

Welsh Government

M4 Corridor around Newport

Environmental Statement Volume
3:

Appendix 10.15 Terrestrial and
Aquatic Invertebrate Survey 2014

M4CaN-DJV-EBD-ZG_GEN-AX-EN-0034

March 2016

M4 CORRIDOR AROUND NEWPORT,
SOUTH WALES

BASELINE INVERTEBRATE SURVEY
2014



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CONTENTS

1. INTRODUCTION	Page 2
2. METHODOLOGY	3
3. RESULTS	5
4. SUMMARY AND RECOMMENDATIONS	45
REFERENCES	46
SURVEY SITE LOCATIONS	

1. INTRODUCTION

- 1.1 Rachel Hacking Ecology Limited was commissioned in 2014 by Ove Arup & Partners Limited to undertake baseline terrestrial and aquatic invertebrate surveys of a proposed new route for the M4 motorway south of Newport in south Wales.
- 1.2 The proposed route runs from Junction 23 of the existing M4 in the east to close to Junction 29 of the M4 in the west. It will provide a quicker travel route by bypassing Newport. The route includes many areas of farmland, ex-industrial land and a number of statutorily and non-statutorily protected sites, such as Sites of Special Scientific Interest (SSSIs) within an area known as the Gwent Levels. The Gwent Levels are renowned for their invertebrate fauna.
- 1.3 The centreline of the study area, within a 50 metre corridor, was surveyed for terrestrial and aquatic invertebrates, within suitable habitat. The survey concentrated on habitats such as reens, ditches, ex-industrial land, woodland, permanent pasture, ponds, grazing marsh and streams.
- 1.4 The invertebrate surveys were commissioned to determine the species assemblages present along the potential route of the M4 and whether any species of conservation concern exist within the study area. The baseline results will inform the need for further survey and provide baseline information for an Environmental Impact Assessment of any scheme. In time, the results will feed into the mitigation and compensation package.

2. METHODOLOGY

- 2.1 Detailed maps were studied to determine survey sites. There are approximately 100 sites, mainly watercourses or waterbodies, which will be affected by the potential route. Due to timing considerations, 50% of the sites were chosen for survey. The sites were chosen either from access availability or from ground work i.e. visiting the sites and deciding which to survey.
- 2.2 At each suitable site, the following terrestrial invertebrate survey methods were used:
- Sweep-netting – A robust insect net was used to sweep the vegetation. For scrub this involved sweeping the net against high branches. Sweeping was also carried out along the ground to collect low-flying invertebrates.
 - Hand-searching – This involved searching under fallen wood, in grass tussocks, sieving through the leaf-litter and searching beneath bark.
 - Pootering – A pooter was used during all the above methodologies to catch smaller invertebrates which would otherwise have been missed.
- 2.3 Where aquatic invertebrate surveying took place, the following methods were used:
- Direct observation - The water surface and emergent vegetation were searched for evidence of egg cocoons, reed beetles and similar genera and evidence of feeding or egg-laying, such as cut sections of floating leaves.
 - Pond-netting - Areas of standing water (ditches, reens ponds) were netted for aquatic invertebrates using a heavy-duty pond-net. All sections of the watercourse or waterbody were netted, including within submerged vegetation and within emergent vegetation, by sweeping the vegetation into the water. The water was netted until no new species were being caught.
- 2.4 Surveying concentrated on specific invertebrate orders, all of which contain ecological indicator species. Within some orders, only certain families have been included in the survey scope due to the habitats present and the survey techniques used across the site. The following terrestrial orders were surveyed for:
- Diptera (true flies)
 - Coleoptera (beetles)
 - Araneae (true spiders) and opiliones (harvestmen)
 - Odonata (dragonflies and damselflies)
 - Lepidoptera (butterflies and day-flying moths)
 - Hymenoptera (bees and wasps)
 - Hemiptera (true bugs – shieldbugs and capsid bugs only)

- 2.5 The aquatic surveys concentrated the following orders:
- Tricladida (flatworms)
 - Hirudinea (leeches)
 - Mollusca (snails and mussels)
 - Malacostraca (shrimps and hoglice)
 - Ephemeroptera (mayflies)
 - Plecoptera (stoneflies)
 - Odonata (dragonflies and damselflies)
 - Hemiptera (aquatic bugs)
 - Coleoptera (water beetles)
 - Megaloptera (alderflies)
 - Trichoptera (caddisflies)
 - Lepidoptera (butterflies and moths (freshwater moths)).
- 2.6 Rachel Hacking and Andy Harmer undertook the field work. Three visits were made, in May, July and September 2014. All survey methods were used during all visits. All invertebrates caught were potted in 70% ethanol to be identified later, unless identification could be made in the field, in which case the animal was released.
- 2.7 Following the survey visits, identification of the specimens was undertaken. Rachel Hacking (Principal Ecologist and Cheshire Carabidae recorder) identified the Coleoptera with critical specimens being sent to Mike Denton FRES, a Coleoptera recorder for south Yorkshire. The Diptera specimens were sorted and sent to Tom Mawdsley, an expert Dipterist at Liverpool Museum. The Araneae were identified by Chris Felton, an expert Arachnologist at Liverpool Museum. Other orders were identified by either Andy Harmer, Rachel Hacking or by other taxonomic experts. All specimens have been retained in the collection of Rachel Hacking.
- 2.8 The invertebrates are assessed for rarity designations. Red Data Book species are our rarest species and are found in less than 16 10km squares of the National Grid. Nationally Scarce species are known to occur in 100 or fewer 10km squares of the National Grid. If enough is known about the species, i.e. its ecology and distribution, then the Nationally Scarce designation is split into Notable A and Notable B (Na species occur within 16 - 30 10km squares, Nb between 31 – 100 10km squares). Designations are taken from Falk (1991), Foster (2010), Hyman & Parsons (1992) and the NBN Gateway.
- 2.9 Some species mentioned in the text are considered 'Local'. These are not scarce but have restricted habitat requirements. Botanical nomenclature follows Stace, 2010. See References for invertebrate nomenclature authors.

Survey Constraints

- 2.10 On all of the sites, static collection techniques were not used (i.e. pitfall traps, yellow bowl traps or malaise traps). This was for a number of reasons. Either the site was accessed by cattle or by the general public. Or it was not possible to set traps within the ground or within strong vegetation.
- 2.11 During some site visits, the weather conditions were not optimum for terrestrial invertebrate survey (e.g. rain or strong winds). Therefore, on some of the multiple visits, invertebrates may have been missed.

3. RESULTS

GENERAL

- 3.1 289 species of terrestrial invertebrate were recorded across the whole survey area in 2014 (see Table 1 for a breakdown of the totals per taxonomic group). 130 species of aquatic invertebrate were recorded across the whole survey area in 2014 (see table 2 for a breakdown of the totals per taxonomic group). This total only included true species, not genus-only records.

Table 1. Total number of species (terrestrial) per taxonomic group	
Taxonomic group:	No. of species:
Diptera (true flies)	118
Coleoptera (beetles)	90
Araneae (true spiders)	26
Opiliones (harvestmen)	5
Lepidoptera (moths and butterflies)	13
Odonata (dragonflies and damselflies)	12
Hymenoptera (bees, ants and wasps)	6
Hemiptera (true bugs)	19
TOTAL NO. OF SPECIES	289

Table 2. Total number of species (aquatic) per taxonomic group	
Taxonomic group:	No. of species:
Tricladida (flatworms)	3
Hirudinea (leeches)	6
Mollusca (snails and mussels)	25
Malacostraca (shrimps and hoglice)	3
Ephemeroptera (mayflies)	2
Plecoptera (stoneflies)	0
Odonata (dragonflies and damselflies)	11
Hemiptera (true bugs)	16
Coleoptera (beetles)	57
Megaloptera (alderflies)	1
Trichoptera (caddisflies)	4
Lepidoptera (butterflies and moths)	2
TOTAL NO. OF SPECIES	130

- 3.2 From the terrestrial invertebrate total, one Red Data Book (IUCN Rare) species was recorded. This is the Yellow-horned Horsefly *Hybomitra ciureai* (Tabanidae). The species has been recorded from the south and south-east coasts of England. One record exists for the west; this is from 1987 when the fly was taken from Magor Marsh, south of Magor village. As far as can be determined, the record from this survey is the second for Gwent. *H. ciureai* was taken from Site 11, a well vegetated ditch just north of the disused laboratory site.
- 3.3 Three Nationally Notable species of terrestrial invertebrate were recorded. These were:
- A rove beetle (Staphylinidae): *Paedurus fuscipes*. This species is associated with damp habitats. A number of records already exist from the Newport area for this species. *P. fuscipes* is designated Notable B and was collected from Site 20; Old Dairy Reen, a well vegetated reen.

- A fruit-fly or picture-winged fly (Tephritidae): *Dioxyna bidentis*. This species is known from marshes and other wet areas. The larvae are often associated with the plant Trifid Bur-marigold *Bidens tripartita*. As far as can be determined, no records exist for this species of fly from the Gwent Levels. The nearest record appears to be from the Swansea area. This species was collected from Site 20; Old Dairy Reen, a well vegetated reen.
 - A house fly (Muscidae): *Coenosia atra*. This species is associated with ex-industrial sites and to a lesser extent, grassland habitats. As far as can be determined, no records exist for this species from the Gwent Levels. The nearest record appears to be from the Swansea area. *C. atra* was collected at the Tata Steel site, within the open habitats present there.
- 3.4 From the aquatic invertebrate total, one Red Data Book species (IUCN Near Threatened) was recorded. This was the Great Silver Water Beetle *Hydophilus piceus*. This species is associated with ditches on grazing marshes. Multiple records already exist for *H. piceus* from the Gwent Levels. This species was recorded at Site 3 - Middle Road Reen and Site 4 - Elver Pill Reen, within the Tata Steel site. Both sites are well vegetated reens. Both the adult and the egg cocoon of *H. piceus* were observed.
- 3.5 One Nationally Scarce species was recorded from the aquatic invertebrate total. This was the water beetle *Hydaticus transversalis*. This species is associated with fenland ponds and ditches. Records exist for the Gwent Levels for this species. *H. transversalis* was recorded from five sites during the survey; Site 3, Site 16, Site 17, Site 18 and Site 20. All are well vegetated ditches or reens.
- 3.6 The results below describe each of the survey sites and the invertebrate interest at each site. The sites are given brief descriptions. For full botanical species lists, habitat descriptions and cross sections, see *M4 Corridor Around Newport, South Wales, Baseline Botanical Report 2014 - Rachel Hacking Ecology Limited*.
- 3.7 The site locations can be found at the back of the report.

Site 1 - Neways Reen

- 3.8 Site 1 is Neways Reen, located on the eastern border of the Tata Steel land. The reen is well vegetated and is approximately 3 metres wide (see Photograph 1). The reen is cattle poached. The vegetation includes Hemlock Water-dropwort *Oenanthe crocata*, Lesser Water-parsnip *Berula erecta* and Celery-leaved Buttercup *Ranunculus sceleratus*.
- 3.9 A total of 53 species of terrestrial invertebrate were recorded here. This total included 27 species of Diptera and 10 species of Coleoptera. The Diptera assemblage included the crane fly *Nigrotipula nigra*. This species is a fenland specialist and is included on the Scottish Biodiversity List. In England, it is widespread but locally confined by habitat. The Local Scathophagidae *Cleigastra apicalis*, a reed-bed species, was also netted from Site 1. Within the Coleoptera assemblage, three Local reed beetle species were recorded; *Donacia semicuprea*, *D. simplex* and *D. vulgaris*.
- 3.10 A total of 46 species of aquatic invertebrate were recorded here. This total included 14 species of Coleoptera, 12 species of mollusc and 8 species of Hemiptera. Two Local water beetles were recorded here; *Hydroporus tessellatus* and *Noterus clavicornis*. Four species of Odonata nymph were recorded here, showing that these species breed at this site. These were Migrant Hawker *Aeshna mixta*, Common Darter *Sympetrum striolatum*, Azure Damselfly *Coenagrion puella* and Blue-tailed Damselfly *Ischnura elegans*.



