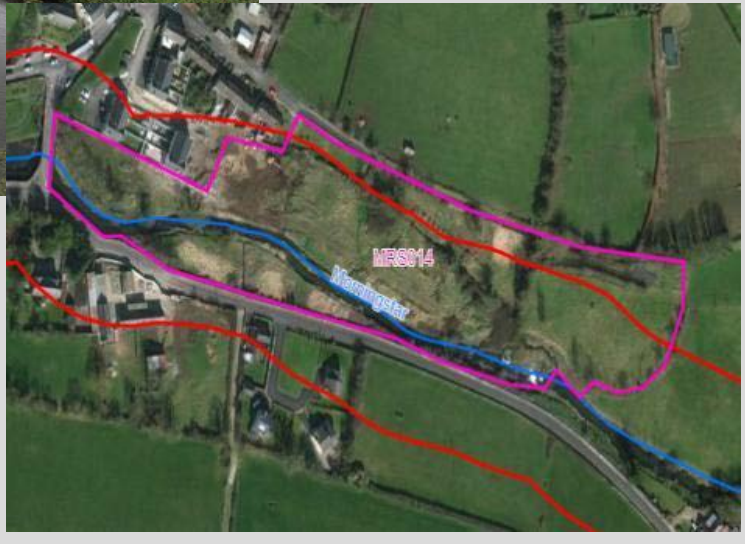
River Maigue Catchment Riparian Habitat Study



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RIVER MAIGUE RIPARIAN HABITAT SURVEYS

FINAL REPORT

October 2019

Prepared by Wetland Surveys

ISBN: 978-1-9161760-4-1

Recommended reference: Wetland Surveys Ireland (2019) River Maigue Catchment Riparian Habitat Study. Maigue Rivers Trust, Ireland.

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1 EXECUTIVE SUMMARY

This report presents the results of a habitat survey undertaken along the main tributaries of the River Maigue during summer 2019 by Wetland Surveys Ireland on behalf of the Maigue Rivers Trust. Baseline information on the extent and condition of riverside (riparian) habitats occurring within the Maigue catchment is provided.

Natural riverside habitats usually have a diversity of native species present ranging from trees to grasses, rushes, and reeds. These areas are very important as they form a buffer between the land and the river, protecting the river from human activities on the land. For example, a natural riverside habitat can soak up some of the nutrients that can run off farm land, reducing the amount of excess nutrients getting into the river. These riverside areas are also a corridor for animals like birds and bats, and are thus an important refuge for biodiversity. It is important to protect these areas, especially within intensively farmed landscapes.

The following outputs of the survey are presented:

- A map of all terrestrial habitats within a 50m corridor along the River Maigue and main tributaries.
- Descriptions of habitats that occur within the catchment.
- Results of river condition assessments undertaken at 58 sites (bridge locations).
- A photographic record of the survey.

A large amount of the natural riverside habitats that would have once occurred in the Maigue catchment are no longer present, with farmland generally extending right up to the river edge. When rivers in the catchment were drained, a lot of the bank side vegetation was removed while the channels were deepened and widened. This drainage led to an increase in agricultural productivity in the catchment, with 89% of the catchment now covered by farmland. Invasive species, in particular Giant Hogweed, have become established along some rivers posing a threat to native species.

The restoration of riparian zones would benefit the ecological status of rivers in the catchment and wider biodiversity. Two of the main actions that are recommended for restoring riparian zones are the creation of buffer zones, in particular in areas where the land use is very intensive, and the control of invasive species. The information presented in this report is a baseline upon which future improvements or changes can be evaluated. The restoration of riparian habitats within the catchment will require the collaboration of various stakeholders including landowners, local groups such as the Maigue Rivers Trust, and relevant state agencies.

2 INTRODUCTION

2.1 Project Background

This report was prepared by Wetland Surveys Ireland Ltd. on behalf of the Maigue Rivers Trust. The Maigue Rivers Trust was established in 2016. The Trust aims to protect, enhance and promote the use and enjoyment of the rivers in the Maigue catchment. In particular, the Trust is interested in implementing measures to enhance and restore the ecological integrity and biodiversity of rivers and streams in the catchment.

While reports on the diversity of fish and invertebrates present within the catchment have been prepared, little is known about the extent or quality of riparian habitats within the catchment. Riparian habitats occur on the boundary of terrestrial and aquatic habitats, and are extremely important in terms of managing natural resources. While they play a crucial role in protecting water features from human activities, they also act as core habitats for semi-aquatic species that depend on wet areas between terrestrial and aquatic habitats to complete their life cycles. Large areas of terrestrial habitat surrounding wetlands are critical for maintaining biodiversity (Semlitsch and Bodie 2003). It is especially important to conserve riparian habitats in agricultural landscapes as they contain wetland plants and associated fauna that are not found in habitats managed for agriculture, therefore providing a refuge and corridor for these species in a landscape that is otherwise intensively managed.

The aim of this survey was to conduct a study of riparian habitats present within the Maigue catchment, report on the presence of invasive species, and recommend management recommendations.This report outlines the findings of field surveys carried out in the Maigue catchment area in July 2019. It describes the habitats present along the corridor of the Maigue and its main tributaries, in addition to presenting the results of river hydromorphology assessments. The presence of invasive species within the catchment is discussed, in addition to management recommendations to conserve and improve the biodiversity value of the Maigue catchment.

2.2 Study Area

The River Maigue and its principal tributaries, the Barnkyle, Camoge, Clonshire, Loobagh, and Morningstar drain an area of ca 1020km^2, predominately in Co. Limerick (Figure 1). The River Maigue flows into the Shannon Estuary approximately 11km to the east of Limerick City. The Maigue and its

tributaries occur in hydrometric area 24 and the Shannon Estuary South catchment area. This catchment is comprised of 17 sub-catchments including the Maigue, Morningstar, Drumcamoge, and Greanagh. The Camoge/Drumcamoge is an area for action as identified in the River Basin Management Plan 2018-2023, that occurs in the eastern part of the catchment.

The majority of the Maigue catchment underlain by lower carboniferous limestone (Wyse Jackson 2009). The sub-soils for the majority of the catchment are comprised of limestone till, with some areas of sandstone till and shales, and sandstone till present in the southern part of the catchment. Average precipitation for Limerick is 977mm annually, the majority of which falls as rain. Air temperatures are generally mild, ranging between an average minimum of 3°C and an average maximum of 20°C.

Landuse in the catchment is predominantly agricultural. 89% of the catchment area is covered by pasture or agricultural land, with an additional 1% classified as 'land principally occupied with agriculture with areas of natural vegetation'. The proportion of natural grasslands (<1%), marsh (<1%), and peatlands (<1%) in the catchment are all relatively low (CORINE 2000). In 2010, 6.8% of the workforce of county Limerick were employed in agriculture, which is significantly higher than the national average of 4.6% (LCC 2010). Dairying is the most common agricultural activity within the county, and this also seems to be the case in the Maigue catchment area.

The lower reaches of the River Maigue, downstream from Adare, are part of the Lower River Shannon SAC (Special Area of Conservation) (NPWS Site Code: 002165). Two of the qualifying interests for this SAC, Mudflats and sandflats not covered by seawater at low tide [1140] and Otter (*Lutra lutra*) [1355], are both reported to occur in the lower reaches of the River Maigue. In addition to this, Salmon, Brook Lamprey, and White-clawed Crayfish, all of which are listed on Annex II of the habitats directive, occur within the catchment (Sweeney 2018). A total of seventeen fish species have been recorded in the Maigue catchment, which is regarded as being significant nationally in terms of fish biodiversity (Harrington 2018). A total of 110 macroinvertebarte taxa have been recorded in the catchment, in addition to 40 macrophyte taxa (Sweeney 2018).

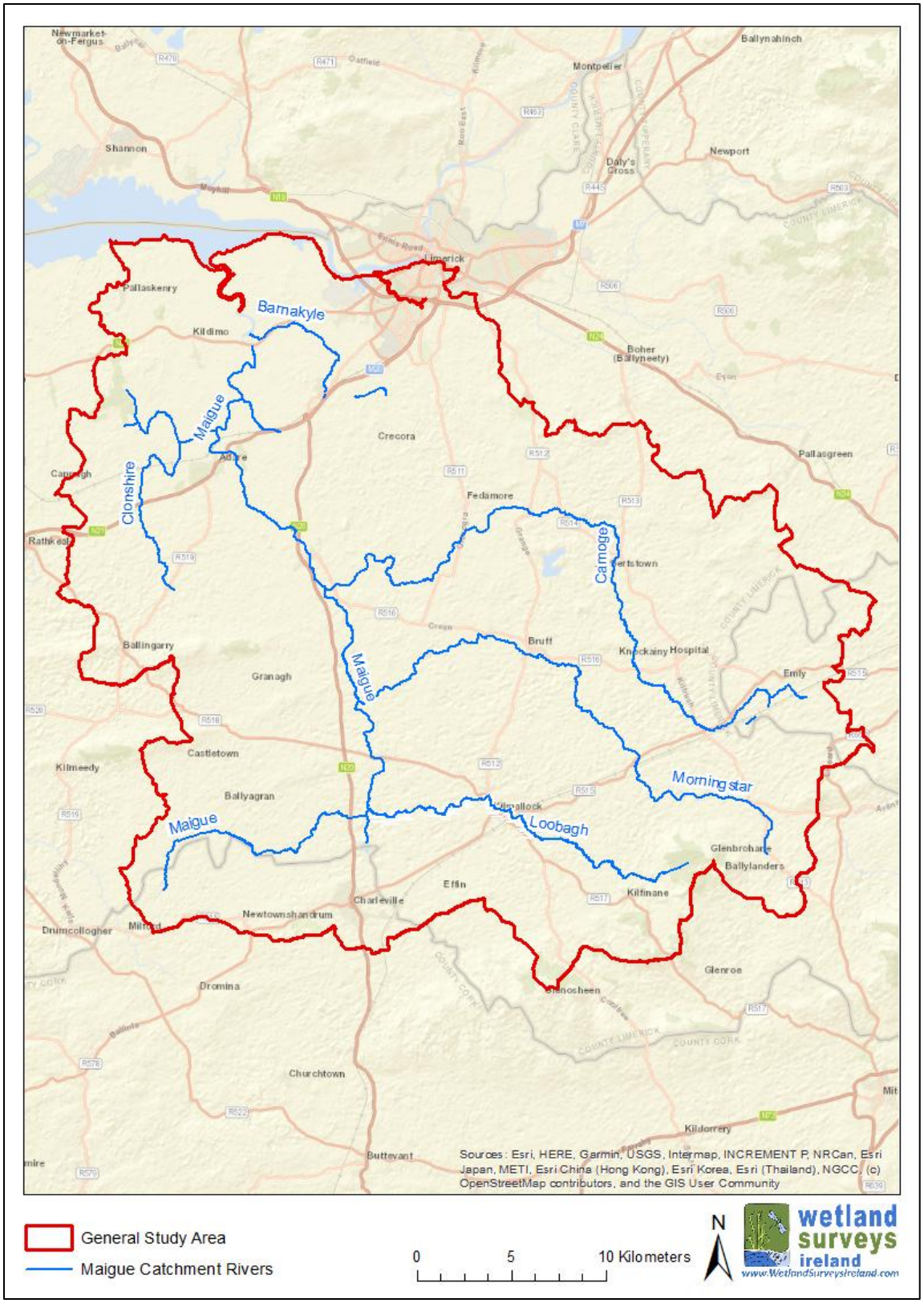

Figure 1: Maigue catchment survey area.

The Maigue catchment has been subject to drainage works (arterial and field) since 1945. The purpose of this drainage work was to reduce periodic flooding, improve the drainage of water off the land, and to allow for an increase in agricultural productivity (Dalton and O'Brien 2019). The arterial and field drainage carried out in the catchment dramatically altered the river channel and its associated riparian habitats. The effects of this drainage can still be seen today, most obviously by the presence of linear earth banks adjacent to certain stretches of the main channel and tributaries, created from spoil removed from the river channel. Arterial drainage reduced, and in some instances completely removed, the connectivity between aquatic and terrestrial ecosystems. This has resulted in dramatic reduction in the natural interactions between rivers and their floodplains. As noted by Little *et al.* (2008), the aquatic zone has effectively been removed from the floodplain due to drainage schemes over most of Ireland.

3 METHODOLOGY

3.1 Desktop review of aerial imagery

A desktop review of aerial imagery using Geographic Information System (GIS) software was carried out prior to field surveys. A 50m buffer zone was created along the Maigue, Loobagh, Camoge, Morningstar, Barnakyle, and Camoge rivers. The habitats present within the buffer zone were digitised following best practice guidelines as described in Smith *et al.* (2011) and classified following Fossitt (2000). All digitising was carried out at a maximum scale of 1:2,500. A number of sites of potential interest were identified during this desktop review and were listed as priority for field survey (see Appendix I).

3.2 Field Surveys

3.2.1 Habitat surveys

During the survey period, a 'drive through' of the catchment area was undertaken, following roads that occurred in proximity to the river. Any habitats that were observed to be different to those determined by the desktop habitat review were noted. Binocular surveys were carried out at a number of locations to determine the habitats present in areas that were not easily accessible. At all river hydromorphology assessment survey locations, the habitats occurring within view of the bridging point were recorded. A list of flora and fauna species occurring in proximity to the main channel and its tributaries was recorded during the course of the 2019 survey, as were specific target notes for species of interest which are recorded in the project GIS. A photo catalogue of all photos taken during the habitat surveys is presented in Appendix III.

Following on from the initial desktop review, a number of sites were identified for targeted field survey. These sites were identified as potential areas of ecological interest comprising semi-natural habitats. Upon visiting these sites in the field, survey notes and associated photographs were collected. None of these sites were determined to be of significant ecological interest, and generally comprised highly modified or altered habitats. Descriptions of these sites, following survey, are presented in Appendix I, and can also be found in the accompanying GIS.

After the field survey the survey notes collected were used to update the habitat mapping. All survey notes and mapped habitats are presented in the accompanying GIS and reproduced as a map-book presented in Appendix V.

3.2.1.1 Species nomenclature

Floral nomenclature follows An Irish Flora (Parnell and Curtis 2012) for Latin and common names. The Latin name is given in brackets following the common name on first mention in the main text. Following this, just the common name is used. Both Latin names and common names are provided in all individual site reports (Appendix I and Appendix II). A list of all flora and fauna recorded during the field survey is presented in Appendix IV.

3.2.2 River Hydromorphology Assessment Technique Surveys

River Hydromorphology Assessment Technique (RHAT) Spot Check surveys were carried out at a total of 58 bridging points on the River Maigue and its main tributaries (Figure 2). Completed RHAT assessment scorecards for each survey location are presented in Appendix II. Where two or more bridging points were in close proximity to each other, one representative point was chosen for the RHAT survey.

The RHAT surveys were carried out according to the River Hydromorphology Assessment Technique Training Guide (NEA 2009), using the 'Spot-Check RHAT Form' (Appendix iv of the training guide). The data collected includes information on in-channel vegetation, substrate condition, bankside habitats, adjoining land use, the presence of artificial features, barriers to continuity, channel form and flow, bank structure and stability, and floodplain connectivity.

The outcome of each RHAT assessment results in an overall score and associated 'spot check class' of High, Good, Moderate, Poor, or Bad. The data collected in this survey and the associated scores provide baseline information on the status of the rivers within the Maigue catchment in 2019. Repeated surveys

can be carried out in the future and any improvements or declines in condition can be determined using the 2019 assessments as a baseline.

A photograph of the stretch of river upstream and downstream from each bridging point was taken as presented in Appendix II. These photographs also act as a useful visual archive and could be used to monitor future changes at these bridging points. A photo catalogue of all photos taken during the RHAT survey is presented in Appendix III. All additional survey photos taken are also presented in Appendix III, along with their coordinates (in ITM).

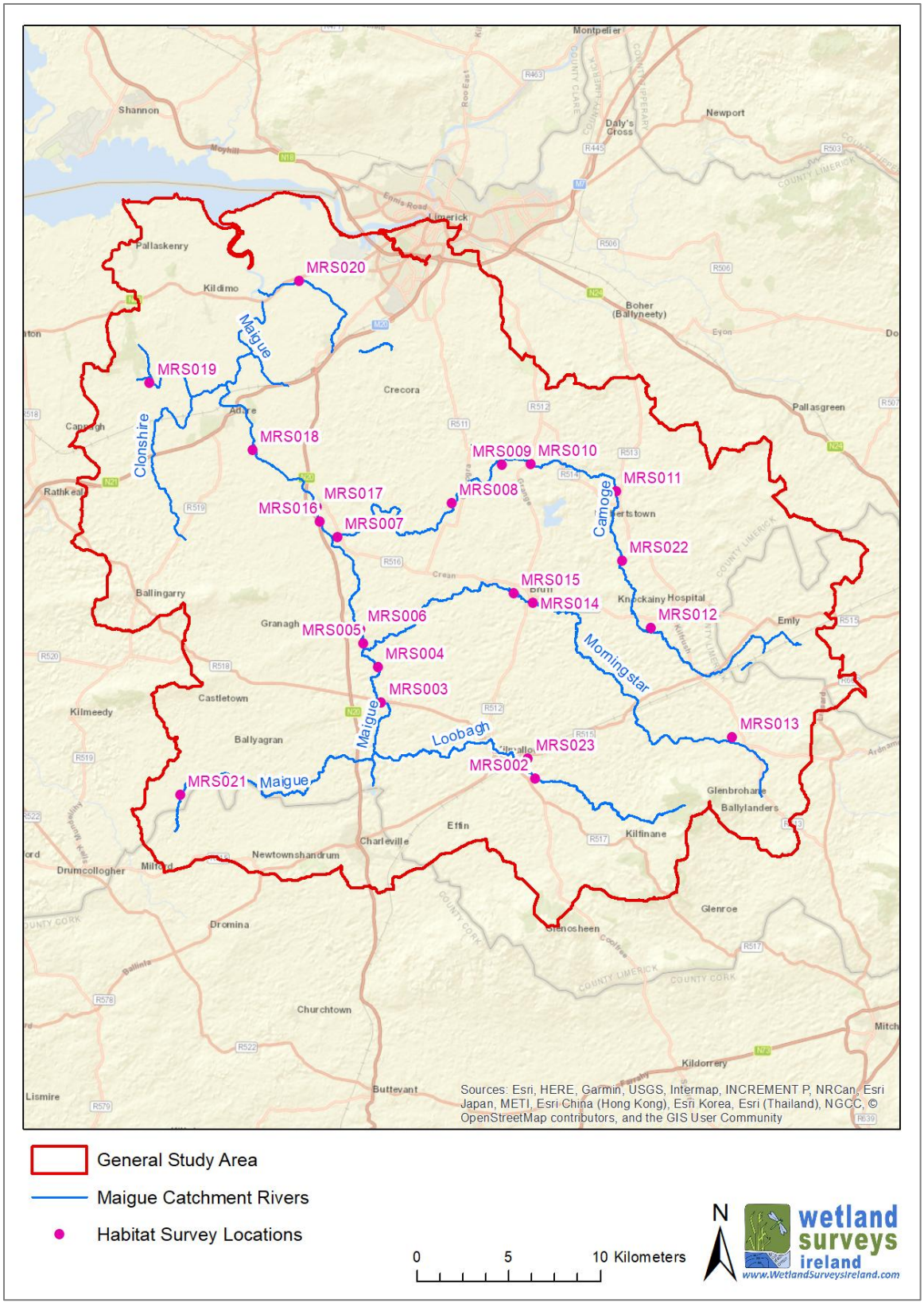

Figure 2: RHAT survey locations recorded in 2019 in the Maigue catchment area.

4 Results

4.1 Habitat Descriptions

The key habitats recorded along the banks of the Maigue and its main tributaries were improved agricultural grassland (GA1), wet grassland (GS4), dry meadows and grassy verges (GS2), scrub (WS1), reed and large sedge swamps (FS1), conifer plantation (WD4), mixed broadleaved woodland (WD1), mixed broadleaved/conifer woodland (WD2), immature woodland (WS2), riparian woodland (WN5), hedgerows (WL1), and treelines (WL2). Habitat mosaics, where two or more of these habitats occurred together, were frequently recorded in the survey area. The locations and extent of the various habitats throughout the study area is presented in the accompanying GIS and as a map-book in Appendix V. A complete species list is presented in Appendix IV, with the frequency of occurrence of each species also recorded. The dominant habitats occurring in proximity to the river are described in the following sections.

4.1.1 Grasslands

Improved agricultural grassland is the dominant habitat in the survey area. This habitat is generally dominated by Perennial Rye Grass (*Lolium perenne*), with additional species such as White Clover (*Trifolium repens*), Creeping Buttercup (*Ranunculus repens*), Dandelion (*Taraxacum* agg.), and Docks (*Rumex* sp.) commonly present. Many improved agricultural grassland fields encountered during field survey have an absence of any riparian vegetation or buffer strip along the river banks (Plate 1). In numerous locations cattle are accessing the river from such improved agricultural grassland areas.

Plate 1: Example of improved agricultural field without riparian habitat or buffer zone. Note cattle access point to river in lower right hand corner (Site Code: CM14).

Where a buffer strip, or area of semi-natural vegetation is present, this is generally comprised of dry meadow and grassy verge vegetation and or a narrow band of reed and large sedge swamps (Plate 2). Dry meadow and grassy verge vegetation is typically dominated by Hedge bindweed (*Calystegia sepium*), Greater Willowherb (*Epilobium hirsutum*), and rank grasses (*Arrhenatherum elatius* and *Dactylis glomerata*). Reed and large swamps are generally dominated by Reed Canary Grass (*Phalaris arundinacea*), with Branched Bur-reed (*Sparganium erectum*), and Common Club-rush (*Schoenoplectus lacustris*) also occurring. In areas with good semi-natural vegetation all three of these species occur together, however, this was not regularly recorded.

Plate 2: Dry meadow and grassy verge vegetation grading into reed and tall herb swamp on right bank of river (Site Code: BK02).

Mosaics of improved agricultural grassland and wet grassland occur frequently within the catchment. In general there is a paucity of wet grassland species, with Rushes (*Juncus* sp.), Iris (*Iris pseudocarus*), and Meadowsweet (*Filipendula ulmaria*) generally dominant (Plate 3). Of the sites targeted for field survey, MRS013 is one of the better examples of a grassland site. The site is relatively unmanaged, and there are aseries of runnels running across the surface that are colonised by wet grassland species. See Appendix I for further details.

Plate 3: Mosaic of improved agricultural grassland and wet grassland (left bank) (Site Code: MS03).

One area of high quality *Molinia* grassland was recorded at Kilgrogan, in proximity to the Curraghchase North River (Plate 4). This grassland occurs just outside the 50m buffer along the river channel and is adjoined by improved agricultural grassland and conifer forestry. Species present include Meadowsweet, Purple Moor-grass (*Molinia caerulea*), Meadow Thistle (*Cirsium dissectum*), Marsh Bedstraw (*Gallium palustre*), Sharp-flowered Rush (*Juncus acutiflorus*), Tufted Vetch (*Viccia cracca*), Purple Loosetrife (*Lythrum salicaria*), Ragged Robin (*Silene flos-cuculi*), Star Sedge (*Carex echinata*) and other sedge species (*Carex* sp.), Devil's-bit Scabious (*Succisa pratensis*), Lesser Spearwort (*Ranunculus flammula*), Common Meadow-grass (*Poa pratensis*), Greater Bird's-foot Trefoil (*Lotus uliginosus*), and Yorkshire Fog (*Holcus lanatus*). This area of grassland is of high ecological value and, based on the absence of similar habitat in the study area efforts should be made towards ensuring it's conservation.

Plate 4: High quality species rich wet grassland with Meadowsweet.

4.1.2 Woodlands

In general there was an absence of vegetation layers (generally shrub and or tree layer were missing) on one or both river banks throughout much of the catchment (Plate 5). All wooded areas recorded along the river banks are highly modified, generally comprising conifer plantation, estate / demesne planted areas, treelines, and hedgerows (Plate 6). Site MRS003 that was targeted for field survey comprised a good example of mature woodland in the catchment area, with a diverse range of tree species present. See Appendix I for more details.

Plate 5: The absence of riparian vegetation along the river channel within improved agricultural areas was a feature of much of the catchment, as seen on the Loobagh.

Plate 6: Example of a section of the Loobagh river channel (looking east) where modified woodland was present on lands adjacent to the river channel.

Where a woodland or shrub layer is present, it is generally comprised of Willows (*Salix cinerea* and *S. viminalis*), with Ash (*Fraxinus excelsior*). Other commonly recorded species include Beech (*Fagus sylvatica*), Sycamore (*Acer pseudoplatanus*), Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), and occasional Alder (*Alnus glutinosa*) (Plate 7).

Plate 7: Treeline present along the left river bank and absent from the right bank (Site Code: CM11).

The National Survey of Native Woodlands (NSNW) has only recorded two sites adjoining the Maigue or its tributaries, Curraghchase Forest Park and Glenma woodland, though there are a number of NSNW sites occurring within the wider catchment area.

Curraghchase Forest Park (NSNW Site Code: 1986) adjoins the upper reaches of the Curraghchase North River, which is a tributary of the Clonshire. The site comprises a large Coillte property with stands of semi-natural woodland occurring within it. The site is subject to seasonal flooding and 25% of the site is comprised of wet woodland habitats (Wet pedunculate oak-ash woodland (5%), Wet willow-alder-ash woodland (15%), and Bog woodland (5%)). Wet woodland occurs in the north of the site, near Blue Lough, and this woodland area merges into open fen. The excellent areas of wet woodland are noted as being one of the most important features of the site (Perrin *et al.* 2008). This site is also a SAC (NPWS Site Code: 000174) designated for the protection of Alluvial forests, Yew woodlands, and Lesser Horseshoe Bat.

Glenma woodland (NSNW Site Code: 1993) occurs on the bank of the River Maigue approximately 4km north of Bruree. This small area of woodland, is comprised of oak-ash-hazel woodland on a hill that slopes down to the river. The canopy is dominated by Ash and while it contains a high proportion of native species, relative to other oak-ash-hazel woodlands it has a low species diversity, and is of moderate conservation value (Perrin *et al*. 2008).

Riparian woodlands are an extremely rare type of native woodland in Ireland (Little *et al.* 2008) and were only recorded on a few islands in the main Maigue channel. These woodlands were surveyed using binoculars, given their isolated location. Riparian woodlands are subject to periodic flooding, during winter flood periods. Flooding can be irregular, but occurs for long enough periods to determine the vegetation (Little *et al.* 2008). Species recorded on these islands include Willows (*Salix cinerea, S. alba* and *S. viminalis*), Ash, and occasional Alder in the tree layer. Other species recorded include Nettles (*Urtica dioica*), Hairy Willowherb, Reed Canary Grass, Bramble (*Rubus fruticosus* agg.), Branched bur-reed, and Fool's-water-cress (*Apium nodiflorum*).

Plate 8: Riparian woodland on island in middle of the Maigue river channel, south of Adare (Site Code: MG13).

4.1.3 Reed and large sedge swamps

Scattered areas of in-stream reed and large swamps were recorded on the Maigue and its main tributaries, while larger reed swamp areas were generally confined to the lower reaches of the Maigue and Barnakyle rivers.

Reed Canary Grass is the dominant species in the smaller in-stream reed bed areas, which are typically species poor habitats (Plate 9). The larger reed swamp areas in the lower part of the main Maigue channel are dominated by Common Reed (*Phragmites australis*), with other species present including Yellow Flag Iris, Nettle, Hemlock Water-dropwort (*Oenanthe crocata*) and Bindweed (Plate 10). Additional species present in this habitat included Fool's Water-cress, Horestail (*Equisitum* sp.), Water Plantain (*Alisma plantago-aquatica*), and Brooklime (*Veronica beccabunga*).

Plate 9: Area of in-stream and stream edge reedswamp dominated by Reed Canary Grass on the Camoge near Coolfune (Site Code: CM12).

Plate 10: Large areas of reedswamp dominated by Common Reed on the Maigue at Ferrybridge (Site Code: MG18).

In areas where the bank side and in channel vegetation was well developed Branched Bur-reed and Common Club-rush were present in addition to Reed Canary Grass, though this was not a frequent occurrence (Plate 11).

Often, areas of reedswamp were the only buffer between agricultural fields and the river, however, frequently there was a band of dry meadow and grassy verge vegetation present between the reedswamp and the grassland field (Plate 11). These areas were generally comprised of Nettles, Hedge Bindweed, Greater Willowherb, rank grasses and scattered Bramble patches.

Plate 11: Area of dry meadow and grassy verge vegetation grading into a more diverse area of reedswamp at the edge of the Maigue river channel with Branched Bur-reed, Common Club-rush and Reed Canary Grass (Site Code: MG14).

4.2 RHAT Surveys

RHAT Spot Check surveys were carried out at a total of 58 bridging points on the River Maigue and its main tributaries (Figure 3). A table summarising the number of bridging locations achieving a Spot Check Class of Good, Moderate, Bad and Poor is presented in Table 1. The majority of sites surveyed were classified as Poor (28) or Moderate (17). The Maigue had the highest number of sites classified as Good (3). More detail on the findings of the RHAT surveys can be found in Section 4.4 and individual site reports can be found in Appendix II.

Table 1: Summary of RHAT surveys in the Maigue catchment

	Bad	Poor	Moderate	Good
Barnakyle	0	2	1	0
Camoge	1	6	6	1
Clonshire	0	3	2	0
Curraghchase North	1	1	0	0
Loobagh	1	2	3	1
Maigue	3	8	4	3
Mondellihy	1	0	0	0
Morningstar	0	6	1	1
Total	**7**	**28**	**17**	**6**

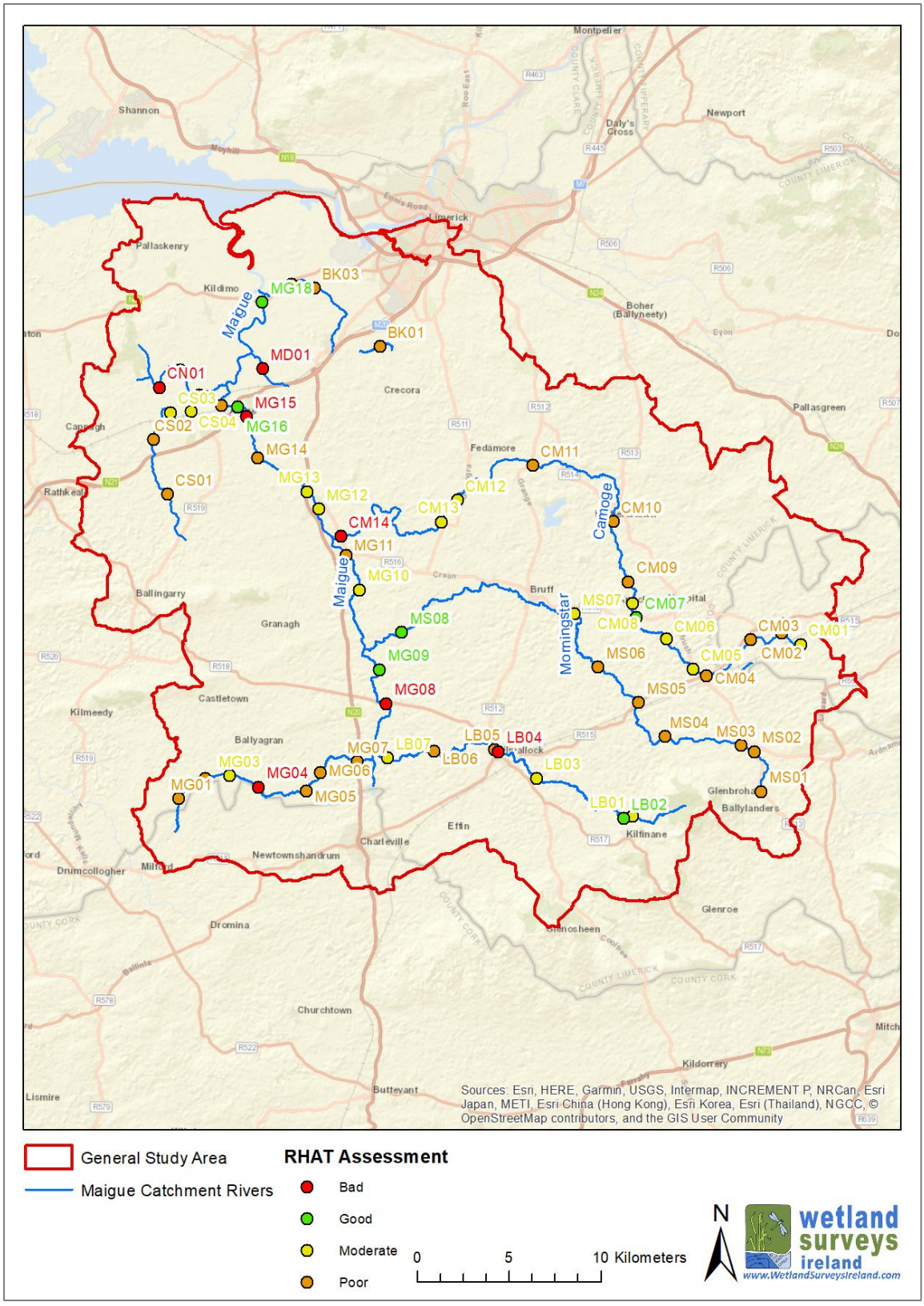

Figure 3: RHAT survey locations and outcome of RHAT survey assessment location.

