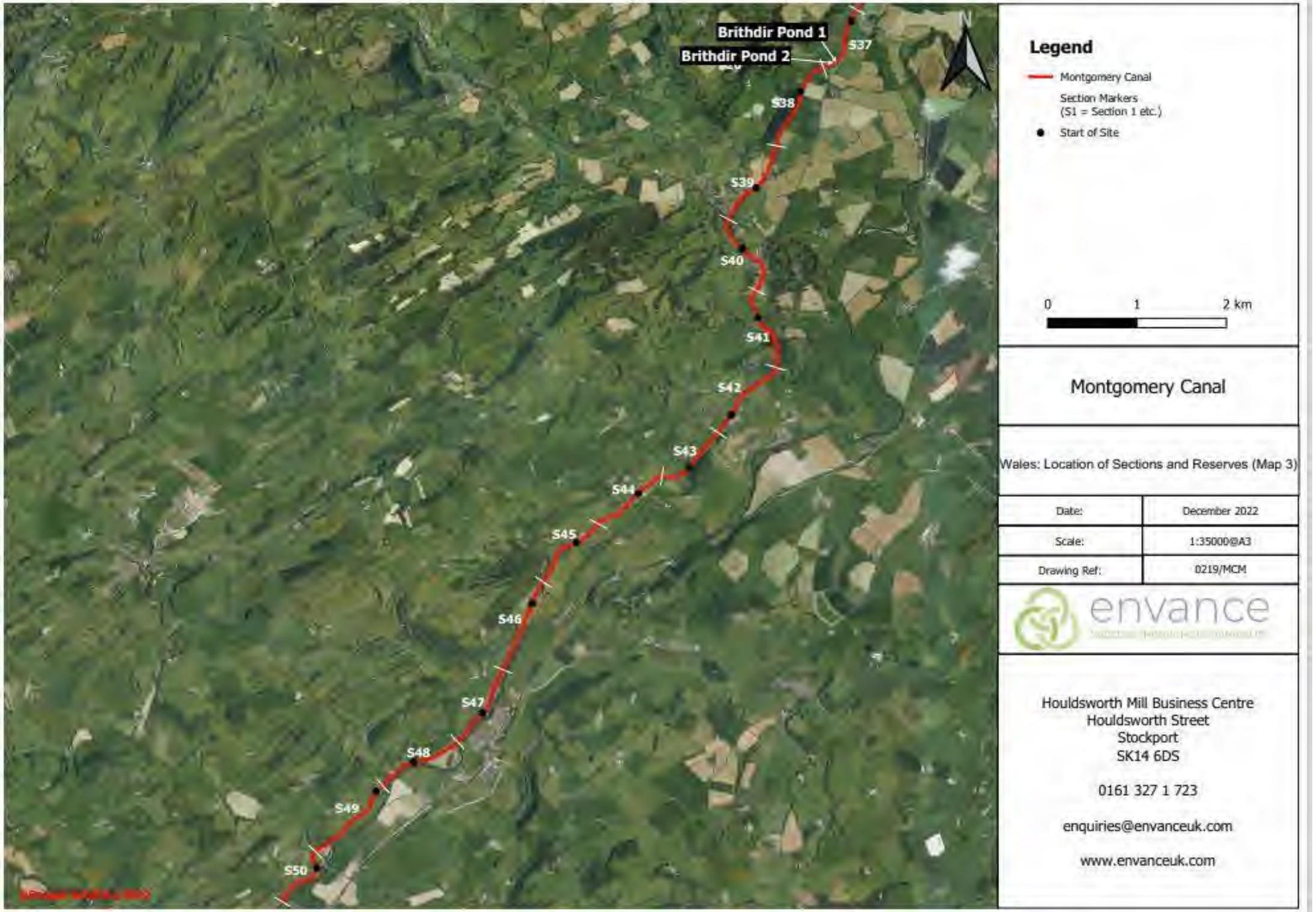
Brithdir Pond 1
Brithdir Pond 2
S37
S38
S39
S40
S41
S42
S43
S44
S45
S46
S47
S48
S49
S50
N
Legend
Montgomery Canal
Section Markers
(S1 = Section 1 etc.)
Start of Site
0
1
2 km
Montgomery Canal
Wales: Location of Sections and Reserves (Map 3)
Date:
December 2022
Scale:
1:35000@A3
Drawing Ref:
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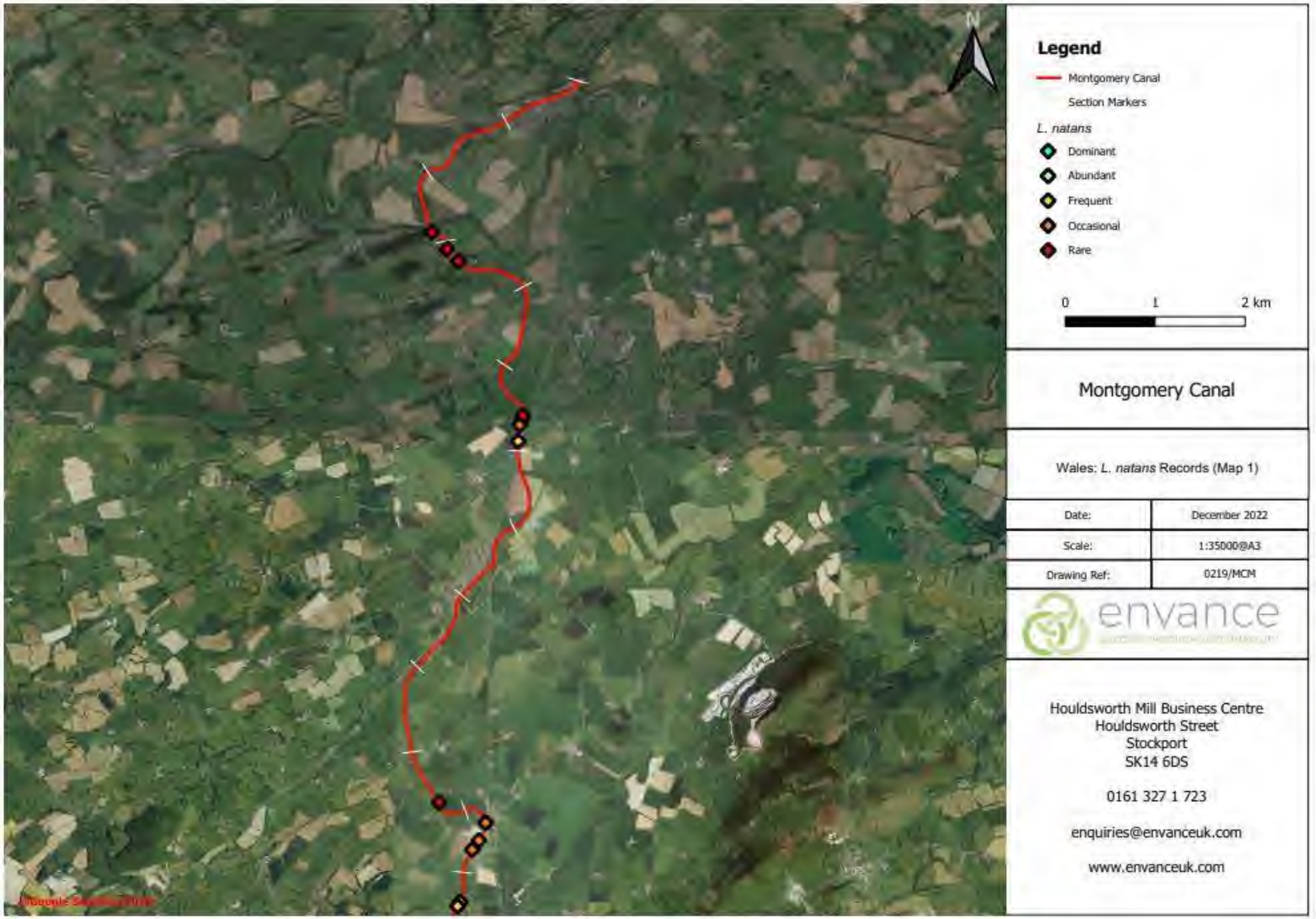
N
Legend
Montgomery Canal
Section Markers
L. natans
Dominant
Abundant
Frequent
Occasional
Rare
0
1
2 km
Montgomery Canal
Wales: L. natans Records (Map 1)
Date:
December 2022
Scale:
1:35000@A3
Drawing Ref:
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envance
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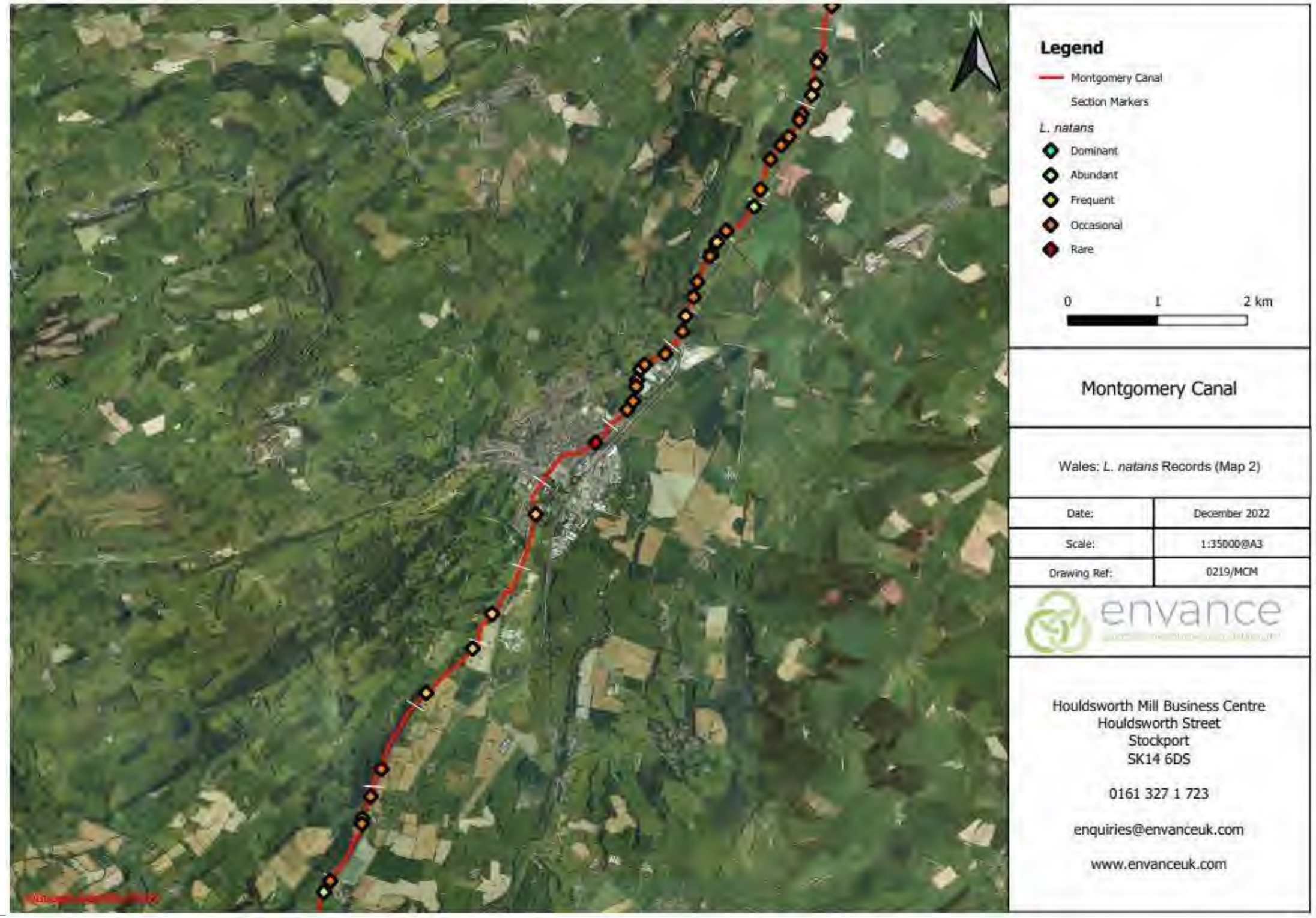