Photograph 1 - Site 1

Site 2

- 3.11 Site 2 is a shaded, shallow ditch, which is poached by cattle. The water is approximately 40cm deep. A large Crack Willow *Salix fragilis* tree has fallen over the ditch. The ditch supports few aquatic plants.
- 3.12 Site 2 was not suitable for terrestrial invertebrate surveys. Little vegetation was present and very few invertebrates could be observed. A total of 15 species of aquatic invertebrate were recorded here. This total included 7 species of Coleoptera and 3 species of mollusc. Two species of Local water beetle were netted from here; *Rhantus grapii* and *Hydroporus tessellatus*.

Site 3 - Middle Road Reen

- 3.13 Middle Road Reen is a wide, deep reen with steep banks (see Photograph 2). The banks are well vegetated, making access to the reen difficult in places. Middle Road Reen is located within the Tata Steel site and is not subject to cattle poaching. The banks are dominated by Hemlock Water-dropwort *Oenanthe crocata*.
- 3.14 A total of 53 species of terrestrial invertebrate were recorded from Site 3, from the bank side and emergent vegetation. This total included 27 species of Diptera, including three Local flies, of restricted habitat preferences. These were *Palloptera quinquemaculata*, *Setisquamalonchaea fumosa* and the Square-spot Deerfly *Chrysops viduatus*. The latter species favours wet habitats and has a distinctly southern distribution. A total of 8 species of Coleoptera were netted at Site 3, including the Local reed beetle *Donacia simplex*. Six species of Lepidoptera were noted at this site; these were Orange-tip, Speckled Wood, Green-veined White, Common Blue, Small Skipper and Cinnabar Moth (larvae). An adult Black-tailed Skimmer dragonfly was noted patrolling the reen.
- 3.15 A total of 37 species of aquatic invertebrate were netted from Site 3. This total included 11 species of mollusc, 6 species of Hemiptera and 12 species of Coleoptera. The Great Silver Water Beetle *Hydrophilus piceus* was recorded from this reen, with an adult netted. *H. piceus* is a Red Data Book species and is listed as Near Threatened (IUCN). The Nationally Scarce diving beetle *Hydaticus transversalis* was also netted from this site. The Local aquatic beetle *Noterus clavicornis* was also recorded from here.



Photograph 2 – Site 3

Site 4 – Elver Pill Reen

- 3.16 Elver Pill Reen is a narrow, deep reen, located within the Tata Steel site (see Photograph 3). The banks are shallow and well vegetated. Common Reed *Phragmites australis* is the most abundant aquatic plant at this site.
- 3.17 A total of 29 species of terrestrial invertebrate were recorded from Site 4. This total included 6 common species of Diptera and 12 species of Coleoptera. Five Local species of beetle were netted here; the flower beetle *Oedemera lurida*, the pollen beetle *Meligethes pedicularius*, the reed beetles *Donacia simplex* and *D. vulgaris* and *Galerucella sagittariae*. Clouded Yellow and Common Blue butterflies were noted at Site 4. Four species of adult Odonata were seen patrolling the reen. These were Southern Hawker, Azure Damselfly, Four-spotted Chaser and Common Darter.
- 3.18 A total of 40 species of aquatic invertebrate were recorded from Site 4. This total included 12 species of Hemiptera and 15 species of Coleoptera. The Great Silver Water Beetle *Hydrophilus piceus* was recorded from Site 4, which was a breeding record. An adult beetle was netted and an egg cocoon was also noted (see Photograph 4). This reen is connected to Site 3, where this species was also recorded. Two species of Local aquatic beetle were netted; *Hygrotus impressopunctatus* and *Noterus clavicornis*. Breeding evidence (nymphs) of Four-spotted Chaser and Azure Damselfly were netted from here.



Photograph 3 – Site 4



Photograph 4 - *H. piceus* egg cocoon found at Site 4

Site 5

- 3.19 Site 5 is a wide rean which runs parallel to North Row (road) off the A4810. The banks are shallow and well vegetated (see Photograph 5). The rean supports a diverse assemblage of plants including Greater Pond-sedge *Carex riparia*, Water Mint *Mentha aquatica*, Greater Duckweed *Spirodela polyrhiza*, Nuttall's Waterweed *Elodea nuttallii* and Arrowhead *Sagittaria sagittifolia*. It is connected to Sites 3 and 4.

- 3.20 A total of 19 species of terrestrial invertebrate were recorded from Site 5. This total included 11 species of Coleoptera and 4 species of Diptera. Two Local species of reed beetle were netted from here; *Donacia semicuprea* and *D. simplex*. *Donacia marginata* was also netted here. This species is included on the Scottish Biodiversity List as it has a distinctly southern distribution in the UK. Meadow Brown and Small Tortoiseshell butterflies were recorded from Site 5.
- 3.21 A total of 43 species of aquatic invertebrate were recorded from Site 5. This total included 4 species of Hirudinea including the Local leech *Glossiphonia heteroclita*. Fifteen species of mollusc were netted including the Local Swan Mussel *Anodonta cygnea*. This species is included on the Scottish and Irish Biodiversity Lists but is widespread in England and Wales. Breeding evidence of 4 species of Odonata was noted. Nymphs were netted of Migrant Hawker, Common Darter, Azure Damselfly and Blue-tailed Damselfly. Ten species of Coleoptera were netted including the Local beetle *Noterus clavicornis*.



Photograph 5 - Site 5

Site 6

- 3.22 Site 6 is a narrow, deep reeve which runs adjacent to the A4810, close to Meadow Farm. The banks are steep and well vegetated (see Photograph 6). An algal scum lay on the surface of the water on every survey visit. The reeve supports Water Dock *Rumex hydrolapathum* and Yellow Flag *Iris pseudacorus*.
- 3.23 A total of 32 species of terrestrial invertebrate were recorded from Site 6. The total included 18 species of Diptera, including 6 species of hoverfly (Syrphidae). No uncommon species of Diptera were netted. Six species of Coleoptera were recorded. Two species of Odonata were observed. Adults of Hairy Dragonfly and Migrant Hawker were seen patrolling the reeve.

- 3.24 A total of 29 species of aquatic invertebrate were netted from Site 6, including 7 species of mollusc and breeding evidence of Azure Damselfly. Twelve species of Coleoptera were recorded, including two Local beetles; *Haliphus immaculatus* and *Noterus clavicornis*.



Photograph 6 - Site 6

Site 7 - Tata Steel land

- 3.25 Site 7 is the ex-industrial land owned by Tata Steel. The site is large and comprises of reed beds, deep lagoons with many tracks and areas of open ground (see Photograph 7). The open ground is becoming colonised with low-growing ruderal vegetation (see Photograph 8). The site offers good structure and botanical diversity for invertebrates. Plant species here include Biting Stonecrop *Sedum acre*, Herb-Robert *Geranium robertianum*, Fern-grass *Catapodium rigidum*, Scentless Mayweed *Tripleurospermum inodorum*, Perforate St. John's-wort *Hypericum perforatum*, Teasel *Dipsacus fullonum*, Butterfly-bush *Buddleja davidii*, Narrow-leaved Everlasting-pea *Lathyrus sylvestris* and Thyme-leaved Speedwell *Veronica serpyllifolia*. Dense areas of Bramble *Rubus fruticosus* agg. add structure. An incidental record of Grass Snake *Natrix natrix* was taken from this site, at Reptile Mat 214.
- 3.26 A total of 78 species of terrestrial invertebrate were recorded from Site 7. A total of 28 species of Diptera were recorded from this site. This included the Nationally Notable muscid fly *Coenosia atra*. This small fly is associated with ex-industrial sites and grassland. No records appear to exist for this species from the survey area. The nearest records are from the Port Talbot area and from Brean, across the Bristol Channel. Eleven species of hoverfly (Syrphidae) were recorded from this site. A total of 19 species of Coleoptera were recorded from Site 7. This included 4 species of Local beetle; the ground beetle *Amara tibialis*, the rove beetle *Paedurus riparius*, and the chrysomelids *Chrysolina hyperici* and *Cryptocephalus fulvus*. *C. hyperici* is dependent on St. John's-worts *Hypericum* sp. whereas *C. fulvus* has a varied diet of plants such as Mugwort *Artemisia vulgaris* and vetches *Vicia* sp. A

total of 10 species of Araneae were recorded, including the Local spider *Mangora acalypha*, a species of southern distribution in the UK, which favours open woodland and heathland. Six species of Lepidoptera and six species of Hymenoptera were recorded here. Seven species of Hemiptera were recorded from this site, including Hairy Shieldbug *Dolycoris baccarum*. This was the only site across the study area for this species.



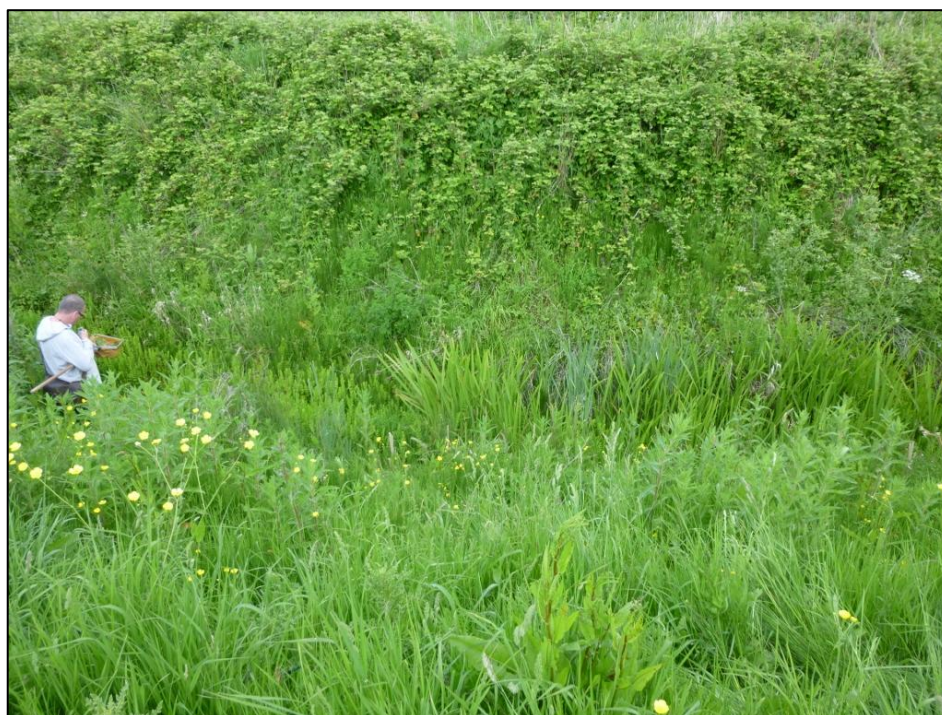
Photograph 7 – Tata Steel land showing the tracks



Photograph 8 – Tata Steel land showing the ruderal vegetation

Site 8

- 3.27 Site 8 is a narrow ditch situated adjacent to Monk's Drain (see Photograph 9). The ditch is well vegetated and was chosen as the survey site as it appeared to support a greater diversity of plants than Monk's Drain. In addition, Monk's Drain is accessed by the nearby travellers camp and was the subject of heavy littering. Site 8 supports little open water. The aquatic vegetation is of limited diversity and includes Lesser Water-parsnip *Berula erecta*, Branched Bur-reed *Sparganium erectum* and Hard Rush *Juncus inflexus*.
- 3.28 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 21 species of aquatic invertebrate were recorded from Site 8. Five species of mollusc were netted. Eight species of Coleoptera were netted, including two Local beetles; *Hydroporus tessellatus* and *Laccobius minutus*. Adults of Banded Demoiselle *Calopteryx splendens* were noted patrolling the ditch and breeding evidence of Azure Damselfly and Four-spotted Chaser was netted.