4.3 Invasive Species

During the course of the survey work a number of invasive species were recorded in the catchment area. The presence of invasive species along river systems is difficult to control, unless a holistic catchment level approach is taken. As invasive species are often spread along river corridors, it is important that any eradication programmes start upstream and work down along the river. The presence of invasive species along river banks can have serious consequences for native flora, as invasive species often outcompete them for light, space and other resources. Areas that become dominated by invasive species are also prone to erosion during the winter months, as the plants die back exposing bare banks.

Plate 12: Giant Hogweed (left hand side) on the banks of the river Maigue (Site Code: MG11).

Most notably, Giant Hogweed was abundant along the banks of the Maigue and the Loobagh (Plate 13). The sap of the Giant Hogweed plant is phototoxic. Contact with the plant sap prevents the skin from being able to protect itself from sunlight, which leads to phytophotodermatitis, a serious skin inflammation. Therefore the presence of this plant poses a threat to native ecosystems and public health.

Some of the Giant Hogweed plants recorded during the field survey occur in proximity to public walkways along the river, for example at Kilmallock (Loobagh) and Bruree (Maigue). Signs have been

placed along the fence of the river walk in Kilmallock warning of the danger of Giant Hogweed (Plate 14), however, at the majority of other locations where this species was recorded, there are no information signs present or any other form of warning to members of the public about the dangers posed by this species.

Plate 13: Giant Hogweed is common along the banks of the Maigue and Loobagh and may spread from the river channel edge into adjacent agricultural lands (near site LB07).

Plate 14: Notices relating to the presence of Giant Hogweed along the river walkway in Kilmallock.

There are ongoing efforts to try and control Giant Hogweed along the banks of the Maigue and the Loobagh, including a pilot project collaboration between the Maigue Rivers Trust and Ballyhoura Development CLG, along a 12km stretch of the Loobagh to its confluence with the Maigue. A new three-year project has just been initiated by Limerick City and County Councils to control the spread of Giant Hogweed along the Loobagh. This project aims to include members of the public in identifying areas where this species is present and helping to eradicate it. As the eradication of this invasive species will require multiple years of effort, it is recommended that information signs, warning of the danger posed by Giant Hogweed be placed in any areas along river banks where there is public access or public walkways.

A small number of Himalayan balsam plants were recorded from a bridging point (MS03) on the Morningstar (Plate 15). There did not appear to be any other plants present immediately upstream or downstream of this location, and the plants found may be recent garden escapes. Given the potential for this species to outcompete native species along water courses, it is recommended that these plants be removed as soon as possible. The seed pods of Himalayan Balsam explode open spreading seeds up to 7m from the parent plant, making it likely that this plant will spread downstream unless it is

eradicated. Eradication is recommended to be carried out between mid-May and June (before the plant develops seed pods). As the seeds remain viable for two years it will be important to revisit this site for two years after the initial removal, to ensure that no new growth has occurred.

Plate 15: Himalayan Balsam on the banks of the Morningstar River (at sit MS03).

Japanese Knotweed (*Fallopia japonica*) is known to occur in the Maigue catchment. No plants were observed from any of the survey locations during the current study, however, some plants were recorded in the vicinity of the Camoge River. In general, it does not appear that this species currently poses a major threat along the river banks of the Maigue and its main tributaries, however, as with all invasive species it is important to continue to monitor and control this species.

Snow Berry (*Symphoricarpos albus*), which an Amber listed invasive species according to Invasive Species Ireland, was also commonly recorded within the catchment area (Plate 16). Amber listed species are recognised as potentially representing a significant threat to native species or habitats, or potentially impacting either / or Natura 2000 sites or the goals of the WFD. Overall these species do not have a high risk rating, however, their presence still results in a loss of native biodiversity.

Plate 16: Snowberry is common in the catchment area, especially in hedgerow and scrub vegetation.

4.4 River habitat descriptions and RHAT assessment

4.4.1 River Maigue

The Maigue rises in north Cork and flows in a northerly direction through Limerick. The Maigue flows through Croom and Adare, before flowing into the Shannon Estuary west of Limerick city. The lower reaches of the Maigue, from Adare onwards are tidal. The main channel of the Maigue underwent extensive arterial drainage works in the 1970s-80s. It was estimated that over 2,000 landowners would benefit from the drainage works carried out (Bruton and Convery 1982). During the Maigue Drainage Scheme it was noted that if the spoil produced by clearing the channel was spread on adjoining land, as opposed to creating an earth bank, this would result in an increased farm income for those landowners. Additional environmental and aesthetic benefits were also cited as advantages to this system (Bruton and Convery 1982). While the absence of earth banks allows the river to retain connectivity with the flood plain, the spreading of spoil on the land indicates that those fields would be improved and intensified, moving away from a catchment with wet grassland to one dominated by drained and improved agricultural fields.

Although the arterial drainage of the Maigue and its tributaries resulted in economic benefits for the catchment, it also resulted in significant alterations to the river channel and adjacent riparian vegetation, the effects of which can still be seen today. In addition to this, the drainage of the

catchment is linked to the “improvement” or intensification of land use in the area, resulting in a loss of wetland supporting habitats within the catchment.

Plate 17: Maigue River with highly modified woodland on right hand side. The white flowers of Giant Hogweed are visible on left bank in distance (Site Code: MG09).

Despite the extensive alterations to the main channel, in comparison with its tributaries the Maigue has the most extensive areas of treelines and hedgerows along the river bank, in addition to more diverse areas of reed and tall herb communities within the river channel. There are a number of islands present within the main channel south of Adare and these were the only potential areas of riparian vegetation recorded during the survey.

In general, the Maigue is adjoined by improved agricultural grassland, with some areas of wet grassland. There are a number of conifer plantations adjoining the river channel, in addition to areas of highly modified broadleaved, or broadleaved and conifer woodland. From Adare northward, earth banks are visible on both banks of the river, as a result of previous drainage. The area of land between the earth bank and the river is typically dominated by dry meadow and grassy verge vegetation merging into reed beds dominated by Common Reed, with some Willow scrub also present.

4.4.1.1 River Hydromorphology Assessment

RHAT surveys were carried out at eighteen locations along the Maigue. Three of these locations were classified as Bad, eight were classified as Poor, four were Moderate, and three were Good (Figure 3). Two of the sites that received a classification of Good are located on the lower reaches of the river. These areas received a good classification due to the presence of relatively natural riparian vegetation. The main factors leading to the lower outcomes of these assessments were the historic channel alterations and the absence of a tree and shrub layer along the river banks. See Appendix II for results of the RHAT surveys undertaken at eighteen sites along the River Maigue.

According to the EPA, all seven sites surveyed on the Maigue in 2017 were in an un unsatisfactory Moderate ecological condition. Excessive siltation and enhanced or abundant algal / macrophyte growth were recorded at the majority of sites surveyed (EPA 2017).

4.4.1.2 Threats and Pressures

The invasive Giant Hogweed (*Heracleum mantegazzianum*) is abundant along the banks of the Maigue (and Loobagh). The sap of the Giant Hogweed plant is phototoxic. Contact with the plant sap prevents the skin from being able to protect itself from sunlight, which leads to phytophotodermatitis, a serious skin inflammation and public health hazard. This species needs to be controlled to avoid further spread along the main channel and its establishment in tributaries where it is not currently present. The presence of this invasive species is an issue not just due to the potential harm it can do to humans who are exposed to it, but also because of its impacts on native biodiversity and ecosystems.

4.4.2 Loobagh River

The Loobagh rises to the north east of Kilfinane. The upper reaches of the river are adjoined by conifer plantation, but as the river flows towards Kilmallock the landscape becomes dominated by agricultural grassland. The majority of this grassland is improved, but there are some areas of wet grassland present. Some areas of estate plated broadleaved woodland adjoin the river Riversfield and Fairyfield before it flows through Kilmallock. The river continues to run through agricultural land, with one area of conifer plantation present before the Loobagh joins the Maigue. In many places agricultural fields run right up to the river bank, with no functioning buffer zone present. Although the channel has been significantly altered by straightening and deepening, there are some meanders present in places, where the river still follows its natural course.

Plate 18: Loobagh River showing improved agricultural grassland to river edge and general lack of riparian vegetation (Site Code: LB06).

4.4.2.1 River Hydromorphology Assessment

A total of seven locations were surveyed for RHAT assessment. One location was classified as Good, two were Moderate, three were Poor, and one was Bad (Figure 3). The main factors leading to these outcomes were the historical alteration of the channel through widening and deepening, and the absence of riparian vegetation and canopy layers as would be expected in a natural system. See Appendix II for results of the RHAT surveys undertaken at seven sites along the Loobagh River.

Water sampling carried out by the EPA in 2017 indicated that there were Good ecological conditions in the upper and lower reaches of the river, however conditions at the sampling location in Kilmallock were Unsatisfactory. This is in keeping with the findings of the RHAT surveys carried out, where the bridging point in Kilmallock received the lowest assessment of sites along the Loobagh.

4.4.2.2 Threats and Pressures

The presence of Giant Hogweed along the banks of the Loobagh poses a major threat to the river. The plant was present at high densities at multiple locations along the river banks. Apart from posing a threat to humans (see Section 4.4.2), it also threatens native biodiversity along the river bank.

Some dumping was noted in the river along the river walkway in Kilmallock. However, it appears that the local tidy towns group have been removing rubbish from the river.

4.4.3 Camoge River

The Camoge river rises just to the south of Emly, runs through Knocklong, Knockainy, and Meanus before joining the Maigue to the south of Croom. The majority of land adjoining the river is comprised of improved agricultural grassland, with some areas of wet grassland. A number of areas that would previously have consisted of wet grassland were found to be comprised of improved agricultural grassland during the field survey. A number of highly modified wooded areas occur along the river, comprising conifer plantation and mixed broadleaved woodland. Overall there is a lack of continuous treelines and hedgerows along the river, and an absence of canopy layers as would be expected in an unaltered riparian zone.

Plate 19: Camoge River with narrow riparian zone dominated by Reed Canary Grass (*Phalaris arundinacaea*) (Site Code: CM07).

4.4.3.1 River Hydromorphology Assessment

A total of fourteen RHAT surveys were conducted along the Camoge river. Of these, just one location was classified as Good, six were classified as Moderate, six were classified as Poor, and a single location was classified as Bad (Figure 3). The main factors contributing to these assessments were the previous channel alterations (deepening and widening/straightening), and cattle access to the river leading to

erosion and sedimentation. See Appendix II for results of the RHAT surveys undertaken at fourteen sites along the Camoge River.

EPA sampling carried out in 2017, indicated that there was no change in ecological conditions on the Camoge compared with previous surveys. Ecological quality remained Moderate at the upstream station (0200) and Poor at Stations 0400 and 0600 downstream. Additional surveys in August 2018 at stations upstream and downstream of the urban waste water discharge in Herbertstown had Poor ecological quality.

4.4.3.2 Threats and Pressures

Slow flows and excessive algal growth were noted at a number of locations. Bank erosion and cattle access to watercourses were also noted, leading to bank damage and high levels of sediment and nutrients entering the river.

4.4.4 Morningstar River

The Morningstar rises in Glenbrohane, and flows through Bruff before joining the Maigue. The Morningstar runs through a landscape mainly comprised of improved agricultural grassland, with some wet grassland also present. There is a noteable absence of treelines or hedgerows along the banks of the river, with agricultural fields running right up to the river bank in many places. Although the channel has been significantly altered by straightening and deepening, there are some meanders present in places, where the river still follows its natural course. There are a number of wooded areas adjoining the river, all of which comprise highly modified woodland, such as conifer plantation and mixed broadleaved woodland.

Plate 20: Morningstar River with scrub woodland on the left bank and rank grassland zone with Butterbur (*Petasites hybridus*) on right bank (Site Code: MS03).

4.4.4.1 River Hydromorphology Assessment

The majority of locations surveyed on the Morningstar received an assessment of Poor (six locations), with just one site being classified as Moderate and one as Good (Figure 3). The site that received an assessment of good was at the bridging point in Athlaca, where the river was noted as being relatively unaltered, with some narrow reed bed areas present in the braided channel. See Appendix II for results of the RHAT surveys undertaken at eight sites along the Morningstar River.

Sampling carried out by the EPA found that water quality was Good at four upstream sites, but that there had been a decline in water quality downstream of Bruff and Athlaca. It was noted that there were signs of enrichment present at the site downstream of Athlaca where there was abundant growth of filamentous algae (*Cladophora*).

4.4.4.2 Threats and Pressures

A number of Himalayan Balsam (*Impatiens glandulifera*) plants were recorded at an isolated location on the Morningstar (RHAT survey location MS03). It is recommended that these plants be eradicated as soon as possible to avoid any further downstream spread along the river.

Cattle access and bank erosion were recorded at a single location along the river, causing bank damage and sedimentation. Cattle access should be reduced or avoided if at all possible.

4.4.5 Clonshire River

The Clonshire and the Curraghchase North rivers meet to form the Greanagh River which is a tributary of the Maigue. The Greanagh joins the Maigue south of Adare. The Curraghchase North river rises within Curraghchase Forest Park / Curraghchase Wood SAC. The majority of the Curraghchase North stream is adjoined by improved agricultural grassland, though a conifer plantation is present about half way along the length of the river. An area of high quality wet grassland was recorded at Kilgrogan, in proximity to the conifer plantation. Towards the confluence with the Clonshire, earth banks are visible on the river banks. These earth banks were created during arterial drainage works, and indicate that this section of the river has been significantly altered. Reed beds and dry meadow and grassy verge vegetation occur between the river and the earth banks, however the presence of the earth banks precludes any interaction between the river and any potential flood plains. The upper stretch of the Clonshire also runs through a landscape dominated by agricultural grassland. In contrast to many of the other rivers in the catchment, treelines/hedgerows are present along significant stretches of the river, though rarely present on both river banks. These strips of vegetation provide a valuable buffer for excess sediment and nutrients originating on agricultural land. The treelines/hedgerows also act as a barrier to livestock, restricting their access to the river. Earthbanks are visible along the lower third of the river, again indicating the altered nature of the river as a result of previous arterial drainage works.

Plate 21: Clonshire River showing scrub and rank grassland community along the bank edge (Site Code: CS04).

Earth banks are present along the entire length of the Greanagh. Improved agricultural grassland is present behind these earthbanks along the majority of the river, though there is a small area of mixed broadleaved conifer woodland present on the lower stretch of the river. Dry meadow and grassy verge vegetation grading into reed beds is present along the majority of the lower stretches, with a treeline/hedgerow occurring close to where the Greanagh joins the Maigue.

4.4.5.1 River Hydromorphology Assessment

Seven RHAT survey points were undertaken on the Curraghchase North and Clonshire Rivers. Two of these survey locations were classified as Moderate, four were classified as Poor, and one was classified as Bad (Figure 3). The main issues identified during the RHAT surveys leading to the low assessments were the previous widening and deepening of the channels, the absence of canopy layers of riparian vegetation where they would be expected to occur and cattle access to rivers leading to erosion. See Appendix II for results of the RHAT surveys undertaken at seven sites along the Clonshire River.

The water status in the Clonshire was described by the EPA as continuing to be unsatisfactory, with poor ecological quality at the four sampling locations in 2017.

4.4.5.2 Threats and Pressures

No high impact invasive species were recorded along the Clonshire, Curraghchase North or the Greanagh rivers. There was evidence of cattle accessing water courses, giving rise to bank side erosion and sedimentation. This not only results increased sediment in the river but also poaching, bank damage and habitat damage. With the exception of the lower reaches of the Clonhsire and the majority of the Greanagh there is an absence of semi-natural vegetation that acts as a buffer zone between the imporved agricultural grassland fields and the river.

4.4.6 Barnakyle River

The Barnkyle river joins the Maigue below Ferry Bridge. This tributary runs through an area that is dominated by improved agricultural grassland. There are limited hedgerows and treelines present along the river bank, being absent from either one or both banks for significant stretches of the river. As the river approaches its confluence with the Maigue, the river widens and the habitats adjoining the river change from improved agricultural grassland to areas comprised of dry meadows and grassy verge vegetation, reed and large sedge swamps, and earth banks. These earth banks are visible along both river banks and are a result of previous arterial drainage. The area of land between these earth banks and the river itself is typically colonised by dry meadow and grassy verge vegetation often grading into reed and large sedge swamp. The presence of these earth banks means that there is no floodplain connectivity between the river and the adjoining land.

Plate 22: Barnakyle River with reedswamp vegetation dominating on the left bank of the river (Site Code: BK03).

4.4.6.1 River Hydromorphology Assessment

RHAT surveys were carried out at three bridging points along the Barnakyle River. Two of these sites were classified as Poor, while one was classified as Moderate (Figure 3). The channel had been deepened and widened at the survey locations and there was an absence of natural riparian habitats. See Appendix II for results of the RHAT surveys undertaken at three sites along the Barnakyle River.

According to the EPA, the water quality at two sampling locations in the Barnakyle River was moderate to poor (EPA 2019).

4.4.6.2 Threats and Pressures

The absence of natural riparian habitats along the river corridor poses a significant threat to the river. The surrounding landscape is dominated by agricultural grassland, and the absence of riparian vegetation, or any type of buffer strip, along the river banks, means that there is high potential for excess sediment and nutrients to enter the river. The retention of any semi-natural vegetation and the establishment of buffer strips, in particular in areas that are dominated by improved agricultural fields should be a priority for this river.

There was some evidence of Glyphosate use on river bank vegetation at a bridging point in Patrickswell. In addition to this, we met a local resident at a bridging point in Clarinea, who wants to spray the

vegetation growing on the bridge, so that the bridge wall is visible. Although we advised him against this action, it is likely that he will proceed to spray the bridge. As there are potentially many individual landowners and local residents who may be using chemical herbicides in proximity to the river, it may be of use to hold some information meetings in the catchment area explaining the dangers associated with using chemical herbicides, in particular in proximity to watercourses.

5 Management Recommendations

A number of pressures were identified within the catchment during the field survey. The main issues identified were hydromorphology, agriculture, forestry, invasive species, and use of chemical herbicides. Each of these issues is further described in the following sections and management recommendations relating to each pressure are also discussed.

5.1 Hydromorphology

This pressure is widespread throughout the catchment. Nationwide, hydromorphology is recognised as a significant pressure in 24% of water bodies that are identified as 'At Risk'. This pressure relates to the physical modification or damage to habitat and natural river processes, and changes in function caused by channelisation, land drainage, dams, weirs, barriers and locks, overgrazing, embankments, and culverts.

While the previous drainage work carried out in the Maigue catchment dramatically altered the river channel and associated riparian vegetation and habitats, there is little that can be done in terms of management to try and rectify this issue. Any future channel clearance or drainage should only be carried out where deemed absolutely necessary and should be subject to an environmental impact assessment prior to being carried out. Isolated sections of the main Maigue cannel and channels of the tributaries retain natural meanders (Plate 23), however, the majority of the channel length has been straightened.

Plate 23: Section of the Loobagh river showing natural meanders and ox bows near Kilfinane Lands.

5.2 Forestry

Forestry is generally confined to the upper stretches of the Maigue and its tributaries. Nationwide, forestry is recognised as a significant pressure in 16% of water bodies identified as 'At Risk'. This pressure is largely associated with sediment from clear felling, drainage, and planting establishment. The majority of forestry in Limerick is comprised of conifer plantation, with broadleafs making up just 13.5% of forestry in the county. This is much lower than the national average of 21% (LCC 2010).

It has been found that streams draining catchments with closed canopy conifer plantation experience altered pH levels, with increased levels of acidity recorded. Tree harvesting and preparation for tree planting have been found to result in elevated nutrient levels (particularly phosphorus) and sediment levels in rivers, often exceeding water quality standards (Kelly-Quinn *et al.* 2007).

In relation to the forested areas within the catchment, best practice guidelines should be followed, in particular where plantations adjoin or occur in proximity to watercourses (Plate 24), when planting or harvesting. An adequate buffer should be observed to reduce the impact of the forestry operations on watercourses and in some situations the use of sediment traps should be considered. Buffer zones of 10m each side of the aquaitic zone are recommended by The Forest Service on moderately sloping soils, increasing to 20m on very steep soils (The Forest Service 2000).

Plate 24: Conifer plantation in proximity to the Loobagh river channel. Damage to the river bank due to livestsock access can also be seen in the centre foreground of the photograph.

5.3 Agriculture

Intensive agriculture is widespread in the catchment, with dairy farming being particularly extensive. As outlined by Sweeney (2018), the main pressure on water quality within the Maigue catchment is from diffuse agricultural runoff. This is an issue in many catchments in Ireland, with agriculture being identified as a significant pressure in 54% of the 1460 water bodies identified as 'At Risk' of not meeting their environmental objectives (DHPLG 2018).

In terms of agriculture, there are a number of recommended management measures. These will require the cooperation of landowners if they are to be implemented successfully, and could potentially be facilitated through the waters and communities officer for the area. The main issues noted as a result of agriculture were (Plate 25):

- Cattle accessing rivers
- Bank side poaching
- Absence of functioning buffer zones
- Eutrophication as a result of nutrient run-off

Plate 25: Absence of functioning buffer zones with evidence of bank poaching and livestock access to Loobagh river.

It is recommended that livestock should not have access to watercourses. Fencing should be put in place where necessary to avoid animals entering the river. In addition, rivers should not be used as crossing points for livestock or farm vehicles, the creation of a livestock footbridge or use of alternative route are potential solutions. Bankside poaching is another issue that was recorded, which can lead to erosion and bank slumping. Fencing off certain areas from livestock or establishing a buffer zone would help to reduce bank damage and the amount of sediment entering watercourses.

The establishment of buffer zones along river banks, in particular where the adjoining land use is improved agricultural grassland is a relatively simple measure that could greatly improve water quality within the rivers but also increase bank side biodiversity. Buffer zones can simply be created by fencing off areas along watercourses, or in some cases by establishing a hedgerow. These buffer zones would not only help to reduce any impacts of livestock on the rivers, but also help to promote bank stabilisation and reduce the amount of sediment and nutrients entering watercourses.

Plate 26: Cattle access to watercourse, with evidence of bank poaching and eutrophication (Site Code: CM14).

5.4 Invasive species

The presence of invasive species is also a major issue within the catchment, particularly along the Maigue and Loobagh rivers. A three-year project has just commenced on the Loobagh to control Giant Hogweed. A catchment wide approach is needed when trying to control or eradicate invasive species. Given the difficultly and cost associated with trying to manage these species after they have become established, preventing the further spread of Giant Hogweed in the catchment should also be a priority. The tributaries where this species has not become established (Camoge, Morningstar, Barnakyle, and Clonshire) should be monitored and plants should be controlled as soon as they are recorded in these areas. Local community groups could play an active role in this monitoring programme, through a citizen science initiative.

Of particular importance is the removal of the Himalayan Balsam plants recorded on the banks of the Morningstar (MS03). These plants were isolated, so their quick removal should help to ensure that they do not spread within the catchment. Again local community groups or even school groups could play an important role in recording the presence of invasive species within the catchment, helping to monitor the spread or establishment of species.

5.5 Use of herbicides

It is recommended that the use of chemical herbicides on vegetation on the river banks be stopped. Again this will require the cooperation of local landowners. In order to encourage this, some public outreach will be required. Many people are unaware of the effects of chemical herbicides on the environment, in particular on aquatic species, in addition to the potential impacts on human health. A series of information meetings within the catchment could provide a good opportunity to discuss the issues associated with chemical herbicides, in particular in proximity to watercourses, and potential alternatives. These information meetings would also allow local communities to become more familiar with the Maigue Rivers Trust, and inform local groups about the value of their rivers and associated habitats. It could be a good opportunity to establish local working groups that could take responsibility for certain tributaries or sections of rivers. Each group could work to develop an action plan that they could work towards implementing.

5.6 Biodiversity conservation and enhancement

Given the overall absence of natural riparian vegetation along the river corridor, rather than focusing on conservation it would be worthwhile directing efforts towards the restoration of riparian habitats within the catchment. The establishment of buffer zones, in particular in areas where intensive agriculture is present, would be of most value. The establishment of buffer zones will not only provide a physical barrier precluding livestock access to rivers, but will also stablise the banks due to the binding action of the plant roots. The presence of buffer zone vegetation will also reduce the amount of nutrients reaching the river, as it will absorb some of the nutrients present in surface water. Over time these buffer zones will form areas of semi-natural vegetation. These will provide important commuting habitat and foraging areas for fauna and will act as corridors for wildlife in an intensively managed landscape.

Site MRS014 in Bruff has been identified as a potential site for enhancement measures. Its proximity to an existing public amenity area adjoining the river and its proximity to the town mean that this area could also be used as a resource for public outreach and education. This could be achieved both through the use of signage in the area and by involving members of the community in developing and maintaining the area. The area in question is comprised of disturbed ground currently covered by dry meadow and grassy verge and scrub vegetation. Planting of native species along the river banks to develop and maintain some semi-natural riparian vegetation would help to improve the biodiversity value of this area in addition to increasing public awareness. The amenity park present directly to the west of this area could also be enhanced. Currently this area is quite intensively managed with amenity

grassland directly adjoining the river bank. The creation of a buffer zone along the river bank would be of benefit in this location and would provide a good opportunity for public outreach and awareness. If it is not possible for a buffer strip to be created then the erection of some public information signs would still help to promote awareness amongst the public.

While there was an absence of wetland sites present on the banks of the Maigue and the main tributaries within the 50m survey zone, there are a number of wetland sites present in the wider catchment. A review of the Map of Irish Wetlands (Foss & Crushell 2019) identified 75 wetland sites in the area (Figure 4). It may be worth reviewing and surveying these sites, to build an inventory of wetlands in the catchment area, provide management recommendations for them, and ensure their protection as valuable biodiversity areas.

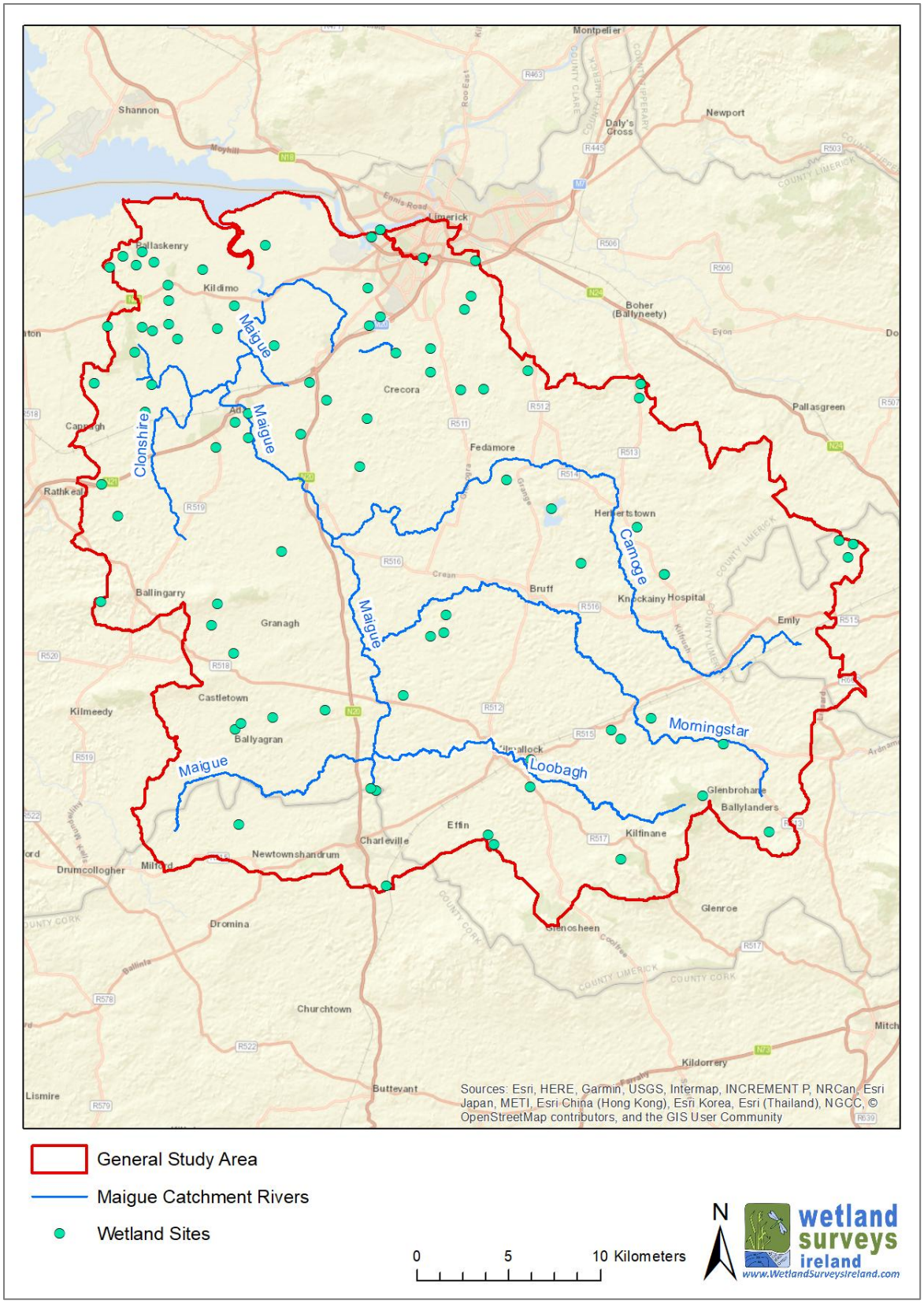

Figure 4: Location of wetland sites (Foss and Crushell 2019) within the Maigue catchment.

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RIVER MAIGUE RIPARIAN HABITAT SURVEYS

FINAL REPORT

October 2019

Prepared by Wetland Surveys Ireland

For

The Maigue Rivers Trust

wetland surveys ireland
www.WetlandSurveysIreland.com

MAIGUE RIVERS TRUST

Contents

FIGURES

Revision	Status	Author	Review	Approved	Date
01	Draft	MCG			19/08/2019
02	Draft		PF		26/08/2019
03	Draft		PC		20/09/2019
04	FINAL	MCG	PC	PC	16/10/2019
Wetland Surveys Ireland					

1 EXECUTIVE SUMMARY

This report presents the results of a habitat survey undertaken along the main tributaries of the River Maigue during summer 2019 by Wetland Surveys Ireland on behalf of the Maigue Rivers Trust. Baseline information on the extent and condition of riverside (riparian) habitats occurring within the Maigue catchment is provided.

Natural riverside habitats usually have a diversity of native species present ranging from trees to grasses, rushes, and reeds. These areas are very important as they form a buffer between the land and the river, protecting the river from human activities on the land. For example, a natural riverside habitat can soak up some of the nutrients that can run off farm land, reducing the amount of excess nutrients getting into the river. These riverside areas are also a corridor for animals like birds and bats, and are thus an important refuge for biodiversity. It is important to protect these areas, especially within intensively farmed landscapes.

The following outputs of the survey are presented:

- A map of all terrestrial habitats within a 50m corridor along the River Maigue and main tributaries.
- Descriptions of habitats that occur within the catchment.
- Results of river condition assessments undertaken at 58 sites (bridge locations).
- A photographic record of the survey.

A large amount of the natural riverside habitats that would have once occurred in the Maigue catchment are no longer present, with farmland generally extending right up to the river edge. When rivers in the catchment were drained, a lot of the bank side vegetation was removed while the channels were deepened and widened. This drainage led to an increase in agricultural productivity in the catchment, with 89% of the catchment now covered by farmland. Invasive species, in particular Giant Hogweed, have become established along some rivers posing a threat to native species.

The restoration of riparian zones would benefit the ecological status of rivers in the catchment and wider biodiversity. Two of the main actions that are recommended for restoring riparian zones are the creation of buffer zones, in particular in areas where the land use is very intensive, and the control of invasive species. The information presented in this report is a baseline upon which future improvements or changes can be evaluated. The restoration of riparian habitats within the catchment will require the collaboration of various stakeholders including landowners, local groups such as the Maigue Rivers Trust, and relevant state agencies.

2 INTRODUCTION

2.1 Project Background

This report was prepared by Wetland Surveys Ireland Ltd. on behalf of the Maigue Rivers Trust. The Maigue Rivers Trust was established in 2016. The Trust aims to protect, enhance and promote the use and enjoyment of the rivers in the Maigue catchment. In particular, the Trust is interested in implementing measures to enhance and restore the ecological integrity and biodiversity of rivers and streams in the catchment.