N
Legend
Montgomery Canal
Section Markers
L. natans
Dominant
Abundant
Frequent
Occasional
Rare
0
1
2 km
Montgomery Canal
Wales: L. natans Records (Map 2)
Date:
December 2022
Scale:
1:35000@A3
Drawing Ref:
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envance
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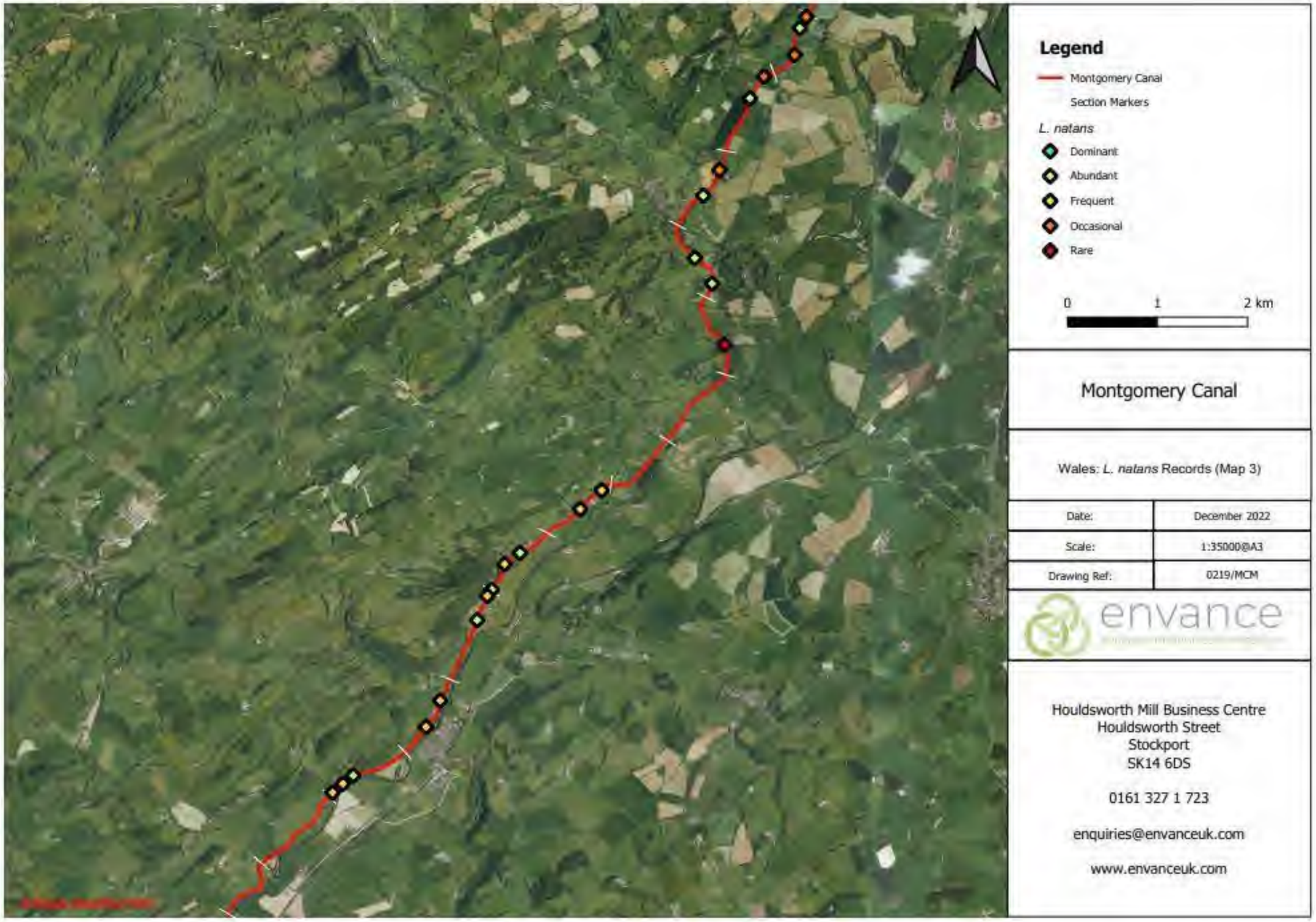
Legend
Montgomery Canal
Section Markers
L. natans
Dominant
Abundant
Frequent
Occasional
Rare
0
1
2 km
Montgomery Canal
Wales: L. natans Records (Map 3)
Date:
December 2022
Scale:
1:35000@A3
Drawing Ref:
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envance
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Houldsworth Street
Stockport
SK14 6DS
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N