Photograph 9 – Site 8

Site 9 - Black Wall

- 3.29 Site 9 is Black Wall reen, which is situated on the western side of Monk's Drain (see Photograph 9). It is botanically species-poor and similar to Site 8. The water channel is narrow. Aquatic plant species include Branched Bur-reed *Sparganium erectum* and Hemlock Water-dropwort *Oenanthe crocata*.
- 3.30 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 20 species of aquatic invertebrate were recorded from Black Wall reen. This total included 6 species of mollusc, including the Local snail *Hippeutis complanatus*. Evidence of breeding Odonates included the species Azure Damselfly and Blue-tailed Damselfly.

Eight species of Coleoptera were netted, including one Local species of beetle; *Hydroporus tessellatus*.



Photograph 10 – Black Wall reen

Site 10

- 3.31 Site 10 is a reen within the land behind the 'Air Products' factory. The whole of this land is criss-crossed with species-poor polluted reens. The water appears to be milky/turbid in a lot of the ditches. Aquatic plants are severely limited in diversity. Site 10 supports Common Reed *Phragmites australis* only (see Photograph 11) with Greater Willowherb *Epilobium hirsutum* on the banks. The reen is approximately 2 metres wide.
- 3.32 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 7 species of aquatic invertebrate were recorded from Site 10. This included 1 species of mollusc, 1 species of water bug and 5 species of Coleoptera, all of which are common and widespread in the UK.



Photograph 11 – Site 10

Site 11

- 3.33 Site 11 is a ditch which lies just north of the disused laboratory site (see Photograph 12). It varies in width, between 1 metre and 2 metres wide. The water is turbid. The ditch is botanically species-rich and supports species such as Common Spike-rush *Eleocharis palustris*, Water-plantain *Alisma plantago-aquatica* and Floating Sweet-grass *Glyceria fluitans*.
- 3.34 A total of 11 species of terrestrial invertebrate were recorded from Site 11. Four species of Diptera were recorded, including the Yellow-horned Horsefly *Hybomitra ciureai* which is a Red Data Book species (IUCN Rare). This species is largely confined to grazing levels. A record exists from Magor Marsh from 1987. Two species of Coleoptera were netted here; the Local leaf beetle *Prasocuris junci* and the common soldier beetle *Rhagonycha fulva*. Three species of adult Odonata were noted at the ditch; Ruddy Darter, Azure Damselfly and Blue-tailed Damselfly.
- 3.35 A total of 28 species of aquatic invertebrate were recorded from Site 11. Four species of mollusc were netted, including the Local snail *Aplexa hypnorum*. Nineteen species of Coleoptera were netted here, including 5 species of Local beetle; *Liopterus haemorrhoidalis*, *Hydroporus tessellatus*, *Hygrotus impressopunctatus*, *Enochrus coarctatus* and *Laccobius minutus*.



Photograph 12 – Site 11

Site 12

- 3.36 Site 12 is a mainly shaded, narrow ditch, covered in tall vegetation (see Photograph 13). Small stretches of the ditch are unshaded. The water is just over 1 metre deep beneath the vegetation. Botanical species include Yellow Flag *Iris pseudacorus*, Greater Pond-sedge *Carex riparia*, Gipsywort *Lycopus europaeus* and Hairy Sedge *Carex hirta*.
- 3.37 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 10 species of aquatic invertebrate were recorded from Site 12. This total included 3 species of mollusc, 2 species of Coleoptera, including the Local beetle *Hydroporus tessellatus*, and 2 species of flatworm. All of the species netted, apart from the Local beetle, are common and widespread in the UK.



Photograph 13 – Site 12

Site 13

- 3.38 Site 13 is a shallow, narrow ditch, which is cattle poached (see Photograph 14). The ditch is covered in vegetation, with the odd pocket of open water. The aquatic vegetation includes Fool's-water-cress *Apium nodiflorum*, Celery-leaved Buttercup *Ranunculus sceleratus* and Soft Rush *Juncus effusus*.
- 3.39 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 10 species of aquatic invertebrate were recorded at Site 13. This total included 4 species of mollusc, 2 species of Coleoptera and 2 species of flatworm. All of the species netted are common and widespread in the UK.



Photograph 14 – Site 13

Site 14

- 3.40 Site 14 is a shallow, cattle poached ditch, varying in width between 1 metre and 2 metres (see Photograph 15). The majority of the ditch is shaded apart from at a land bridge, which is where the survey took place. The vegetation is of limited diversity and includes Lesser Water-parsnip *Berula erecta*, Cuckooflower *Cardamine pratensis* and Reed Sweet-grass *Glyceria fluitans*.



Photograph 15 – Site 14

- 3.41 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 13 species of aquatic invertebrate were recorded at Site 14. This total included breeding evidence (nymphs) of the Southern Hawker dragonfly. Three species of water bug were netted along with 5 species of Coleoptera, including the Local beetle *Hydroporus tessellatus*.

Site 15 - Julian's Reen

- 3.42 Julian's Reen is a wide reen, situated next to a farm track (see Photograph 16). The water is completely covered in Common Duckweed *Lemna minor* and Greater Duckweed *Spirodela polyrhiza*. There are few other aquatic plant species associated with this site, other than bank-side vegetation such as Water Figwort *Scrophularia auriculata* and Yellow Flag *Iris pseudacorus*.
- 3.43 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 14 species of aquatic invertebrate were recorded at Site 14. The water was noticeably cold beneath the thick layer of floating vegetation. The total included 6 species of mollusc and 1 species of Lepidoptera, the Small China-mark moth *Cataclysta lemnata*, which feeds on duckweed. Four species of Coleoptera were netted including the Local beetle *Noterus clavicornis*.



Photograph 16 – Site 15

Site 16

- 3.44 Site 16 is a wide reen running by the side of a track leading to New Dairy Farm (see Photograph 17). The reen is 2-3 metres wide and approximately 1.5 metres deep. The vegetation exists in dense clusters, fragmented by stretches of open water. Species include Water-cress *Nasturtium officinale*, Frogbit *Hydrocharis morsus-ranae* and Broad-leaved Pondweed *Potamogeton natans*.
- 3.45 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 22 species of aquatic invertebrate were recorded from Site 16. This total included 8 species of mollusc, 4 species of water bug and 2 species of Malacostraca. Five species of Coleoptera were netted, including the Nationally Scarce beetle *Hydaticus transversalis*. This species is associated with fenland.



Photograph 17 – Site 16

Site 17

- 3.46 Site 17 is a where two ditches meet. This corner ditch is narrow and shallow (see Photograph 18). The ditch is covered in Reed Sweet-grass *Glyceria maxima* with patches of Common Reed *Phragmites australis*.
- 3.47 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 26 species of aquatic invertebrate were netted from Site 17. This total included 4 species of mollusc, 3 species of Malacostraca and 17 species of Coleoptera. The beetle assemblage included the Nationally Scarce *Hydaticus transversalis* and two Local beetles; *Liopterus haemorrhoidalis* and *Laccobius minutus*.



Photograph 18 – Site 17

Site 18

- 3.48 Site 18 is a narrow ditch which is connected to Site 16 (see Photograph 19). The ditch is approximately 1 metre wide and 1 metre deep. The ditch has emergent vegetation on the edges and a small amount of open water in the centre. Plant species include Common Reed *Phragmites australis*, Lesser Water-parsnip *Berula erecta* and Water Horse-tail *Equisetum fluviatile*.
- 3.49 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 19 species of aquatic invertebrate were recorded from Site 18. This total included 2 species of flatworm, 9 species of mollusc and 3 species of Coleoptera, including the Nationally Scarce *Hydaticus transversalis*.



Photograph 19 – Site 18

Site 19

- 3.50 Site 19 lies opposite Old Dairy Reen (Site 20) and runs parallel with it. Site 19 is approximately 1 metre in width, with shallow banks (see Photograph 20). The ditch is partially cattle poached. No open water exists. Plant species include Yellow Flag *Iris pseudacorus*, Marsh Bedstraw *Galium palustre* and Branched Bur-reed *Sparganium erectum*.
- 3.51 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 14 species of aquatic invertebrate were netted from Site 19. This total includes 5 species of mollusc, 2 species of Malacostraca and 7 species of Coleoptera, including the Local beetle *Lioporus haemorrhoidalis*.



Photograph 20 – Site 19

Site 20 - Old Dairy Reen

- 3.52 Site 20 is Old Dairy Reen, a wide reen which is sparsely vegetated (see Photograph 21). The reen is 3-4 metres wide with shallow banks. Aquatic vegetation includes Lesser Water-parsnip *Berula erecta*, Water Horse-tail *Equisetum fluvatile* and Common Duckweed *Lemna minor*.
- 3.53 A total of 21 species of terrestrial invertebrate were recorded from Site 20. This total included 9 species of Diptera, including the Nationally Notable Tephritid fly *Dioxyna bidentis*. This species is associated with Bur-marigold *Bidens* sp. and other aquatic vegetation. Seven species of Coleoptera were netted, including the Notable B rove beetle *Paedurus fuscipes*. This species is recorded from permanently wet mires and saltmarshes. The Local rove beetle *Paedurus riparius* was also recorded here. Two species of adult Odonata were noted patrolling Site 20; Migrant Hawker and Common Darter.
- 3.54 A total of 31 species of aquatic invertebrate were recorded from Site 20. This total included 10 species of mollusc, 1 species of stonefly larvae, and the nymphs of 3 species of Odonata; Southern Hawker, Azure Damselfly and Blue-tailed Damselfly. Eight species of Coleoptera were netted including the Nationally Scarce *Hydaticus transversalis*.



Photograph 21 – Site 20

Site 21 - Percoed Reen

- 3.55 Site 21 runs alongside Green Lane. It is a wide (2 metres) reen with emergent vegetation at the edges and open water in the centre (see Photograph 22). The water is turbid. Aquatic vegetation includes Common Reed *Phragmites australis*, Hemlock Water-dropwort *Oenanthe crocata* and Greater Duckweed *Spirodela polyrhiza*.



Photograph 22 – Site 21

- 3.56 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 16 species of aquatic invertebrate were recorded from Site 21. This total included 1 species of leech, 6 species of mollusc and 3 species of water bug. Five species of Coleoptera were netted, including the Local beetle *Noterus clavicornis*.