While reports on the diversity of fish and invertebrates present within the catchment have been prepared, little is known about the extent or quality of riparian habitats within the catchment. Riparian habitats occur on the boundary of terrestrial and aquatic habitats, and are extremely important in terms of managing natural resources. While they play a crucial role in protecting water features from human activities, they also act as core habitats for semi-aquatic species that depend on wet areas between terrestrial and aquatic habitats to complete their life cycles. Large areas of terrestrial habitat surrounding wetlands are critical for maintaining biodiversity (Semlitsch and Bodie 2003). It is especially important to conserve riparian habitats in agricultural landscapes as they contain wetland plants and associated fauna that are not found in habitats managed for agriculture, therefore providing a refuge and corridor for these species in a landscape that is otherwise intensively managed.

The aim of this survey was to conduct a study of riparian habitats present within the Maigue catchment, report on the presence of invasive species, and recommend management recommendations.This report outlines the findings of field surveys carried out in the Maigue catchment area in July 2019. It describes the habitats present along the corridor of the Maigue and its main tributaries, in addition to presenting the results of river hydromorphology assessments. The presence of invasive species within the catchment is discussed, in addition to management recommendations to conserve and improve the biodiversity value of the Maigue catchment.

2.2 Study Area

The River Maigue and its principal tributaries, the Barnkyle, Camoge, Clonshire, Loobagh, and Morningstar drain an area of ca 1020km^2, predominately in Co. Limerick (Figure 1). The River Maigue flows into the Shannon Estuary approximately 11km to the east of Limerick City. The Maigue and its

tributaries occur in hydrometric area 24 and the Shannon Estuary South catchment area. This catchment is comprised of 17 sub-catchments including the Maigue, Morningstar, Drumcamoge, and Greanagh. The Camoge/Drumcamoge is an area for action as identified in the River Basin Management Plan 2018-2023, that occurs in the eastern part of the catchment.

The majority of the Maigue catchment underlain by lower carboniferous limestone (Wyse Jackson 2009). The sub-soils for the majority of the catchment are comprised of limestone till, with some areas of sandstone till and shales, and sandstone till present in the southern part of the catchment. Average precipitation for Limerick is 977mm annually, the majority of which falls as rain. Air temperatures are generally mild, ranging between an average minimum of 3°C and an average maximum of 20°C.

Landuse in the catchment is predominantly agricultural. 89% of the catchment area is covered by pasture or agricultural land, with an additional 1% classified as 'land principally occupied with agriculture with areas of natural vegetation'. The proportion of natural grasslands (<1%), marsh (<1%), and peatlands (<1%) in the catchment are all relatively low (CORINE 2000). In 2010, 6.8% of the workforce of county Limerick were employed in agriculture, which is significantly higher than the national average of 4.6% (LCC 2010). Dairying is the most common agricultural activity within the county, and this also seems to be the case in the Maigue catchment area.

The lower reaches of the River Maigue, downstream from Adare, are part of the Lower River Shannon SAC (Special Area of Conservation) (NPWS Site Code: 002165). Two of the qualifying interests for this SAC, Mudflats and sandflats not covered by seawater at low tide [1140] and Otter (*Lutra lutra*) [1355], are both reported to occur in the lower reaches of the River Maigue. In addition to this, Salmon, Brook Lamprey, and White-clawed Crayfish, all of which are listed on Annex II of the habitats directive, occur within the catchment (Sweeney 2018). A total of seventeen fish species have been recorded in the Maigue catchment, which is regarded as being significant nationally in terms of fish biodiversity (Harrington 2018). A total of 110 macroinvertebarte taxa have been recorded in the catchment, in addition to 40 macrophyte taxa (Sweeney 2018).

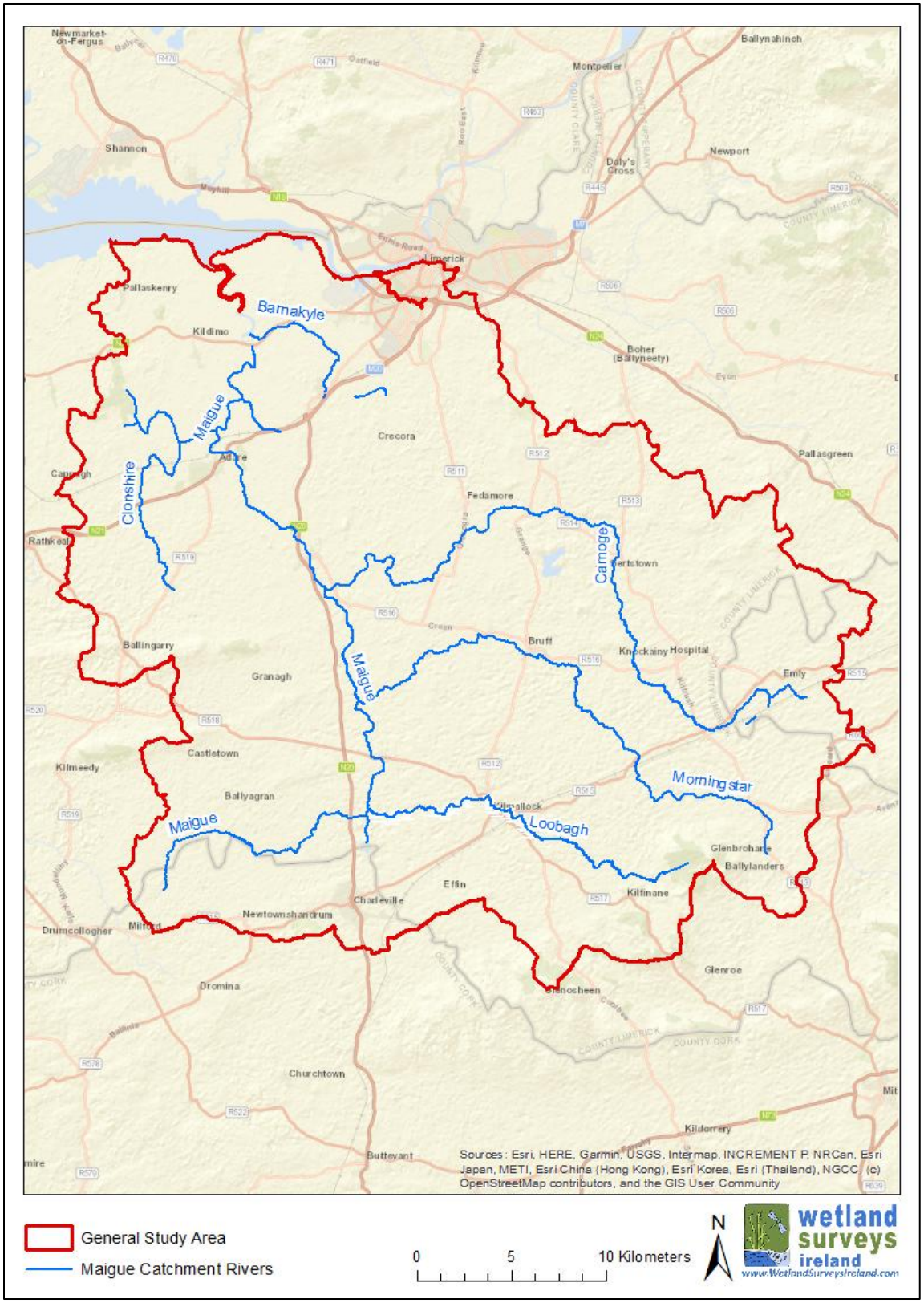

Figure 1: Maigue catchment survey area.

The Maigue catchment has been subject to drainage works (arterial and field) since 1945. The purpose of this drainage work was to reduce periodic flooding, improve the drainage of water off the land, and to allow for an increase in agricultural productivity (Dalton and O'Brien 2019). The arterial and field drainage carried out in the catchment dramatically altered the river channel and its associated riparian habitats. The effects of this drainage can still be seen today, most obviously by the presence of linear earth banks adjacent to certain stretches of the main channel and tributaries, created from spoil removed from the river channel. Arterial drainage reduced, and in some instances completely removed, the connectivity between aquatic and terrestrial ecosystems. This has resulted in dramatic reduction in the natural interactions between rivers and their floodplains. As noted by Little *et al.* (2008), the aquatic zone has effectively been removed from the floodplain due to drainage schemes over most of Ireland.

3 METHODOLOGY

3.1 Desktop review of aerial imagery

A desktop review of aerial imagery using Geographic Information System (GIS) software was carried out prior to field surveys. A 50m buffer zone was created along the Maigue, Loobagh, Camoge, Morningstar, Barnakyle, and Camoge rivers. The habitats present within the buffer zone were digitised following best practice guidelines as described in Smith *et al.* (2011) and classified following Fossitt (2000). All digitising was carried out at a maximum scale of 1:2,500. A number of sites of potential interest were identified during this desktop review and were listed as priority for field survey (see Appendix I).

3.2 Field Surveys

3.2.1 Habitat surveys

During the survey period, a 'drive through' of the catchment area was undertaken, following roads that occurred in proximity to the river. Any habitats that were observed to be different to those determined by the desktop habitat review were noted. Binocular surveys were carried out at a number of locations to determine the habitats present in areas that were not easily accessible. At all river hydromorphology assessment survey locations, the habitats occurring within view of the bridging point were recorded. A list of flora and fauna species occurring in proximity to the main channel and its tributaries was recorded during the course of the 2019 survey, as were specific target notes for species of interest which are recorded in the project GIS. A photo catalogue of all photos taken during the habitat surveys is presented in Appendix III.

Following on from the initial desktop review, a number of sites were identified for targeted field survey. These sites were identified as potential areas of ecological interest comprising semi-natural habitats. Upon visiting these sites in the field, survey notes and associated photographs were collected. None of these sites were determined to be of significant ecological interest, and generally comprised highly modified or altered habitats. Descriptions of these sites, following survey, are presented in Appendix I, and can also be found in the accompanying GIS.

After the field survey the survey notes collected were used to update the habitat mapping. All survey notes and mapped habitats are presented in the accompanying GIS and reproduced as a map-book presented in Appendix V.

3.2.1.1 Species nomenclature

Floral nomenclature follows An Irish Flora (Parnell and Curtis 2012) for Latin and common names. The Latin name is given in brackets following the common name on first mention in the main text. Following this, just the common name is used. Both Latin names and common names are provided in all individual site reports (Appendix I and Appendix II). A list of all flora and fauna recorded during the field survey is presented in Appendix IV.

3.2.2 River Hydromorphology Assessment Technique Surveys

River Hydromorphology Assessment Technique (RHAT) Spot Check surveys were carried out at a total of 58 bridging points on the River Maigue and its main tributaries (Figure 2). Completed RHAT assessment scorecards for each survey location are presented in Appendix II. Where two or more bridging points were in close proximity to each other, one representative point was chosen for the RHAT survey.

The RHAT surveys were carried out according to the River Hydromorphology Assessment Technique Training Guide (NEA 2009), using the 'Spot-Check RHAT Form' (Appendix iv of the training guide). The data collected includes information on in-channel vegetation, substrate condition, bankside habitats, adjoining land use, the presence of artificial features, barriers to continuity, channel form and flow, bank structure and stability, and floodplain connectivity.

The outcome of each RHAT assessment results in an overall score and associated 'spot check class' of High, Good, Moderate, Poor, or Bad. The data collected in this survey and the associated scores provide baseline information on the status of the rivers within the Maigue catchment in 2019. Repeated surveys

can be carried out in the future and any improvements or declines in condition can be determined using the 2019 assessments as a baseline.

A photograph of the stretch of river upstream and downstream from each bridging point was taken as presented in Appendix II. These photographs also act as a useful visual archive and could be used to monitor future changes at these bridging points. A photo catalogue of all photos taken during the RHAT survey is presented in Appendix III. All additional survey photos taken are also presented in Appendix III, along with their coordinates (in ITM).

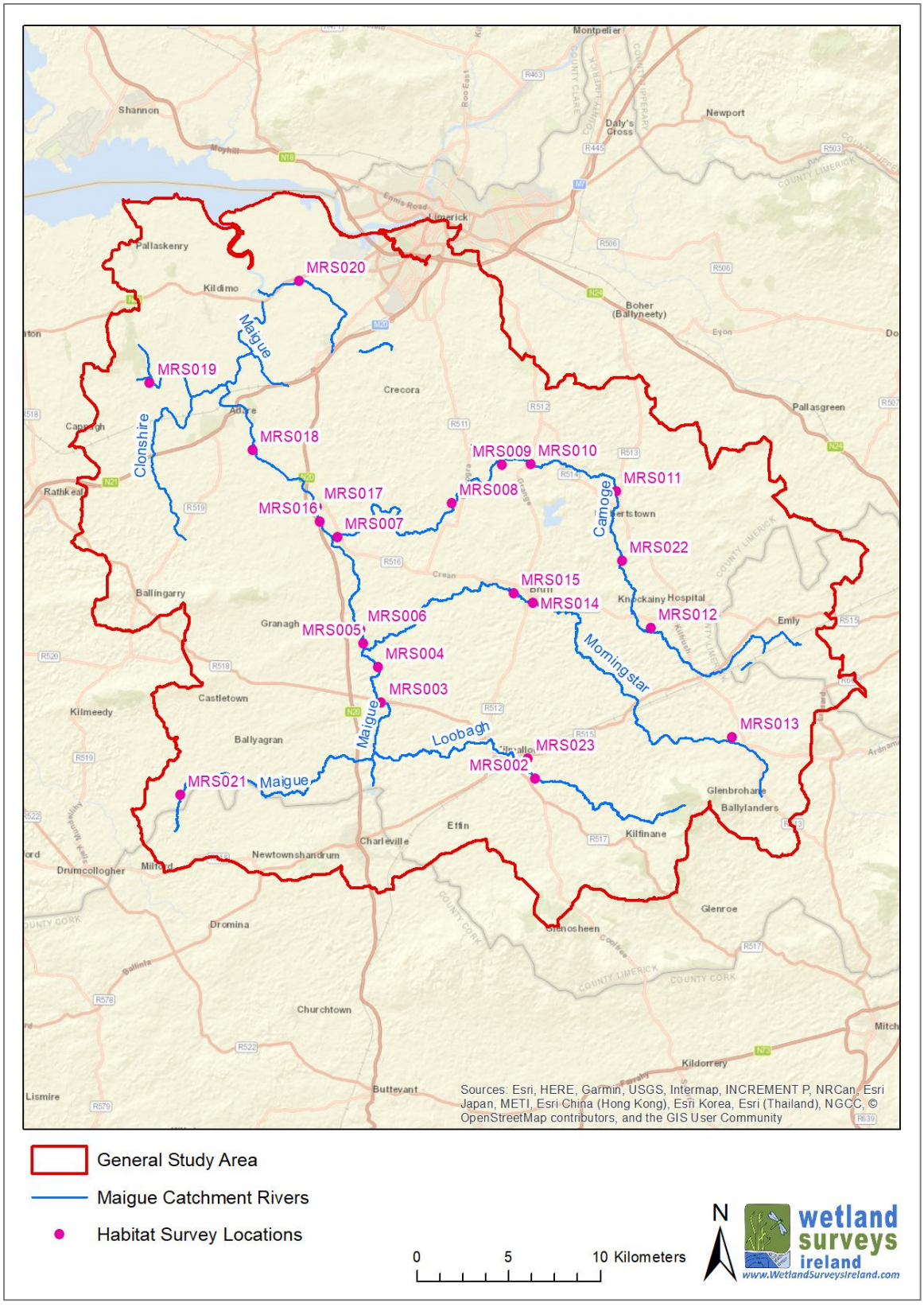

Figure 2: RHAT survey locations recorded in 2019 in the Maigue catchment area.

4 Results

4.1 Habitat Descriptions

The key habitats recorded along the banks of the Maigue and its main tributaries were improved agricultural grassland (GA1), wet grassland (GS4), dry meadows and grassy verges (GS2), scrub (WS1), reed and large sedge swamps (FS1), conifer plantation (WD4), mixed broadleaved woodland (WD1), mixed broadleaved/conifer woodland (WD2), immature woodland (WS2), riparian woodland (WN5), hedgerows (WL1), and treelines (WL2). Habitat mosaics, where two or more of these habitats occurred together, were frequently recorded in the survey area. The locations and extent of the various habitats throughout the study area is presented in the accompanying GIS and as a map-book in Appendix V. A complete species list is presented in Appendix IV, with the frequency of occurrence of each species also recorded. The dominant habitats occurring in proximity to the river are described in the following sections.

4.1.1 Grasslands

Improved agricultural grassland is the dominant habitat in the survey area. This habitat is generally dominated by Perennial Rye Grass (*Lolium perenne*), with additional species such as White Clover (*Trifolium repens*), Creeping Buttercup (*Ranunculus repens*), Dandelion (*Taraxacum* agg.), and Docks (*Rumex* sp.) commonly present. Many improved agricultural grassland fields encountered during field survey have an absence of any riparian vegetation or buffer strip along the river banks (Plate 1). In numerous locations cattle are accessing the river from such improved agricultural grassland areas.

Plate 1: Example of improved agricultural field without riparian habitat or buffer zone. Note cattle access point to river in lower right hand corner (Site Code: CM14).

Where a buffer strip, or area of semi-natural vegetation is present, this is generally comprised of dry meadow and grassy verge vegetation and or a narrow band of reed and large sedge swamps (Plate 2). Dry meadow and grassy verge vegetation is typically dominated by Hedge bindweed (*Calystegia sepium*), Greater Willowherb (*Epilobium hirsutum*), and rank grasses (*Arrhenatherum elatius* and *Dactylis glomerata*). Reed and large swamps are generally dominated by Reed Canary Grass (*Phalaris arundinacea*), with Branched Bur-reed (*Sparganium erectum*), and Common Club-rush (*Schoenoplectus lacustris*) also occurring. In areas with good semi-natural vegetation all three of these species occur together, however, this was not regularly recorded.

Plate 2: Dry meadow and grassy verge vegetation grading into reed and tall herb swamp on right bank of river (Site Code: BK02).

Mosaics of improved agricultural grassland and wet grassland occur frequently within the catchment. In general there is a paucity of wet grassland species, with Rushes (*Juncus* sp.), Iris (*Iris pseudocarus*), and Meadowsweet (*Filipendula ulmaria*) generally dominant (Plate 3). Of the sites targeted for field survey, MRS013 is one of the better examples of a grassland site. The site is relatively unmanaged, and there are aseries of runnels running across the surface that are colonised by wet grassland species. See Appendix I for further details.

Plate 3: Mosaic of improved agricultural grassland and wet grassland (left bank) (Site Code: MS03).

One area of high quality *Molinia* grassland was recorded at Kilgrogan, in proximity to the Curraghchase North River (Plate 4). This grassland occurs just outside the 50m buffer along the river channel and is adjoined by improved agricultural grassland and conifer forestry. Species present include Meadowsweet, Purple Moor-grass (*Molinia caerulea*), Meadow Thistle (*Cirsium dissectum*), Marsh Bedstraw (*Gallium palustre*), Sharp-flowered Rush (*Juncus acutiflorus*), Tufted Vetch (*Viccia cracca*), Purple Loosetrife (*Lythrum salicaria*), Ragged Robin (*Silene flos-cuculi*), Star Sedge (*Carex echinata*) and other sedge species (*Carex* sp.), Devil's-bit Scabious (*Succisa pratensis*), Lesser Spearwort (*Ranunculus flammula*), Common Meadow-grass (*Poa pratensis*), Greater Bird's-foot Trefoil (*Lotus uliginosus*), and Yorkshire Fog (*Holcus lanatus*). This area of grassland is of high ecological value and, based on the absence of similar habitat in the study area efforts should be made towards ensuring it's conservation.

Plate 4: High quality species rich wet grassland with Meadowsweet.

4.1.2 Woodlands

In general there was an absence of vegetation layers (generally shrub and or tree layer were missing) on one or both river banks throughout much of the catchment (Plate 5). All wooded areas recorded along the river banks are highly modified, generally comprising conifer plantation, estate / demesne planted areas, treelines, and hedgerows (Plate 6). Site MRS003 that was targeted for field survey comprised a good example of mature woodland in the catchment area, with a diverse range of tree species present. See Appendix I for more details.

Plate 5: The absence of riparian vegetation along the river channel within improved agricultural areas was a feature of much of the catchment, as seen on the Loobagh.

Plate 6: Example of a section of the Loobagh river channel (looking east) where modified woodland was present on lands adjacent to the river channel.

Where a woodland or shrub layer is present, it is generally comprised of Willows (*Salix cinerea* and *S. viminalis*), with Ash (*Fraxinus excelsior*). Other commonly recorded species include Beech (*Fagus sylvatica*), Sycamore (*Acer pseudoplatanus*), Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), and occasional Alder (*Alnus glutinosa*) (Plate 7).

Plate 7: Treeline present along the left river bank and absent from the right bank (Site Code: CM11).

The National Survey of Native Woodlands (NSNW) has only recorded two sites adjoining the Maigue or its tributaries, Curraghchase Forest Park and Glenma woodland, though there are a number of NSNW sites occurring within the wider catchment area.

Curraghchase Forest Park (NSNW Site Code: 1986) adjoins the upper reaches of the Curraghchase North River, which is a tributary of the Clonshire. The site comprises a large Coillte property with stands of semi-natural woodland occurring within it. The site is subject to seasonal flooding and 25% of the site is comprised of wet woodland habitats (Wet pedunculate oak-ash woodland (5%), Wet willow-alder-ash woodland (15%), and Bog woodland (5%)). Wet woodland occurs in the north of the site, near Blue Lough, and this woodland area merges into open fen. The excellent areas of wet woodland are noted as being one of the most important features of the site (Perrin *et al.* 2008). This site is also a SAC (NPWS Site Code: 000174) designated for the protection of Alluvial forests, Yew woodlands, and Lesser Horseshoe Bat.

Glenma woodland (NSNW Site Code: 1993) occurs on the bank of the River Maigue approximately 4km north of Bruree. This small area of woodland, is comprised of oak-ash-hazel woodland on a hill that slopes down to the river. The canopy is dominated by Ash and while it contains a high proportion of native species, relative to other oak-ash-hazel woodlands it has a low species diversity, and is of moderate conservation value (Perrin *et al*. 2008).

Riparian woodlands are an extremely rare type of native woodland in Ireland (Little *et al.* 2008) and were only recorded on a few islands in the main Maigue channel. These woodlands were surveyed using binoculars, given their isolated location. Riparian woodlands are subject to periodic flooding, during winter flood periods. Flooding can be irregular, but occurs for long enough periods to determine the vegetation (Little *et al.* 2008). Species recorded on these islands include Willows (*Salix cinerea, S. alba* and *S. viminalis*), Ash, and occasional Alder in the tree layer. Other species recorded include Nettles (*Urtica dioica*), Hairy Willowherb, Reed Canary Grass, Bramble (*Rubus fruticosus* agg.), Branched bur-reed, and Fool's-water-cress (*Apium nodiflorum*).

Plate 8: Riparian woodland on island in middle of the Maigue river channel, south of Adare (Site Code: MG13).

4.1.3 Reed and large sedge swamps

Scattered areas of in-stream reed and large swamps were recorded on the Maigue and its main tributaries, while larger reed swamp areas were generally confined to the lower reaches of the Maigue and Barnakyle rivers.

Reed Canary Grass is the dominant species in the smaller in-stream reed bed areas, which are typically species poor habitats (Plate 9). The larger reed swamp areas in the lower part of the main Maigue channel are dominated by Common Reed (*Phragmites australis*), with other species present including Yellow Flag Iris, Nettle, Hemlock Water-dropwort (*Oenanthe crocata*) and Bindweed (Plate 10). Additional species present in this habitat included Fool's Water-cress, Horestail (*Equisitum* sp.), Water Plantain (*Alisma plantago-aquatica*), and Brooklime (*Veronica beccabunga*).

Plate 9: Area of in-stream and stream edge reedswamp dominated by Reed Canary Grass on the Camoge near Coolfune (Site Code: CM12).

Plate 10: Large areas of reedswamp dominated by Common Reed on the Maigue at Ferrybridge (Site Code: MG18).

In areas where the bank side and in channel vegetation was well developed Branched Bur-reed and Common Club-rush were present in addition to Reed Canary Grass, though this was not a frequent occurrence (Plate 11).

Often, areas of reedswamp were the only buffer between agricultural fields and the river, however, frequently there was a band of dry meadow and grassy verge vegetation present between the reedswamp and the grassland field (Plate 11). These areas were generally comprised of Nettles, Hedge Bindweed, Greater Willowherb, rank grasses and scattered Bramble patches.

Plate 11: Area of dry meadow and grassy verge vegetation grading into a more diverse area of reedswamp at the edge of the Maigue river channel with Branched Bur-reed, Common Club-rush and Reed Canary Grass (Site Code: MG14).

4.2 RHAT Surveys

RHAT Spot Check surveys were carried out at a total of 58 bridging points on the River Maigue and its main tributaries (Figure 3). A table summarising the number of bridging locations achieving a Spot Check Class of Good, Moderate, Bad and Poor is presented in Table 1. The majority of sites surveyed were classified as Poor (28) or Moderate (17). The Maigue had the highest number of sites classified as Good (3). More detail on the findings of the RHAT surveys can be found in Section 4.4 and individual site reports can be found in Appendix II.

Table 1: Summary of RHAT surveys in the Maigue catchment

	Bad	Poor	Moderate	Good
Barnakyle	0	2	1	0
Camoge	1	6	6	1
Clonshire	0	3	2	0
Curraghchase North	1	1	0	0
Loobagh	1	2	3	1
Maigue	3	8	4	3
Mondellihy	1	0	0	0
Morningstar	0	6	1	1
Total	**7**	**28**	**17**	**6**

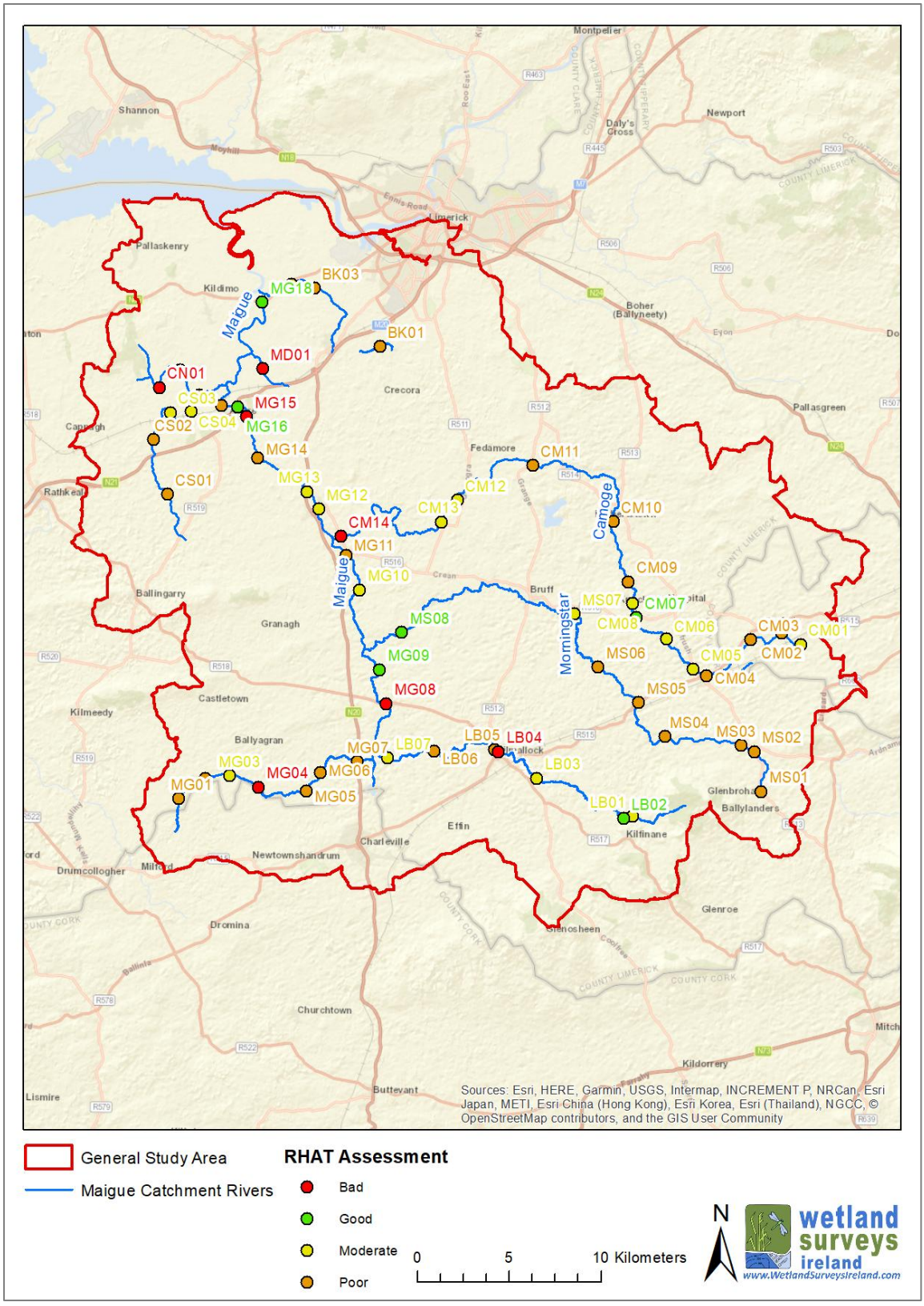

Figure 3: RHAT survey locations and outcome of RHAT survey assessment location.

4.3 Invasive Species

During the course of the survey work a number of invasive species were recorded in the catchment area. The presence of invasive species along river systems is difficult to control, unless a holistic catchment level approach is taken. As invasive species are often spread along river corridors, it is important that any eradication programmes start upstream and work down along the river. The presence of invasive species along river banks can have serious consequences for native flora, as invasive species often outcompete them for light, space and other resources. Areas that become dominated by invasive species are also prone to erosion during the winter months, as the plants die back exposing bare banks.

Plate 12: Giant Hogweed (left hand side) on the banks of the river Maigue (Site Code: MG11).

Most notably, Giant Hogweed was abundant along the banks of the Maigue and the Loobagh (Plate 13). The sap of the Giant Hogweed plant is phototoxic. Contact with the plant sap prevents the skin from being able to protect itself from sunlight, which leads to phytophotodermatitis, a serious skin inflammation. Therefore the presence of this plant poses a threat to native ecosystems and public health.

Some of the Giant Hogweed plants recorded during the field survey occur in proximity to public walkways along the river, for example at Kilmallock (Loobagh) and Bruree (Maigue). Signs have been

placed along the fence of the river walk in Kilmallock warning of the danger of Giant Hogweed (Plate 14), however, at the majority of other locations where this species was recorded, there are no information signs present or any other form of warning to members of the public about the dangers posed by this species.

Plate 13: Giant Hogweed is common along the banks of the Maigue and Loobagh and may spread from the river channel edge into adjacent agricultural lands (near site LB07).

Plate 14: Notices relating to the presence of Giant Hogweed along the river walkway in Kilmallock.

There are ongoing efforts to try and control Giant Hogweed along the banks of the Maigue and the Loobagh, including a pilot project collaboration between the Maigue Rivers Trust and Ballyhoura Development CLG, along a 12km stretch of the Loobagh to its confluence with the Maigue. A new three-year project has just been initiated by Limerick City and County Councils to control the spread of Giant Hogweed along the Loobagh. This project aims to include members of the public in identifying areas where this species is present and helping to eradicate it. As the eradication of this invasive species will require multiple years of effort, it is recommended that information signs, warning of the danger posed by Giant Hogweed be placed in any areas along river banks where there is public access or public walkways.

A small number of Himalayan balsam plants were recorded from a bridging point (MS03) on the Morningstar (Plate 15). There did not appear to be any other plants present immediately upstream or downstream of this location, and the plants found may be recent garden escapes. Given the potential for this species to outcompete native species along water courses, it is recommended that these plants be removed as soon as possible. The seed pods of Himalayan Balsam explode open spreading seeds up to 7m from the parent plant, making it likely that this plant will spread downstream unless it is

eradicated. Eradication is recommended to be carried out between mid-May and June (before the plant develops seed pods). As the seeds remain viable for two years it will be important to revisit this site for two years after the initial removal, to ensure that no new growth has occurred.

Plate 15: Himalayan Balsam on the banks of the Morningstar River (at sit MS03).

Japanese Knotweed (*Fallopia japonica*) is known to occur in the Maigue catchment. No plants were observed from any of the survey locations during the current study, however, some plants were recorded in the vicinity of the Camoge River. In general, it does not appear that this species currently poses a major threat along the river banks of the Maigue and its main tributaries, however, as with all invasive species it is important to continue to monitor and control this species.

Snow Berry (*Symphoricarpos albus*), which an Amber listed invasive species according to Invasive Species Ireland, was also commonly recorded within the catchment area (Plate 16). Amber listed species are recognised as potentially representing a significant threat to native species or habitats, or potentially impacting either / or Natura 2000 sites or the goals of the WFD. Overall these species do not have a high risk rating, however, their presence still results in a loss of native biodiversity.

Plate 16: Snowberry is common in the catchment area, especially in hedgerow and scrub vegetation.