Legend
Montgomery Canal
Section Markers
Potamogeton compressus
Potamogeton praelongus
0
1
2 km
Montgomery Canal
England: Notable Potamogeton Records
Date:
December 2022
Scale:
1:35000@A3
Drawing Ref:
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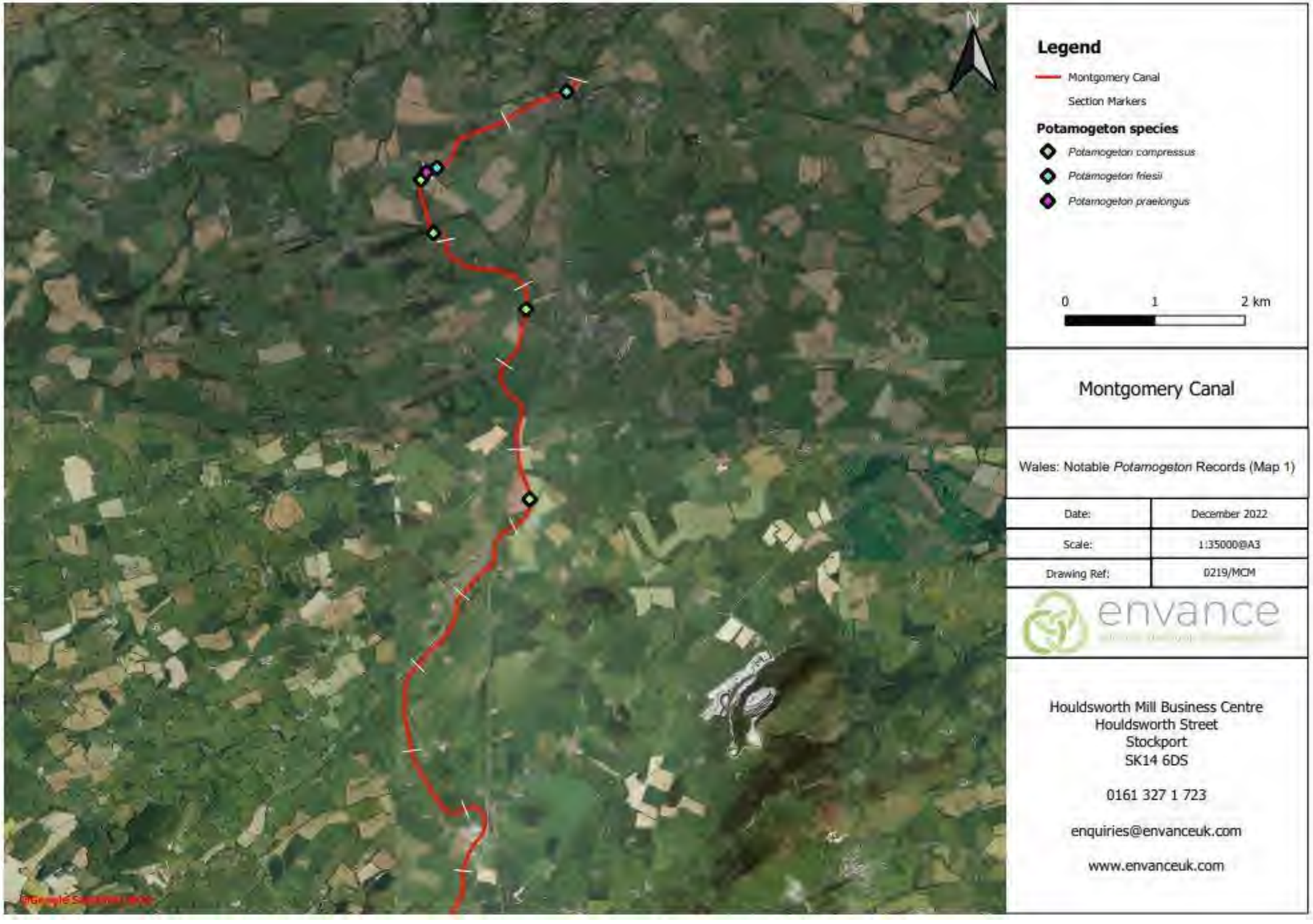
N
Legend
Montgomery Canal
Section Markers
Potamogeton species
Potamogeton compressus
Potamogeton friesii
Potamogeton praelongus
0
1
2 km
Montgomery Canal
Wales: Notable Potamogeton Records (Map 1)
Date:
December 2022
Scale:
1:35000@A3
Drawing Ref:
0219/MCM
envance
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Stockport
SK14 6DS
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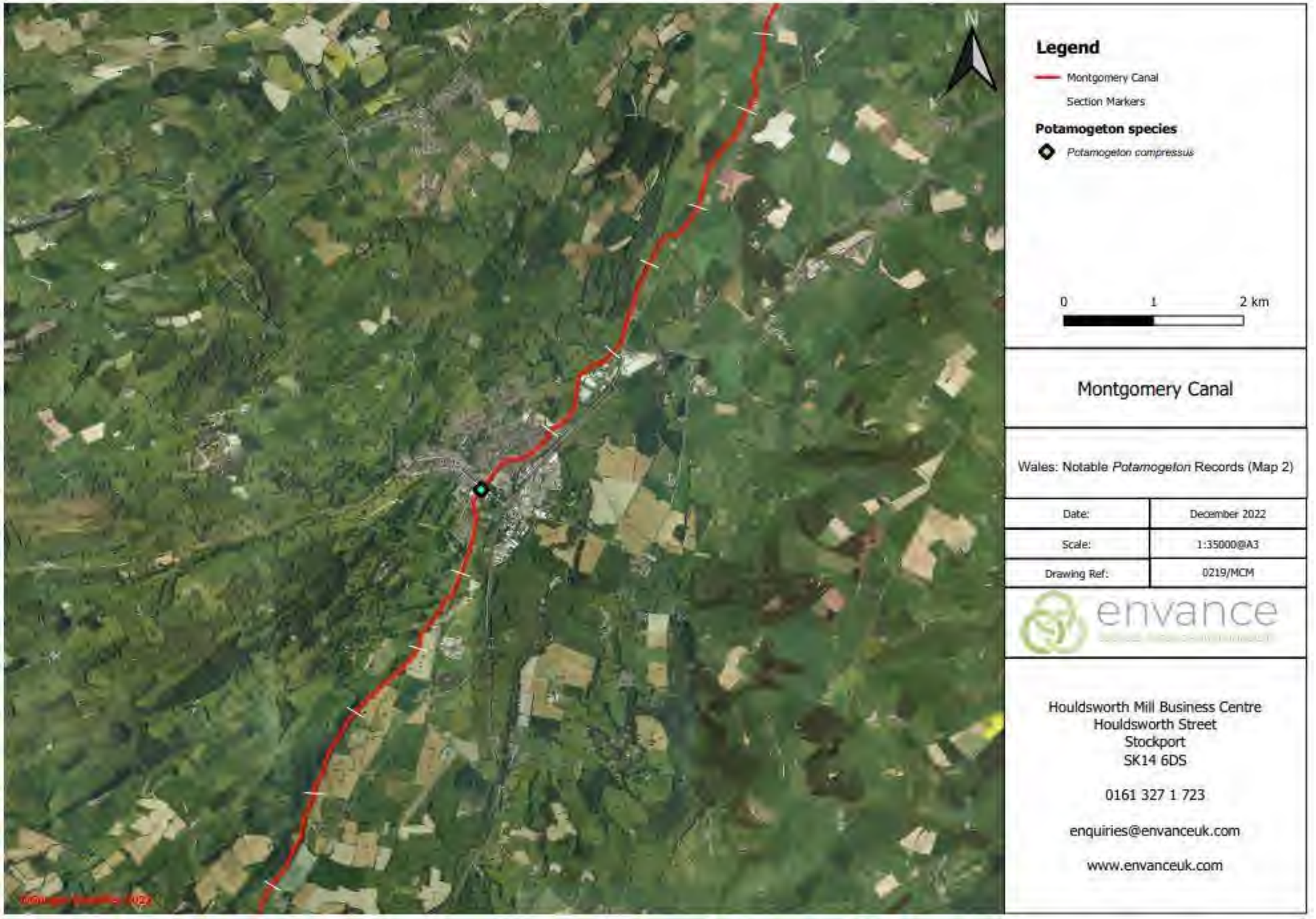
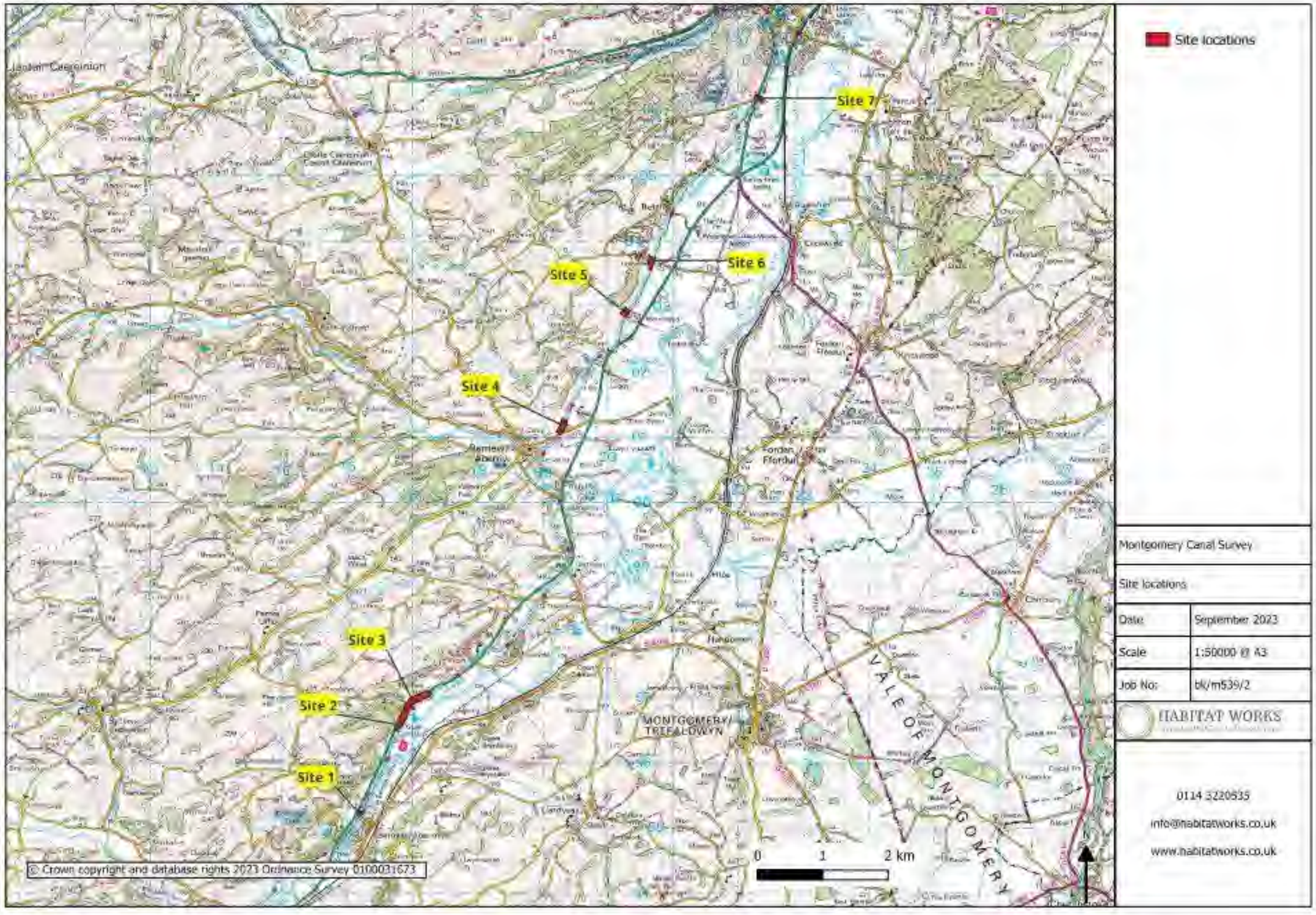