Site 22

- 3.57 Site 22 is a shaded ditch of poor quality. A small part could be sampled (see Photograph 23). The water surface is completely covered in Common Duckweed *Lemna minor* and Greater Duckweed *Spirodela polyrhiza*. The ditch is shaded by scrub and hedgerows. Other aquatic vegetation includes Soft Rush *Juncus effusus* and Lesser Water-parsnip *Berula erecta*.
- 3.58 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 7 species of aquatic invertebrate were recorded from Site 22. This total included 1 species of flatworm, 1 species of mollusc and 3 species of Coleoptera. All of the species recorded are common and widespread in the UK.



Photograph 23 – Site 22

Site 23

- 3.59 Site 23 is a shaded ditch of poor quality. The water is open and turbid (see Photograph 24). Aquatic vegetation is limited and includes Floating Sweet-grass *Glyceria fluitans* and Hemlock Water-dropwort *Oenanthe crocata*. The ditch is approximately 1 metre in width.

- 3.60 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 5 species of aquatic invertebrate were recorded from Site 23. This total included 1 species of flatworm, 2 species of water bug and 1 species of water beetle. All of the species recorded are common and widespread in the UK.



Photograph 24 – Site 23

Site 24

- 3.61 Site 24 is an unshaded ditch, covered in vegetation (see Photograph 25). The ditch is approximately 1.5 metres wide. The aquatic vegetation includes New Zealand Pigmyweed *Crassula helmsii*, Reed Sweet-grass *Glyceria maxima* and Bulrush *Typha latifolia*. *Crassula helmsii* is an invasive species, listed on Schedule 9 of The Wildlife & Countryside Act 1981 (as amended). The water here is approximately 0.5 metres deep.
- 3.62 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 11 species of aquatic invertebrate were recorded from Site 24. This total included 5 species of mollusc and 4 species of Coleoptera. All of the species recorded are common and widespread in the UK.



Photograph 25 – Site 24

Site 25

- 3.63 Site 25 is a large, open pond (see Photograph 26), situated just north of a disused road on the western edge of Newport. The pond supports a mixture of open water and emergent and marginal vegetation, including Lesser Spearwort *Ranunculus flammula*, Water Dock *Rumex hydrolapathum*, Gipsywort *Lycopus europaeus*, Bulrush *Typha latifolia* and Broad-leaved Pondweed *Potamogeton natans*.



Photograph 26 – Site 25

- 3.64 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 23 species of aquatic invertebrate were recorded from Site 25. This total included 6 species of mollusc, 2 species of Hemiptera and evidence of breeding (nymphs) of 2 species of Odonata; Common Darter and Blue-tailed Damselfly. Ten species of Coleoptera were netted from Site 25, including 4 species of Local beetle; *Haliphus immaculatus*, *Noterus clavicornis*, *Rhantus grapii* and *Laccobius minutus*.

Site 26

- 3.65 Site 26 is a small stream (see Photograph 27), which flows into a small pond, close to the disused site of Great Pen-carn. The stream is dominated by Reed Canary-grass *Phalaris arundinacea* with occasional Teasel *Dipsacus fullonum*, Greater Bird's-foot Trefoil *Lotus pedunculatus* and Hard Rush *Juncus inflexus*. The water column is approximately 0.25 metres deep.
- 3.66 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 8 species of aquatic invertebrate were recorded from Site 26. This total included 1 species of flatworm, 2 species of mollusc and 4 species of Coleoptera, including 2 Local beetles; *Liopterus haemorrhoidalis* and *Hygrotus impressopunctatus*.



Photograph 27 – Site 26

Site 27

- 3.67 Site 27 is a small stream of poor quality. The stream is heavily shaded and supports no aquatic vegetation. The stream forms part of Berryhill Farm. The banks of the stream are shallow and support Bramble *Rubus fruticosus* agg. and Ivy *Hedera helix*.
- 3.68 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 7 species of aquatic invertebrate were netted from Site 27. This total included 1 species of leech, 1 species of mollusc and 2 species of water beetle. All of the species recorded are common and widespread in the UK.

Site 28

- 3.69 Site 28 is a large, recently created pond (see Photograph 28). The pond is part of a County Wildlife Site. The pond is surrounded by seeded grassland. Aquatic vegetation includes Common Spike-rush *Eleocharis palustris*, Bulrush *Typha latifolia*, Water-plantain *Alisma plantago-aquatica*, Ivy-leaved Duckweed *Lemna trisulca* and Broad-leaved Pondweed *Potamogeton natans*.
- 3.70 A total of 17 species of terrestrial invertebrate were recorded from Site 28. Four species of Diptera were netted, including the rare Sphaeroceridae fly *Coproica hirtula*. Only 17 records of this species exist on the NBN Gateway, none from the study area. The nearest record is from Port Talbot. Little is known about the ecology of this fly. Six species of Coleoptera were recorded from this site along with 4 species of spider. Two adult Southern Hawker dragonflies were noted at the pond.
- 3.71 A total of 31 species of aquatic invertebrate were recorded from Site 28. Four species of mollusc were recorded, including the Local snail *Hippeutis complanatus*. Breeding evidence (nymphs) of 4 species of Odonata were netted from this site; Migrant Hawker, Emperor, Blue-tailed Damselfly and Azure Damselfly. Eight species of Hemiptera were recorded. Two species of Lepidoptera were noted; Small China-mark moth *Cataclysta lemnata* and Brown China-mark moth *Nymphula nymphaeata*. Twelve species of Coleoptera were netted including the Nationally Scarce beetle *Peltodytes caesus*. This beetle is associated with lowland rich fen pools. The Local beetle *Noterus clavicornis* was also netted.



Photograph 28 – Site 28

Site 29

- 3.72 Site 29 is a large pond (see Photograph 29). It is 80% shaded along its edge by mature trees and scrub. The edges of the pond are deep silt. It lies within a field which has been surveyed for terrestrial invertebrates (Site 35). The pond supports a good diversity of aquatic vegetation including Brooklime *Veronica beccabunga*, Water Star-wort *Callitriche stagnalis*, Small Sweet-grass *Glyceria declinata* and Tufted Forget-me-not *Myosotis laxa*.



Photograph 29 – Site 29

- 3.73 No terrestrial invertebrate survey was undertaken due to the lack of terrestrial invertebrates observed at the pond although the surrounding grassland was sampled (Site 35). A total of 7 species of aquatic invertebrate were recorded from Site 29. This included 1 species of mollusc, 1 species of leech and 2 species of Malacostraca. All of the species recorded are common and widespread in the UK.

Site 30

- 3.74 Site 30 is a stream flowing through an area of wet woodland, close to Sites 29 and 35. The stream is shallow and flows over mud, which is cattle poached. The stream supports Brooklime *Veronica beccabunga*.
- 3.75 No terrestrial invertebrate survey was undertaken of the stream. However, terrestrial invertebrate sampling was undertaken within the wet woodland (Site 36). A total of 4 species of aquatic invertebrate were recorded from Site 30. All of the species recorded are common and widespread in the UK.

Site 31 - St. Bride's Brook

- 3.76 Site 31 is St. Bride's Brook, a stream which flows through the village of Magor. The stream is cattle poached where the survey took place (see Photograph 30). In other places, the banks are steep. The substrate comprises of stones and silt. The stream supports aquatic vegetation such as Canadian Pondweed *Elodea canadensis*, Water-cress *Nasturtium officinale* and Water Figwort *Scrophularia auriculata*.
- 3.77 A total of 28 species of terrestrial invertebrate were recorded from St. Bride's Brook. This total included 16 species of Diptera, all of which are common and widespread in the UK. Two species of Coleoptera were netted along with 4 species of Hemiptera. Adults of the Broad-bodied Chaser dragonfly were noted at the stream. Three species of Bumblebee were seen here; White-tailed *Bombus lucorum*, Common Carder *Bombus pascuorum* and Buff-tailed *Bombus terrestris*.
- 3.78 A total of 27 species of aquatic invertebrate were recorded from Site 31. This total included 6 species of mollusc, 1 species of Mayfly larvae *Baetis rhodani* and 4 species of Hemiptera. Breeding evidence (a nymph) of Beautiful Demoiselle *Calopteryx virgo* was netted. Eight species of Coleoptera were netted, including the Local diving beetle *Agabus didymus*.



Photograph 30 – Site 31

Site 32

- 3.79 Site 32 is a ditch which runs on the southern side of the A4810, close to the Tesco distribution centre. It lies at the bottom a steep embankment which supports the road and is a well vegetated ditch (see Photograph 31). Little water was present during the surveys. The aquatic vegetation includes Hemp-agrimony *Eupatorium cannabinum*, Skullcap *Scutellaria galericulata* and Tufted Forget-me-not *Myosotis laxa*.



Photograph 31 – Site 32

- 3.80 A total of 24 species of terrestrial invertebrate were recorded from Site 32. This total included 5 species of Diptera and 9 species of Coleoptera, including 2 Local beetles; the rove beetle *Paedurus riparius* and the 16-Spot Ladybird *Tytthaspis sedecimpunctata*, which is mainly found in the south of the UK. Five species of spider were recorded from this site. Adults of 3 species of Odonata were noted at the ditch; Azure Damselfly, Blue-tailed Damselfly and Common Darter.
- 3.81 A total of 14 species of aquatic invertebrate were recorded from Site 32. This total included 6 species of mollusc and 5 species of Coleoptera, including the Local beetles *Noterus clavicornis* and Water Ladybird *Anisosticta 19-punctata*.

Site 33

- 3.82 Site 33 lies across a field from Site 32. It is a well vegetated ditch and supports areas of open water (see Photograph 32). The ditch is approximately 2 metres wide and at least 1 metre deep. Aquatic vegetation includes Reed Sweet-grass *Glyceria maxima*, Water Mint *Mentha aquatica* and Marsh Woundwort *Stachys palustris*.
- 3.83 A total of 11 species of terrestrial invertebrate were recorded from Site 33. This total included 4 species of Diptera and 5 species of Coleoptera. Two species of adult Odonata were noted at the ditch; Blue-tailed Damselfly and Emerald Damselfly.



Photograph 32 – Site 33

- 3.84 A total of 24 species of aquatic invertebrate were recorded from Site 33. This total included 8 species of mollusc and 3 species of water bug. Breeding evidence (nymphs) of 3 species of Odonata was netted; Migrant Hawker, Emerald Damselfly and Common Darter. Four species of Coleoptera were recorded, including the Local beetle *Scirtes hemisphaericus*.

Site 34

- 3.85 Site 34 lies close to the A4810 roundabout which leads to the Tesco distribution centre. It is a deep, wide (2 metres) ditch with very steep banks (see Photograph 33). Access to the water was difficult. The aquatic vegetation includes Common Reed *Phragmites australis*, Hemlock Water-dropwort *Oenanthe crocata* and Reed Sweet-grass *Glyceria maxima*.
- 3.86 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. The ditch is exposed and disturbed regularly by passing articulated lorries. A total of 19 species of aquatic invertebrate were recorded from Site 34. This total included 7 species of mollusc and 3 species of water bug. Eight species of Coleoptera were netted. All of the species recorded are common and widespread in the UK.



Photograph 33 – Site 34

Site 35

- 3.87 Site 35 lies just south of the M4, towards Cardiff. It is an area of semi-improved grassland, which supports a good diversity of flowering plant species (see Photograph 34). The site has good structure, with both tall plant species and low-growing plant species. The assemblage includes Bird's-foot Trefoil *Lotus corniculatus*, Self-heal *Prunella vulgaris*, Ragwort *Senecio jacobaea*, Common Vetch *Vicia sativa*, Meadow Buttercup *Ranunculus acris* and Crested Dog's-tail *Cynosurus cristatus*.