4.4 River habitat descriptions and RHAT assessment

4.4.1 River Maigue

The Maigue rises in north Cork and flows in a northerly direction through Limerick. The Maigue flows through Croom and Adare, before flowing into the Shannon Estuary west of Limerick city. The lower reaches of the Maigue, from Adare onwards are tidal. The main channel of the Maigue underwent extensive arterial drainage works in the 1970s-80s. It was estimated that over 2,000 landowners would benefit from the drainage works carried out (Bruton and Convery 1982). During the Maigue Drainage Scheme it was noted that if the spoil produced by clearing the channel was spread on adjoining land, as opposed to creating an earth bank, this would result in an increased farm income for those landowners. Additional environmental and aesthetic benefits were also cited as advantages to this system (Bruton and Convery 1982). While the absence of earth banks allows the river to retain connectivity with the flood plain, the spreading of spoil on the land indicates that those fields would be improved and intensified, moving away from a catchment with wet grassland to one dominated by drained and improved agricultural fields.

Although the arterial drainage of the Maigue and its tributaries resulted in economic benefits for the catchment, it also resulted in significant alterations to the river channel and adjacent riparian vegetation, the effects of which can still be seen today. In addition to this, the drainage of the

catchment is linked to the “improvement” or intensification of land use in the area, resulting in a loss of wetland supporting habitats within the catchment.

Plate 17: Maigue River with highly modified woodland on right hand side. The white flowers of Giant Hogweed are visible on left bank in distance (Site Code: MG09).

Despite the extensive alterations to the main channel, in comparison with its tributaries the Maigue has the most extensive areas of treelines and hedgerows along the river bank, in addition to more diverse areas of reed and tall herb communities within the river channel. There are a number of islands present within the main channel south of Adare and these were the only potential areas of riparian vegetation recorded during the survey.

In general, the Maigue is adjoined by improved agricultural grassland, with some areas of wet grassland. There are a number of conifer plantations adjoining the river channel, in addition to areas of highly modified broadleaved, or broadleaved and conifer woodland. From Adare northward, earth banks are visible on both banks of the river, as a result of previous drainage. The area of land between the earth bank and the river is typically dominated by dry meadow and grassy verge vegetation merging into reed beds dominated by Common Reed, with some Willow scrub also present.

4.4.1.1 River Hydromorphology Assessment

RHAT surveys were carried out at eighteen locations along the Maigue. Three of these locations were classified as Bad, eight were classified as Poor, four were Moderate, and three were Good (Figure 3). Two of the sites that received a classification of Good are located on the lower reaches of the river. These areas received a good classification due to the presence of relatively natural riparian vegetation. The main factors leading to the lower outcomes of these assessments were the historic channel alterations and the absence of a tree and shrub layer along the river banks. See Appendix II for results of the RHAT surveys undertaken at eighteen sites along the River Maigue.

According to the EPA, all seven sites surveyed on the Maigue in 2017 were in an un unsatisfactory Moderate ecological condition. Excessive siltation and enhanced or abundant algal / macrophyte growth were recorded at the majority of sites surveyed (EPA 2017).

4.4.1.2 Threats and Pressures

The invasive Giant Hogweed (*Heracleum mantegazzianum*) is abundant along the banks of the Maigue (and Loobagh). The sap of the Giant Hogweed plant is phototoxic. Contact with the plant sap prevents the skin from being able to protect itself from sunlight, which leads to phytophotodermatitis, a serious skin inflammation and public health hazard. This species needs to be controlled to avoid further spread along the main channel and its establishment in tributaries where it is not currently present. The presence of this invasive species is an issue not just due to the potential harm it can do to humans who are exposed to it, but also because of its impacts on native biodiversity and ecosystems.

4.4.2 Loobagh River

The Loobagh rises to the north east of Kilfinane. The upper reaches of the river are adjoined by conifer plantation, but as the river flows towards Kilmallock the landscape becomes dominated by agricultural grassland. The majority of this grassland is improved, but there are some areas of wet grassland present. Some areas of estate plated broadleaved woodland adjoin the river Riversfield and Fairyfield before it flows through Kilmallock. The river continues to run through agricultural land, with one area of conifer plantation present before the Loobagh joins the Maigue. In many places agricultural fields run right up to the river bank, with no functioning buffer zone present. Although the channel has been significantly altered by straightening and deepening, there are some meanders present in places, where the river still follows its natural course.

Plate 18: Loobagh River showing improved agricultural grassland to river edge and general lack of riparian vegetation (Site Code: LB06).

4.4.2.1 River Hydromorphology Assessment

A total of seven locations were surveyed for RHAT assessment. One location was classified as Good, two were Moderate, three were Poor, and one was Bad (Figure 3). The main factors leading to these outcomes were the historical alteration of the channel through widening and deepening, and the absence of riparian vegetation and canopy layers as would be expected in a natural system. See Appendix II for results of the RHAT surveys undertaken at seven sites along the Loobagh River.

Water sampling carried out by the EPA in 2017 indicated that there were Good ecological conditions in the upper and lower reaches of the river, however conditions at the sampling location in Kilmallock were Unsatisfactory. This is in keeping with the findings of the RHAT surveys carried out, where the bridging point in Kilmallock received the lowest assessment of sites along the Loobagh.

4.4.2.2 Threats and Pressures

The presence of Giant Hogweed along the banks of the Loobagh poses a major threat to the river. The plant was present at high densities at multiple locations along the river banks. Apart from posing a threat to humans (see Section 4.4.2), it also threatens native biodiversity along the river bank.

Some dumping was noted in the river along the river walkway in Kilmallock. However, it appears that the local tidy towns group have been removing rubbish from the river.

4.4.3 Camoge River

The Camoge river rises just to the south of Emly, runs through Knocklong, Knockainy, and Meanus before joining the Maigue to the south of Croom. The majority of land adjoining the river is comprised of improved agricultural grassland, with some areas of wet grassland. A number of areas that would previously have consisted of wet grassland were found to be comprised of improved agricultural grassland during the field survey. A number of highly modified wooded areas occur along the river, comprising conifer plantation and mixed broadleaved woodland. Overall there is a lack of continuous treelines and hedgerows along the river, and an absence of canopy layers as would be expected in an unaltered riparian zone.

Plate 19: Camoge River with narrow riparian zone dominated by Reed Canary Grass (*Phalaris arundinacaea*) (Site Code: CM07).

4.4.3.1 River Hydromorphology Assessment

A total of fourteen RHAT surveys were conducted along the Camoge river. Of these, just one location was classified as Good, six were classified as Moderate, six were classified as Poor, and a single location was classified as Bad (Figure 3). The main factors contributing to these assessments were the previous channel alterations (deepening and widening/straightening), and cattle access to the river leading to

erosion and sedimentation. See Appendix II for results of the RHAT surveys undertaken at fourteen sites along the Camoge River.

EPA sampling carried out in 2017, indicated that there was no change in ecological conditions on the Camoge compared with previous surveys. Ecological quality remained Moderate at the upstream station (0200) and Poor at Stations 0400 and 0600 downstream. Additional surveys in August 2018 at stations upstream and downstream of the urban waste water discharge in Herbertstown had Poor ecological quality.

4.4.3.2 Threats and Pressures

Slow flows and excessive algal growth were noted at a number of locations. Bank erosion and cattle access to watercourses were also noted, leading to bank damage and high levels of sediment and nutrients entering the river.

4.4.4 Morningstar River

The Morningstar rises in Glenbrohane, and flows through Bruff before joining the Maigue. The Morningstar runs through a landscape mainly comprised of improved agricultural grassland, with some wet grassland also present. There is a noteable absence of treelines or hedgerows along the banks of the river, with agricultural fields running right up to the river bank in many places. Although the channel has been significantly altered by straightening and deepening, there are some meanders present in places, where the river still follows its natural course. There are a number of wooded areas adjoining the river, all of which comprise highly modified woodland, such as conifer plantation and mixed broadleaved woodland.

Plate 20: Morningstar River with scrub woodland on the left bank and rank grassland zone with Butterbur (*Petasites hybridus*) on right bank (Site Code: MS03).

4.4.4.1 River Hydromorphology Assessment

The majority of locations surveyed on the Morningstar received an assessment of Poor (six locations), with just one site being classified as Moderate and one as Good (Figure 3). The site that received an assessment of good was at the bridging point in Athlaca, where the river was noted as being relatively unaltered, with some narrow reed bed areas present in the braided channel. See Appendix II for results of the RHAT surveys undertaken at eight sites along the Morningstar River.

Sampling carried out by the EPA found that water quality was Good at four upstream sites, but that there had been a decline in water quality downstream of Bruff and Athlaca. It was noted that there were signs of enrichment present at the site downstream of Athlaca where there was abundant growth of filamentous algae (*Cladophora*).

4.4.4.2 Threats and Pressures

A number of Himalayan Balsam (*Impatiens glandulifera*) plants were recorded at an isolated location on the Morningstar (RHAT survey location MS03). It is recommended that these plants be eradicated as soon as possible to avoid any further downstream spread along the river.

Cattle access and bank erosion were recorded at a single location along the river, causing bank damage and sedimentation. Cattle access should be reduced or avoided if at all possible.

4.4.5 Clonshire River

The Clonshire and the Curraghchase North rivers meet to form the Greanagh River which is a tributary of the Maigue. The Greanagh joins the Maigue south of Adare. The Curraghchase North river rises within Curraghchase Forest Park / Curraghchase Wood SAC. The majority of the Curraghchase North stream is adjoined by improved agricultural grassland, though a conifer plantation is present about half way along the length of the river. An area of high quality wet grassland was recorded at Kilgrogan, in proximity to the conifer plantation. Towards the confluence with the Clonshire, earth banks are visible on the river banks. These earth banks were created during arterial drainage works, and indicate that this section of the river has been significantly altered. Reed beds and dry meadow and grassy verge vegetation occur between the river and the earth banks, however the presence of the earth banks precludes any interaction between the river and any potential flood plains. The upper stretch of the Clonshire also runs through a landscape dominated by agricultural grassland. In contrast to many of the other rivers in the catchment, treelines/hedgerows are present along significant stretches of the river, though rarely present on both river banks. These strips of vegetation provide a valuable buffer for excess sediment and nutrients originating on agricultural land. The treelines/hedgerows also act as a barrier to livestock, restricting their access to the river. Earthbanks are visible along the lower third of the river, again indicating the altered nature of the river as a result of previous arterial drainage works.

Plate 21: Clonshire River showing scrub and rank grassland community along the bank edge (Site Code: CS04).

Earth banks are present along the entire length of the Greanagh. Improved agricultural grassland is present behind these earthbanks along the majority of the river, though there is a small area of mixed broadleaved conifer woodland present on the lower stretch of the river. Dry meadow and grassy verge vegetation grading into reed beds is present along the majority of the lower stretches, with a treeline/hedgerow occurring close to where the Greanagh joins the Maigue.

4.4.5.1 River Hydromorphology Assessment

Seven RHAT survey points were undertaken on the Curraghchase North and Clonshire Rivers. Two of these survey locations were classified as Moderate, four were classified as Poor, and one was classified as Bad (Figure 3). The main issues identified during the RHAT surveys leading to the low assessments were the previous widening and deepening of the channels, the absence of canopy layers of riparian vegetation where they would be expected to occur and cattle access to rivers leading to erosion. See Appendix II for results of the RHAT surveys undertaken at seven sites along the Clonshire River.

The water status in the Clonshire was described by the EPA as continuing to be unsatisfactory, with poor ecological quality at the four sampling locations in 2017.

4.4.5.2 Threats and Pressures

No high impact invasive species were recorded along the Clonshire, Curraghchase North or the Greanagh rivers. There was evidence of cattle accessing water courses, giving rise to bank side erosion and sedimentation. This not only results increased sediment in the river but also poaching, bank damage and habitat damage. With the exception of the lower reaches of the Clonhsire and the majority of the Greanagh there is an absence of semi-natural vegetation that acts as a buffer zone between the imporved agricultural grassland fields and the river.

4.4.6 Barnakyle River

The Barnkyle river joins the Maigue below Ferry Bridge. This tributary runs through an area that is dominated by improved agricultural grassland. There are limited hedgerows and treelines present along the river bank, being absent from either one or both banks for significant stretches of the river. As the river approaches its confluence with the Maigue, the river widens and the habitats adjoining the river change from improved agricultural grassland to areas comprised of dry meadows and grassy verge vegetation, reed and large sedge swamps, and earth banks. These earth banks are visible along both river banks and are a result of previous arterial drainage. The area of land between these earth banks and the river itself is typically colonised by dry meadow and grassy verge vegetation often grading into reed and large sedge swamp. The presence of these earth banks means that there is no floodplain connectivity between the river and the adjoining land.

Plate 22: Barnakyle River with reedswamp vegetation dominating on the left bank of the river (Site Code: BK03).

4.4.6.1 River Hydromorphology Assessment

RHAT surveys were carried out at three bridging points along the Barnakyle River. Two of these sites were classified as Poor, while one was classified as Moderate (Figure 3). The channel had been deepened and widened at the survey locations and there was an absence of natural riparian habitats. See Appendix II for results of the RHAT surveys undertaken at three sites along the Barnakyle River.

According to the EPA, the water quality at two sampling locations in the Barnakyle River was moderate to poor (EPA 2019).

4.4.6.2 Threats and Pressures

The absence of natural riparian habitats along the river corridor poses a significant threat to the river. The surrounding landscape is dominated by agricultural grassland, and the absence of riparian vegetation, or any type of buffer strip, along the river banks, means that there is high potential for excess sediment and nutrients to enter the river. The retention of any semi-natural vegetation and the establishment of buffer strips, in particular in areas that are dominated by improved agricultural fields should be a priority for this river.

There was some evidence of Glyphosate use on river bank vegetation at a bridging point in Patrickswell. In addition to this, we met a local resident at a bridging point in Clarinea, who wants to spray the

vegetation growing on the bridge, so that the bridge wall is visible. Although we advised him against this action, it is likely that he will proceed to spray the bridge. As there are potentially many individual landowners and local residents who may be using chemical herbicides in proximity to the river, it may be of use to hold some information meetings in the catchment area explaining the dangers associated with using chemical herbicides, in particular in proximity to watercourses.

5 Management Recommendations

A number of pressures were identified within the catchment during the field survey. The main issues identified were hydromorphology, agriculture, forestry, invasive species, and use of chemical herbicides. Each of these issues is further described in the following sections and management recommendations relating to each pressure are also discussed.

5.1 Hydromorphology

This pressure is widespread throughout the catchment. Nationwide, hydromorphology is recognised as a significant pressure in 24% of water bodies that are identified as 'At Risk'. This pressure relates to the physical modification or damage to habitat and natural river processes, and changes in function caused by channelisation, land drainage, dams, weirs, barriers and locks, overgrazing, embankments, and culverts.

While the previous drainage work carried out in the Maigue catchment dramatically altered the river channel and associated riparian vegetation and habitats, there is little that can be done in terms of management to try and rectify this issue. Any future channel clearance or drainage should only be carried out where deemed absolutely necessary and should be subject to an environmental impact assessment prior to being carried out. Isolated sections of the main Maigue cannel and channels of the tributaries retain natural meanders (Plate 23), however, the majority of the channel length has been straightened.

Plate 23: Section of the Loobagh river showing natural meanders and ox bows near Kilfinane Lands.

5.2 Forestry

Forestry is generally confined to the upper stretches of the Maigue and its tributaries. Nationwide, forestry is recognised as a significant pressure in 16% of water bodies identified as 'At Risk'. This pressure is largely associated with sediment from clear felling, drainage, and planting establishment. The majority of forestry in Limerick is comprised of conifer plantation, with broadleafs making up just 13.5% of forestry in the county. This is much lower than the national average of 21% (LCC 2010).

It has been found that streams draining catchments with closed canopy conifer plantation experience altered pH levels, with increased levels of acidity recorded. Tree harvesting and preparation for tree planting have been found to result in elevated nutrient levels (particularly phosphorus) and sediment levels in rivers, often exceeding water quality standards (Kelly-Quinn *et al.* 2007).

In relation to the forested areas within the catchment, best practice guidelines should be followed, in particular where plantations adjoin or occur in proximity to watercourses (Plate 24), when planting or harvesting. An adequate buffer should be observed to reduce the impact of the forestry operations on watercourses and in some situations the use of sediment traps should be considered. Buffer zones of 10m each side of the aquaitic zone are recommended by The Forest Service on moderately sloping soils, increasing to 20m on very steep soils (The Forest Service 2000).

Plate 24: Conifer plantation in proximity to the Loobagh river channel. Damage to the river bank due to livestsock access can also be seen in the centre foreground of the photograph.

5.3 Agriculture

Intensive agriculture is widespread in the catchment, with dairy farming being particularly extensive. As outlined by Sweeney (2018), the main pressure on water quality within the Maigue catchment is from diffuse agricultural runoff. This is an issue in many catchments in Ireland, with agriculture being identified as a significant pressure in 54% of the 1460 water bodies identified as 'At Risk' of not meeting their environmental objectives (DHPLG 2018).

In terms of agriculture, there are a number of recommended management measures. These will require the cooperation of landowners if they are to be implemented successfully, and could potentially be facilitated through the waters and communities officer for the area. The main issues noted as a result of agriculture were (Plate 25):

- Cattle accessing rivers
- Bank side poaching
- Absence of functioning buffer zones
- Eutrophication as a result of nutrient run-off

Plate 25: Absence of functioning buffer zones with evidence of bank poaching and livestock access to Loobagh river.

It is recommended that livestock should not have access to watercourses. Fencing should be put in place where necessary to avoid animals entering the river. In addition, rivers should not be used as crossing points for livestock or farm vehicles, the creation of a livestock footbridge or use of alternative route are potential solutions. Bankside poaching is another issue that was recorded, which can lead to erosion and bank slumping. Fencing off certain areas from livestock or establishing a buffer zone would help to reduce bank damage and the amount of sediment entering watercourses.

The establishment of buffer zones along river banks, in particular where the adjoining land use is improved agricultural grassland is a relatively simple measure that could greatly improve water quality within the rivers but also increase bank side biodiversity. Buffer zones can simply be created by fencing off areas along watercourses, or in some cases by establishing a hedgerow. These buffer zones would not only help to reduce any impacts of livestock on the rivers, but also help to promote bank stabilisation and reduce the amount of sediment and nutrients entering watercourses.

Plate 26: Cattle access to watercourse, with evidence of bank poaching and eutrophication (Site Code: CM14).

5.4 Invasive species

The presence of invasive species is also a major issue within the catchment, particularly along the Maigue and Loobagh rivers. A three-year project has just commenced on the Loobagh to control Giant Hogweed. A catchment wide approach is needed when trying to control or eradicate invasive species. Given the difficultly and cost associated with trying to manage these species after they have become established, preventing the further spread of Giant Hogweed in the catchment should also be a priority. The tributaries where this species has not become established (Camoge, Morningstar, Barnakyle, and Clonshire) should be monitored and plants should be controlled as soon as they are recorded in these areas. Local community groups could play an active role in this monitoring programme, through a citizen science initiative.

Of particular importance is the removal of the Himalayan Balsam plants recorded on the banks of the Morningstar (MS03). These plants were isolated, so their quick removal should help to ensure that they do not spread within the catchment. Again local community groups or even school groups could play an important role in recording the presence of invasive species within the catchment, helping to monitor the spread or establishment of species.

5.5 Use of herbicides

It is recommended that the use of chemical herbicides on vegetation on the river banks be stopped. Again this will require the cooperation of local landowners. In order to encourage this, some public outreach will be required. Many people are unaware of the effects of chemical herbicides on the environment, in particular on aquatic species, in addition to the potential impacts on human health. A series of information meetings within the catchment could provide a good opportunity to discuss the issues associated with chemical herbicides, in particular in proximity to watercourses, and potential alternatives. These information meetings would also allow local communities to become more familiar with the Maigue Rivers Trust, and inform local groups about the value of their rivers and associated habitats. It could be a good opportunity to establish local working groups that could take responsibility for certain tributaries or sections of rivers. Each group could work to develop an action plan that they could work towards implementing.

5.6 Biodiversity conservation and enhancement

Given the overall absence of natural riparian vegetation along the river corridor, rather than focusing on conservation it would be worthwhile directing efforts towards the restoration of riparian habitats within the catchment. The establishment of buffer zones, in particular in areas where intensive agriculture is present, would be of most value. The establishment of buffer zones will not only provide a physical barrier precluding livestock access to rivers, but will also stablise the banks due to the binding action of the plant roots. The presence of buffer zone vegetation will also reduce the amount of nutrients reaching the river, as it will absorb some of the nutrients present in surface water. Over time these buffer zones will form areas of semi-natural vegetation. These will provide important commuting habitat and foraging areas for fauna and will act as corridors for wildlife in an intensively managed landscape.

Site MRS014 in Bruff has been identified as a potential site for enhancement measures. Its proximity to an existing public amenity area adjoining the river and its proximity to the town mean that this area could also be used as a resource for public outreach and education. This could be achieved both through the use of signage in the area and by involving members of the community in developing and maintaining the area. The area in question is comprised of disturbed ground currently covered by dry meadow and grassy verge and scrub vegetation. Planting of native species along the river banks to develop and maintain some semi-natural riparian vegetation would help to improve the biodiversity value of this area in addition to increasing public awareness. The amenity park present directly to the west of this area could also be enhanced. Currently this area is quite intensively managed with amenity

grassland directly adjoining the river bank. The creation of a buffer zone along the river bank would be of benefit in this location and would provide a good opportunity for public outreach and awareness. If it is not possible for a buffer strip to be created then the erection of some public information signs would still help to promote awareness amongst the public.

While there was an absence of wetland sites present on the banks of the Maigue and the main tributaries within the 50m survey zone, there are a number of wetland sites present in the wider catchment. A review of the Map of Irish Wetlands (Foss & Crushell 2019) identified 75 wetland sites in the area (Figure 4). It may be worth reviewing and surveying these sites, to build an inventory of wetlands in the catchment area, provide management recommendations for them, and ensure their protection as valuable biodiversity areas.

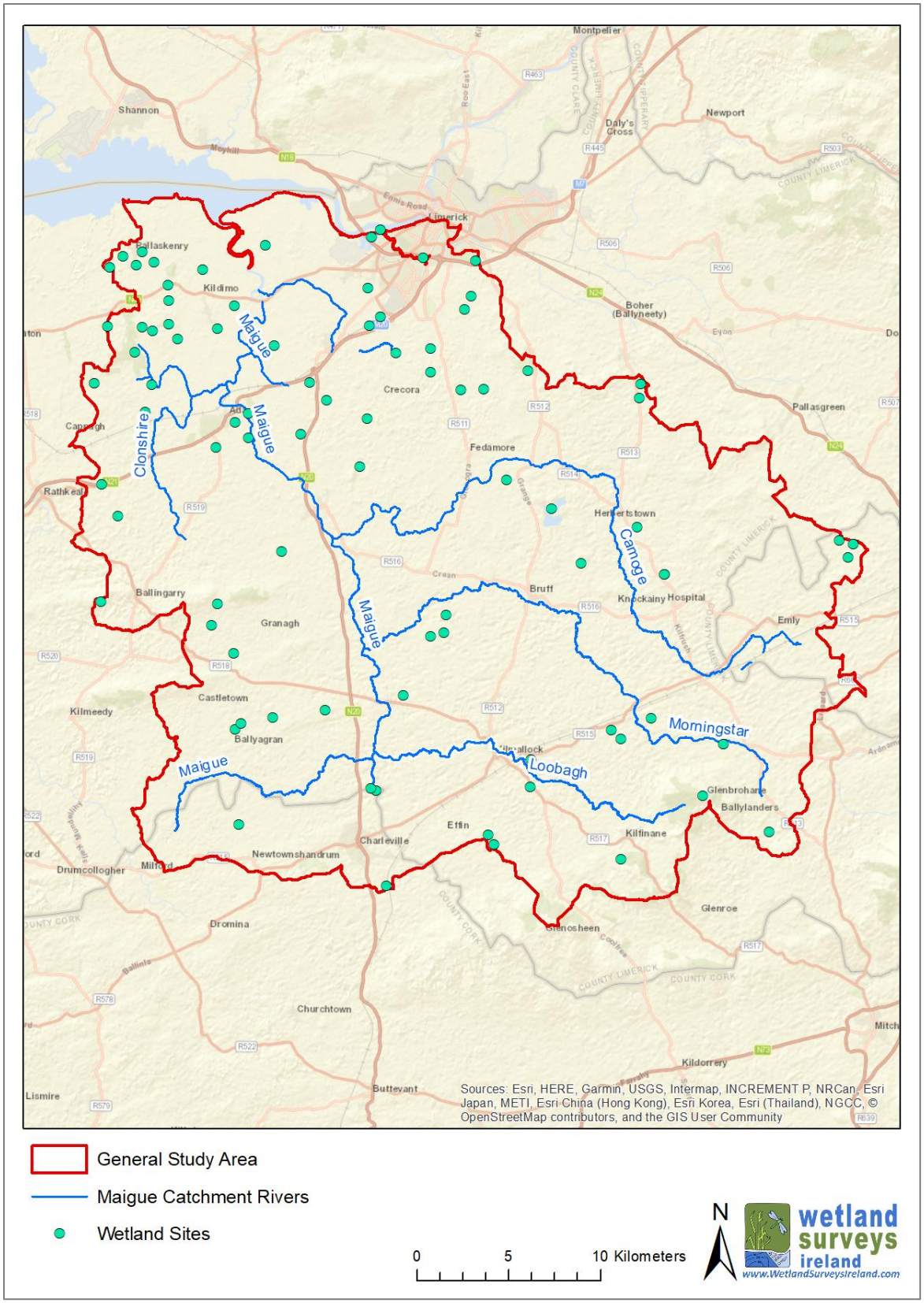

Figure 4: Location of wetland sites (Foss and Crushell 2019) within the Maigue catchment.

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Appendix I – Site Descriptions

During a review of aerial imagery sites that appeared to comprise semi-natural habitats or that appeared to have potentially high biodiversity value were identified. Nineteen of these sites were visited during the 2019 field survey. A description of the habitat(s) present at each of these sites, the biodiversity value of the site, and a site photograph are presented in this Appendix.

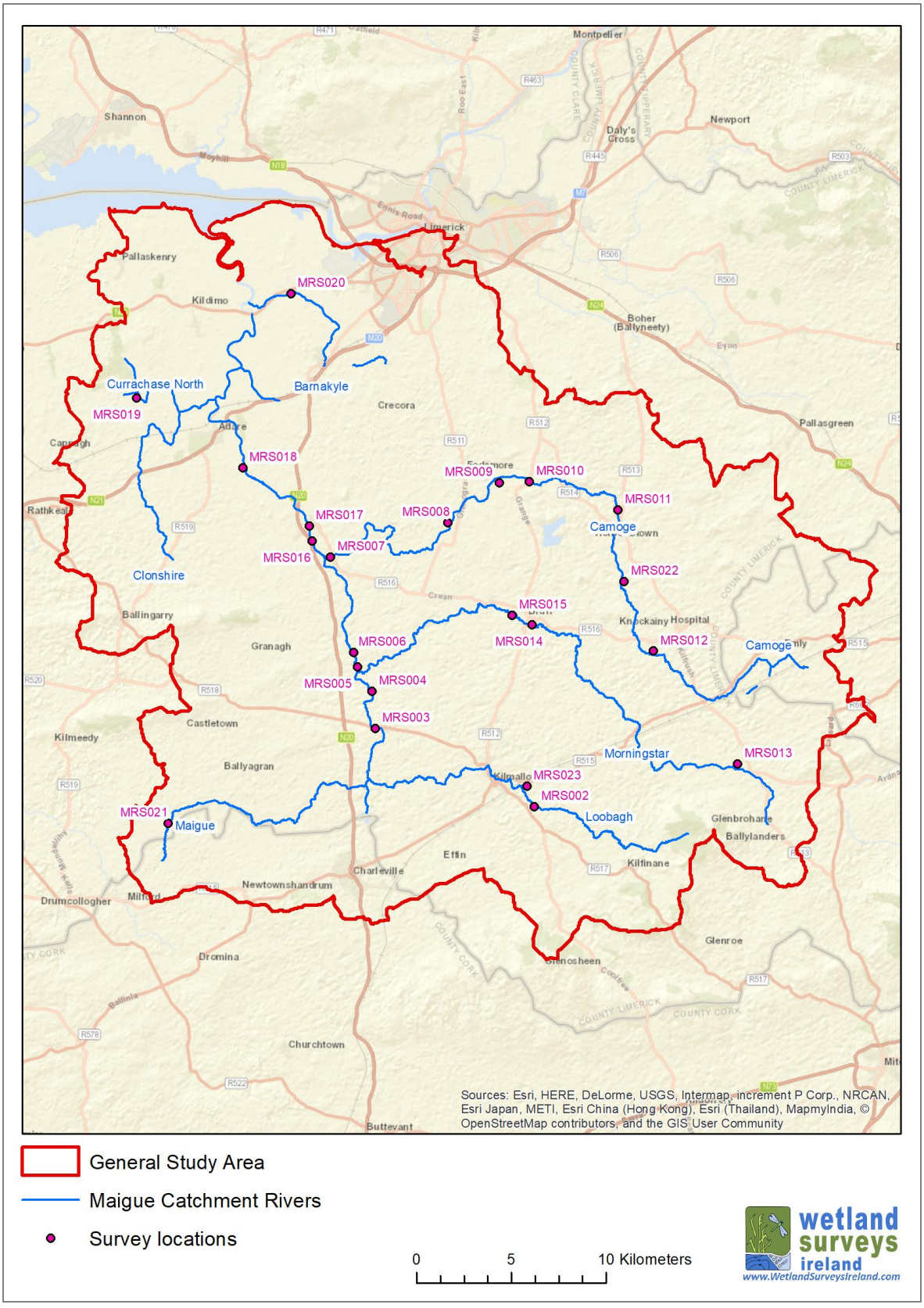


Figure 5: Location of habitat survey sites

Site Code: MRS 002	**River:** Loobagh
Habitat Code: WD1	**Biodiversity value**: Local value
Description: Highly modified deciduous estate woodland with Beech (*Fagus sylvatica*), Walnut (*Juglans* sp.), Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), and Spanish Chestnut (*Castanea sativa*).	
	

Site Code: MRS 003	**River:** Maigue
Habitat Code: WD1	**Biodiversity value:** Local value
Description: Mature woodland with extensive Ivy (*Hedera helix*) in ground layer. Hawthorn (*Crataegus monogyna*) dominant in shrub layer. Elder (*Sambucus nigra*), Balckthorn (*Prunus spinosa*), Osier (*Salix viminalis*), Sycamore (*Acer pseudoplatanus*), Grey Willow (*Salix cinerea*). Giant Hogweed (*Heracleum mantegazzianum*) is common, with Nettles (*Urtica dioica*) and Bramble (*Rubus fruticosus* agg.) also abundant. Very steep slope down to river. Small area of tall herb swamp occurs on opposite bank.	
	

Site Code: MRS 004	**River:** Maigue
Habitat Code: WL2	**Biodiversity value:** Local value
Description: Double treeline along track parallel with river. The stream side is on a very steep bank, which drops 10m to the river. Sycamore (*Acer pseudoplatanus*) is dominant, with Ash (*Fraxinus excelsior*) and Willow (Salix sp.) bushes near the river. Grassy understory. Giant Hogweed (*Heracleum mantegazzianum*) present.	

Site Code: MRS 006	**River:** Maigue
Habitat Code: WN2	**Biodiversity value:** Local value
Description: The southern part of this site comprises NSNW Site 1993 (Glenma) and is comprised of Ash (*Fraxinus excelsior*), Grey Willow (*Salix cinerea*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*), and Ivy (*Hedera helix*) on sloped mineral soil embankment above river. The northern part of the site is comprised of a matue hedgerow with Ash (*Fraxinous excelsior*) standarads. The understory is domianted by Hazel, with Willow, Hawthon, Blackthorn (*Prunus spinosa*), and Honeysuckle (*Lonicera periclymenum*) also present.	

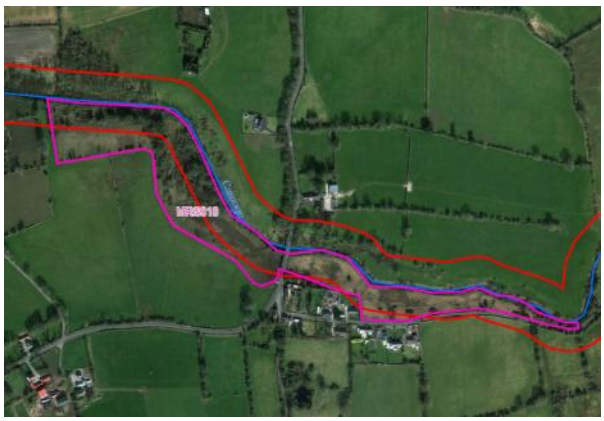
Site Code: MRS 007	**River:** Camoge
Habitat Code: WD1	**Biodiversity value:** Local value
Description: Mixed broadleaved woodland with mature Beech (*Fagus sylvatica*), Oak (*Quercus* sp.), and Ash (*Fraxinus excelsior*).	