N
Legend
Montgomery Canal
Section Markers
Potamogeton species
Potamogeton compressus
0
1
2 km
Montgomery Canal
Wales: Notable Potamogeton Records (Map 2)
Date:
December 2022
Scale:
1:35000@A3
Drawing Ref:
0219/MCM
envance
Houldsworth Mill Business Centre
Houldsworth Street
Stockport
SK14 6DS
0161 327 1 723
enquiries@envanceuk.com
www.envanceuk.com


Site 1
Site 2
Site 3
Site 4
Site 5
Site 6
Site 7
Site locations
Montgomery Canal Survey
Site locations
Date: September 2023
Scale: 1:50000 @ A3
Job No: bk/m539/2
HABITAT WORKS
0114 3220535
info@habitatworks.co.uk
www.habitatworks.co.uk
0 1 2 km
© Crown copyright and database rights 2023 Ordnance Survey 0100031673


SO 16208 95252
SO 16916 95189
Canal vegetation
Berula erecta
Callitriche sp.
Collapsed willow
Elodea nuttallii
Glyceria maxima
Lurbhium natans
Lemna minor
Nuphar lutea
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Site marker
0
10
20 m
N
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Montgomery Canal Survey
Site 1
Date: September 2023
Scale: 1:300 @ A3
Job No: bk/m5.19/1a
HABITAT WORKS
0114 3220535
info@habitatworks.co.uk
www.habitatworks.co.uk


SO 16788 96556
SO 16757 96504
Canal vegetation
Glyceria maxima
Luronium natans
Nuphar lutea
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Site marker
0
10
20 m
N
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Montgomery Canal Survey
Site 2
Date: September 2023
Scale: 1:300 @ A3
Job No: bb/m539/1a
HABITAT WORKS
0114 3220515
info@habitatworks.co.uk
www.habitatworks.co.uk


SO 16833 96608
SO 16793 96556
Canal vegetation
Berula erecta
Glyceria maxima
Luronium natans
Nuphar lutea
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Site marker
0
10
20 m
N
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Montgomery Canal Survey
Site 3 section 1
Date
September 2023
Scale
1:300 @ A3
Job No:
bk/m539/1a
HABITAT WORKS
0114 3220535
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Canal vegetation
Berula erecta
Luronium natans
Nuphar lutea
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
SO 16872 96660
SO 16833 96608
0
10
20 m
N
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Montgomery Canal Survey
Site 3 section 2
Date
September 2023
Scale
1:300 @ A3
Job No:
bk/m539/1a
HABITAT WORKS
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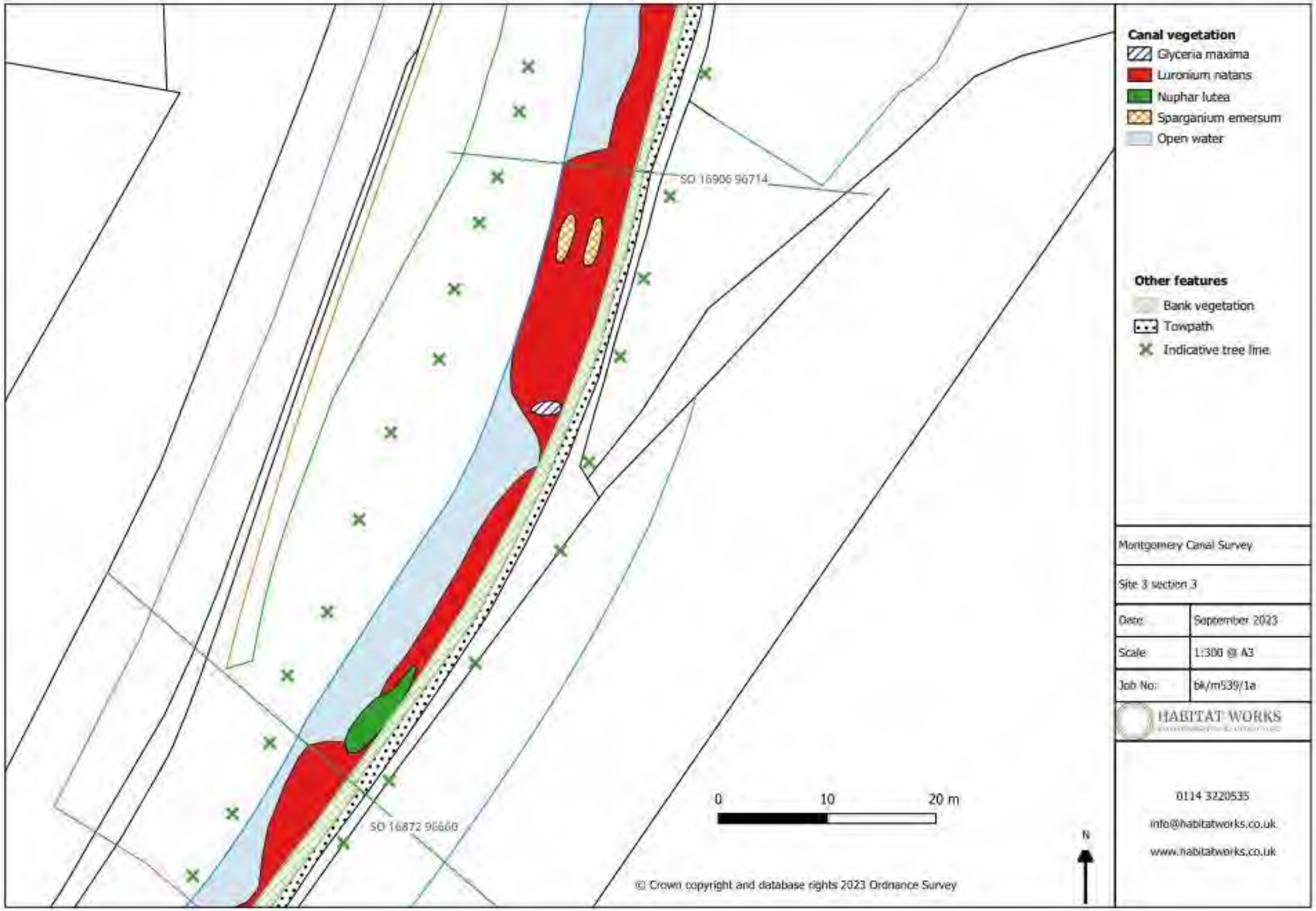
SO 16906 96714
SO 16872 96660
Canal vegetation
Glyceria maxima
Luronium natans
Nuphar lutea
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
0
10
20 m
N
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Montgomery Canal Survey
Site 3 section 3
Date
September 2023
Scale
1:300 @ A3
Job No:
bk/m539/1a
HABITAT WORKS
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info@habitatworks.co.uk
www.habitatworks.co.uk


SO 16917 96780
SO 16906 96714
Canal vegetation
Berula erecta
Luronium natans
Lemna minor
Nuphar lutea
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
0
10
20 m
N
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Montgomery Canal Survey
Site 3 section 4
Date
September 2023
Scale
1:300 @ A3
Job No:
bk/m539/1a
HABITAT WORKS
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www.habitatworks.co.uk