- 3.88 A total of 57 species of terrestrial invertebrate were recorded from here. This total included 20 species of Diptera, including 11 species of hoverfly (Syrphidae). Fifteen species of Coleoptera were recorded from here along with 4 species of spider. Eight species of Lepidoptera were seen here, including the butterflies Peacock, Small Skipper, Common Blue and the moth 6-Spot Burnet. Five species of Hemiptera were netted. All of the species recorded are common and widespread in the UK.



Photograph 34 – Site 35

Site 36

- 3.89 Site 36 is an area of wet woodland, next to Site 35. The woodland is species-poor, with a canopy of Alder *Alnus glutinosa* and Hawthorn *Crataegus monogyna*. The ground flora is species-poor and includes Dog's Mercury *Mercurialis perennis*, Creeping Buttercup *Ranunculus repens* and Bramble *Rubus fruticosus* agg. The ground is cattle-poached with large expanses of bare mud. A stream flows through the site which has been sampled (Site 30).
- 3.90 A total of 36 species of terrestrial invertebrate were recorded from Site 36. This total included 16 species of Diptera. The crane fly *Nephrotoma cornicina* was netted from this site. This is a species which has a southern distribution in the UK and as such is included on the Scottish Biodiversity List. No records appear to exist for this fly from the study area. Twelve species of Coleoptera were recorded from Site 36, including 2 Local beetles; the ground beetle *Leistus fulvibarbis* and the flower beetle *Oedemera lurida*. Two species of spider were netted along with 3 species of Hemiptera.

Site 37

- 3.91 Site 37 is a deep, wide reen, close to the River Ebbw (see Photograph 35). It was dredged earlier in the year. The reen is approximately 3 metres wide. Aquatic vegetation includes Frogbit *Hydrocharis morsus-ranae*, Arrowhead *Sagittaria sagittifolia* and Reed Canary-grass *Phalaris arundinacea*.
- 3.92 A total of 28 species of terrestrial invertebrate were recorded from Site 37. This total included 10 species of Diptera and 12 species of Coleoptera, including the Local beetles *Agonum thoreyi* and *Paedurus riparius*. The reed beetle *Donacia marginata* was netted here. This species is included on the Scottish Biodiversity Lists due to its southerly distribution in the UK. Two species of spider were netted from here and one species of butterfly; Green-veined White.
- 3.93 A total of 29 species of aquatic invertebrate were recorded from Site 37. This total included five species of mollusc, three species of Malacostraca and 9 species of Hemiptera, including the Local bug *Notonecta maculata*. Evidence of breeding (nymphs) of 3 species of Odonata was netted; Migrant Hawker, Emperor and Blue-tailed Damselfly. Seven species of Coleoptera were netted, including the Local beetle *Hygrobia hermanni*.



Photograph 35 – Site 37

Site 38

- 3.94 Site 38 is a narrow ditch of poor quality. It is situated on the edge of improved grassland fields. The ditch is heavily shaded on one side by a mature hedgerow (see Photograph 36). The water surface is covered in Common Duckweed *Lemna minor* and Least Duckweed *Lemna minuta*. Common Reed *Phragmites australis* fringes the water on one side.
- 3.95 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 9 species of aquatic invertebrate were recorded from Site 38. This total included 1 species of flatworm, one species of water bug and one species of stonefly larva. Two species of Coleoptera were netted, including the Local beetle *Suphrodytes dorsalis*.



Photograph 36 – Site 38

Site 39

- 3.96 Site 39 is a narrow, shallow ditch which is cattle poached (see Photograph 37). The site is partially shaded by remnant hedgerows and mature trees. The ditch supports moderate botanical species diversity, which includes Lesser Water-parsnip *Berula erecta*, Water-pepper *Persicaria hydropiper* and Lesser Pond-sedge *Carex acutiformis*.
- 3.97 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 11 species of aquatic invertebrate were recorded from Site 39. This total came from 6 species of mollusc, 1 species of water bug and 2 species of Coleoptera. All of the species recorded are common and widespread in the UK.



Photograph 37 – Site 39

Site 40

- 3.98 Site 40 is a wide ditch (approximately 2 metres), which is completely covered in tall vegetation. 20 inches of water lies below the vegetation. The ditch is unshaded and supports mainly Bulrush *Typha latifolia* with some Reed Canary-grass *Phalaris arundinacea* and Greater Willowherb *Epilobium hirsutum*.



Photograph 38 – Site 40

- 3.99 A total of 14 species of terrestrial invertebrate were recorded from Site 40. This total included 4 species of Diptera and 7 species of Coleoptera, including two Local beetles; the rove beetle *Paedurus riparius* and *Anthocomus rufus*, a reedbed specialist.
- 3.100 A total of 22 species of aquatic invertebrate were recorded from Site 40. This total came from 3 species of mollusc, 2 species of Malacostraca and 4 species of water bug. Eleven species of Coleoptera were netted, all common and widespread in the UK.

Site 41 - Disused Laboratory

- 3.101 Site 41 is an area of ex-industrial land, previously the site of a laboratory for Tata Steel. The remnants of buildings, car parking areas and paths can still be seen (see Photograph 39). The site is botanically species-rich, with many ruderal species. It also has good structure with a number of habitats including woodland, scrub, glades, open ground and low-growing vegetation. Species include Vervain *Verbena officinalis*, Cut-leaved Crane's-bill *Geranium dissectum*, Perforate St. John's-wort *Hypericum perforatum*, Creeping Cinquefoil *Potentilla reptans*, Hemp-agrimony *Eupatorium cannabinum*, Scarlet Pimpernel *Anagallis arvensis* and Rough Hawkbit *Leontodon hispidus*.



Photograph 41 – Site 41 showing an old track

- 3.102 A total of 77 species of terrestrial invertebrate were recorded from here. This total included 26 species of Diptera, including the Local fly *Sapromyza sexpunctata*. Eighteen species of Coleoptera were recorded here, including the Local rove beetle *Stenus solutus*. This species has a typically south-eastern distribution in the UK. Eight species of spider were netted, including the Local *Mangora acalypha*. Six species of Lepidoptera were observed; Peacock, Small Copper, Meadow Brown, Green-veined White, Common Blue and the larvae of Cinnabar moth. Five species of Hymenoptera were observed which included 2 species of ant and 3 species of bumblebee; Red-tailed Bumblebee, Common Carder Bee and Buff-tailed Bumblebee. Adults of

the Southern Hawker and Migrant Hawker were frequently observed hunting over this site. This indicates that an abundance of insect food was available for them. Eleven species of bug were netted, all common and widespread species.

Control Sites

- 3.103 The following four control sites were chosen away from the potential route of the M4 corridor. They will not be directly affected if the M4 is constructed following the Black Route. The sites were chosen for their diversity and to reflect similarities with ditches along the route.

Control Site 1

- 3.104 Control Site 1 is an open, unshaded ditch which is cattle poached. The water surface is covered in Common Duckweed *Lemna minor* and Greater Duckweed *Spirodela polyrhiza*. The edges of the ditch are lined with Reed Canary-grass *Phalaris arundinacea*. The ditch is approximately 3 metres wide and 1 metre deep.
- 3.105 A total of 24 species of terrestrial invertebrate were recorded from Control Site 1. This total included 12 species of Diptera, including the Local muscid fly *Coenosia humilis*. Five species of Coleoptera were recorded, along with 2 species of spider. Common Carder bee and Green-veined White butterfly were noted at this ditch. Adults of Blue-tailed Damselfly and Common Darter were observed patrolling the ditch.



Photograph 40 – Control Site 1

- 3.106 A total of 22 species of aquatic invertebrate were recorded from Control Site 1. This total included 2 species of flatworm and 5 species of mollusc. Breeding evidence of Migrant Hawker was netted in the form of nymphs. Four species of water bug were netted along with 7 species of Coleoptera. All of the species are common and widespread in the UK.

Control Site 2

- 3.107 Control Site 2 is a wide, open reën, covered in vegetation (see Photograph 41). The reën is approximately 3 metres wide and 1.5 metres deep. The reën is cattle poached along one edge. Vegetation includes dense Lesser Water-parsnip *Berula erecta*, Marsh Woundwort *Stachys palustris*, Clustered Rush *Juncus conglomeratus* and Branched Bur-reed *Sparganium erectum*.
- 3.108 A total of 21 species of terrestrial invertebrate were recorded from Control Site 2. This total included 8 species of Diptera and 6 species of Coleoptera, including the Local ground beetle *Agonum thoreyi*. Three species of spider were recorded. Adults of both Migrant Hawker and Common Darter dragonflies were observed patrolling the site.



Photograph 41 – Control Site 2

- 3.109 A total of 19 species of aquatic invertebrate were recorded from Control Site 2. This total included 3 species of mollusc and 4 species of Hemiptera, including the Local water bug *Notonecta maculata*. Seven species of Coleoptera were netted including the Local Water Ladybird *Anisosticta 19-punctata*.

Control Site 3

- 3.110 Control Site 3 is a shallow, poached ditch which is unshaded (see Photograph 42). The site is approximately 1 metre wide and 0.5 metres deep. The ditch is poached by sheep. Aquatic vegetation is limited and includes Small Sweet-grass *Glyceria declinata*, Hard Rush *Juncus inflexus*, Soft Rush *Juncus effusus* and Common Duckweed *Lemna minor*.
- 3.111 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 22 species of aquatic invertebrate were recorded from Control Site 3. This total included 2 species of flatworm

and 1 species of leech, which was the Local leech *Erpobdella testacea*. Five species of mollusc were netted including the Local snail *Aplexa hypnorum*. Adults of Common Darter dragonfly were observed at the ditch. Breeding evidence (nymphs) of Blue-tailed Damselfly were netted. Three species of water bug and 7 species of Coleoptera were also netted from here.



Photograph 42 – Control Site 3

Control Site 4

- 3.112 Control Site 4 is a wide, deep reed (approximately 3 metres wide and 1.5 metres deep). It is unshaded and the water surface is covered in a thick layer of Common Duckweed *Lemna minor* and Greater Duckweed *Spirodela polyrrhiza* (see Photograph 43). Other vegetation is limited and includes Reed Sweet-grass *Glyceria maxima*.
- 3.113 No terrestrial invertebrate survey was undertaken due to the limited botanical diversity and lack of terrestrial invertebrates observed at the ditch, even in optimum weather conditions. A total of 22 species of aquatic invertebrate were recorded from Control Site 4. This total included 2 species of leech and 8 species of mollusc. Adults of Southern Hawker and Common Darter dragonflies were noted patrolling the ditch. Breeding evidence of Migrant Hawker (nymphs) were netted. Three species of water bug and 5 species of Coleoptera were also netted.



Photograph 43 – Control Site 4

4. SUMMARY AND RECOMMENDATIONS

4.1 A total of 41 sites, plus 4 control sites, were surveyed for invertebrates within the study area. Within the 45 sites, 19 sites were surveyed for terrestrial invertebrates and 41 sites were surveyed for aquatic invertebrates. A number of rare or uncommon species were recorded (see Paragraphs 3.2 to 3.5). These included two Red Data Book species; the Yellow-horned Horsefly *Hybomitra ciureai* and Great Silver Water Beetle *Hydrophilus piceus*. A speciality species of the survey area is Shrill Carder Bee *Bombus sylvarum*. This was searched for and no specimens were located.