Site Code: MRS 009	**River:** Camoge
Habitat Code: GA1	**Biodiversity value:** Local value

Description: Area has been extensively drained and is now covered by improved agricultural grassland. Hay was being cut during field visit. Along the river channel there is a thin band of dry meadow and grassy verge vegetation. Species present include Creeping Thistle (*Cirsium arvense*), False oat-grass (*Arrhenatherum elatius*), Hedge Bindweed (*Calystegia sepium*), and Nettles (*Urtica dioica*). This band of vegetation grades into reed and large sedge swamp dominated by Reed Canary Grass (*Phalaris arundinacea*). Yellow Water-lily (*Nuphar lutea*) was also present adjacent to the area of reed swamp.

Site Code: MRS 010	**River:** Camoge
Habitat Code: WD1, GS4 / GS2	**Biodiversity value:** Local value

Description: The western part of the site is comprised of mixed broadleaved woodland on sloped embankment above river with Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), and Beech (*Fagus sylvatica*) grading into scrub to the east.
The eastern part of the site is covered by wet grassland with abundant Yellow Flag Iris (*Iris pseudacorus*), and Creeping Thistle (*Cirsium arvense*), with some Meadowsweet (*Filipendula ulmaria*). Dry meadow and grassy verge vegetation covers the upslope areas.



Site Code: MRS 013	**River:** Morningstar
Habitat Code: GS1 / GS4	**Biodiversity value:** Local value
Description: Gently undulating field with series of runnels running across the surface. Runnels are colonised by Smooth Rush (*Juncus effusus*), Yellow Flag Iris (*Iris pseudocarus*), and Meadowsweet (*Filipendula ulmaria*). Limited amounts of Perennial Rye-grass (*Lolium perenne*). Yorkshire Fog (*Holcus lanatus*), Timothy (*Phleum pratense*), Sweet Vernal Grass (*Anthoxanthum odoratum*), and Creeping Bent Grass (*Agrostis stolonifera*). The field is relatively unmanaged. GGS1/GS4 overall.	

Site Code: MRS 014	**River:** Morningstar
Habitat Code: GS2 / WS1	**Biodiversity value:** Local value
Description: Nettle (*Urtica dioica*) dominated area with some Willow (*Salix* sp.) scrub. Rank grasses, Brambles (*Rubus fruticosus* agg.), Thistle (*Cirsium arvense*), and Butterbur (*Petasites hybridus*). Highly disturbed ground.	

Site Code: MRS 017	**River:** Maigue
Habitat Code: WD2	**Biodiversity value:** Local value
Description: Mixed broadleaved / conifer woodland with Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), Beech (*Fagus sylvatica*), Leyland Cypress (*Cypress leylandii*), and Horse Chestnut (*Aesculus hippocastanum*). There appears to be an access track running through the wooded area with a stone wall present at the bottom.	

Site Code: MRS 018	**River:** Maigue
Habitat Code: WD2	**Biodiversity value:** Local value
Description: Mixed broadleaved / conifer woodland with Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), Grey Willow (*Salix cinerea*), Pine (*Pinus* sp.), Cedar (*Cedrus* sp.), Sitka Spruce (*Picea sitchensis*), Scot's Pine (*Pinus sylvestris*), Birch (*Betula pubescens*), Oak (*Quercus* sp.), with Hawthorn (*Crataegus monogyna*) along the edge. Planted demesne woodland.	


Site Code: MRS 019	**River:** Curraghchase North
Habitat Code: GS4	**Biodiversity value:** Local value
Description: Cattle grazed GS4, probably covered by scrub in the past but this has now been removed.	

Site Code: MRS 020	**River:** Barnakyle
Habitat Code: BL2 / GS2 / FS1	**Biodiversity value:** Local value
Description: Earth bank with dry meadow and grassy verge vegetation, adjoined by reed and large sedge swamp along the river bank. Representative of bankside vegetation along the lower reaches of this river and the Maigue.	


Site Code: MRS 021	**River:** Maigue
Habitat Code: WL2 / WS1	**Biodiversity value:** Local value
Description: Mosaic of treeline and scrub. The treeline extends away from the road in some places. Dominated by Ash (*Fraxinus excelsior*), Hawthorn (*Crataegus monogyna*), Dog Rose (*Rosa canina*), Spindle (*Euonymus europaeus*), Blackthorn (*Prunus spinosa*), Bramble (*Rubus fruticosus* agg.), with a single Black Poplar (*Populous nigra*) tree present.	

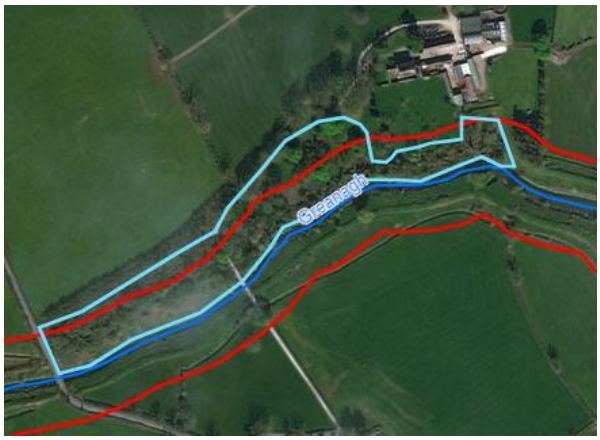
Site Code: MRS 023	**River:** Loobagh
Habitat Code: WD2	**Biodiversity value:** Local value
Description: Highly modified broadleaved / conifer woodland. Estate planting with Ash (*Fraxinus excelsior*), Beech (*Fagus sylvatica*), Maple (*Acer* sp.), Cedar (*Cedrus* sp.), Cherry Laurel (*Prunus laurocerasus*), Yew (*Taxus baccata*), London Plane (*Platanus × acerifolia*), Small-leaved lime (*Tilia cordata*), Evergreen Oak (*Quercus ilex*), and Larch (*Larix* sp.).	

Site Code: MRS 024	**River:** Maigue
Habitat Code: WL2	**Biodiversity value:** Local value
Description: Willow (*Salix* sp.) dominated treeline either side of river. Willows growing out of river bank.	


Site Code: MRS 025	**River:** Morningstar
Habitat Code: WD1	**Biodiversity value:** Local value
Description: Highly modified mixed broadleaved woodland with Beech (*Fagus sylvatica*), Oak (*Quercus* sp.), Sycamore (*Acer pseudoplatanus*), Ash (*Fraxinus excelsior*), and Hawthorn (*Crataegus monogyna*).	

Site Code: MRS 026	**River:** Morningstar
Habitat Code: WD1	**Biodiversity value:** Local value
Description: Highly modified broadleaved woodland with Ash (*Fraxinus excelsior*), Oak (*Quercus* sp.), Osier Willow (*Salix viminalis*), Italian Alder (*Alnus cordata*), Sycamore (*Acer pseudoplatanus*).	

Site Code: MRS 027	**River:** Greanagh
Habitat Code: WD2	**Biodiversity value:** Local value
Description: Mixed broadleaved / conifer woodland with Grey Willow (*Salix cinerea*), Sycamore (*Acer pseudoplatanus*), Ash (*Fraxinus excelsior*), Scot's Pine (*Pinus sylvestris*), Osier Willow (*Salix viminalis*), Maple (*Acer* sp.), and Oak (*Quercus* sp.)	



Appendix II – RHAT Survey Details

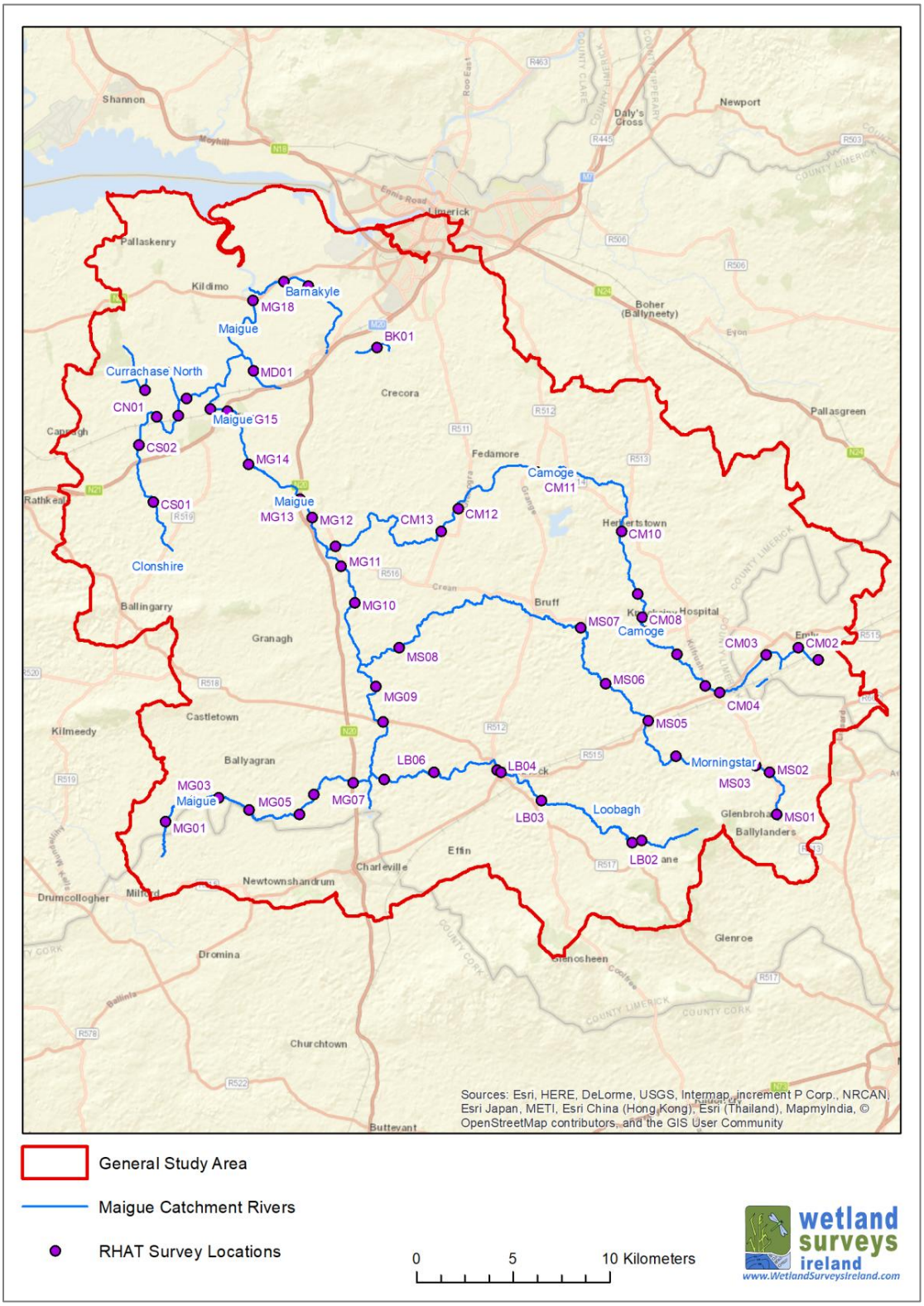


Figure 6: RHAT survey locations.

River: Barnakyle	**Site Code:** BK01
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): WL1	**Bank Vegetation D/S (L):** WS1
Bank Vegetation U/S (R): WS1	**Bank Vegetation D/S (R):** WS1 / WL1
Land Cover U/S (L): BL3	**Land Cover D/S (L):** BL3
Land Cover U/S (R): GA2 / BL3	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	2	2
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 16	**Spot-Check Class:** Poor

Comments:
Upper reaches of the river, channel width approx 2m. Channel has been deepened, limited vegetation present on bank, some erosion present upstream. Adjoining land use comprises residential houses, and roads.

River: Barnakyle	**Site Code:** BK02
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): FS1	**Bank Vegetation D/S (L):** FS1
Bank Vegetation U/S (R): FS1	**Bank Vegetation D/S (R):** FS1
Land Cover U/S (L): FS1 / GS2	**Land Cover D/S (L):** FS1 / GS2
Land Cover U/S (R): FS1 / GS2	**Land Cover D/S (R):** FS1 / GS2
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	4	4
Substrate condition	4	4
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	4	4
Riparian land cover	3	3
Floodplain connectivity	0	0

Total Score: 38	**Spot-Check Class:** Moderate

Comments:
Channel approx 6m wide. The channel has been extensively widened, with sediment placed on adjoining land to create earth bank. Thick band of Common Reed (*Phragmites australis*) present on both sides of the channel.

River: Barnakyle	**Site Code:** BK03
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2 / WS1
Bank Vegetation U/S (R): WL2	**Bank Vegetation D/S (R):** WL2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** ED3
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	3	3
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	2	2
Bank vegetation	2	2
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 26	**Spot-Check Class:** Poor

Comments:
Channel width 3-4m. No treeline on left bank upstream or downstream. Fishing platform present downstream, bare soil and source of sedimentation present surrounding it.

River: Camoge	**Site Code:** CM01
Survey Date: 11/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): GS2 / GA1	**Bank Vegetation D/S (L):** GS2 / GA1
Bank Vegetation U/S (R): GS2 / BL3	**Bank Vegetation D/S (R):** WL1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): BL3 / GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	4	4
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	4	4
Bank vegetation	1	1
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 32	**Spot-Check Class:** Moderate

Comments:

Narrow channel up to 2m wide. Channel is infilled with Reed Canary Grass (*Phalaris arundinacea*) and Fool's-water-cress (*Apium nodiflorum*) with Thistle (*Cirsium* sp.) and Nettles (*Urtica dioica*) on the banks. River is just a slow trickle at this point.

River: Camoge	**Site Code:** CM02
Survey Date: 11/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): GS2 / WL1	**Bank Vegetation D/S (L):** WL1 (Cypress)
Bank Vegetation U/S (R): GA1	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GS4 / GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	4	4
Substrate condition	1	1
Barriers to continuity	4	4
Bank structure and stability	1	2
Bank vegetation	0	0
Riparian land cover	1	0
Floodplain connectivity	0	0

Total Score: 22	**Spot-Check Class:** Poor

Comments:

Stream 1m wide, with Fool's-water-cress (*Apium nodiflorum*) and Branched Bur-reed (*Sparganium erectum*) in channel. Bank erosion present. No fence. Downstream channel is subject to extensive shading from Cypress (*Cypress* sp.) treeline.

River: Camoge	**Site Code:** CM03
Survey Date: 11/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): WS1 / WL1	**Bank Vegetation D/S (L):** WL2 / WS1
Bank Vegetation U/S (R): FS1 / GS2	**Bank Vegetation D/S (R):** WS1 / GS2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	4	4
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	3	3
Bank vegetation	1	1
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 28	**Spot-Check Class:** Poor

Comments:

This stretch of the river is highly altered and has been straightened and widened. Channel width is approx. 3m and is infilled with Branched Bur-reed (*Sparganium erectum*), Reed Canary Grass (*Phalaris arundinacea*) and Bindweed (*Calystegia sepium*). Duckweed (*Lemna* sp.) present in open channel areas.

River: Camoge	**Site Code:** CM04
Survey Date: 11/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GA1	**Bank Vegetation D/S (L):** BL3 / WL2
Bank Vegetation U/S (R): GS2	**Bank Vegetation D/S (R):** WL1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** BL3
Land Cover U/S (R): GS2 / GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

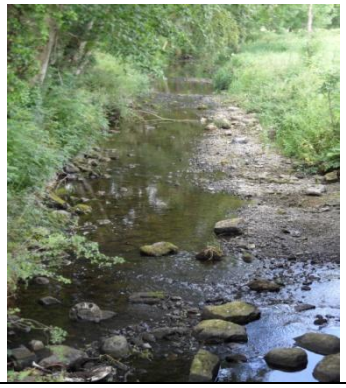
Scoring Matrix

	U/S	D/S
Channel from and flow	0	2
Channel vegetation	4	3
Substrate condition	2	3
Barriers to continuity	4	4
Bank structure and stability	0	1
Bank vegetation	1	2
Riparian land cover	0	1
Floodplain connectivity	0	0

Total Score: 27	**Spot-Check Class:** Poor

Comments:

Upstream channel is approx. 2.5-3m wide, infilled with Reed Canary Grass (*Phalaris arundinacea*). The downstream stretch has a steep bank which is overgrown with Willow (*Salix* sp.) / Ash (*Fraxinus excelsior*) scrub. Downstream section is less altered than upstream section.

River: Camoge	**Site Code:** CM05
Survey Date: 11/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GS2 / WS1 / BL3	**Bank Vegetation D/S (L):** WL2 (Beech)
Bank Vegetation U/S (R): GA1	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): BL3	**Land Cover D/S (L):** BL3 / WL2
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GS2
Artificial Features U/S: Reinforced	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	4
Channel vegetation	4	4
Substrate condition	2	4
Barriers to continuity	4	4
Bank structure and stability	0	4
Bank vegetation	1	3
Riparian land cover	1	1
Floodplain connectivity	0	0

Total Score: 36	**Spot-Check Class:** Moderate

Comments:

The upstream section has been extensively modified. The bank has been straightened and rock armature is present on the right hand side. Channel is infilled with Reed Canary Grass (*Phalaris arundinacea*). The downstream section appears relatively unmodified, with gravel areas present at side and Beech treeline. Channel width up to 5m downstream, but only 2m upstream.

River: Camoge	**Site Code:** CM06
Survey Date: 11/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** WS1
Bank Vegetation U/S (R): WL1 / WL2	**Bank Vegetation D/S (R):** WL1 / WS1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	1	1
Channel vegetation	4	4
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	3	3
Bank vegetation	1	1
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 32	**Spot-Check Class:** Moderate

Comments:
This section of river has been straightened and deepened, channel 3m wide.

River: Camoge	**Site Code:** CM07
Survey Date: 11/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): WL1 / GS2	**Bank Vegetation D/S (L):** WL2 / WS1
Bank Vegetation U/S (R): FS1 / GS2	**Bank Vegetation D/S (R):** GS2 / WL1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	4	4
Channel vegetation	4	4
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	4	4
Bank vegetation	3	3
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 42	**Spot-Check Class:** Good

Comments:

Channel width 4-5m, with Branched Bur-reed (*Sparganium erectum*), Reed Canary Grass (*Phalaris arundinacea*), Yellow Water-lily (*Nuphar lutea*), and Common Club-rush (*Schoenoplectus lacustris*). Duckweed (*Lemna* sp.) is present in some open areas of channel. Riparian vegetation is beginning to become more diverse here, with multiple layers present in some parts.

River: Camoge	**Site Code:** CM08
Survey Date: 11/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): GS2 / WL2	**Bank Vegetation D/S (L):** WS1 / GS2
Bank Vegetation U/S (R): GS2	**Bank Vegetation D/S (R):** WL2 / GS2
Land Cover U/S (L): WL2	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GS4
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	1	1
Channel vegetation	4	4
Substrate condition	1	1
Barriers to continuity	4	4
Bank structure and stability	4	4
Bank vegetation	1	1
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 30	**Spot-Check Class:** Moderate

Comments:
Channel 4-5m wide. Extensive areas of banks are colonised by Butterbur (*Petasites hybridus*).

River: Camoge	**Site Code:** CM09
Survey Date: 11/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): WS1 / GS2	**Bank Vegetation D/S (L):** GS2
Bank Vegetation U/S (R): WL2	**Bank Vegetation D/S (R):** WL2 (Sycamore)
Land Cover U/S (L): GS4	**Land Cover D/S (L):** GS4
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None (possible weir, but out of site)	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	1
Channel vegetation	3	4
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	2	2
Bank vegetation	1	1
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 26	**Spot-Check Class:** Poor

Comments:
Channel width 4-8m. River is slow flowing and there are extensive areas without channel vegetation. Some areas of bare soil at base of river banks which are eroding. Earth bund associated with arterial drainage visible on upstream side of bridge. Trout present in pool.

River: Camoge	**Site Code:** CM10
Survey Date: 11/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2
Bank Vegetation U/S (R): WS1 / GS2	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GS2 / GS4
Land Cover U/S (R): GS4	**Land Cover D/S (R):** GA1
Artificial Features U/S: Over-deepened / Over-widened	**Artificial Features D/S:** Over-deepened / Over-widened

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	3	3
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 18	**Spot-Check Class:** Poor

Comments:

Extensively altered stretch of river. Channel has been deepened and straightened. Channel width 4-5m. Emergent vegetation includes Branched Bur-reed (*Sparganium erectum*), Reed Canary Grass (*Phalaris arundinacea*), and patches of Yellow Water-lily (*Nuphar lutea*).

River: Camoge	**Site Code:** CM11
Survey Date: 17/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): FS1 / WL1	**Bank Vegetation D/S (L):** GS2 / WS1
Bank Vegetation U/S (R): WL1	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): GS4	**Land Cover D/S (L):** GS4
Land Cover U/S (R): WS1	**Land Cover D/S (R):** GS2
Artificial Features U/S: Over-deepened / Over-widened	**Artificial Features D/S:** Over-deepened / Over-widened / Poaching

Scoring Matrix

	U/S	D/S
Channel from and flow	1	1
Channel vegetation	2	1
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	2	2
Bank vegetation	2	1
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 24	**Spot-Check Class:** Poor

Comments:
Channel 6m wide. Excess algae present on surface, in particular downstream. Absence of treeline downstream, but limited trees present along upstream banks. Cattle access river from downstream left bank. Wet grassland present on left bank up and down stream.

River: Camoge	**Site Code:** CM12
Survey Date: 17/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2 / WL1
Bank Vegetation U/S (R): GS2	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: Over-deepened / Over-widened	**Artificial Features D/S:** Over-deepened / Over-widened

Scoring Matrix

	U/S	D/S
Channel from and flow	2	3
Channel vegetation	3	2
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	1	2
Bank vegetation	1	3
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 29	**Spot-Check Class:** Moderate

Comments:
Channel up to 10 m wide. Cattle access and erosion visible upstream. No treeline present along upstream banks. Section of bank reinforcement on right upstream, likely to do with adjacent ruined building. Green algae visible on surface and in water column.

River: Camoge	**Site Code:** CM13
Survey Date: 17/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): WL2	**Bank Vegetation D/S (L):** WL2
Bank Vegetation U/S (R): WS1 / GS2	**Bank Vegetation D/S (R):** GS2 / WL1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GS2	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	4	3
Channel vegetation	2	2
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	2	1
Bank vegetation	2	3
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 31	**Spot-Check Class:** Moderate

Comments:
Channel up to 10m wide. Area of reclaimed land surrounded by boulders, present downstream, likely a fishing location. Riparian vegetation limited, treeline present on left hand bank, limited on right bank. Relatively high cover of algae on the substrate, but no surface algae.

River: Camoge	**Site Code:** CM14
Survey Date: 17/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2
Bank Vegetation U/S (R): GS2	**Bank Vegetation D/S (R):** WD1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** WD1
Artificial Features U/S: Poaching	**Artificial Features D/S:** Poaching

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	0	0
Substrate condition	0	0
Barriers to continuity	4	4
Bank structure and stability	1	1
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 10	**Spot-Check Class:** Bad

Comments:

Channel approx 15m wide. Cattle access river upstream and downstream, resulting in sedimentation. Excessive amounts of green filamentous algae present in water column and on surface. Upstream, all riparian cover has been removed and GA1 goes right up to bank. Downstream GA1 to bank on left, WD1 to bank on right.

River: Clonshire	**Site Code:** CS01
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): WS1 / WL1	**Bank Vegetation D/S (L):** GS2
Bank Vegetation U/S (R): WS1	**Bank Vegetation D/S (R):** WL1 / WL2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: Over-deepened / Over-widened	**Artificial Features D/S:** Over-deepened / Over-widened

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	2	2
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 16	**Spot-Check Class:** Poor

Comments:

Very narrow section of channel, 1-2m wide. There has been significant alteration to channel, and it is shaded and overhung by scrub and treelines. No significant riparian vegetation present. Bank side vegetation is dominated by Bramble (*Rubus fruticosus* agg.), Ash (*Fraxinus excelsior*) and Hawthorn (*Crataegus monogyna*) dominated. The majority of the treeline present is comprised of Ash. GA1 adjoins river channel with only a narrow strip of bankside vegetation present.

River: Clonshire	**Site Code:** CS02
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** WS1
Bank Vegetation U/S (R): WL1	**Bank Vegetation D/S (R):** WL2 / WS1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: Over-deepened / Over-widened	**Artificial Features D/S:** Over-deepened / Over-widened / Poaching

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	3	2
Substrate condition	3	2
Barriers to continuity	4	4
Bank structure and stability	2	1
Bank vegetation	1	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 22	**Spot-Check Class:** Poor

Comments:

Channel approx 3m wide. Riparian vegetation completely absent from the left bank upstream and downstream. Overhanging trees on the right bank are beginning to shade out the channel in places. Intensive GA1 fields are almost directly adjoining steep bank. Previous channel clearance has been carried out. Cattle access on downstream stretch, resulting in erosion and sedimentation. Brown trout in river.

River: Clonshire	**Site Code:** CS03
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): WL2	**Bank Vegetation D/S (L):** GS2 / WL1
Bank Vegetation U/S (R): WS1 / WL1	**Bank Vegetation D/S (R):** GS2 / WL1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** Over-deepened / Over-widened

Scoring Matrix

	U/S	D/S
Channel from and flow	3	3
Channel vegetation	3	2
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	2	3
Bank vegetation	1	2
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 31	**Spot-Check Class:** Moderate

Comments:
Channel 5-6m wide. The upstream section is shaded by an overhanging Ash (*Fraxinus excelsior*) treeline. Limited riparian zone present, GA1 present to bank edge. Some straightening and deepening was previously carried out.

River: Clonshire	**Site Code:** CS04
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2 / WL1
Bank Vegetation U/S (R): FS1 / GS2	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): GS2 / WS1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GS2	**Land Cover D/S (R):** GA1
Artificial Features U/S: Over-deepened / Over-widened	**Artificial Features D/S:** Over-deepened / Over-widened

Scoring Matrix

	U/S	D/S
Channel from and flow	1	1
Channel vegetation	3	3
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	2	1
Bank vegetation	2	2
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 29	**Spot-Check Class:** Moderate

Comments:
Channel 4-5m wide. Has been deepened and straightened, Earth banks present. In general treelines are absent.

River: Clonshire	**Site Code:** CS05
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): FS1 / WS1	**Bank Vegetation D/S (L):** FS1 / GS2
Bank Vegetation U/S (R): FS1 / GS2	**Bank Vegetation D/S (R):** FS1
Land Cover U/S (L): WS1 / GA1	**Land Cover D/S (L):** WD1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: Over-deepened / Over-widened	**Artificial Features D/S:** Over-deepened / Over-widened

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	2	2
Substrate condition	1	1
Barriers to continuity	4	4
Bank structure and stability	1	1
Bank vegetation	0	1
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 17	**Spot-Check Class:** Poor

Comments:
Channel 4-5m wide. The upstream right bank has been recently cleared (tree removal etc.). Large earth bank present 5m in from channel as a result of previous arterial drainage works. Erosion evident on upstream stretch.

River: Curraghchase North	**Site Code:** CN01
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): WS1	**Bank Vegetation D/S (L):** WS1
Bank Vegetation U/S (R): WS1	**Bank Vegetation D/S (R):** WS1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** WS1
Land Cover U/S (R): WS1	**Land Cover D/S (R):** WD4
Artificial Features U/S: Reinforced	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	1	1
Substrate condition	0	0
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 10	**Spot-Check Class:** Bad

Comments:
Very narrow upstream stretch of channel, approx. 1m wide. Extremely low flow. Walls present along both sides of river bank for approx 4-5m after bridge. Vegetation beginning to decompose in river. Scrub present on both banks. Influenced by adjacent conifer forestry.

River: Curraghchase North	**Site Code:** CN02
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): WL1	**Bank Vegetation D/S (L):** WL1 / WS1
Bank Vegetation U/S (R): WS1	**Bank Vegetation D/S (R):** WS1
Land Cover U/S (L): BL3 / GA2	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** Over-deepened

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	0	3
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	0	2
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 19	**Spot-Check Class:** Poor

Comments:

Narrow channel, approx 2m wide. Upstream section is totally shaded by overhanging Beech (*Fagus sylvatica*) treeline, which also makes it difficult to see channel. Riparian vegetation present downstream with a gappy hedgerow with Ash (*Fraxinus excelsior*) standards on the left bank and scrub grading into GA1 on right bank. Earth bank present on right bank downstream, due to channel deepening. Small island area present downstream with GS1/GS2.

River: Loobagh	**Site Code:** LB01
Survey Date: 10/07/2019	**Surveyors:** PF and PC
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** WS1
Bank Vegetation U/S (R): WS1	**Bank Vegetation D/S (R):** WS1
Land Cover U/S (L): BL3 / WD4 / GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** BL3 / GS2
Artificial Features U/S: Over-deepened	**Artificial Features D/S:** Over-deepened

Scoring Matrix

	U/S	D/S
Channel from and flow	1	1
Channel vegetation	3	3
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	3	3
Bank vegetation	3	2
Riparian land cover	0	1
Floodplain connectivity	0	0

Total Score: 34	**Spot-Check Class:** Moderate

Comments:
N/A

River: Loobagh	**Site Code:** LB02
Survey Date: 10/07/2019	**Surveyors:** PF and PC
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): GA1 / GS4	**Bank Vegetation D/S (L):** GS4
Bank Vegetation U/S (R): GS4 / GA1	**Bank Vegetation D/S (R):** GS4
Land Cover U/S (L): GA1 / GS4	**Land Cover D/S (L):** GA1 / GS4
Land Cover U/S (R): GA1 / GS4	**Land Cover D/S (R):** GA1 / GS4
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	4	4
Channel vegetation	4	4
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	4	4
Bank vegetation	2	2
Riparian land cover	2	2
Floodplain connectivity	4	4

Total Score: 54	**Spot-Check Class:** Good

Comments:
Semi natural river section with extensive meanders. Possibly not affected by past drainage works. Sandmartins nesting in exposed sandy river banks. No woodland margins along this river section.

River: Loobagh	**Site Code:** LB03
Survey Date: 10/07/2019	**Surveyors:** PF and PC
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): FS2 / GS2	**Bank Vegetation D/S (L):** WD1
Bank Vegetation U/S (R): FS1 / WD1	**Bank Vegetation D/S (R):** WD1
Land Cover U/S (L): GA2 / BL3	**Land Cover D/S (L):** WD1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** WD1
Artificial Features U/S: Reinforced	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	2	3
Channel vegetation	4	4
Substrate condition	4	4
Barriers to continuity	0	4
Bank structure and stability	3	3
Bank vegetation	3	3
Riparian land cover	1	2
Floodplain connectivity	0	0

Total Score: 40	**Spot-Check Class:** Moderate

Comments:
Weir present 150m upstream, likely water abstraction point. Downstream rivers runs through demesne woodland planting.

River: Loobagh	**Site Code:** LB04
Survey Date: 15/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): BL3	**Bank Vegetation D/S (L):** BL3
Bank Vegetation U/S (R): WS1	**Bank Vegetation D/S (R):** GA2
Land Cover U/S (L): BL3	**Land Cover D/S (L):** BL3
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: Reinforced	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	0	0
Substrate condition	0	0
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	1	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 9	**Spot-Check Class:** Bad

Comments:
Highly altered river section with armature in Kilmallock town. Adjacent area built land and amenity park.

River: Loobagh	**Site Code:** LB05
Survey Date: 10/07/2019	**Surveyors:** PF and PC
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): BL3	**Bank Vegetation D/S (L):** WL2
Bank Vegetation U/S (R): FS1 / GS2 / WL2	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): GA2	**Land Cover D/S (L):** GA2 / BL3
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: Reinforced	**Artificial Features D/S:** Reinforced

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	3	3
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	1	1
Bank vegetation	1	1
Riparian land cover	1	1
Floodplain connectivity	0	0

Total Score: 26	**Spot-Check Class:** Poor

Comments:
Concrete wall forms left hand bank adjacent to industrial buildings.

River: Loobagh	**Site Code:** LB06
Survey Date: 10/07/2019	**Surveyors:** PF and PC
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2 / WL2
Bank Vegetation U/S (R): GS2	**Bank Vegetation D/S (R):** GA2 / WL2
Land Cover U/S (L): GA1 / WL1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GS4	**Land Cover D/S (R):** GA1 / WL1
Artificial Features U/S: Over-deepened	**Artificial Features D/S:** Over-deepened

Scoring Matrix

	U/S	D/S
Channel from and flow	2	1
Channel vegetation	2	2
Substrate condition	2	4
Barriers to continuity	4	2
Bank structure and stability	1	1
Bank vegetation	1	1
Riparian land cover	1	1
Floodplain connectivity	1	0

Total Score: 26	**Spot-Check Class:** Poor

Comments:
Small artificial weirs present downstream. Limited woodland vegetation along river banks. Small managed amenity grassland area with picnic bench on downstream bank.