Canal vegetation
Berula erecta
Luronium natans
Lemna minor
Myosotis Scorpiodes
Nuphar lutea
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
SO 16940 96843
SO 16917 96780
0
10
20 m
N
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Montgomery Canal Survey
Site 3 section 5
Date
September 2023
Scale
1:300 @ A3
Job No:
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HABITAT WORKS
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SO 16974 96807
SO 16940 96843
0
10
20 m
N
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Canal vegetation
Berula erecta
Elodea nuttallii
Luronium natans
Myosotis Scorpioides
Nuphar lutea
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Montgomery Canal Survey
Site 3 section 6
Date
September 2023
Scale
1:300 @ A3
Job No:
bk/m539/1a
HABITAT WORKS
0114 3220535
info@habitatworks.co.uk
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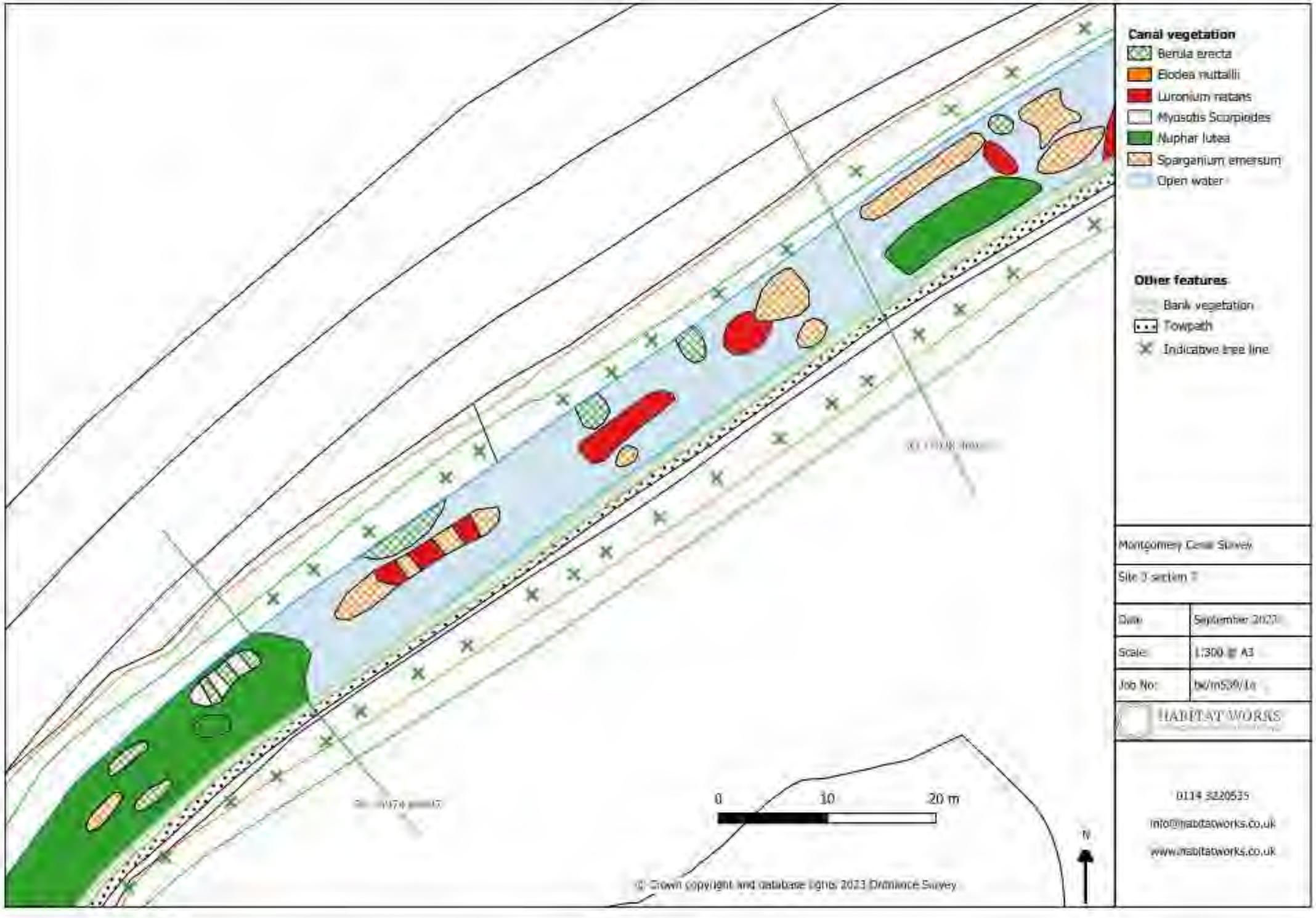
Canal vegetation
Berula erecta
Elodea nuttallii
Luronium natans
Myosotis Scorpioides
Nuphar lutea
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Montgomery Canal Survey
Site 3 section 7
Date
September 2023
Scale:
1:300 @ A3
Job No:
hw/m539/1a
HABITAT WORKS
0114 3220535
info@habitatworks.co.uk
www.habitatworks.co.uk
0
10
20 m
N
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Canal vegetation
Berula erecta
Luronium natans
Nuphar lutea
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
SO 17082 96965
SO 17028 96933
0
10
20 m
N
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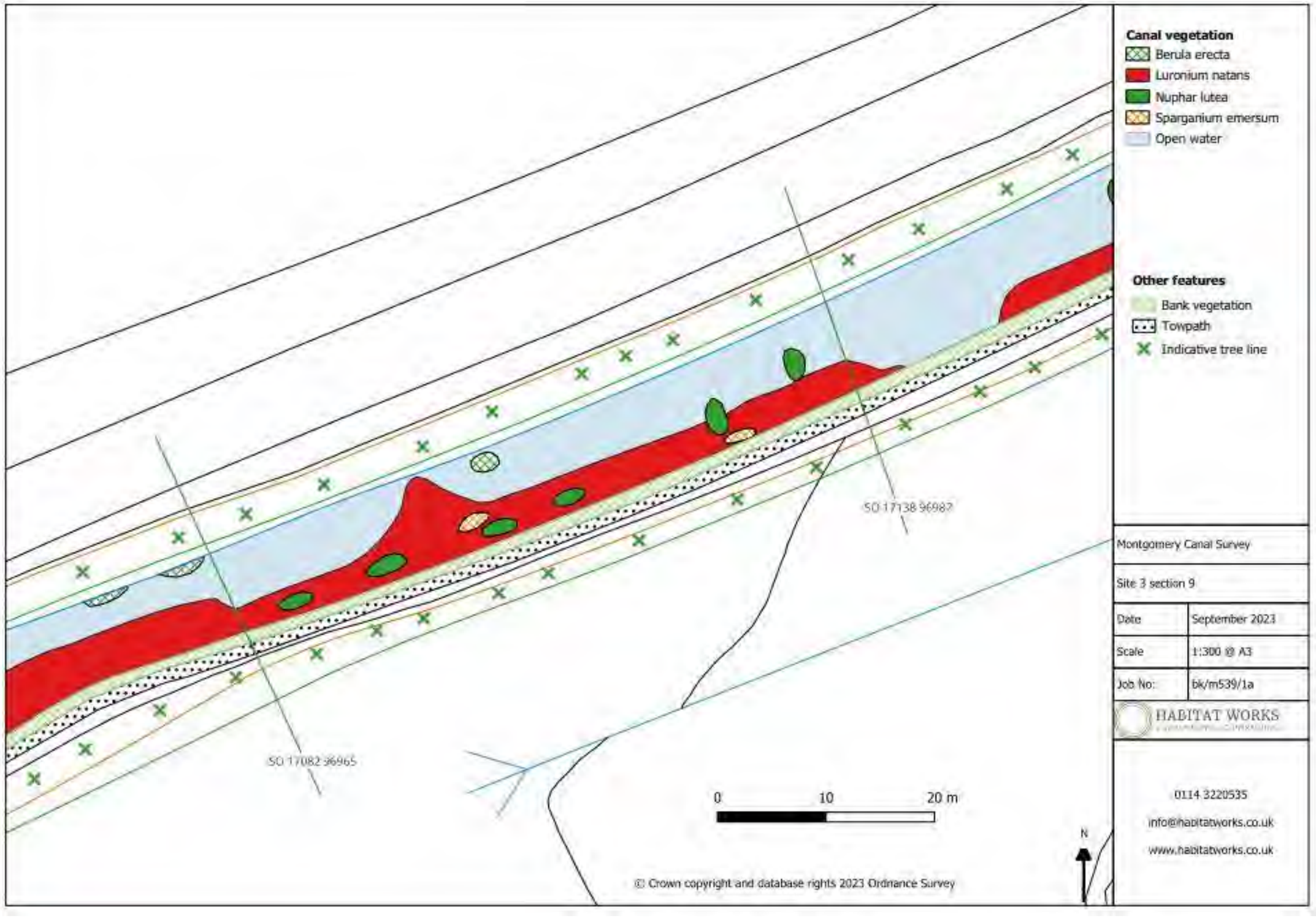
Montgomery Canal Survey
Site 3 section 8
Date
September 2023
Scale
1:300 @ A3
Job No:
bk/m539/1a
HABITAT WORKS
0114 3220535
info@habitatworks.co.uk
www.habitatworks.co.uk