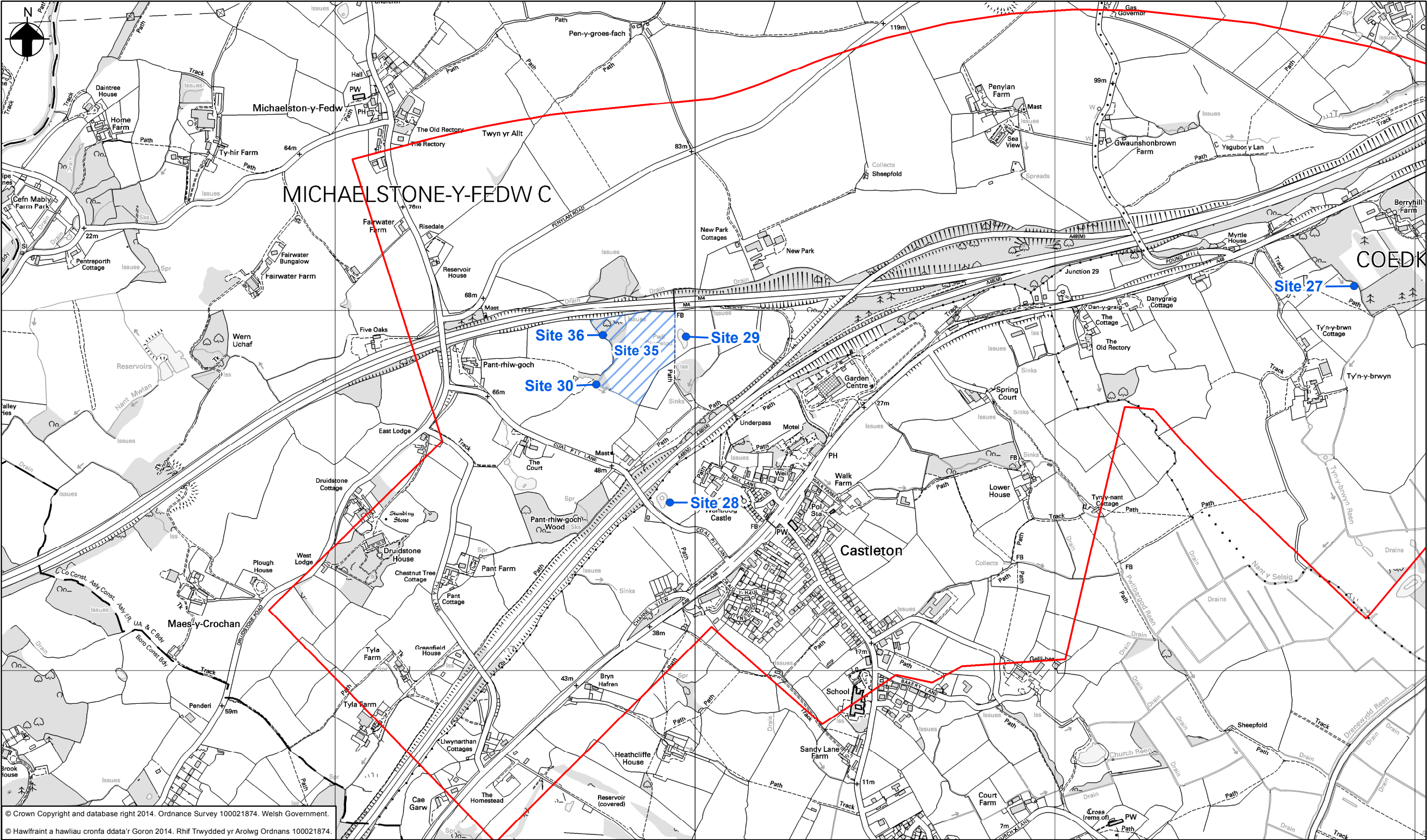
4.2 Recommendations for future survey work include:

- Surveys along the Usk estuary and Newport Docks area. Access was difficult to obtain during 2014. This area has valuable ex-industrial land which is an excellent habitat for invertebrates. It is known that the Red Data Book (IUCN Endangered) ground beetle *Amara fusca* occurs at Newport Docks.
- Surveys of the ditches and ruderal habitats surrounding the M4 toll booth at Rogiet Moor. No access was given in 2014.
- Consecutive surveys of the species-rich sites covered in 2014, particularly land and reens within the Tata Steel site, the disused laboratory and other botanically diverse reens along the route. Species-rich sites include those with a good diversity of botanical species and those that support 20 or more species of terrestrial invertebrate and/or 15 or more species of aquatic invertebrate. Invertebrate populations wax and wane and sampling over a number of seasons gives a better picture of the species assemblage present.
- Static collection techniques would increase the diversity and richness of the invertebrates collected. Sites should be found on which static techniques can be used. Alternatively, existing sites could be managed to allow static techniques, such as fencing an area off from cattle.

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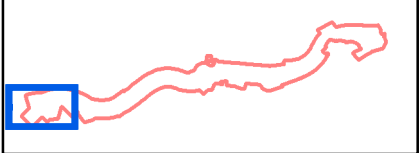
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Legend

- Invertebrate Sample Location Points
- Invertebrate Sample Areas
- Study Area



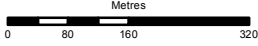
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Issue	Date	By	Chkd	Appd



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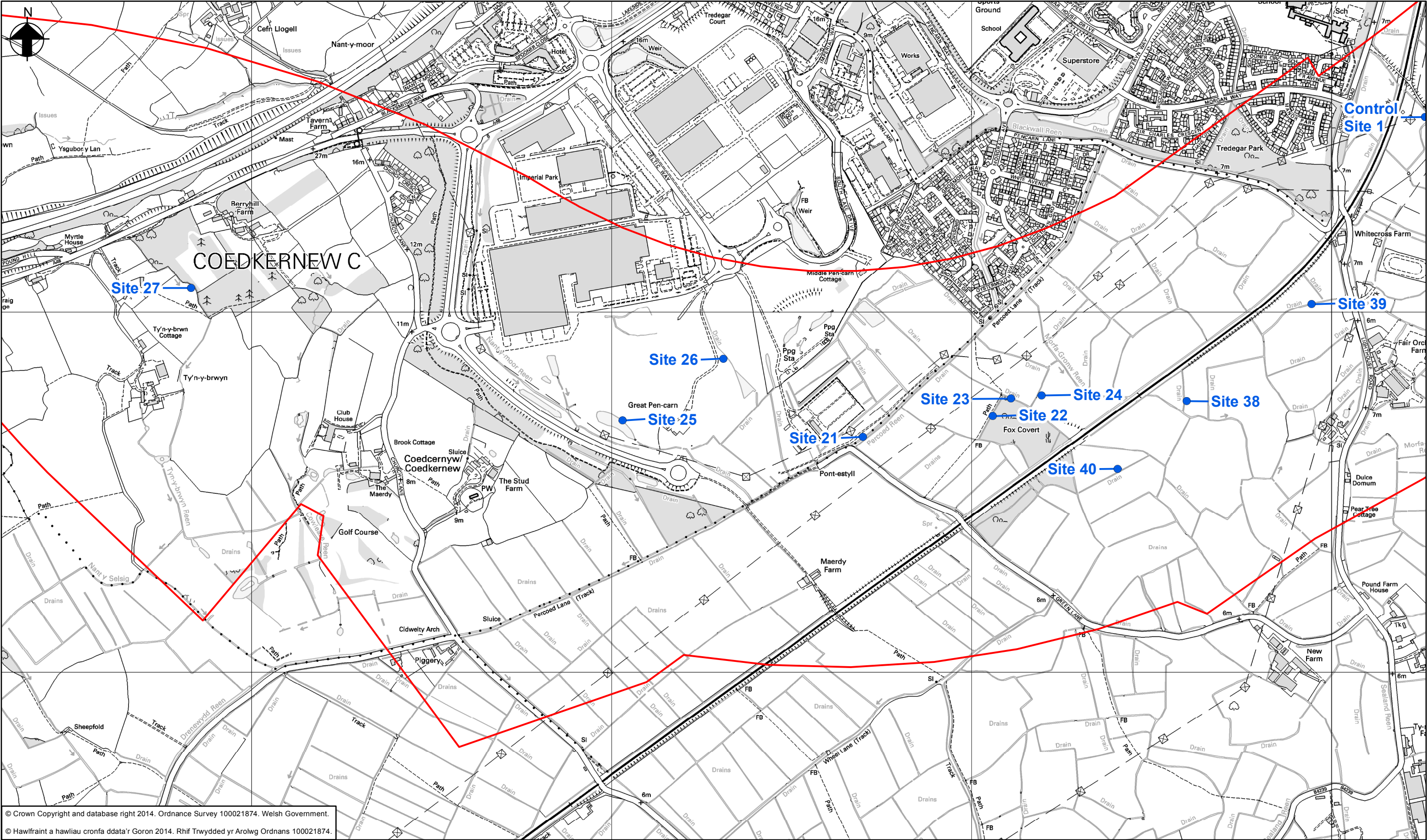
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**Invertebrate Survey Sample Locations
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Job No
117300-01

Drawing Status
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Drawing No
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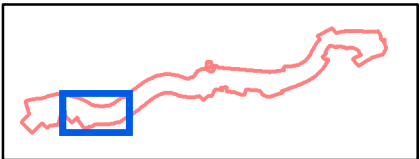
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Legend