River: Loobagh	**Site Code:** LB07
Survey Date: 10/07/2019	**Surveyors:** PF and PC
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): WS1	**Bank Vegetation D/S (L):** WS1
Bank Vegetation U/S (R): WL2	**Bank Vegetation D/S (R):** WL2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** BL3 / GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: Over-deepened	**Artificial Features D/S:** Over-deepened

Scoring Matrix

	U/S	D/S
Channel from and flow	3	3
Channel vegetation	3	3
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	1	1
Bank vegetation	1	1
Riparian land cover	1	1
Floodplain connectivity	0	0

Total Score: 30	**Spot-Check Class:** Moderate

Comments:
N/A

River: Mondellihy	**Site Code:** MD01
Survey Date: 17/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): WS1	**Bank Vegetation D/S (L):** WS1 / WL2
Bank Vegetation U/S (R): WL1	**Bank Vegetation D/S (R):** WS1
Land Cover U/S (L): BL3	**Land Cover D/S (L):** GA2
Land Cover U/S (R): GA2 / BL3	**Land Cover D/S (R):** GA2
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	0	1
Substrate condition	1	1
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 11	**Spot-Check Class:** Bad

Comments:
Extremely altered section of river running under road through pipe. Banks have been reinforced close to bridge. Downstream treeline shades the channel, resulting in little channel vegetation. No riparian vegetation present upstream.

River: Morningstar	**Site Code:** MS01
Survey Date: 15/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): GS2 / FS1	**Bank Vegetation D/S (L):** GS2
Bank Vegetation U/S (R): GS2	**Bank Vegetation D/S (R):** WL1
Land Cover U/S (L): BL3	**Land Cover D/S (L):** GA2 / BL3
Land Cover U/S (R): GA1	**Land Cover D/S (R):** WS1 / GA1
Artificial Features U/S: Poaching	**Artificial Features D/S:** Poaching

Scoring Matrix

	U/S	D/S
Channel from and flow	1	0
Channel vegetation	3	2
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	0	1
Bank vegetation	0	1
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 22	**Spot-Check Class:** Poor

Comments:
Upper reach of river, flowing under main road. Channel 2-3m wide. Cattle are crossing through river underpass to get to fields. Significant bank erosion at crossing points. No treeline upstream and downstream stretch has been totally realigned due to road works.

River: Morningstar	**Site Code:** MS02
Survey Date: 15/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2
Bank Vegetation U/S (R): GS2	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): GS2 / BL3	**Land Cover D/S (L):** GA1 / GS4
Land Cover U/S (R): GA1 / WD4	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	3	3
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	1	1
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 20	**Spot-Check Class:** Poor

Comments:
Very altered upper reach of river. Channel 2-3m wide.

River: Morningstar	**Site Code:** MS03
Survey Date: 15/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2
Bank Vegetation U/S (R): GS2	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): BL3	**Land Cover D/S (L):** GS4 / GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GS2
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	4	4
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	1	1
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 22	**Spot-Check Class:** Poor

Comments:

Channel approx 4m wide. Himalayan Balsam (*Impatiens glandulifera*) present both upstream and downstream, but not yet extensive. Four plants observed from bridge. Removal recommended as soon as possible to avoid the spread of this invasive species. Natural riparian vegetation absent, treeline totally removed.

River: Morningstar	**Site Code:** MS04
Survey Date: 15/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2
Bank Vegetation U/S (R): WS1	**Bank Vegetation D/S (R):** WL2
Land Cover U/S (L): GS4	**Land Cover D/S (L):** GA1 / GS4
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA2 / BL3
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	2	2
Channel vegetation	2	2
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	1	1
Bank vegetation	1	1
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 24	**Spot-Check Class:** Poor

Comments:

Channel 5m wide. Erosion visible on upstream right bank. Complete lack of tree/ shrub layer. Plaque on bridge states drainage work has been ongoing since 1886. Downstream right bank has mature Beech (*Fagus sylvatica*) treeline, left hand side complete lack of shrubs / trees. Erosion also occurring downstream, beneath Beech treeline, which is overhanging and shading channel.

River: Morningstar	**Site Code:** MS05
Survey Date: 15/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2 / WS1
Bank Vegetation U/S (R): WL1 / WL2	**Bank Vegetation D/S (R):** WS1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1 / GS4
Land Cover U/S (R): BL3	**Land Cover D/S (R):** BL3
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	1	1
Channel vegetation	3	3
Substrate condition	2	3
Barriers to continuity	4	4
Bank structure and stability	1	1
Bank vegetation	2	2
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 27	**Spot-Check Class:** Poor

Comments:
Channel 4-5m wide. This stretch has been deepened in the past and tree layer removal has also taken place.

River: Morningstar	**Site Code:** MS06
Survey Date: 15/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GS2 / FS1	**Bank Vegetation D/S (L):** FS1 / GS2
Bank Vegetation U/S (R): GS2 / FS1	**Bank Vegetation D/S (R):** FS1 / GS2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	4	4
Substrate condition	4	4
Barriers to continuity	4	4
Bank structure and stability	1	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 25	**Spot-Check Class:** Poor

Comments:

Channel approx. 5m wide. Intensively managed agricultural area. Channel has been deepened. Narrow band of FS1/GS2 on banks which is directly adjoined by GA1 fields and farm tracks. Complete absence of treeline. Some evidence of bankside erosion on downstream right bank. All banks fenced from livestock.

River: Morningstar	**Site Code:** MS07
Survey Date: 15/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2 / WS1
Bank Vegetation U/S (R): GS2	**Bank Vegetation D/S (R):** WS1 / WL1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GS4
Artificial Features U/S: Over-deepened	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	1
Channel vegetation	4	4
Substrate condition	4	4
Barriers to continuity	4	4
Bank structure and stability	2	2
Bank vegetation	2	2
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 33	**Spot-Check Class:** Moderate

Comments:

Channel approx. 5m wide. Upstream section in particular, has clearly been deepened in the past. Steep banks now colonised by Bramble (*Rubus fruticosus* agg.), Bindweed (*Calystegia sepium*), Greater Willowherb (*Epilobium hirsutum*) and limited Willow (*Salix* sp.) scrub. *Ranunculus* present in channel. Downstream stretch lacks riffles and glides as seen upstream. Bank adjoining wet grassland still has Willow/Ash (*Fraxinus excelsior*) treeline mostly intact. Opposite bank has had all riparian vegetation removed.

River: Morningstar	**Site Code:** MS08
Survey Date: 12/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): WL2	**Bank Vegetation D/S (L):** WL2
Bank Vegetation U/S (R): FS1 / WS1	**Bank Vegetation D/S (R):** WL2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): BL3	**Land Cover D/S (R):** BL3
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	4	4
Channel vegetation	4	4
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	4	4
Bank vegetation	3	3
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 44	**Spot-Check Class:** Good

Comments:
Channel 8-10m wide. There appears to have been little alteration to this section of river. Some narrow reed areas in braided channel.

River: Maigue	**Site Code:** MG01
Survey Date: 08/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** WL1
Bank Vegetation U/S (R): WS1	**Bank Vegetation D/S (R):** GA1
Land Cover U/S (L): BL3	**Land Cover D/S (L):** BL3 / GA1
Land Cover U/S (R): BL3	**Land Cover D/S (R):** GA1 / WL2
Artificial Features U/S: None	**Artificial Features D/S:** Reinforced

Scoring Matrix

	U/S	D/S
Channel from and flow	2	1
Channel vegetation	3	4
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	1	1
Riparian land cover	0	0
Floodplain connectivity	1	1

Total Score: 28	**Spot-Check Class:** Poor

Comments:
Small upstream river section with low flow rate and few river features.

River: Maigue	**Site Code:** MG02
Survey Date: 08/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): GA1	**Bank Vegetation D/S (L):** FS1 / GS2
Bank Vegetation U/S (R): WL2 / WL1	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): BL1 / GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

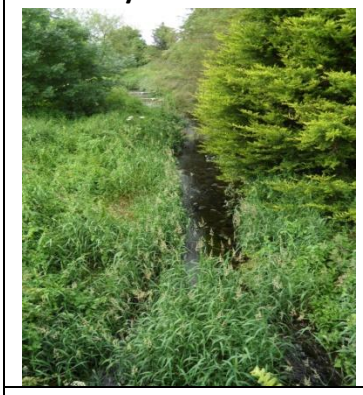
Scoring Matrix

	U/S	D/S
Channel from and flow	1	1
Channel vegetation	0	0
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	2	2
Bank vegetation	2	2
Riparian land cover	0	0
Floodplain connectivity	1	1

Total Score: 22	**Spot-Check Class:** Poor

Comments:

Area river is mostly surrounded by GA1. Well fenced off, no cattle access to river. There is a 1m wide band of GS2 bordering river, dominated by Greater Willowherb (*Epilobium hirsutum*), Nettles (*Urtica dioica*), Cleavers (*Gallium aparine*), Meadowsweet (*Fillipendula ulmaria*), Creeping Thistle (*Cirsium arvense*), Winter Heliotrope (*Petasites fragrans*), and tall grasses. Bank vegetation photo 5562. Brown algal/slime dominates channel vegetation. Water level in river is low with slow flow.

River: Maigue	**Site Code:** MG03
Survey Date: 08/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): WL2 (Conifers)	**Bank Vegetation D/S (L):** GA1
Bank Vegetation U/S (R): GA1	**Bank Vegetation D/S (R):** WL2 (Sycamore)
Land Cover U/S (L): BL3	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	3	2
Channel vegetation	2	2
Substrate condition	3	2
Barriers to continuity	4	4
Bank structure and stability	2	1
Bank vegetation	1	1
Riparian land cover	1	0
Floodplain connectivity	1	0

Total Score: 29	**Spot-Check Class:** Moderate

Comments:

This section of river appears less modified than previous crossing point. Flow is faster. There has been some channel alteration in the past. Riparian zone remains narrow, with Reed Canary Grass (*Phalaris arundinacea*) and Bindweed (*Calystegia sepium*) dominant, but Nettles (*Urtica dioica*) still abundant.

River: Maigue	**Site Code:** MG04
Survey Date: 08/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): GA1	**Bank Vegetation D/S (L):** GA1
Bank Vegetation U/S (R): WL1	**Bank Vegetation D/S (R):** GA1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** WL1 / BL3
Land Cover U/S (R): BL3	**Land Cover D/S (R):** GA1
Artificial Features U/S: Reinforced	**Artificial Features D/S:** Reinforced

Scoring Matrix

	U/S	D/S
Channel from and flow	1	1
Channel vegetation	0	1
Substrate condition	2	1
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 14	**Spot-Check Class:** Bad

Comments:
Banks have been altered. Reinforcements associated with bridge building, in addition to some stone reinforcement present. Abundance of green algae floating on surface and within water column (photos 5576-5577).

River: Maigue	**Site Code:** MG05
Survey Date: 08/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): GA1	**Bank Vegetation D/S (L):** GA1
Bank Vegetation U/S (R): GA1	**Bank Vegetation D/S (R):** GA1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	3	3
Channel vegetation	2	2
Substrate condition	2	3
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 23	**Spot-Check Class:** Poor

Comments:

This is the first point on this tributary where Common Club-rush (*Schoenoplectus lacustris*), Branched Bur-reed (*Sparganium erectum*), and Reed Canary Grass (*Phalaris arundinacea*) form semi-natural vegetation stands within the channel. Also first riffle and pool present here. Some filamentous algal growth present in river. Channel has been significantly altered in the past. Still a very steep (3m) high embankment along river bank. Agricultural land runs almost to river bank. Good fencing present.

River: Maigue	**Site Code:** MG06
Survey Date: 12/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): WS1	**Bank Vegetation D/S (L):** WS1
Bank Vegetation U/S (R): WL2 / GS2	**Bank Vegetation D/S (R):** WS1
Land Cover U/S (L): GS4	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GS2 / GA1
Artificial Features U/S: Over-widened / Over-straightened	**Artificial Features D/S:** Over-widened / Over-straightened

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	3	3
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	1	1
Bank vegetation	2	2
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 24	**Spot-Check Class:** Poor

Comments:

Bank 4-5m wide, with 3m high bank. This stretch has been extensively deepened and straightened. Channel vegetation includes Common Club-rush (*Schoenoplectus lacustris*), Branched Bur-reed (*Sparganium erectum*) with abundant Pondweed (*Potamogeton* sp.). High abundance of fine silt present on river bed. Trout and Mink present based on local land owner comments. Extensive dumping of household rubbish, with warning signs being ignored.

River: Maigue	**Site Code:** MG07
Survey Date: 12/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Other	**Channel Type D/S:** Other
Bank Vegetation U/S (L): GA1	**Bank Vegetation D/S (L):** GA1
Bank Vegetation U/S (R): WD4 / GS2	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): WD4	**Land Cover D/S (R):** GS2
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	4	4
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 20	**Spot-Check Class:** Poor

Comments:
Highly altered stretch of river with no woodland scrub present in riparian zone. Channel infilled with FS1. Intensive agriculture and forestry adjoins river.

River: Maigue	**Site Code:** MG08
Survey Date: 10/07/2019	**Surveyors:** PF and PC
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Other
Bank Vegetation U/S (L): FS1	**Bank Vegetation D/S (L):** GS2 / WL2
Bank Vegetation U/S (R): BL3 / WS1	**Bank Vegetation D/S (R):** BL3
Land Cover U/S (L): GA1 / GS2	**Land Cover D/S (L):** GA2
Land Cover U/S (R): BL3	**Land Cover D/S (R):** BL3 / GA2
Artificial Features U/S: Reinforced	**Artificial Features D/S:** Reinforced

Scoring Matrix

	U/S	D/S
Channel from and flow	1	1
Channel vegetation	1	1
Substrate condition	1	0
Barriers to continuity	4	0
Bank structure and stability	0	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 9	**Spot-Check Class:** Bad

Comments:
River wall along river upstream and downstream. Weir and mill race approx 100m downstream.

River: Maigue	**Site Code:** MG09
Survey Date: 12/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): WL2	**Bank Vegetation D/S (L):** WS1
Bank Vegetation U/S (R): WL2	**Bank Vegetation D/S (R):** WL2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** WL2 /GS2
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	4	4
Channel vegetation	4	4
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	3	3
Bank vegetation	4	4
Riparian land cover	1	1
Floodplain connectivity	0	0

Total Score: 46	**Spot-Check Class:** Good

Comments:

This river stretch is approx 12m wide. Seems to be unaltered, though some straightening/deepening may have occurred in the past. Some algal mats present at the bank edges. Bank contains immature Osier Willow (Salix viminalis) scrub with extensive Giant Hogweed (*Heracleum mantegazzianum*).

River: Maigue	**Site Code:** MG10
Survey Date: 12/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): WS1	**Bank Vegetation D/S (L):** WS1
Bank Vegetation U/S (R): GS2	**Bank Vegetation D/S (R):** WS1 / WL1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	4	4
Channel vegetation	2	3
Substrate condition	3	3
Barriers to continuity	2	4
Bank structure and stability	3	3
Bank vegetation	2	3
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 36	**Spot-Check Class:** Moderate

Comments:
This stretch of river appears relatively unaltered. The absence of trees along the banks is notable. Intermediate weirs in the upstream stretch do not impede water flow but may result in an increase in sediment.

River: Maigue	**Site Code:** MG11
Survey Date: 17/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): WS1 / GS2	**Bank Vegetation D/S (L):** WL2
Bank Vegetation U/S (R): WS1	**Bank Vegetation D/S (R):** WL1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	3	3
Channel vegetation	2	1
Substrate condition	2	2
Barriers to continuity	1	4
Bank structure and stability	3	2
Bank vegetation	3	2
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 28	**Spot-Check Class:** Poor

Comments:
Channel 15-20m wide, with relatively good channel and bank side vegetation overall. Fishing occurs on this stretch of river. Giant Hogweed (*Heracleum mantegazzianum*) present.

River: Maigue	**Site Code:** MG12
Survey Date: 17/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): WL2	**Bank Vegetation D/S (L):** WL2
Bank Vegetation U/S (R): WL2	**Bank Vegetation D/S (R):** BL3 / WL2
Land Cover U/S (L): GA2	**Land Cover D/S (L):** WD1
Land Cover U/S (R): WD1	**Land Cover D/S (R):** GA2 / BL3
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	4	3
Channel vegetation	3	2
Substrate condition	4	3
Barriers to continuity	4	4
Bank structure and stability	4	2
Bank vegetation	3	2
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 38	**Spot-Check Class:** Moderate

Comments:
Channel up to 20m wide. Upstream section appears to have minimal alteration/disturbance. Amenity park present on upstream left bank. Downstream section has been more altered, with reinforced walls present along banks. Green algae present on surface.

River: Maigue	**Site Code:** MG13
Survey Date: 17/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Pool-riffle-glide	**Channel Type D/S:** Pool-riffle-glide
Bank Vegetation U/S (L): WS1 / WL2	**Bank Vegetation D/S (L):** WS1
Bank Vegetation U/S (R): WS1 / GS2	**Bank Vegetation D/S (R):** WL1
Land Cover U/S (L): WS1 / GS2	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1 / GS2	**Land Cover D/S (R):** WD1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	3	3
Channel vegetation	2	2
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	3	2
Bank vegetation	3	3
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 33	**Spot-Check Class:** Moderate

Comments:

Channel 15-20m wide. There has been some tree removal on the left downstream bank. Upstream there is a wooded island. Diversity of substrates present. Giant Hogweed (*Heracleum mantegazzianum*) present upstream and downstream. A lot of algae present in channel. Riparian woodland on island in river.

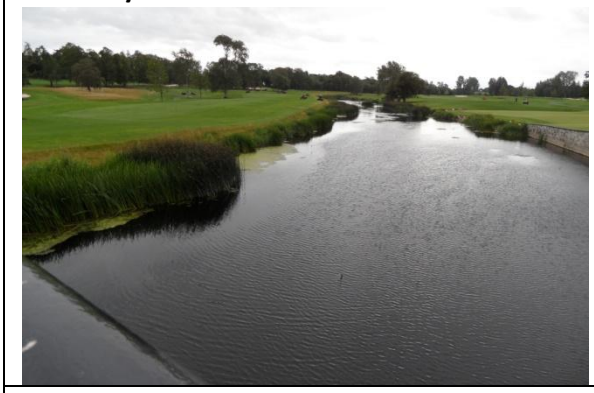
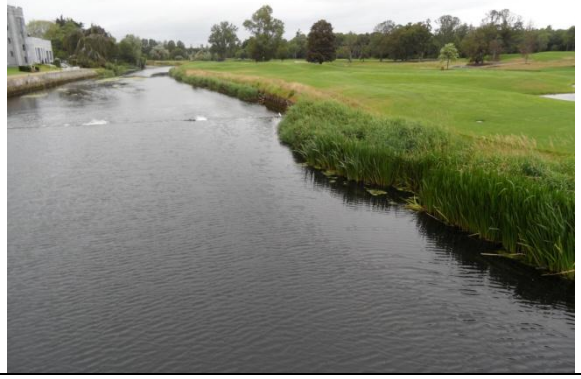
River: Maigue	**Site Code:** MG14
Survey Date: 17/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): WS1 / WL2	**Bank Vegetation D/S (L):** GS2 / WS1
Bank Vegetation U/S (R): WL2	**Bank Vegetation D/S (R):** GS2
Land Cover U/S (L): GA1	**Land Cover D/S (L):** GA1
Land Cover U/S (R): GA1	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	2	1
Channel vegetation	2	2
Substrate condition	2	2
Barriers to continuity	4	4
Bank structure and stability	1	1
Bank vegetation	2	1
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 24	**Spot-Check Class:** Poor

Comments:
Channel up to 20m wide. Earth bank as a result of arterial drainage works visible. There has been extensive tree removal. GA1 fields run to edge of bank, cattle are accessing river resulting in significant bank erosion (photo 6242). Wooded island visible in upstream (photo 6243).

River: Maigue	**Site Code:** MG15
Survey Date: 17/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): GA2	**Bank Vegetation D/S (L):** BL3
Bank Vegetation U/S (R): GA2	**Bank Vegetation D/S (R):** GA2
Land Cover U/S (L): GA2	**Land Cover D/S (L):** BL3
Land Cover U/S (R): GA2	**Land Cover D/S (R):** GA2
Artificial Features U/S: Reinforced	**Artificial Features D/S:** Reinforced

Scoring Matrix

	U/S	D/S
Channel from and flow	0	0
Channel vegetation	3	3
Substrate condition	2	2
Barriers to continuity	4	0
Bank structure and stability	0	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 14	**Spot-Check Class:** Bad

Comments:
Channel up to 20m wide. Whole stretch has been extensively altered. Complete absence of riparian vegetation. Extensive reinforcement of both banks. Golf paths and green extend right up to bank top. Weir present downstream.

River: Maigue	**Site Code:** MG16
Survey Date: 17/07/2019	**Surveyors:** PF and MCG
Photo U/S Not possible to get photo due to busy road.	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): GS2	**Bank Vegetation D/S (L):** GS2
Bank Vegetation U/S (R): GS2	**Bank Vegetation D/S (R):** WL2
Land Cover U/S (L): GS2	**Land Cover D/S (L):** GA2 / BL3
Land Cover U/S (R): GA2 / BL3	**Land Cover D/S (R):** GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	4	4
Channel vegetation	4	4
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	3	3
Bank vegetation	2	2
Riparian land cover	1	1
Floodplain connectivity	0	0

Total Score: 42	**Spot-Check Class:** Good

Comments:
Survey done from Adare river walk path (downstream left bank) as very busy main road crosses river, not possible to do survey from road. Earth bank present along both banks as a result of previous arterial drainage. In channel vegetation is good, however, bankside vegetation is limited due to earth banks. Where trees are present, shading is occurring. Island present on downstream side of bridge.

River: Maigue	**Site Code:** MG17
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): WS1	**Bank Vegetation D/S (L):** WS1 / GS2
Bank Vegetation U/S (R): WS1 / WL1	**Bank Vegetation D/S (R):** FS1
Land Cover U/S (L): GA2	**Land Cover D/S (L):** GS2
Land Cover U/S (R): WS1	**Land Cover D/S (R):** GS2 / GA1
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	3	3
Channel vegetation	3	3
Substrate condition	3	3
Barriers to continuity	4	4
Bank structure and stability	0	0
Bank vegetation	0	0
Riparian land cover	0	0
Floodplain connectivity	0	0

Total Score: 26	**Spot-Check Class:** Poor

Comments:
Channel 15-20m wide. Low water level with exposed mud banks in centre of channel. Riparian vegetation almost absent. Amenity park present upstream. Earth bank present after arterial drainage. Channel has been extensively altered.

River: Maigue	**Site Code:** MG18
Survey Date: 16/07/2019	**Surveyors:** PF and MCG
Photo U/S 	**Photo D/S** 
Channel Type U/S: Lowland meandering	**Channel Type D/S:** Lowland meandering
Bank Vegetation U/S (L): FS1	**Bank Vegetation D/S (L):** FS1
Bank Vegetation U/S (R): FS1	**Bank Vegetation D/S (R):** FS1
Land Cover U/S (L): GA1	**Land Cover D/S (L):** FS1 / GS2
Land Cover U/S (R): FS1 / GS2	**Land Cover D/S (R):** GA2
Artificial Features U/S: None	**Artificial Features D/S:** None

Scoring Matrix

	U/S	D/S
Channel from and flow	3	3
Channel vegetation	4	4
Substrate condition	4	4
Barriers to continuity	4	4
Bank structure and stability	1	1
Bank vegetation	4	4
Riparian land cover	3	3
Floodplain connectivity	0	0

Total Score: 46	**Spot-Check Class:** Good

Comments:

Estuarine stretch with tidal influence. This stretch was previously straightened and deepened and there are earth banks present either side of the channel. This stretch of river has recovered relatively well, it follows the path of least resistance, and there are reed beds present at both sides of the channel.

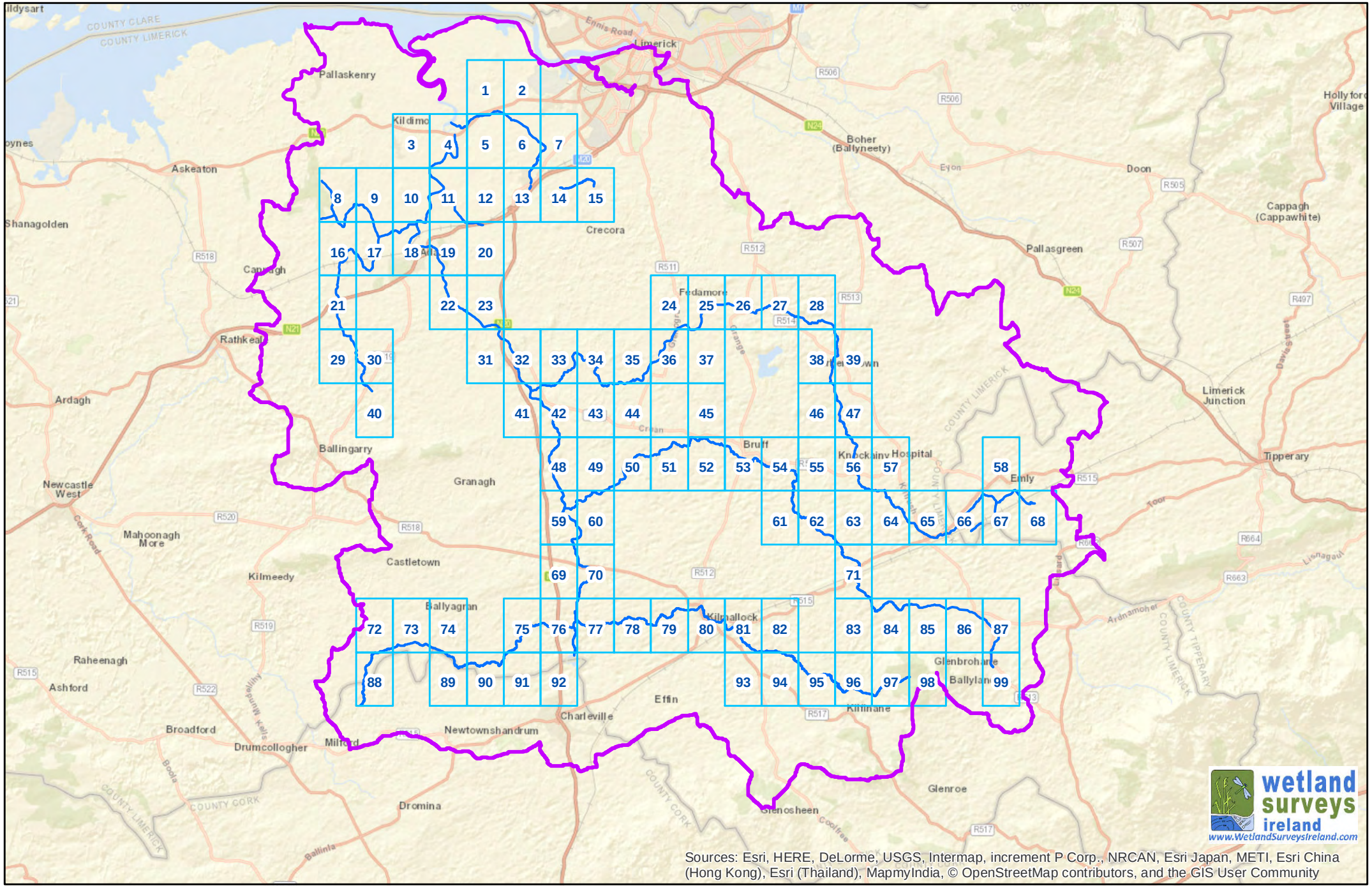
Appendix III – Photo Catalogue

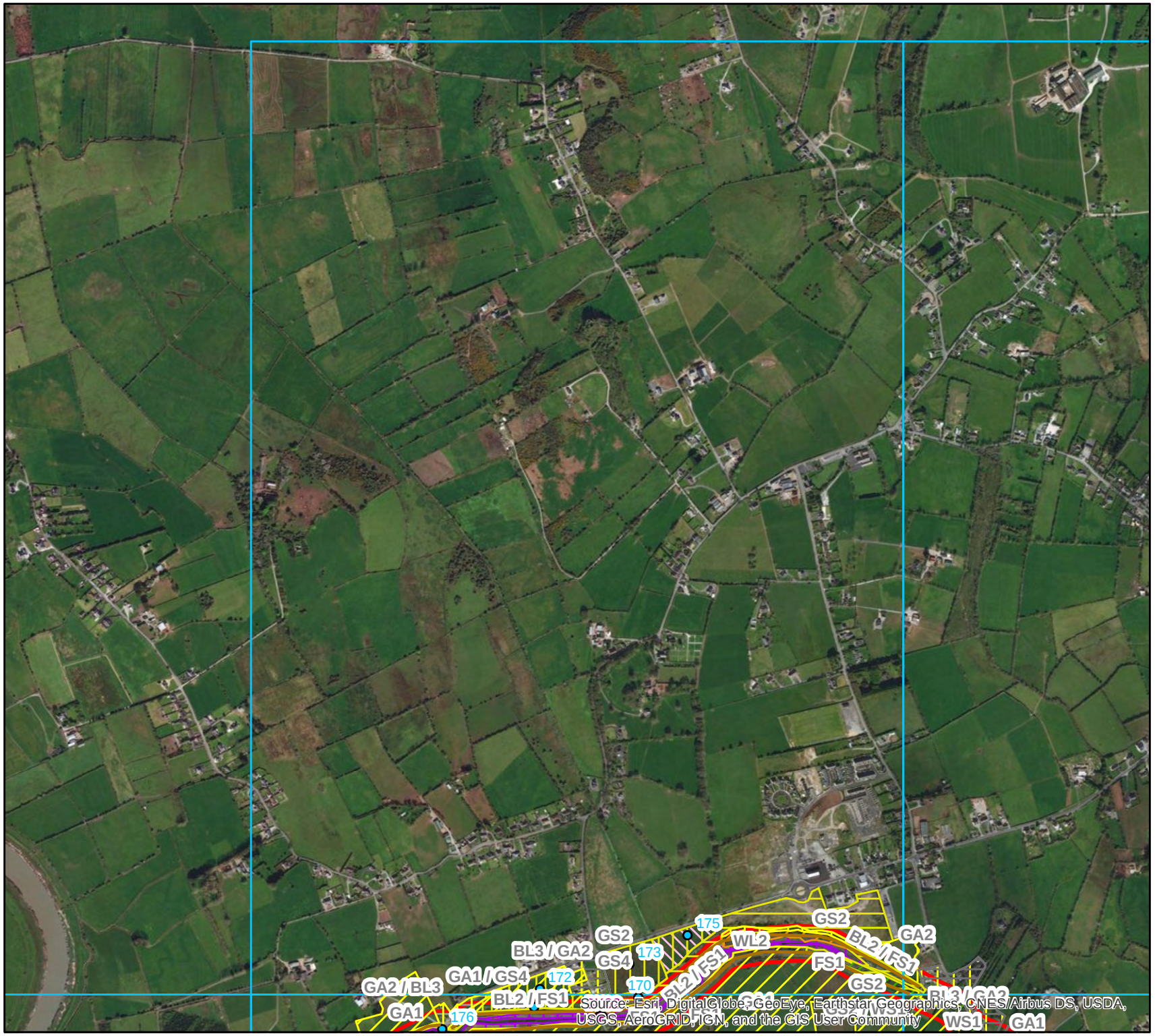
River Name	Site Code	Photo ID
Barnakyle	BK01	Upstream: 6040-6041, 6045; Downstream: 6042-6044.
Barnakyle	BK02	Upstream: 6063-6064; Downstream: 6060-6062; Earth bank: 6065-6066.
Barnakyle	BK03	Upstream: 6054-6056; Downstream: 6057-6059.
Camoge	CM01	Upstream: 5812; Downstream: 5813-5814.
Camoge	CM02	Upstream: 5819-5820; Downstream: 5821-5823.
Camoge	CM03	Upstream: 5824-5825; Downstream: 5826-5827.
Camoge	CM04	Upstream: 5830-5831; Downstream: 5832-5834.
Camoge	CM05	Upstream: 5835-5836; Downstream: 5837-5839.
Camoge	CM06	Upstream: 5840-5841; Downstream: 5842-5844; Fish: 5845.
Camoge	CM07	Upstream: 5846-5847; Downstream:5848-5850.
Camoge	CM08	Upstream: 5852-5853; Downstream: 5854-5855.
Camoge	CM09	Upstream: 5858-5860; Downstream: 5861-5863.
Camoge	CM10	Upstream: 5876-5879; Downstream: 5871-5873; Wet grassland: 5874-5875.
Camoge	CM11	Upstream: 6331-6333; Downstream: 6334-6337.
Camoge	CM12	Upstream: 6316-6319; Downstream: 6313-6315.
Camoge	CM13	Upstream: 6303-6305; Downstream: 6306-6309.
Camoge	CM14	Upstream: 6277-6278; Downstream: 6279-6282.
Clonshire	CS01	Upstream: 6159-6160, 6163; Downstream: 6161-6162.
Clonshire	CS02	Upstream: 6144-6146, 6152; Downstream: 6147-6151.
Clonshire	CS03	Upstream: 6140-6143; Downstream: 6136-6139.
Clonshire	CS04	Upstream: 6130-6132; Downstream: 6133-6135.
Clonshire	CS05	Upstream: 6107-6109; Downstream: 6110-6112.
Curraghchase North	CN01	Upstream: 6090-6092; Downstream: 6087-6089.
Curraghchase North	CN02	Upstream: 6105-6106; Downstream: 6102-6104.
Loobagh	LB01	Upstream: 5777-5780; Downstream: 5775-5776.
Loobagh	LB02	Upstream: 5791; Downstream:5792; Additional: 5793-5803.
Loobagh	LB03	Upstream: 5764-5766, Downstream: 5767-5770.
Loobagh	LB04	Upstream: 6015-6016; Downstream 6017-6018.
Loobagh	LB05	Upstream: 5741-5742; Downstream: 5743-5745.
Loobagh	LB06	Upstream: 5719-5720; Downstream: 5721-5722.
Loobagh	LB07	Upstream: 5695-5696; Downstream: 5693-5694.
Maigue	MG01	Upstream: 5549; Downstream: 5550.