Canal vegetation
Berula erecta
Luronium natans
Nuphar lutea
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
SO 17138 96987
SO 17082 96965
0
10
20 m
N
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Montgomery Canal Survey
Site 3 section 9
Date
September 2023
Scale
1:300 @ A3
Job No:
bk/m539/1a
HABITAT WORKS
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Canal vegetation
Berula erecta
Elodea nuttallii
Glyceria maxima
Luronium natans
Nuphar lutea
Potomogeton natans
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Montgomery Canal Survey
Site 3 section 10
Date: September 2023
Scale: 1:300 @ A3
Job No: bf/m539/10
HABITAT WORKS
0114 3220535
info@habitatworks.co.uk
www.habitatworks.co.uk
0
10
20 m
N
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SO 17271 97060
Canal vegetation
Berula erecta
Elodea nuttallii
Glyceria maxima
Luronium natans
Myosotis Scorpioides
Nuphar lutea
Potomogeton natans
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Site marker
0
10
20 m
N
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Montgomery Canal Survey
Site 3 sections 11 and 12
Date: September 2023
Scale: 1:500 @ A3
Job No: br/m539/1a
HABITAT WORKS
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info@habitatworks.co.uk
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Canal vegetation
Elodea nuttallii
Glyceria maxima
Hydrocharis morsus-ranae
Luronium natans
Nuphar lutea
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Site marker
Section markers
SJ 19268 01097
SJ 19268 01072
SJ 19248 01047
0
10
20 m
N
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Montgomery Canal Survey
Site 4 sections 1 and 2
Date
September 2023
Scale
1:300 @ A3
Job No:
bk/m539/1a
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www.habitatworks.co.uk


Canal vegetation
Eladea nuttallii
Glyceria maxima
Hydrocharis morsus-ranae
Luronium natans
Nuphar lutea
Potomogeton natans
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Section markers
SJ 19290 01123
SJ 19286 01077
0
10
20 m
N
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Montgomery Canal Survey
Site 4 sections 3 and 4
Date: September 2023
Scale: 1:300 @ A3
Job No: bk/m539/1a
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Canal vegetation
Elodea nuttallii
Glyceria maxima
Hydrocharis morsus-ranae
Luronium natans
Nuphar lutea
Potamogeton natans
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Section markers
SJ 19823 01243
SJ 19820 01190
SJ 19809 01156
Mosaic
0
10
20 m
N
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Montgomery Canal Survey
Site 4 sections 5 and 6
Date
September 2023
Scale
1:300 @ A3
Job No:
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HABITAT WORKS
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SJ 19343 01249
SJ 19333 01213
0
10
20 m
N
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Canal vegetation
Elodea nuttallii
Glyceria maxima
Hydrocharis morsus-ranae
Luronium natans
Nuphar lutea
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Site marker
Section markers
Montgomery Canal Survey
Site 4 section 7
Date
September 2023
Scale
1:300 @ A3
Job No:
bk/m539/1a
HABITAT WORKS
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Canal vegetation
Equisetum fluviatile
Elodea nuttallii
Glyceria maxima
Hydrocharis morsus-ranae
Luronium natans
Nuphar lutea
Potomogeton natans
Stratiotes aloides
Sparganium emersum
Open water
Willow
Other features
Bank vegetation
Towpath
Indicative tree line
Site marker
Section markers
SJ 20280 02904
SJ 20265 02876
SJ 20248 02846
0
10
20 m
N
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Montgomery Canal Survey
Site 5 sections 1 and 2
Date
September 2023
Scale
1:300 @ A3
Job No:
bk/m539/1a
HABITAT WORKS
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info@habitatworks.co.uk
www.habitatworks.co.uk


SJ 20311 02953
SJ 20296 02940
SJ 20280 02904
Canal vegetation
Berula erecta
Elodea nuttallii
Glyceria maxima
Hydrocharis morsus-ranae
Luronium natans
Nuphar lutea
Potomogeton natans
Stratiotes aloides
Sparganium emersum
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Site marker
Section markers
Montgomery Canal Survey
Site 5 sections 3 and 4
Date
September 2023
Scale
1:300 @ A3
Job No.
bk/m939/1a
HABITAT WORKS
0114 3220535
info@habitatworks.co.uk
www.habitatworks.co.uk
0
10
20 m
N
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SJ 20663 03681

SJ 20656 03650

SJ 20652 03618

0 10 20 m

N

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Canal vegetation
- Elodea nuttallii
- Glyceria maxima
- Hydrocharis morsus-ranae
- Luronium natans
- Nuphar lutea
- Stratiotes aloides
- Open water

Other features
- Bank vegetation
- Towpath
- Indicative tree line
- Site marker
- Section markers

Montgomery Canal Survey	
Site 6 sections 1 and 2	
Date	September 2023
Scale	1:300 @ A3
Job No:	pk/m539/1a

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info@habitatworks.co.uk
www.habitatworks.co.uk


SJ 20687 03745
SJ 20675 03709
SJ 20563 03681
Canal vegetation
Elodea nuttallii
Glyceria maxima
Hydrocharis morsus-ranae
Luronium natans
Nuphar lutea
Stratiotes aloides
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Site marker
Section markers
0
10
20 m
N
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Montgomery Canal Survey
Site 6 sections 3 and 4
Date
September 2023
Scale
1:300 @ A3
Job No
bk/m539/1a
HABITAT WORKS
0114 3228535
info@habitatworks.co.uk
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SJ 22339 06223
SJ 22318 06154
Canal vegetation
Ceratophyllum demersum
Elodea nuttallii
Hydrocharis morsus-ranae
Luronium natans
Nuphar lutea
Potomogeton compressus
Potomogeton obtusifolius
Stratiotes aloides
Sparganium emersum
Typha latifolia
Open water
Other features
Bank vegetation
Towpath
Indicative tree line
Site marker
Montgomery Canal Survey
Site 7
Date: September 2023
Scale: 1:300 @ A3
Job No: bk/m539/1a
HABITAT WORKS
0114 3220535
info@habitatworks.co.uk
www.habitatworks.co.uk
0
10
20 m
N
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Appendix 1. Plant Species Lists

England: species recorded in the canal and in the reserves			
Common Name*	**Scientific Name**	**Category****	**Conservation Status*****
Water-plantain	*Alisma plantago-aquatica*	Emergent	LC
Fool's water-cress	*Apium nodiflorum*	Emergent	LC
Lesser water-parsnip	*Berula erecta*	Emergent	LC
Water-starwort sp.	*Callitriche sp.*	Emergent/Floating-leaved/Submerged	unknown
Greater tussock-sedge	*Carex paniculata*	Emergent	LC
Greater pond-sedge	*Carex riparia*	Emergent	LC
Rigid hornwort	*Ceratophyllum demersum*	Submerged Q	LC
Nuttall's waterweed	*Elodea nuttallii*	Submerged	Sch 9
Water horsetail	*Equisetum fluviatile*	Emergent	LC
Japanese knotweed	*Fallopia japonica*	Terrestrial	Sch 9
Floating sweet-grass	*Glyceria fluitans*	Emergent/Floating-leaved	LC
Reed sweet-grass	*Glyceria maxima*	Emergent	LC
Water violet	*Hottonia palustris*	Submerged/Emergent	VU
Frogbit	*Hydrocharis morsus-ranae*	Floating-leaved Q	VU
Himalayan balsam	*Impatiens glandulifera*	Terrestrial	Sch 9
Yellow iris	*Iris pseudacorus*	Emergent	LC
Soft rush	*Juncus effusus*	Emergent	LC
Common duckweed	*Lemna minor*	Floating-leaved	LC
Least duckweed	*Lemna minuta*	Floating-leaved	neophyte
Ivy-leaved duckweed	*Lemna trisulca*	Floating-leaved/Submerged	LC
Water mint	*Mentha aquatica*	Emergent	LC
Water forget-me-not	*Myosotis scorpiodes*	Emergent	LC
Spiked water-milfoil	*Myriophyllum spicatum*	Submerged	LC
Yellow water-lily	*Nuphar lutea*	Floating-leaved/Submerged	LC
Hemlock water-dropwort	*Oenanthe crocata*	Emergent	LC
Amphibious bistort	*Persicaria amphibia*	Emergent/Floating-leaved	LC
Reed canary-grass	*Phalaris arundinacea*	Emergent	LC
Common reed	*Phragmites australis*	Emergent	LC
Grass-wrack pondweed	*Potamogeton compressus*	Submerged	VU
Broad-leaved Pondweed	*Potamogeton natans*	Floating-leaved/Submerged	LC
Blunt-leaved Pondweed	*Potamogeton obtusifolius*	Submerged	LC
Long-stalked pondweed	*Potamogeton praelongus*	Submerged Q	EN
Water-crowfoot sp.	*Ranunculus sp.*	Emergent/Floating-leaved/Submerged	unknown
Water dock	*Rumex hydrolapathum*	Emergent	LC
Arrowhead	*Sagittaria sagittifolia*	Emergent/Floating-leaved/Submerged	LC
Bittersweet	*Solanum dulcamara*	Emergent	LC
Unbranched bur-reed	*Sparganium emersum*	Emergent/Floating-leaved	LC
Branched bur-reed	*Sparganium erectum*	Emergent	LC
Bur-reed sp.	*Sparganium sp.*	Emergent/Floating-leaved	LC
Bulrush	*Typha latifolia*	Emergent	LC
Brooklime	*Veronica beccabunga*	Emergent	LC