- Invertebrate Sample Location Points
- Invertebrate Sample Areas
- Study Area



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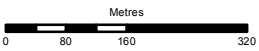
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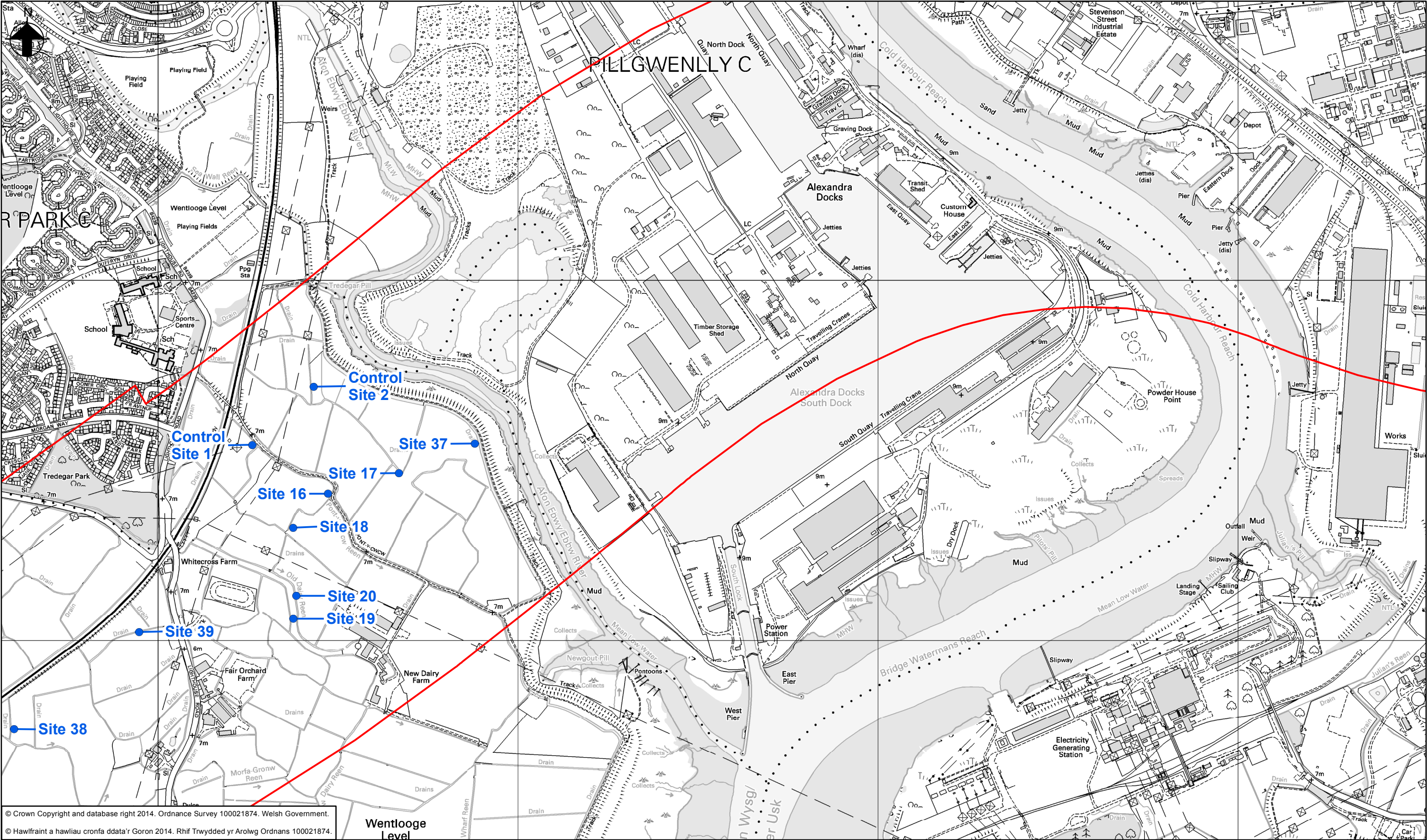
Invertebrate Survey Sample Locations
Map 2

Job No
117300-01

Drawing Status
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Drawing No
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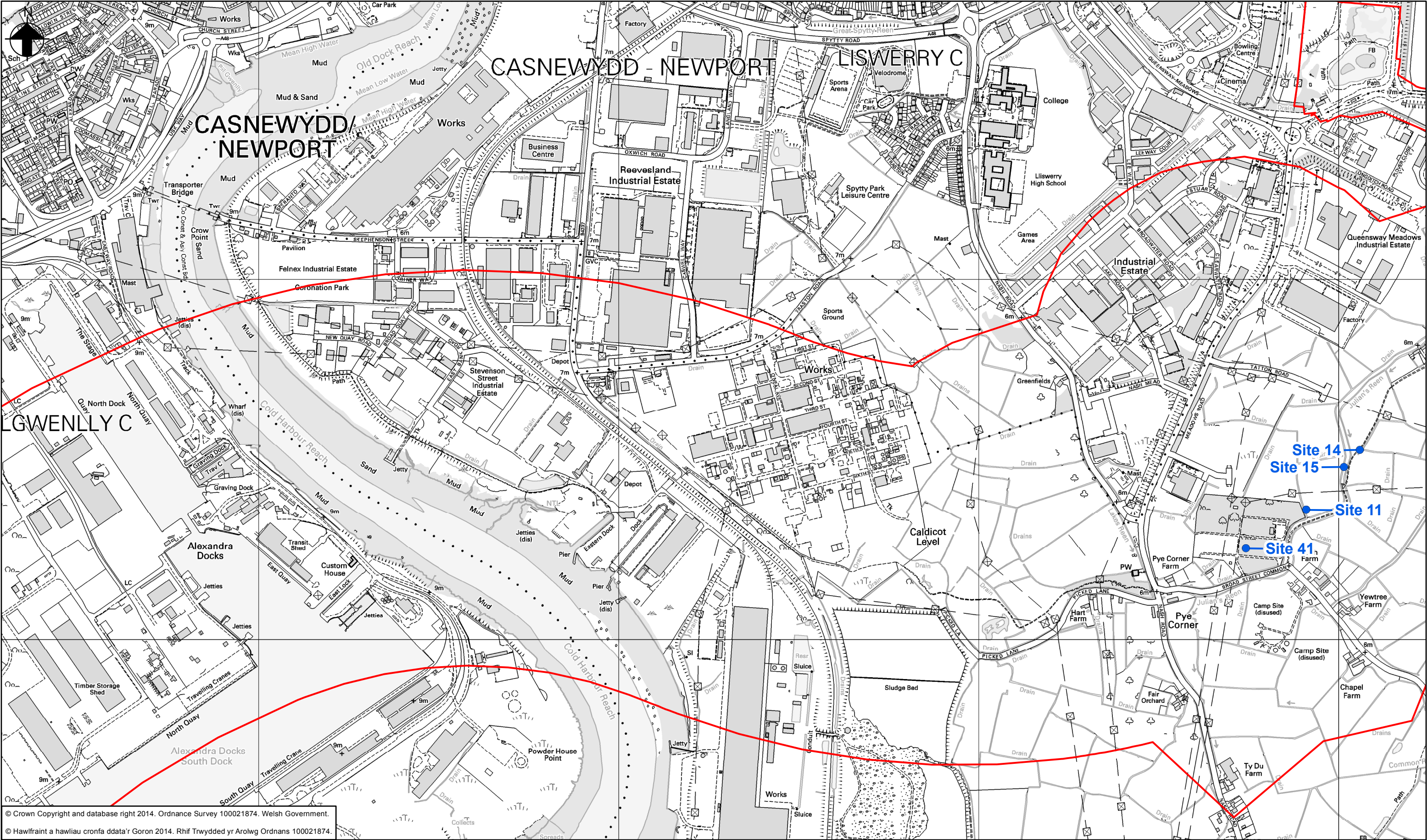
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Drawing Title
Invertebrate Survey Sample Locations
Map 3

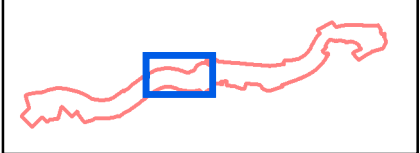
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- ▨ Invertebrate Sample Areas
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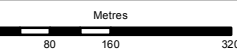
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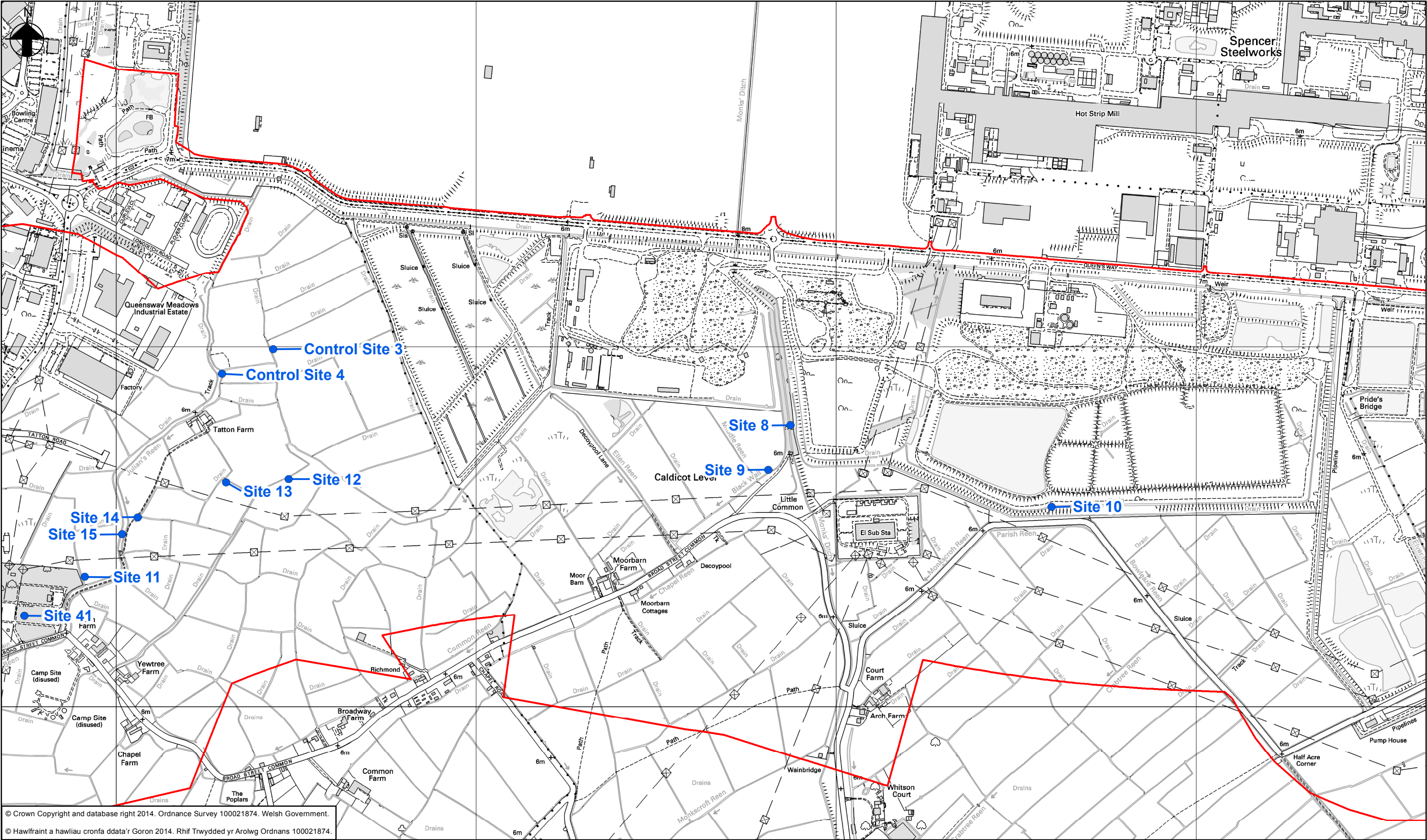
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**Invertebrate Survey Sample Locations
Map 4**

Job No
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Drawing Status
For Issue

Drawing No
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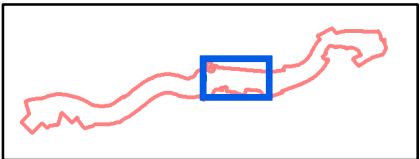
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Legend