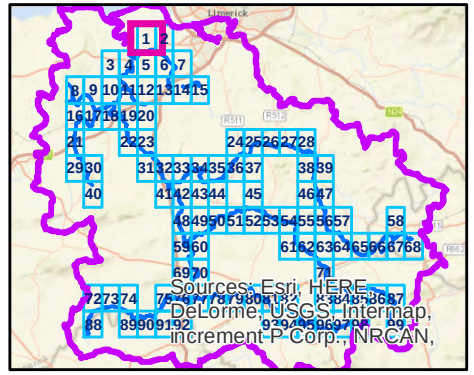
River Name	Site Code	Photo ID
Maigue	MG02	Upstream: 5561; Downstream: 5559-5560.
Maigue	MG03	Upstream: 5565; Downstream: 5566-5567.
Maigue	MG04	Upstream: 5571-5572; Downstream: 5573-5575.
Maigue	MG05	Upstream: 5579-5580; Downstream: 5581-5582.
Maigue	MG06	Upstream: 5880-5881; Downstream: 5882-5883; Dumping: 5584-5889.
Maigue	MG07	Upstream: 5890-5892; Downstream: 5893-5895.
Maigue	MG08	Upstream: 5705-5706; Downstream: 5707-5708.
Maigue	MG09	Upstream: 5908-5911; Downstream:5905-5907.
Maigue	MG10	Upstream: 5929-5932; Downstream: 5925-5928.
Maigue	MG11	Upstream: 6272-6274; Downstream: 6269-6271.
Maigue	MG12	Upstream: 6258-6261; Downstream: 6262-6265.
Maigue	MG13	Upstream: 6246-6248; Downstream: 6249-6252; Island 6245.
Maigue	MG14	Upstream: 6239-6241; Downstream: 6236-6238.
Maigue	MG15	Upstream: 6224-6225; Downstream: 6226-6227.
Maigue	MG16	Downstream: 6182-6187.
Maigue	MG17	Upstream: 6118-6119; Downstream: 6120-6129.
Maigue	MG18	Upstream: 6082-6084; Downstream: 6075-6081.
Mondellihy	MD01	Upstream: 6174-6175; Downstream: 6176-6177; Algae 6178.
Morningstar	MS01	Upstream: 6009-6011; Downstream: 6012-6013.
Morningstar	MS02	Upstream: 6003-6005; Downstream: 6000-6002.
Morningstar	MS03	Upstream: 5991-5993; Downstream: 5994-5996.
Morningstar	MS04	Upstream: 5980-5982; Downstream: 5983-5986.
Morningstar	MS05	Upstream: 5977-5979; Downstream: 5974-5976.
Morningstar	MS06	Upstream: 5965-5966; Downstream: 5967-5969.
Morningstar	MS07	Upstream: 5957-5959; Downstream: 5960-5962.

Appendix V – Maigue Catchment Mapbook

Maigue Catchment Mapbook







- General Study Area
- MaigueRivers_50mBuffer
- BL2 / FS1 (Earth banks / Reed and large sedge swamps)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- FS1 (Reed and large sedge swamps)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 (Amenity grassland (improved))
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS2 (Dry meadows and grassy verges)
- GS2 / GA1 (Dry meadows and grassy verges / Improved agricultural grassland)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- GS4 (Wet grassland)
- GS4 / GM1 (Wet grassland / Marsh)
- WL2 (Treelines)
- WS1 (Scrub)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 1

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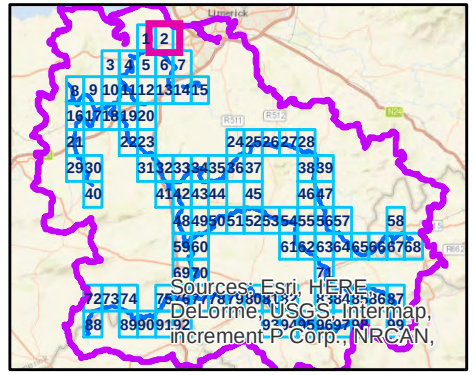
www.WetlandSurveysIreland.com



General Study Area
MaigueRivers_50mBuffer
BL2 / FS1 (Earth banks / Reed and large sedge swamps)
BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
FS1 (Reed and large sedge swamps)
GA1 (Improved agricultural grassland)
GA2 (Amenity grassland (improved))
GS2 (Dry meadows and grassy verges)
GS2 / WS1 (Dry meadows and grassy verges / Scrub)
GS4 (Wet grassland)
GS4 / GM1 (Wet grassland / Marsh)
WL2 (Treelines)
WS1 (Scrub)
Survey Note

0 300 600 Meters

Map area: 2

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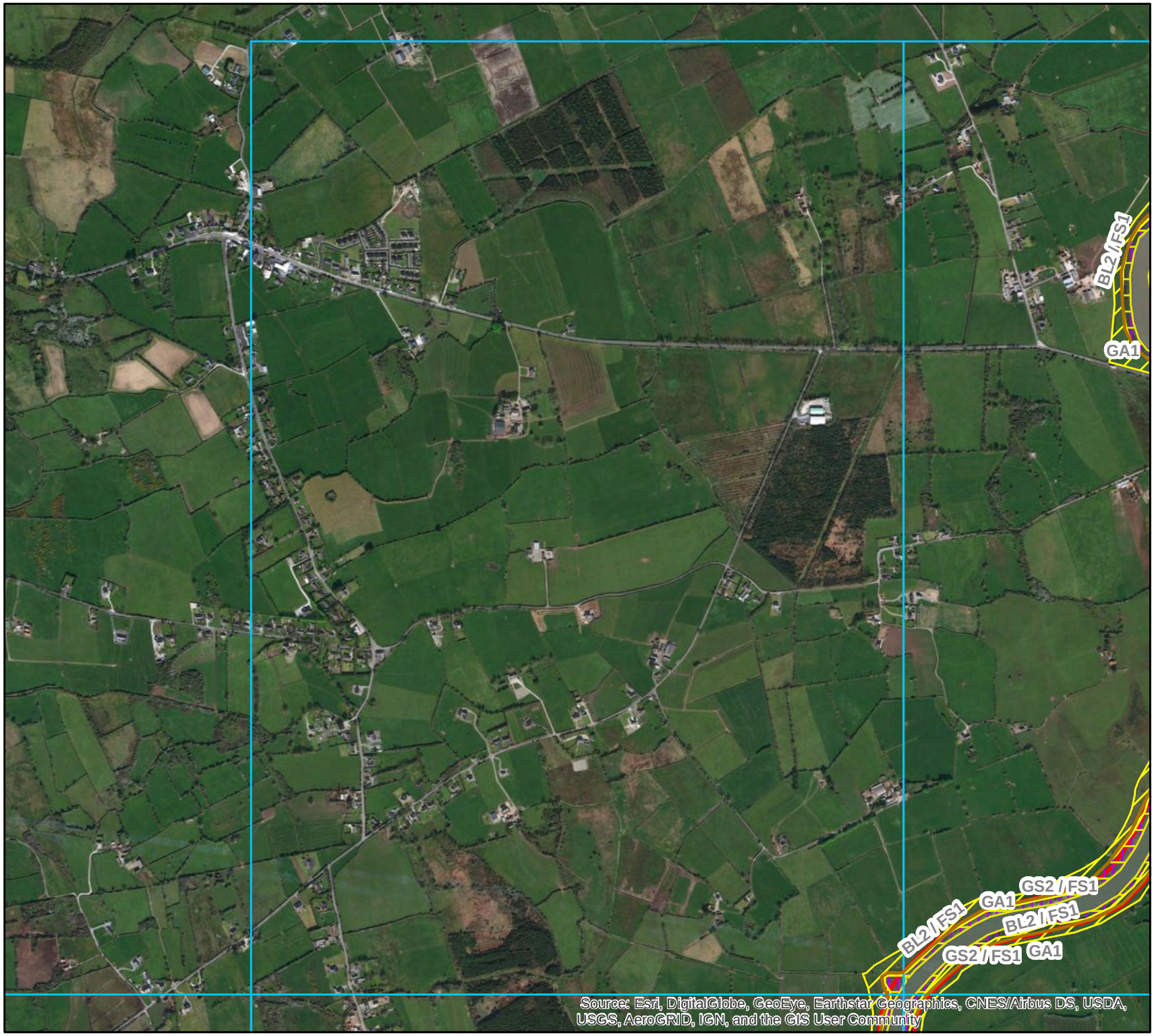

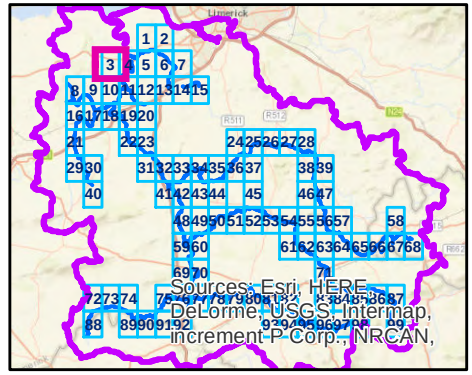

General Study Area
MaigueRivers_50mBuffer
BL2 / FS1 (Earth banks / Reed and large sedge swamps)
GA1 (Improved agricultural grassland)
GS2 / FS1 (Dry meadows and grassy verges / Reed and large sedge swamps)

0 300 600 Meters

Map area: 3

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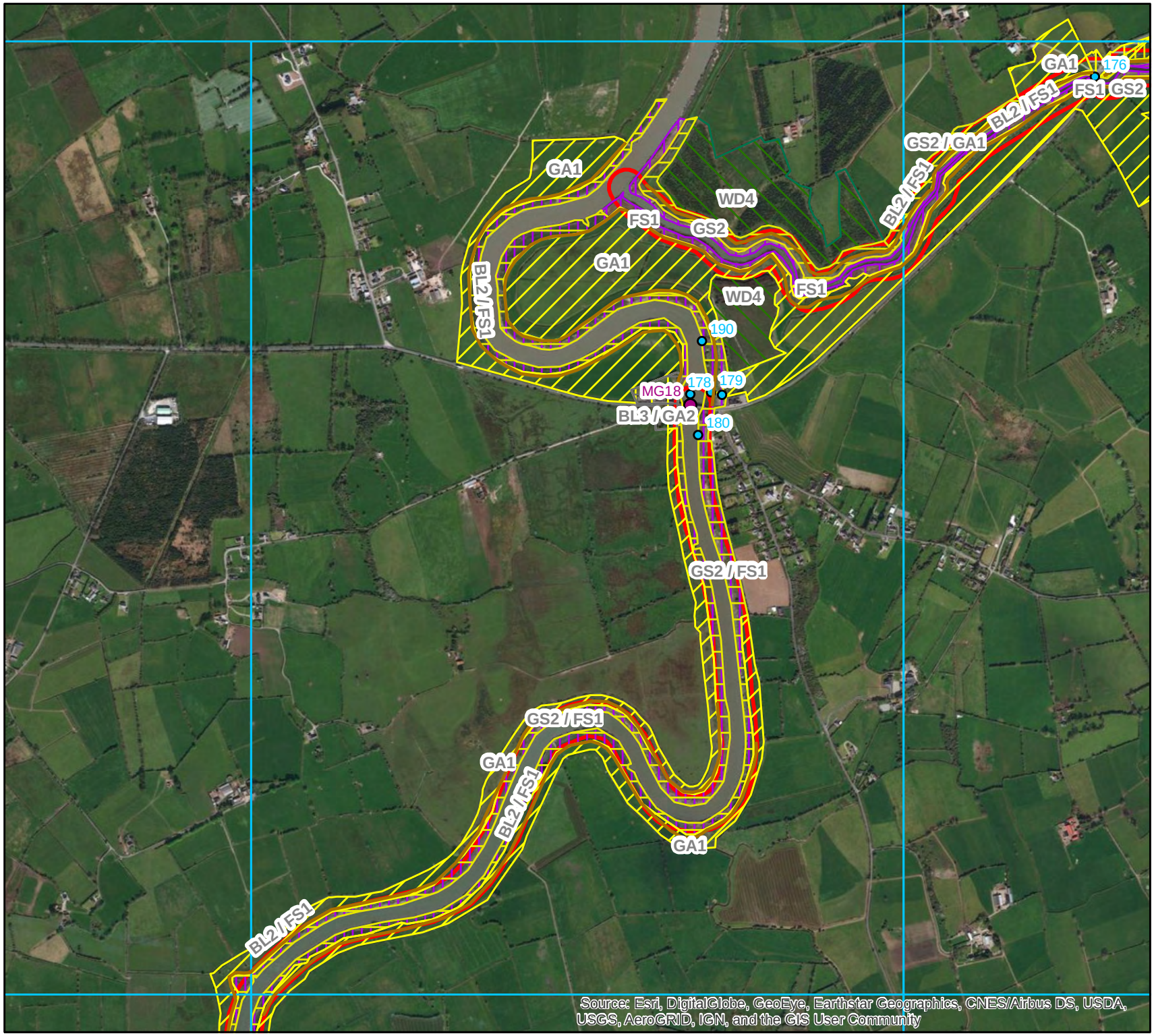

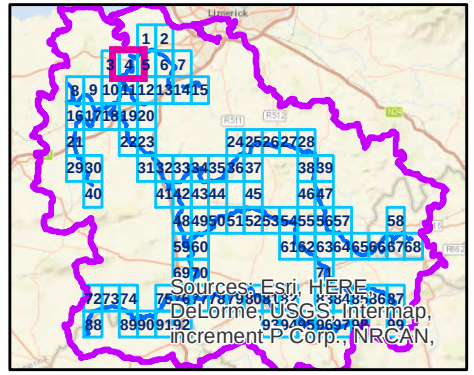

- General Study Area
- MaigueRivers_50mBuffer
- BL2 / FS1 (Earth banks / Reed and large sedge swamps)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- FS1 (Reed and large sedge swamps)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS2 (Dry meadows and grassy verges)
- GS2 / FS1 (Dry meadows and grassy verges / Reed and large sedge swamps)
- GS2 / GA1 (Dry meadows and grassy verges / Improved agricultural grassland)
- WD4 (Conifer plantation)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 4

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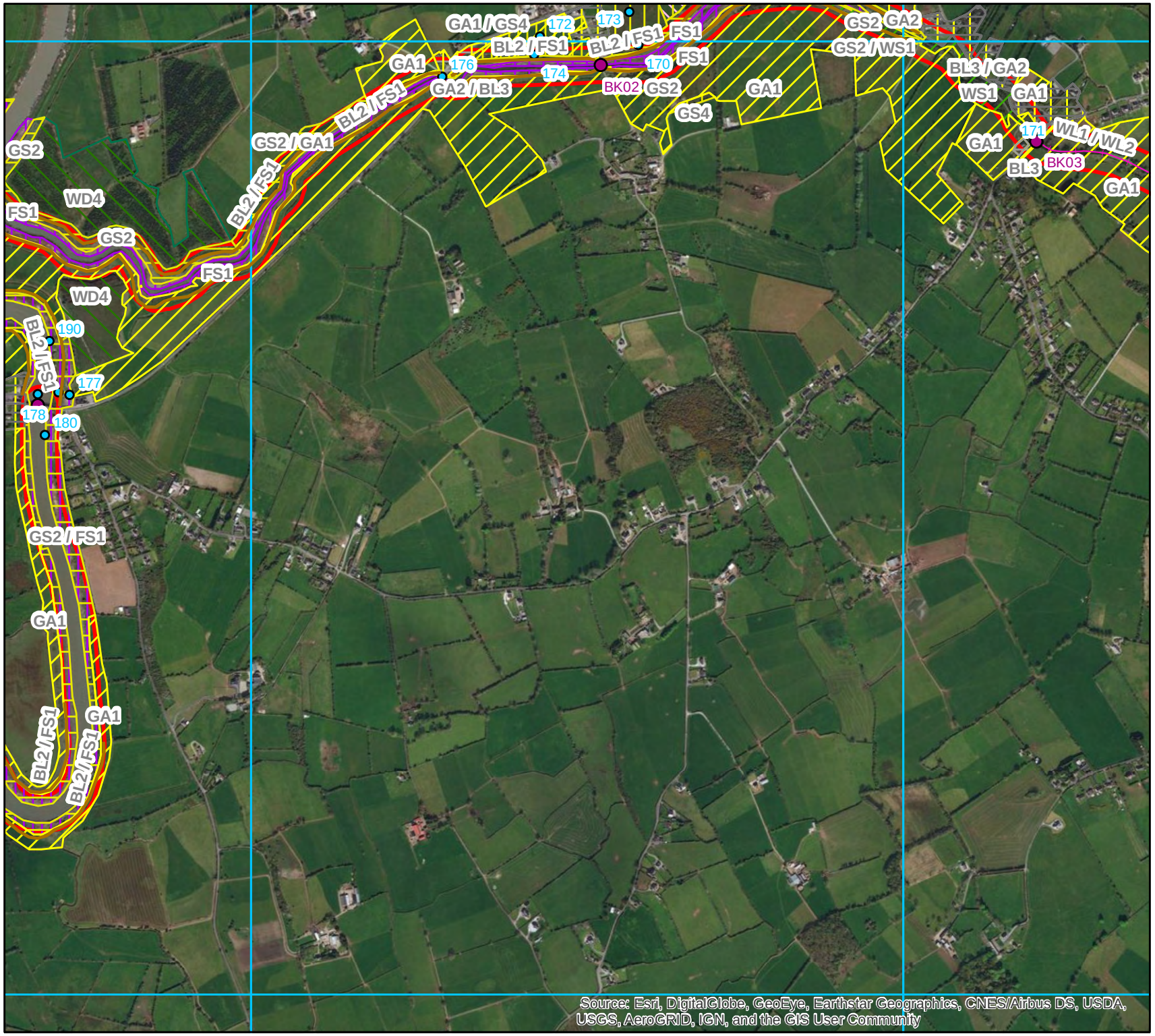

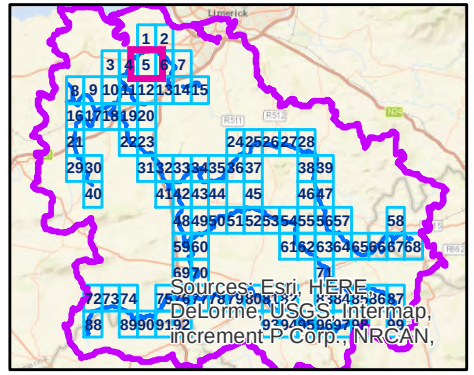

- General Study Area
- MaigueRivers_50mBuffer
- BL2 / FS1 (Earth banks / Reed and large sedge swamps)
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- FS1 (Reed and large sedge swamps)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 (Amenity grassland (improved))
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS2 (Dry meadows and grassy verges)
- GS2 / FS1 (Dry meadows and grassy verges / Reed and large sedge swamps)
- GS2 / GA1 (Dry meadows and grassy verges / Improved agricultural grassland)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- GS4 (Wet grassland)
- GS4 / GM1 (Wet grassland / Marsh)
- WD4 (Conifer plantation)
- WS1 (Scrub)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 5

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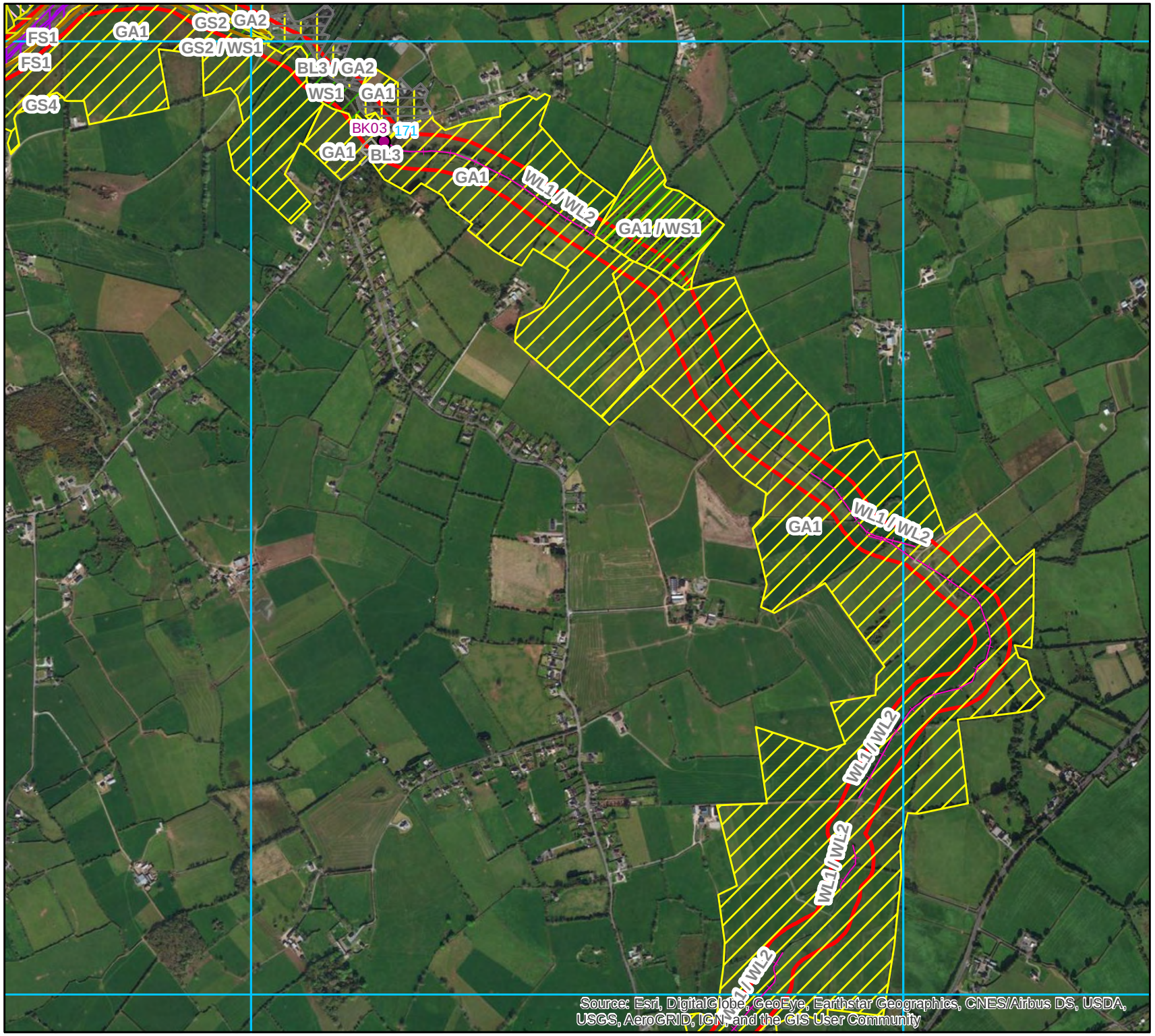

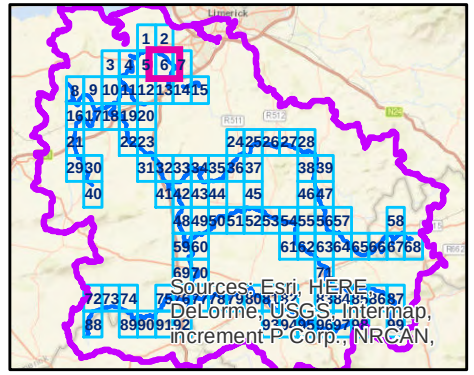

- General Study Area
- MaigueRivers_50mBuffer
- BL2 / FS1 (Earth banks / Reed and large sedge swamps)
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- FS1 (Reed and large sedge swamps)
- GA1 (Improved agricultural grassland)
- GA1 / WS1 (Improved agricultural grassland / Scrub)
- GA2 (Amenity grassland (improved))
- GS2 (Dry meadows and grassy verges)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- GS4 (Wet grassland)
- GS4 / GM1 (Wet grassland / Marsh)
- WS1 (Scrub)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 6

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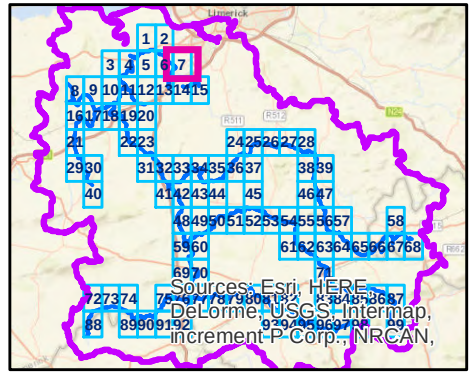

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / WS1 (Improved agricultural grassland / Scrub)

0 300 600 Meters

Map area: 7

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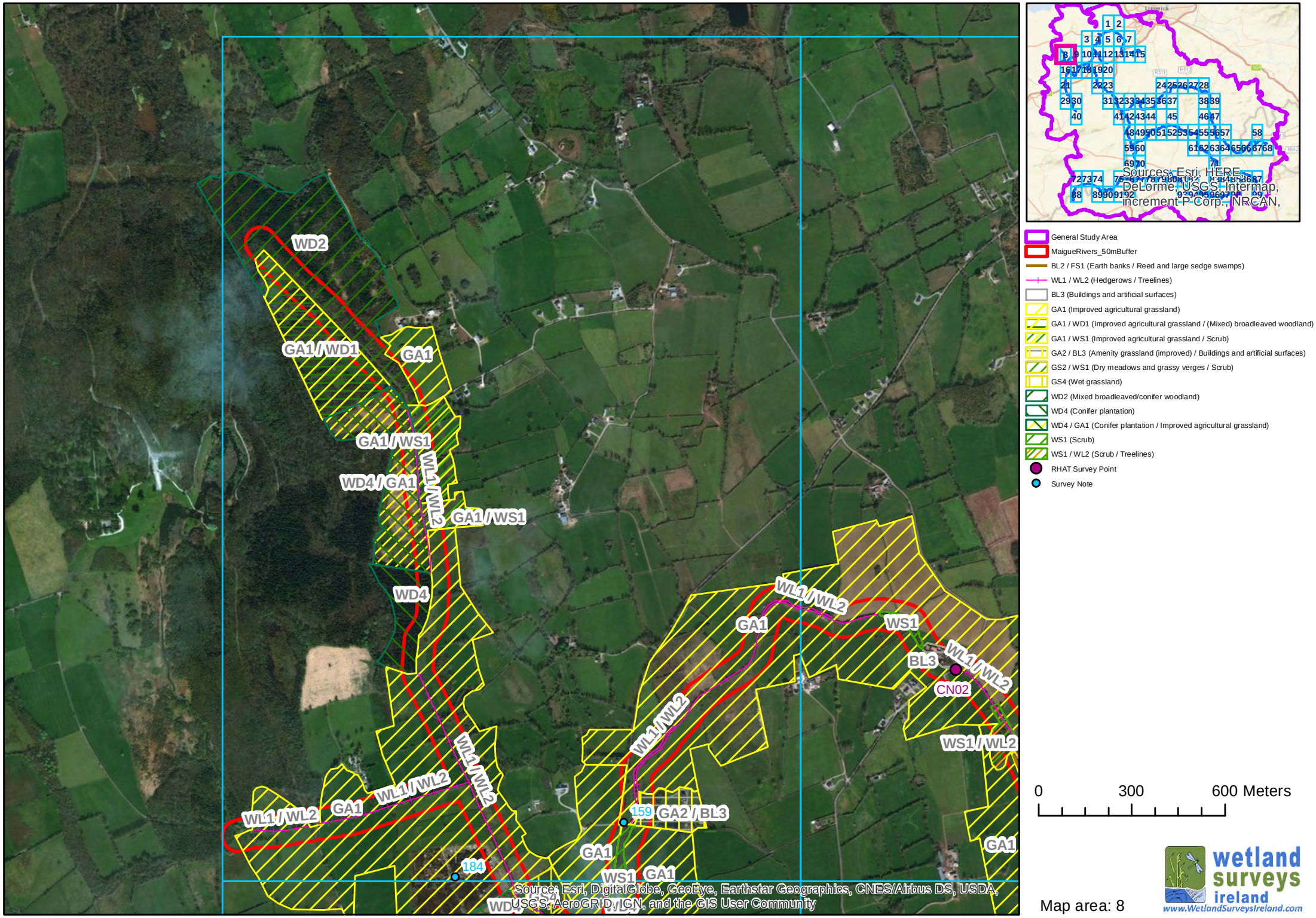
WD2
GA1 / WD1
GA1
GA1 / WS1
WL1 / WL2
WD4 / GA1
GA1 / WS1
WD4
WL1 / WL2
GA1
WS1
WL1 / WL2
BL3
CN02
WS1 / WL2
WL1 / WL2
WL1 / WL2
WL1 / WL2
GA1
WL1 / WL2
159
GA2 / BL3
GA1
184
WS1
GA1
GA1
WD
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN,
General Study Area
MaigueRivers_50mBuffer
BL2 / FS1 (Earth banks / Reed and large sedge swamps)
WL1 / WL2 (Hedgerows / Treelines)
BL3 (Buildings and artificial surfaces)
GA1 (Improved agricultural grassland)
GA1 / WD1 (Improved agricultural grassland / (Mixed) broadleaved woodland)
GA1 / WS1 (Improved agricultural grassland / Scrub)
GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
GS2 / WS1 (Dry meadows and grassy verges / Scrub)
GS4 (Wet grassland)
WD2 (Mixed broadleaved/conifer woodland)
WD4 (Conifer plantation)
WD4 / GA1 (Conifer plantation / Improved agricultural grassland)
WS1 (Scrub)
WS1 / WL2 (Scrub / Treelines)
RHAT Survey Point
Survey Note
0
300
600 Meters
Map area: 8
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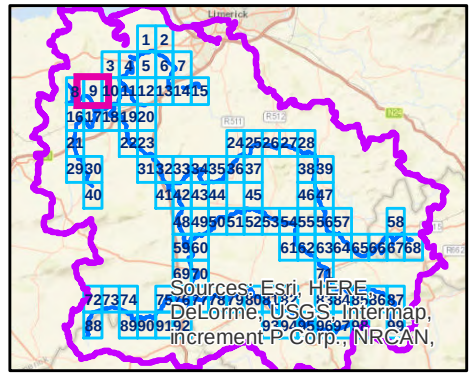

- General Study Area
- MaigueRivers_50mBuffer
- BL2 / FS1 (Earth banks / Reed and large sedge swamps)
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- GA1 (Improved agricultural grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- WS1 (Scrub)
- WS1 / WL2 (Scrub / Treelines)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 9