Wales: species recorded in the canal and in the reserves			
Common Name*	**Scientific Name**	**Category****	**Conservation Status*****
Sweet-flag	*Acorus calamus*	Emergent	Neophyte
Water-plantain	*Alisma plantago-aquatica*	Emergent	LC
Fool's water-cress	*Apium nodiflorum*	Emergent	LC
Lesser water-parsnip	*Berula erecta*	Emergent	LC
Water-starwort sp.	*Callitriche sp.*	Emergent/Floating-leaved/Submerged	unknown
Greater tussock-sedge	*Carex paniculata*	Emergent	LC
Rigid hornwort	*Ceratophyllum demersum*	Submerged Q	LC
Needle spike-rush	*Eleocharis acicularis*	Emergent/Submerged Q	LC
Common spike-rush	*Eleocharis palustris*	Emergent	LC
Canadian waterweed	*Elodea canadensis*	Submerged	Sch 9
Nuttall's waterweed	*Elodea nuttallii*	Submerged	Sch 9
Water horsetail	*Equisetum fluviatile*	Emergent	LC
Floating sweet-grass	*Glyceria fluitans*	Emergent/Floating-leaved	LC
Reed sweet-grass	*Glyceria maxima*	Emergent	LC
Giant hogweed	*Heracleum mantegazzianum*	Terrestrial	Sch 9
Frogbit	*Hydrocharis morsus-ranae*	Floating-leaved Q	NT
Himalayan balsam	*Impatiens glandulifera*	Terrestrial	Sch 9
Yellow iris	*Iris pseudacorus*	Emergent	LC
Soft rush	*Juncus effusus*	Emergent	LC
Common duckweed	*Lemna minor*	Floating-leaved	LC
Least duckweed	*Lemna minuta*	Floating-leaved	Neophyte
Ivy-leaved duckweed	*Lemna trisulca*	Floating-leaved/Submerged	LC
Floating water-plantain	*Luronium natans*	Floating-leaved/Submerged	LC
Water mint	*Mentha aquatica*	Emergent	LC
Water forget-me-not	*Myosotis scorpiodes*	Emergent	LC
Spiked water-milfoil	*Myriophyllum spicatum*	Submerged	LC
Yellow water-lily	*Nuphar lutea*	Floating-leaved/Submerged	LC
Fringed water-lily	*Nymphoides peltata*	Floating-leaved	Neophyte
Hemlock water-dropwort	*Oenanthe crocata*	Emergent	LC
Amphibious bistort	*Persicaria amphibia*	Emergent/Floating-leaved	LC
Reed canary-grass	*Phalaris arundinacea*	Emergent	LC
Common reed	*Phragmites australis*	Emergent	LC
Grass-wrack pondweed	*Potamogeton compressus*	Submerged	VU
Flat-stalked pondweed	*Potamogeton friesii*	Submerged Q	NT
Broad-leaved Pondweed	*Potamogeton natans*	Floating-leaved/Submerged	LC
Blunt-leaved Pondweed	*Potamogeton obtusifolius*	Submerged	LC
Long-stalked pondweed	*Potamogeton praelongus*	Submerged Q	CR
Water-cress	*Rorippa nasturtium-aquaticum*	Emergent	LC
Water dock	*Rumex hydrolapathum*	Emergent	LC
Bittersweet	*Solanum dulcamara*	Emergent	LC
Unbranched bur-reed	*Sparganium emersum*	Emergent/Floating-leaved	LC
Branched bur-reed	*Sparganium erectum*	Emergent	LC
Bur-reed sp.	*Sparganium sp.*	Emergent/Floating-leaved	LC

Greater duckweed	*Spirodela polyrhiza*	Floating-leaved	LC
Water soldier	*Stratiotes aloides*	Floating-leaved/Submerged	Neophyte
Bulrush	*Typha latifolia*	Emergent	LC
Charophyte sp.	*Chara sp. / Nitella sp.*	Submerged Q	unknown

Species mentioned in the text but not recorded during the surveys			
Common Name*	**Scientific Name**	**Category****	**Conservation Status*****
Flowering-rush	*Butomus umbellatus*	Emergent	LC (England) VU (Wales)
Intermediate water-starwort	*Callitriche brutia ssp. hamulata*	Emergent/Floating-leaved/Submerged	LC (England and Wales)
Autumnal water-starwort	*Callitriche hermaphroditica*	Submerged Q	LC (England) VU (Wales)
Lesser pond-sedge	*Carex acutiformis*	Emergent	LC (England and Wales)
Alternate water-milfoil	*Myriophyllum alterniflorum*	Submerged	LC (England and Wales)
Tubular water-dropwort	*Oenanthe fistulosa*	Emergent	VU (England and Wales)
Red pondweed	*Potamogeton alpinus*	Submerged Q	VU (England) CR (Wales)
Small pondweed	*Potamogeton berchtoldii*	Submerged	LC (England and Wales)
Curled pondweed	*Potamogeton crispus*	Submerged	LC (England and Wales)
Fennel pondweed	*Potamogeton pectinatus*	Submerged	LC (England and Wales)
Perfoliate pondweed	*Potamogeton perfoliatus*	Submerged	LC (England and Wales)
Lesser pondweed	*Potamogeton pusillus*	Submerged	LC (England and Wales)
Fan-leaved water-crowfoot	*Ranunculus circinatus*	Submerged	LC (England and Wales)

* Names follow Stace (2010).

** Q = quality indicator (indicative of good water quality and/or sensitive to boat traffic).

*** LC = least concern, NT = near threatened, VU = vulnerable, CR = critically endangered (Stroh *et al.*, 2014 for England; Dines, 2008 for Wales). Neophytes are not given a conservation status. Sch 9 = invasive non-native species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

Ellenberg indicator value for key species (Hill *et al.*, 1999)*		
Common Name	**Light**	**Nitrogen**
Water-plantain	7	7
Flowering rush	7	7
Intermediate water-starwort	7	5
Autumnal water-starwort	7	5
Lesser pond-sedge	7	6
Water violet	7	5
Frogbit	7	7
Floating water-plantain	8	3
Red pondweed	7	5
Small pondweed	6	5
Grass-wrack pondweed	6	4
Curled pondweed	6	6
Flat-stalked pondweed	5	5
Broad-leaved Pondweed	6	4
Blunt-leaved Pondweed	6	5
Fennel pondweed	6	7

Perfoliate pondweed	6	5
Long-stalked pondweed	8	5
Lesser pondweed	6	6
Greater duckweed	7	7

* Indicator values range from 1 to 9. For light, a plant species that can tolerate deep shade would score 1, whereas a species that requires full sun would score 9. For nitrogen, a plant species that requires very nutrient poor conditions would score 1, whereas a species that can tolerate highly eutrophic conditions would score 9.

Appendix 2. Locations of Canal Sections/Sites and Reserves

Section Number[10]	Section Start	Section End	Site Start	Site End
1 (1)	SJ 37058 31824	SJ 36662 30906	SJ 36838 31319	SJ 36868 31186
2 (2)	SJ 36662 30906	SJ 36449 30050	SJ 36634 30496	SJ 36614 30361
3 (3)	SJ 36449 30050	SJ 35717 29421	SJ 35929 29683	SJ 35845 29573
4 (4)	SJ 35717 29421	SJ 35106 28643	SJ 35532 29193	SJ 35436 29076
5 (5)	SJ 35149 28717	SJ 35151 27678	SJ 35128 28174	SJ 35127 28018
6 (6)	SJ 35151 27678	SJ 34309 27060	SJ 34541 27222	SJ 34437 27151
7 (7)	SJ 34309 27060	SJ 33622 26460	SJ 33758 26679	SJ 33695 26560
8 (8)	SJ 33622 26460	SJ 32862 25696	SJ 33135 25980	SJ 33042 25901
9 (9)	SJ 32862 25696	SJ 32327 24958	SJ 32768 25417	SJ 32716 25299
10 (10)	SJ 32327 24958	SJ 31373 25014	SJ 31994 25038	SJ 31862 25059
11 (11)	SJ 31373 25014	SJ 30427 24822	SJ 30748 24947	SJ 30619 24955
12 (12)	SJ 30427 24822	SJ 30094 24110	SJ 30436 24532	SJ 30338 24453
13 (13)	SJ 30094 24110	SJ 29771 23945	SJ 30021 24001	SJ 29895 23969
14 (17-18)	SJ 27061 21264	SJ 26269 20822	SJ 26572 20995	SJ 26452 20937
15 (18-19)	SJ 26253 20807	SJ 25394 20248	SJ 25704 20522	SJ 25656 20407
16 (19-20)	SJ 25394 20248	SJ 25598 19476	SJ 25474 19553	SJ 25578 19514
17 (20-21)	SJ 25600 19478	SJ 26462 18967	SJ 25976 19164	SJ 26113 19160
18 (21-22)	SJ 26462 18967	SJ 26250 18100	SJ 26375 18229	SJ 26283 18135
19 (22-23)	SJ 26250 18100	SJ 26394 17200	SJ 26423 17665	SJ 26456 17527
20 (23-24)	SJ 26404 17092	SJ 26348 16287	SJ 26486 16785	SJ 26524 16658
21 (24-25)	SJ 26346 16291	SJ 25783 15525	SJ 25951 15726	SJ 25864 15617
22 (25-26)	SJ 25783 15525	SJ 25282 14741	SJ 25714 15310	SJ 25674 15188
23 (26-27)	SJ 25282 14741	SJ 25221 13788	SJ 25170 14055	SJ 25198 13924
24 (27-28)	SJ 25221 13788	SJ 25813 13146	SJ 25489 13272	SJ 25558 13164
25 (28-29)	SJ 25813 13146	SJ 25790 12453	SJ 25964 12804	SJ 25889 12702
26 (29-30)	SJ 25790 12453	SJ 25601 11592	SJ 25708 11825	SJ 25665 11706
27 (30-31)	SJ 25601 11592	SJ 25051 10520	SJ 25409 11240	SJ 25323 11147
28 (31-32)	SJ 25051 10520	SJ 24508 09884	SJ 24542 09933	SJ 24595 10054
29 (32-33)	SJ 24508 09884	SJ 24101 08903	SJ 24499 09866	SJ 24449 09756
30 (33-35)	SJ 24101 08903	SJ 23402 08029	SJ 23749 08652	SJ 23710 08524
31 (35-36)	SJ 23364 07954	SJ 22656 07390	SJ 23254 07827	SJ 23131 07740
32 (36-37)	SJ 22656 07390	SJ 22414 06439	SJ 22584 07047	SJ 22561 06900
33 (37-38)	SJ 22414 06439	SJ 21940 05602	SJ 22049 05854	SJ 21964 05737
34 (38-39)	SJ 21940 05602	SJ 21236 04890	SJ 21395 05054	SJ 21289 04951
35 (39-40)	SJ 21236 04890	SJ 20776 03985	SJ 20923 04384	SJ 20884 04239
36 (40-41)	SJ 20776 03985	SJ 20310 02959	SJ 20652 03648	SJ 20639 03500
37 (41-42)	SJ 20310 02959	SJ 19930 02313	SJ 20240 02836	SJ 20180 02701
38 (42-43)	SJ 19930 02313	SJ 19405 01440	SJ 19676 02052	SJ 19641 01906
39 (43-44)	SJ 19405 01440	SJ 18864 00616	SJ 19177 00967	SJ 19049 00892
40 (44-45)	SJ 18864 00616	SO 19182 99813	SJ 19019 00284	SJ 19137 00192