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- Invertebrate Sample Areas
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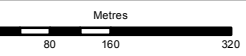
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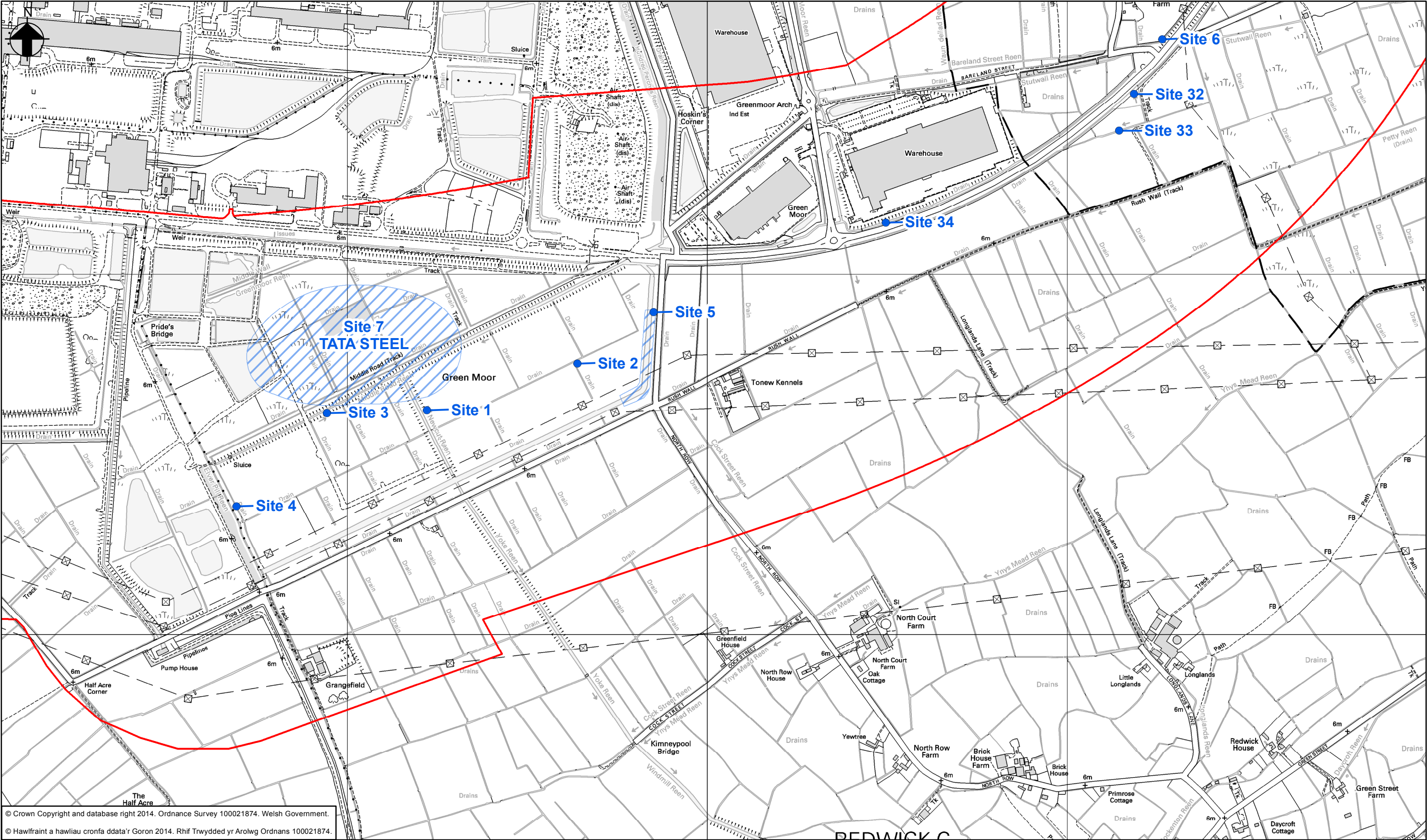
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**Invertebrate Survey Sample Locations
Map 5**

Job No
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Drawing Status
For Issue

Drawing No
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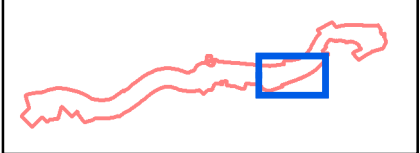
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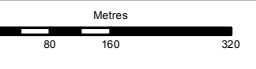
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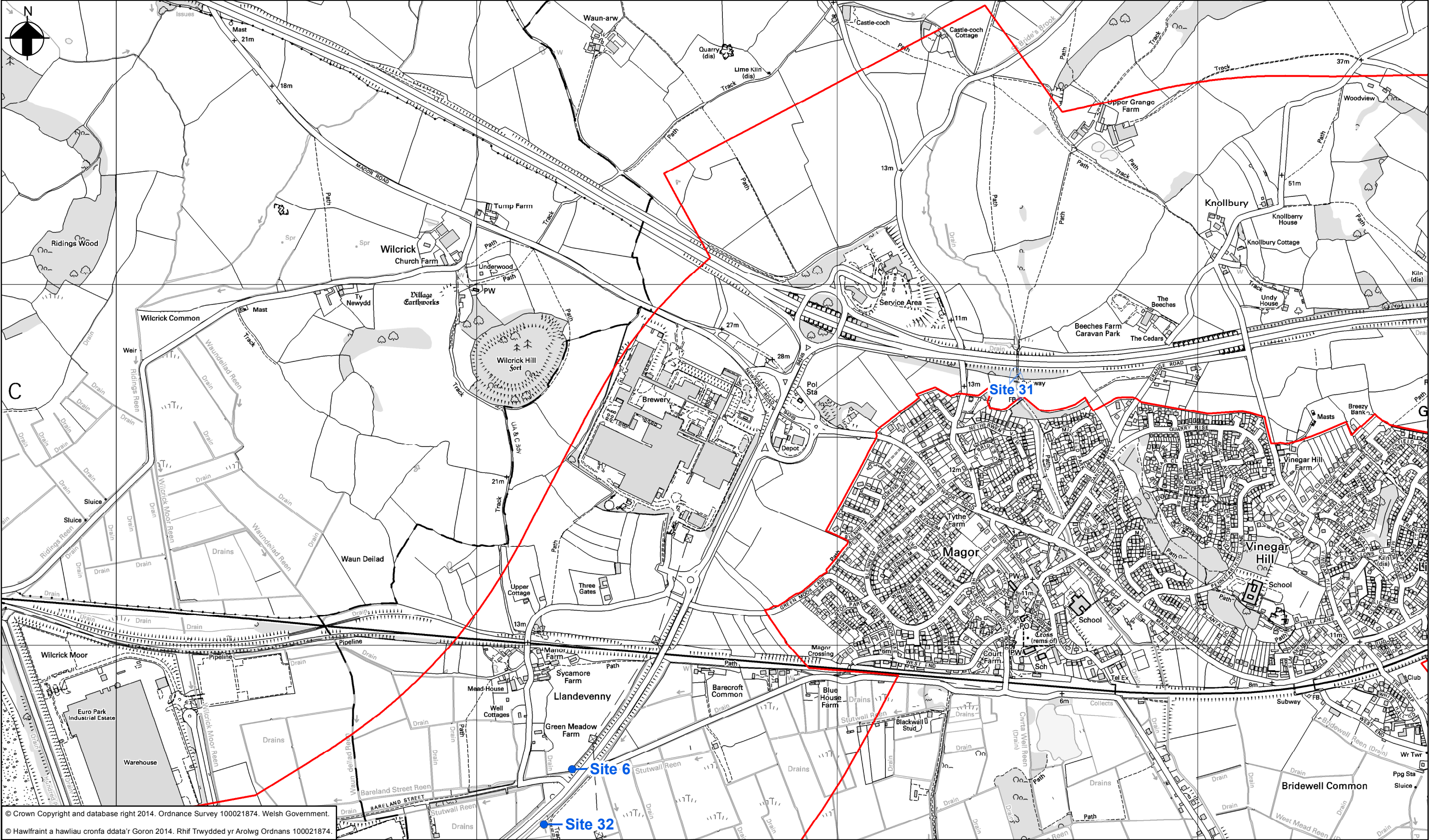
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Drawing Title
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Map 6**

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Drawing Status
For Issue

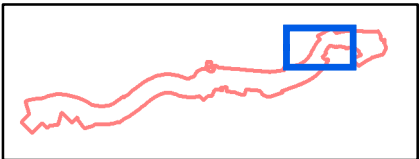
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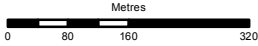


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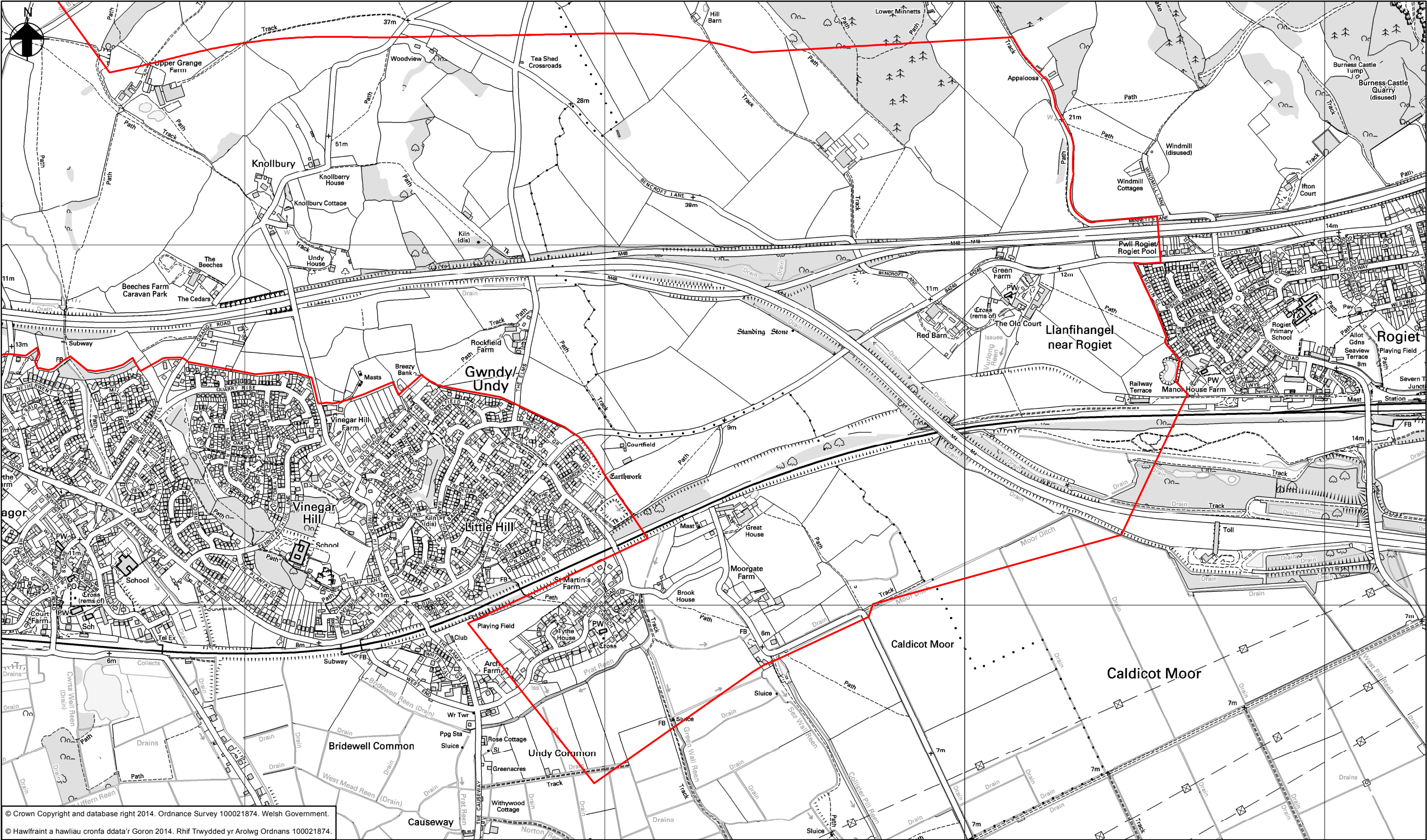
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**Invertebrate Survey Sample Locations
Map 7**

Job No
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For Issue

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Drawing Title

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Drawing No	Issue
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