[10] Numbers in parentheses are the corresponding kilometre sections laid out by Briggs (1988). Note that the England-Wales border cuts through section 14 so part of the canal here is actually in England and is not included in the SAC.

41 (45-46)	SO 19182 99813	SO 19408 98979	SO 19199 99512	SO 19278 99390
42 (46-47)	SO 19392 98934	SO 18746 98228	SO 18899 98423	SO 18813 98305
43 (47-48)	SO 18746 98228	SO 18136 97738	SO 18431 97843	SO 18322 97740
44 (48-49)	SO 18113 97746	SO 17422 97220	SO 17858 97546	SO 17761 97437
45 (49)	SO 17398 97177	SO 16793 96552	SO 17164 96992	SO 17026 96930
46 (49-51)	SO 16793 96552	SO 16342 95567	SO 16669 96309	SO 16614 96169
47 (51)	SO 16342 95567	SO 15855 94782	SO 16116 95084	SO 16011 94975
48 (52-53)	SO 15810 94740	SO 14999 94267	SO 15344 94533	SO 15212 94471
49 (53-54)	SO 14999 94267	SO 14246 93528	SO 14922 94204	SO 14864 94065
50 (54)	SO 14246 93528	SO 13872 92968	SO 14261 93345	SO 14191 93223

Reserve	**Location**
Weston Arm	SJ 37005 31090
Rednal Basin	SJ 35050 27826
Aston Locks (Old) Pond 1	SJ 33625 26515
Aston Locks (Old) Pond 2	SJ 33588 26511
Aston Locks (Old) Pond 3	SJ 33537 26470
Aston Locks (Old) Pond 4	SJ 33487 26430
Aston Locks (Old) Pond 5	SJ 33444 26376
Aston Locks (New) Pond 1	SJ 33302 26217
Aston Locks (New) Pond 2	SJ 32864 25873
Aston Locks (New) Pond 3	SJ 32806 25747
Guilsfield Arm	SJ 24707 14445
Wern	SJ 25234 14060
Whitehouse	SJ 22284 06087
Welshpool in channel	SJ 22496 06644
Brithdir Pond 1	SJ 20019 02373
Brithdir Pond 2	SJ 20059 02401

Appendix 3. Photographs

Photograph 1. Site 1.

Photograph 2. Site 2.

Photograph 3. Site 3.

Photograph 4. Site 4.

Photograph 5. Site 5.

Photograph 6. Site 6.

Photograph 7. Site 7.

Photograph 8. Site 8.

Photograph 9. Site 9.

Photograph 10. Site 10.

Photograph 11. Site 11.

Photograph 12. Site 12.

Photograph 13. Site 13.

Photograph 14. Site 14.

Photograph 15. Site 15.

Photograph 16. Site 16.

Photograph 17. Site 17.

Photograph 18. Site 18.

Photograph 19. Site 19.

Photograph 20. Site 20.

Photograph 21. Site 21.

Photograph 22. Site 22.

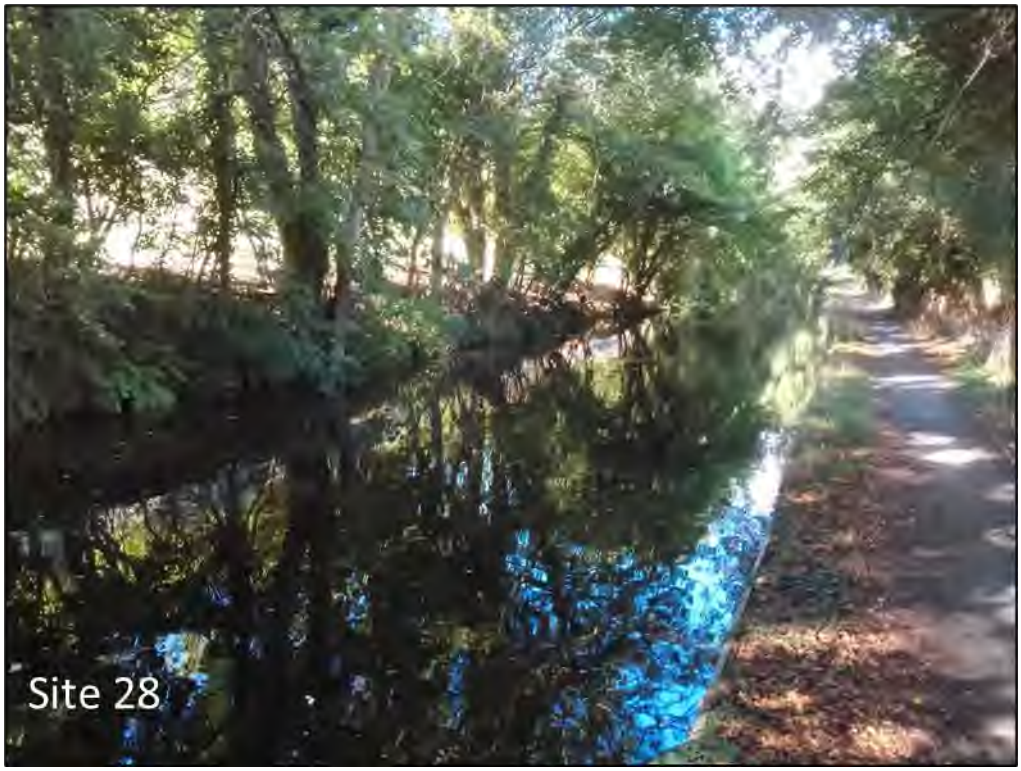
Photograph 23. Site 23.

Photograph 24. Site 24.

Photograph 25. Site 25.

Photograph 26. Site 26.

Photograph 27. Site 27.



Photograph 28. Site 28.

Photograph 29. Site 29.

Photograph 30. Site 30.

Photograph 31. Site 31.

Photograph 32. Site 32.

Photograph 33. Site 33.

Photograph 34. Site 34.

Photograph 35. Site 35.

Photograph 36. Site 36.

Photograph 37. Site 37.

Photograph 38. Site 38.

Photograph 39. Site 39.

Photograph 40. Site 40.

Photograph 41. Site 41.

Photograph 42. Site 42.

Photograph 43. Site 43.

Photograph 44. Site 44.

Photograph 45. Site 45.

Photograph 46. Site 46.

Photograph 47. Site 47.

Photograph 48. Site 48.

Photograph 49. Site 49.

Photograph 50. Site 50.

Photograph 51. Weston Arm.

Photograph 52. Rednal Basin.

Photograph 53. Aston Locks (Old) Pond 1.

Photograph 54. Aston Locks (Old) Pond 2.

Photograph 55. Aston Locks (Old) Pond 3.

Photograph 56. Aston Locks (Old) Pond 4.

Photograph 57. Aston Locks (Old) Pond 5.

Photograph 58. Aston Locks (New) Pond 1.

Photograph 59. Aston Locks (New) Pond 2.

Photograph 60. Aston Locks (New) Pond 3.