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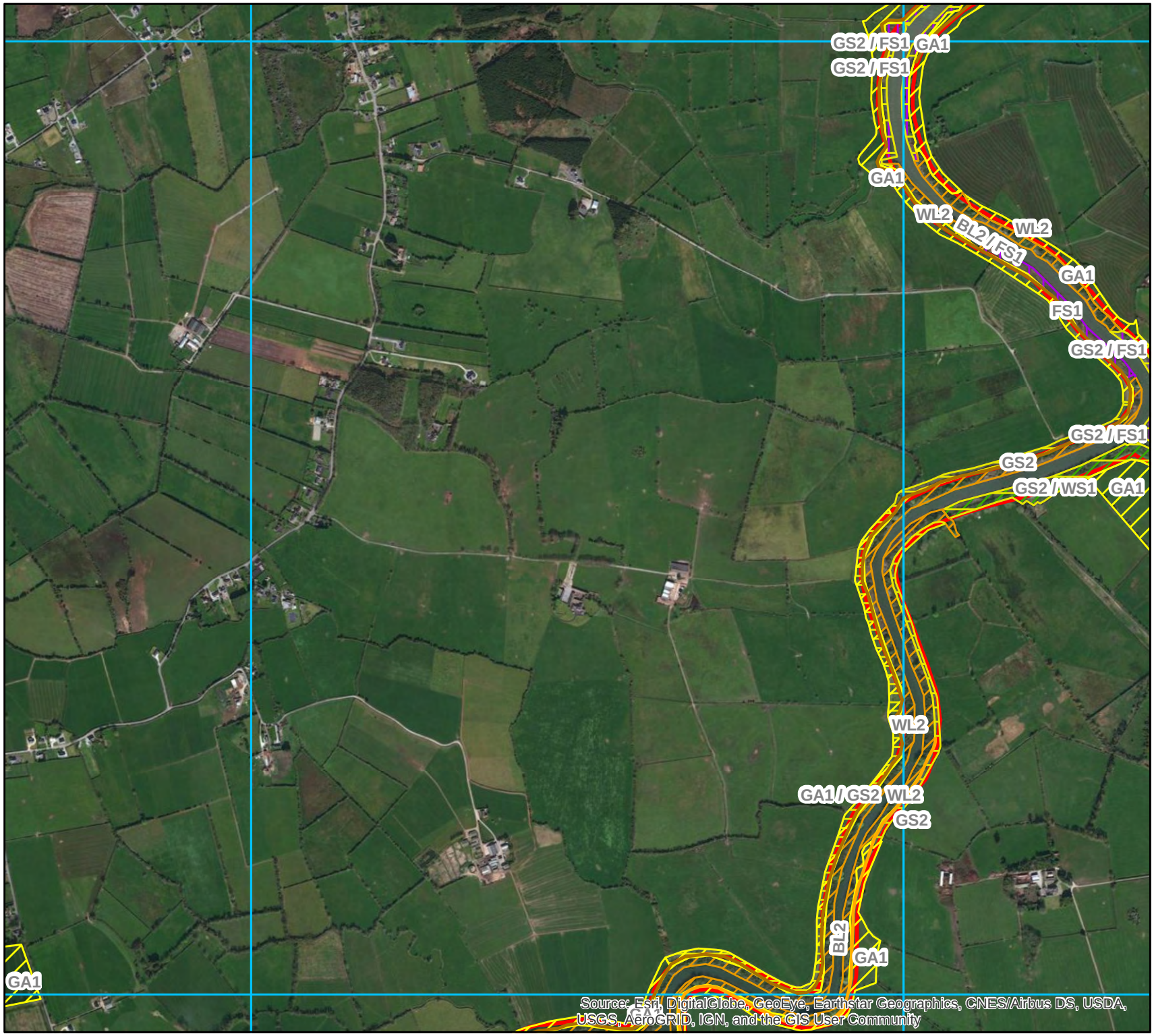

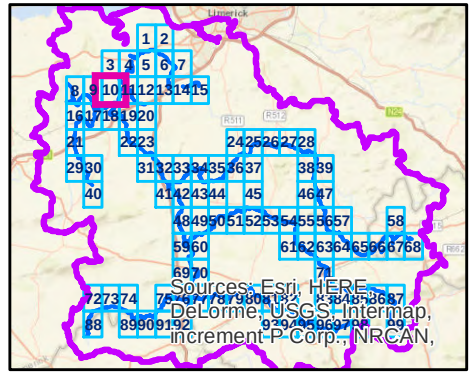

- General Study Area
- MaigueRivers_50mBuffer
- BL2 / FS1 (Earth banks / Reed and large sedge swamps)
- BL2 (Earthbanks)
- FS1 (Reed and large sedge swamps)
- GA1 (Improved agricultural grassland)
- GA1 / GS2 (Improved agricultural grassland / Dry meadows and grassy verges)
- GS2 (Dry meadows and grassy verges)
- GS2 / FS1 (Dry meadows and grassy verges / Reed and large sedge swamps)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- WL2 (Treelines)

0 300 600 Meters

Map area: 10

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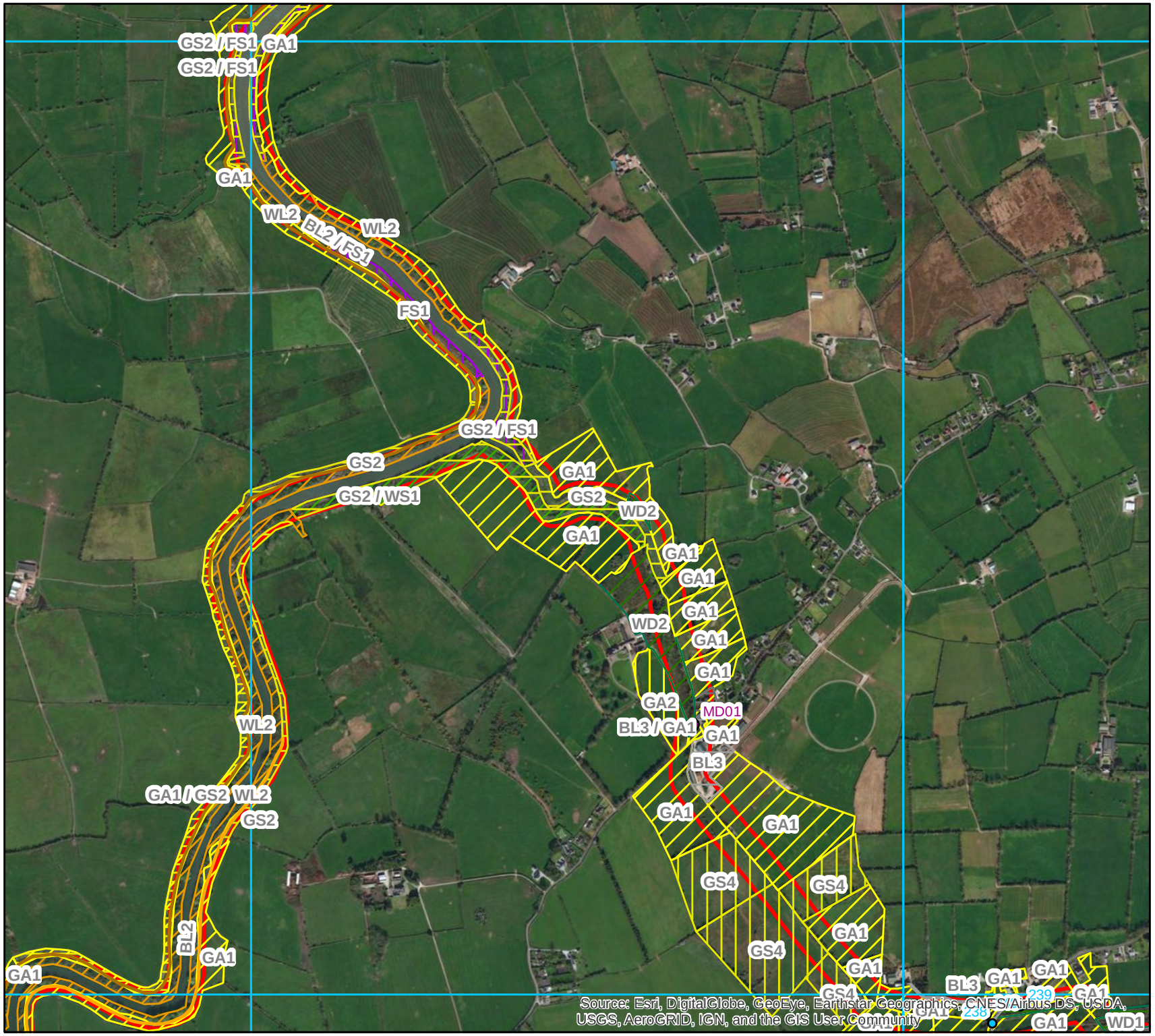

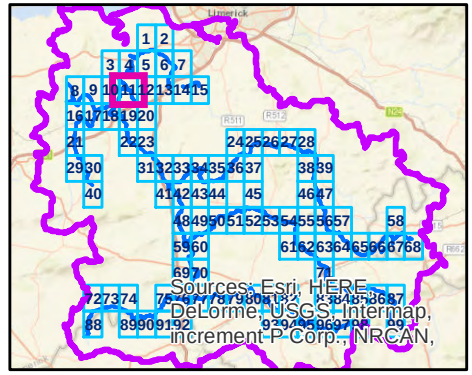

- General Study Area
- MaigueRivers_50mBuffer
- BL2 / FS1 (Earth banks / Reed and large sedge swamps)
- BL2 (Earthbanks)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA1 (Buildings and artificial surfaces / Improved agricultural grassland)
- FS1 (Reed and large sedge swamps)
- GA1 (Improved agricultural grassland)
- GA1 / GS2 (Improved agricultural grassland / Dry meadows and grassy verges)
- GA2 (Amenity grassland (improved))
- GS2 (Dry meadows and grassy verges)
- GS2 / FS1 (Dry meadows and grassy verges / Reed and large sedge swamps)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- GS4 (Wet grassland)
- WD1 (Mixed) broadleaved woodland
- WD2 (Mixed broadleaved/conifer woodland)
- WL2 (Treelines)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 11

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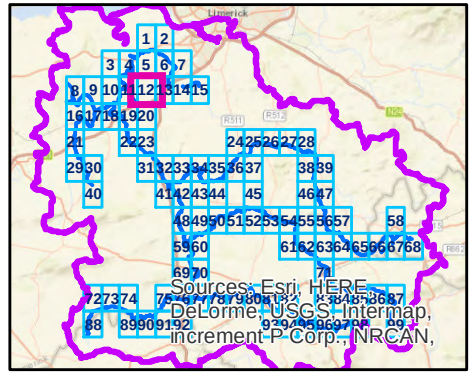

General Study Area
MaigueRivers_50mBuffer
BL3 (Buildings and artificial surfaces)
BL3 / GA1 (Buildings and artificial surfaces / Improved agricultural grassland)
GA1 (Improved agricultural grassland)
GA2 (Amenity grassland (improved))
GS2 (Dry meadows and grassy verges)
GS4 (Wet grassland)
WD1 (Mixed) broadleaved woodland
WD2 (Mixed broadleaved/conifer woodland)
RHAT Survey Point
Survey Note

0 300 600 Meters

Map area: 12

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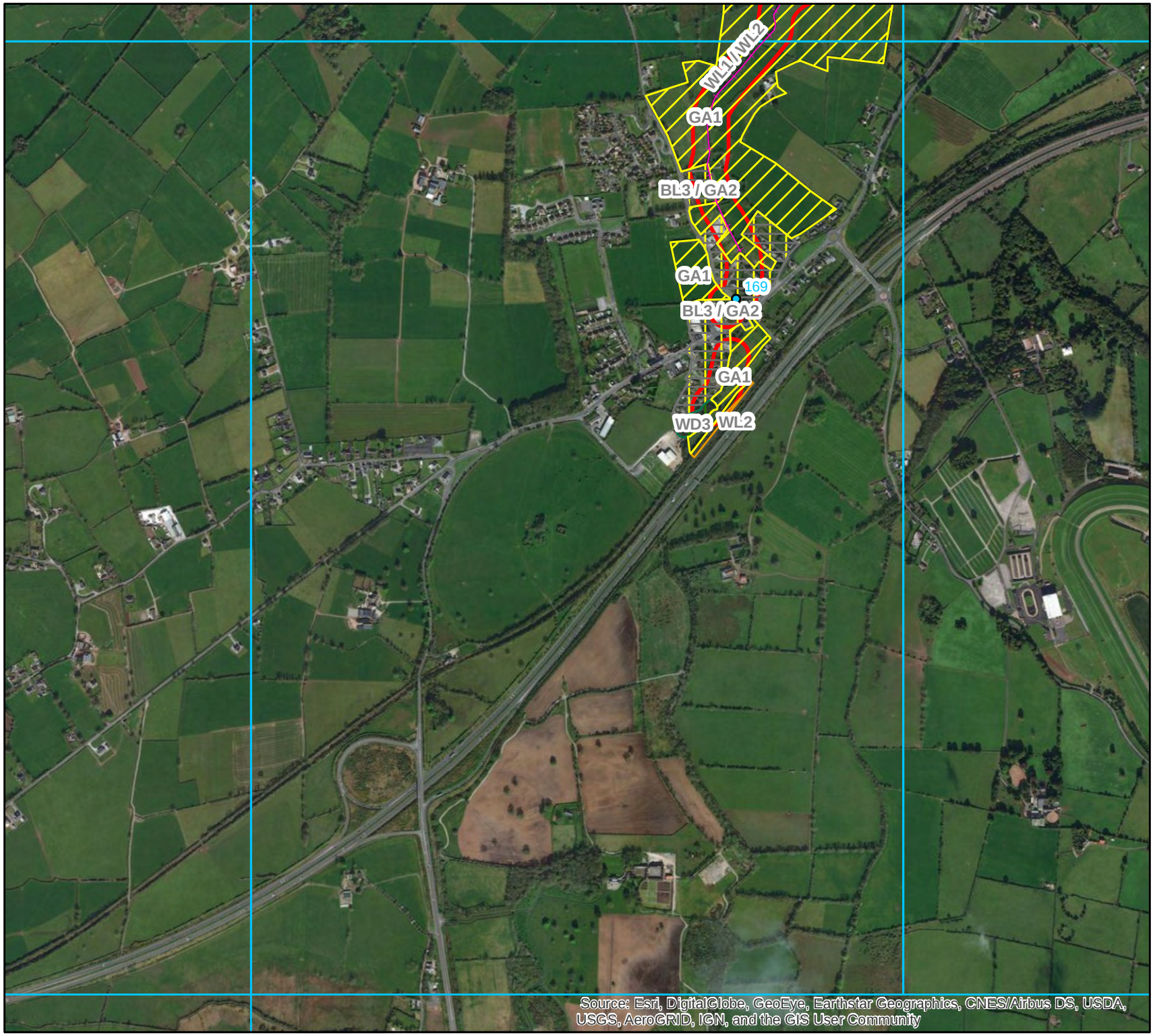

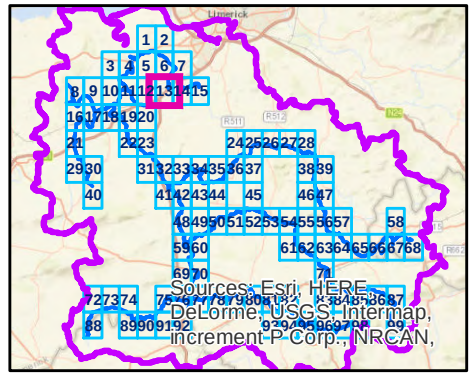

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- WD3 ((Mixed) conifer woodland)
- WL2 (Treelines)
- Survey Note

0 300 600 Meters

Map area: 13

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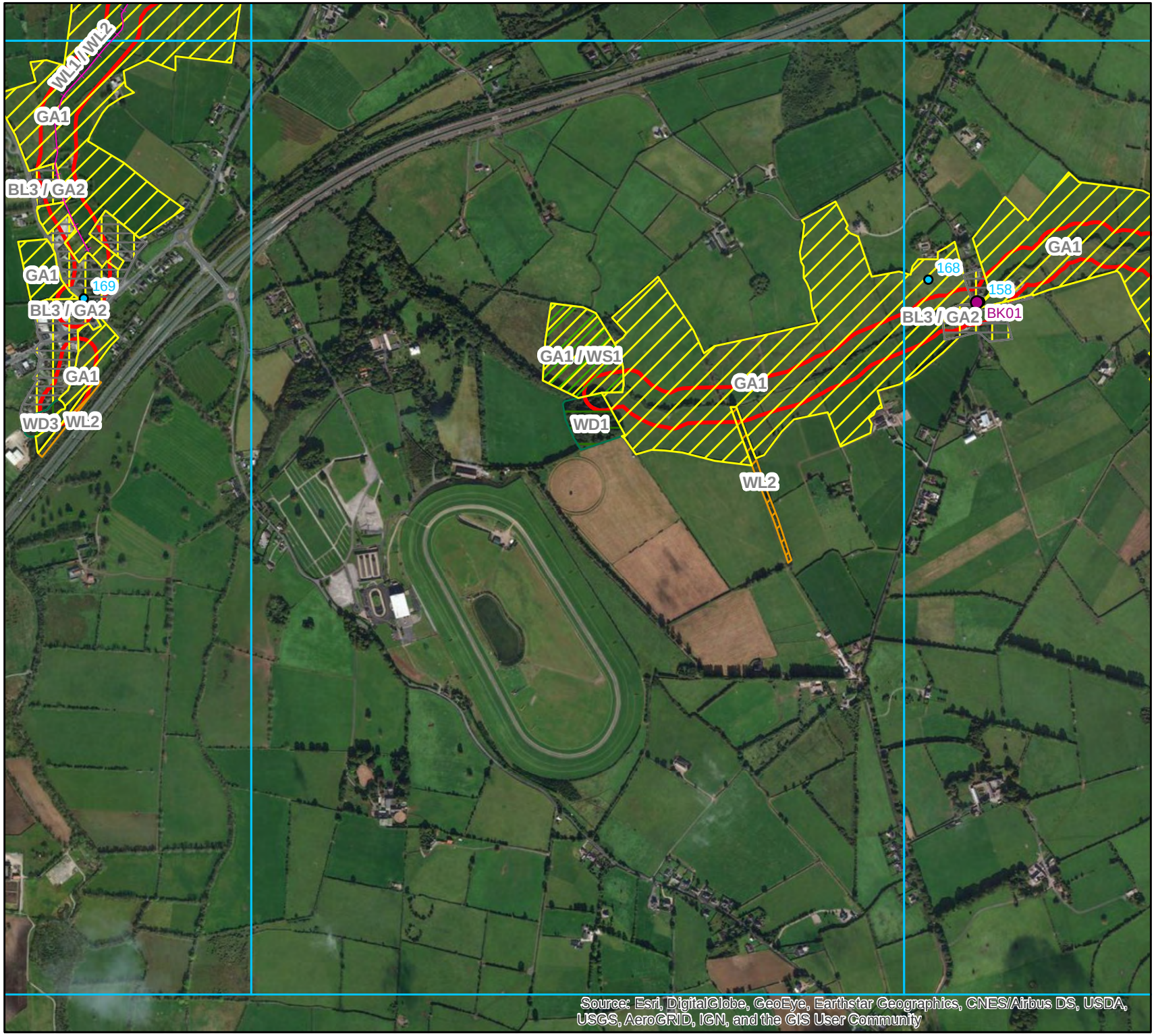

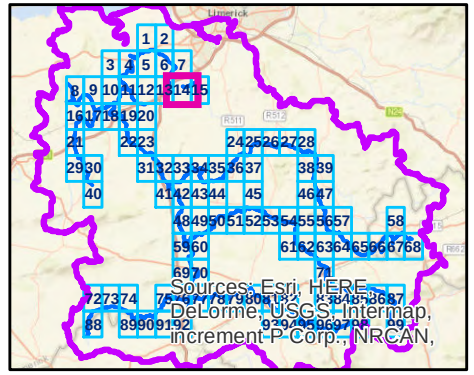

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
GA1 (Improved agricultural grassland)
GA1 / WS1 (Improved agricultural grassland / Scrub)
WD1 (Mixed) broadleaved woodland
WD3 ((Mixed) conifer woodland)
WL2 (Treelines)
RHAT Survey Point
Survey Note

0 300 600 Meters

Map area: 14

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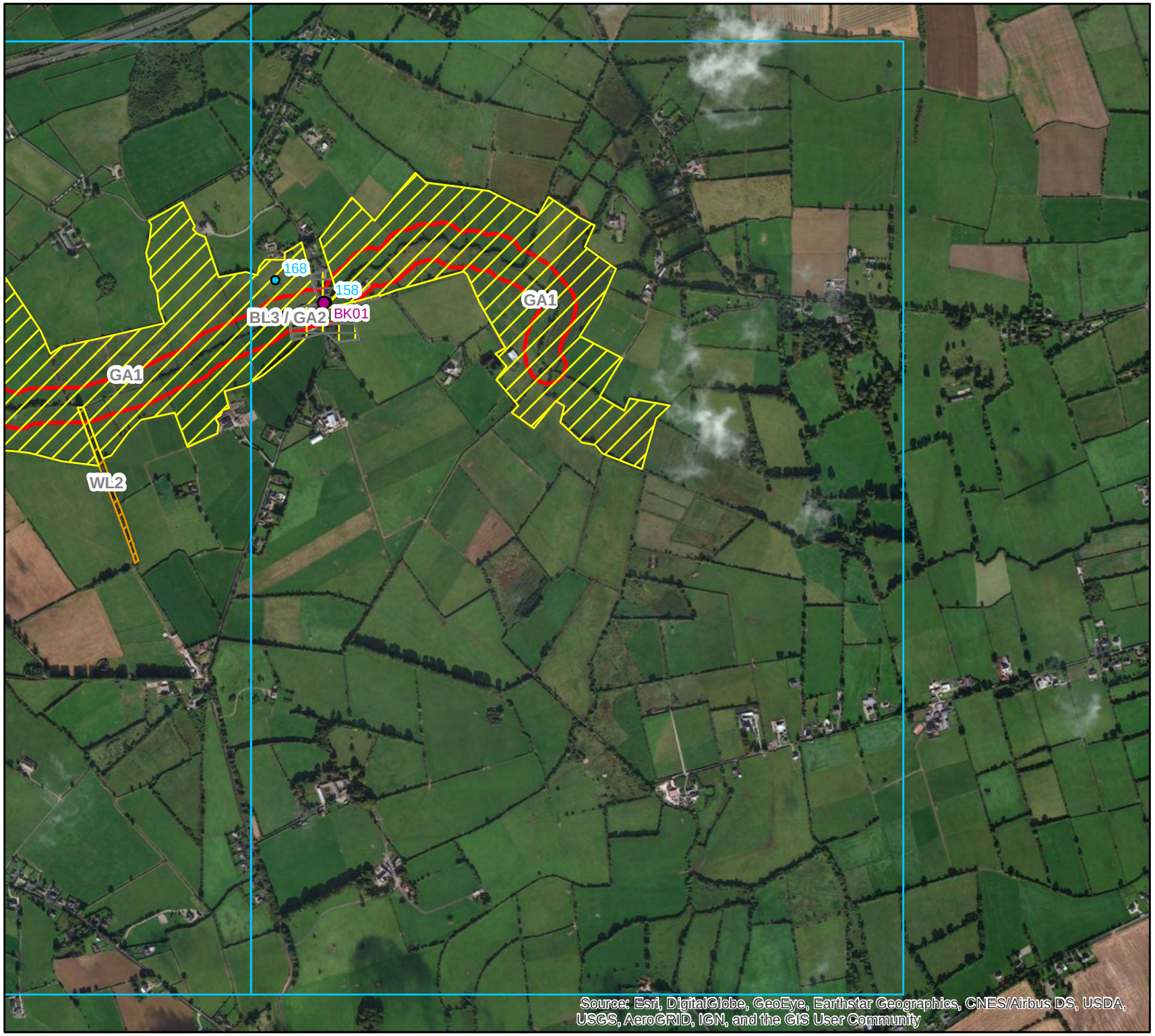

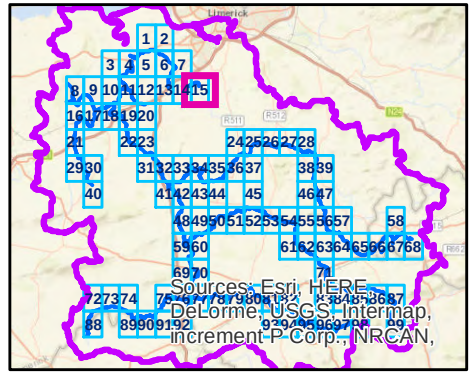

- General Study Area
- MaigueRivers_50mBuffer
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- WL2 (Treelines)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 15

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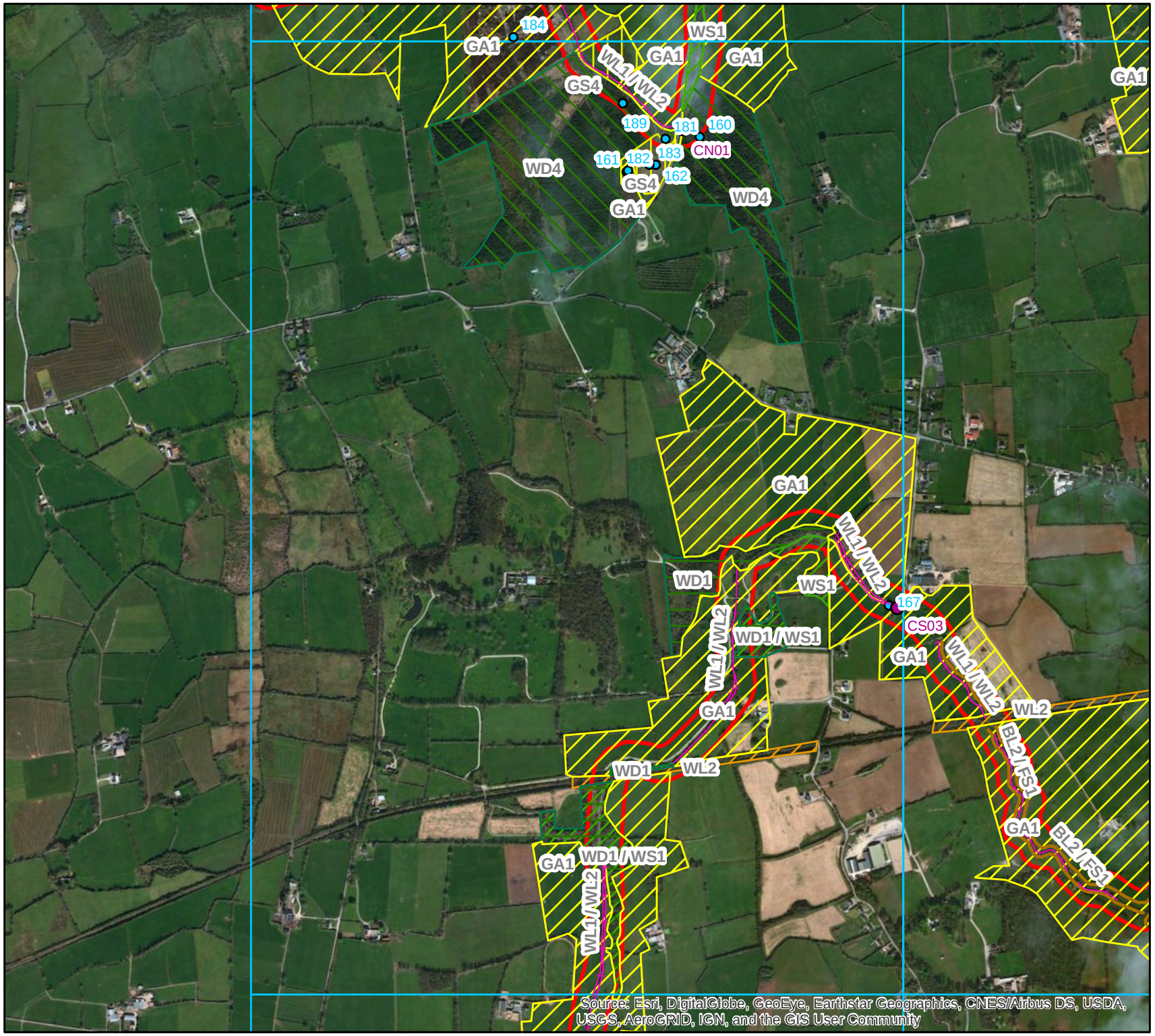

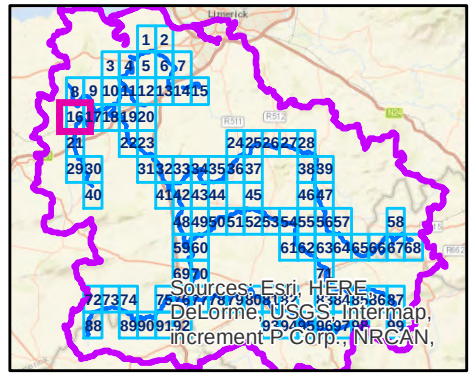

- General Study Area
- MaigueRivers_50mBuffer
- BL2 / FS1 (Earth banks / Reed and large sedge swamps)
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GS4 (Wet grassland)
- WD1 (Mixed) broadleaved woodland
- WD1 / WS1 ((Mixed) braodleaved woodland / Scrub)
- WD4 (Conifer plantation)
- WL2 (Treelines)
- WS1 (Scrub)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 16

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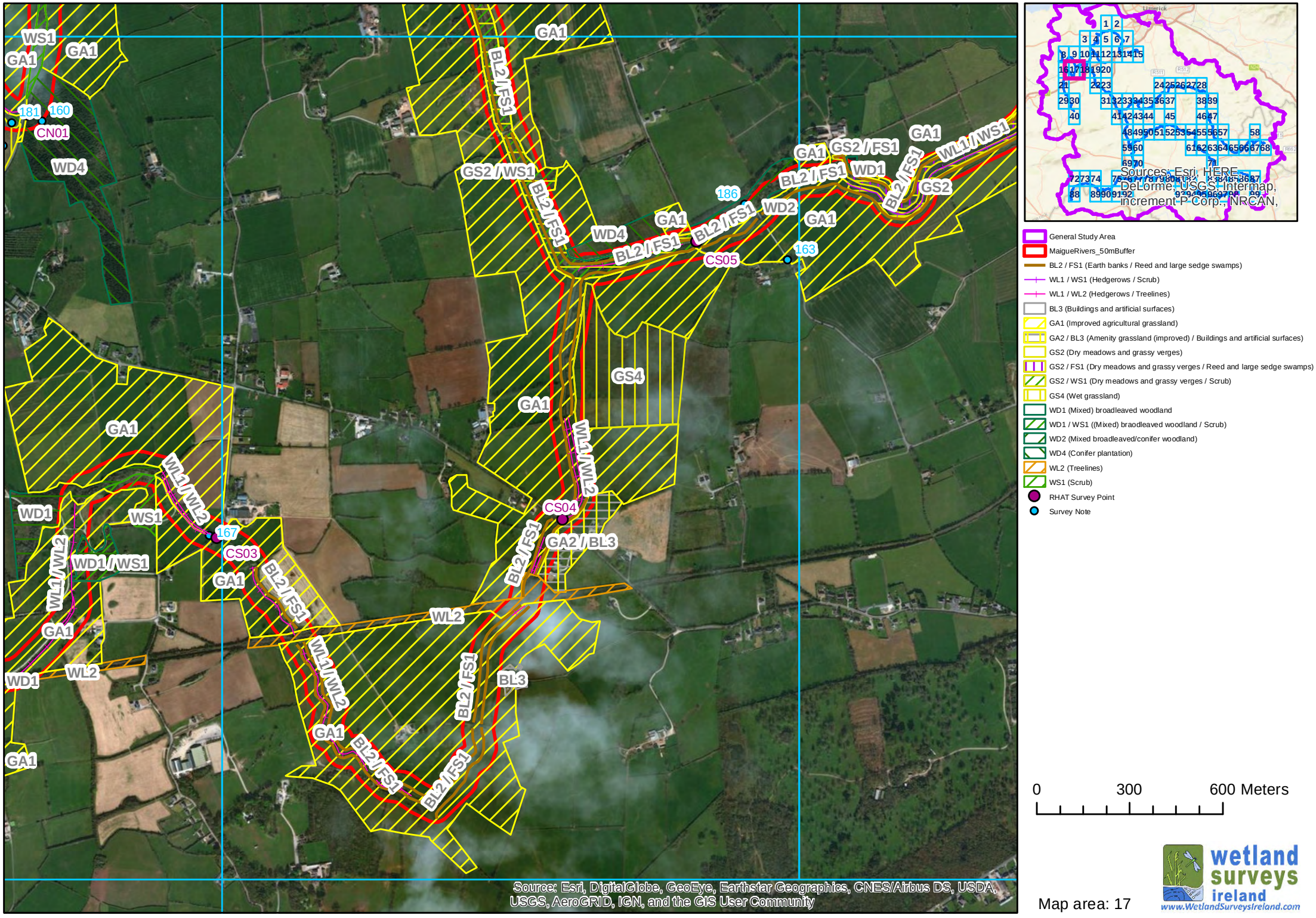
WS1
GA1
GA1
181
160
CN01
WD4
GA1
BL2 / FS1
GS2 / WS1
BL2 / FS1
WD4
GA1
BL2 / FS1
BL2 / FS1
CS05
186
WD2
GA1
GA1
GS2 / FS1
WD1
BL2 / FS1
GS2
GA1
WL1 / WS1
163
GS4
GA1
GA1
WL1 / WL2
WD1
WS1
WL1 / WL2
167
CS03
WD1 / WS1
WL1 / WL2
GA1
GA1
BL2 / FS1
WL2
CS04
GA2 / BL3
BL2 / FS1
WL1 / WL2
BL2 / FS1
BL3
WD1
WL2
GA1
GA1
BL2 / FS1
BL2 / FS1
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN,
General Study Area
MaigueRivers_50mBuffer
BL2 / FS1 (Earth banks / Reed and large sedge swamps)
WL1 / WS1 (Hedgerows / Scrub)
WL1 / WL2 (Hedgerows / Treelines)
BL3 (Buildings and artificial surfaces)
GA1 (Improved agricultural grassland)
GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
GS2 (Dry meadows and grassy verges)
GS2 / FS1 (Dry meadows and grassy verges / Reed and large sedge swamps)
GS2 / WS1 (Dry meadows and grassy verges / Scrub)
GS4 (Wet grassland)
WD1 (Mixed) broadleaved woodland
WD1 / WS1 ((Mixed) braodleaved woodland / Scrub)
WD2 (Mixed broadleaved/conifer woodland)
WD4 (Conifer plantation)
WL2 (Treelines)
WS1 (Scrub)
RHAT Survey Point
Survey Note
0
300
600 Meters
Map area: 17
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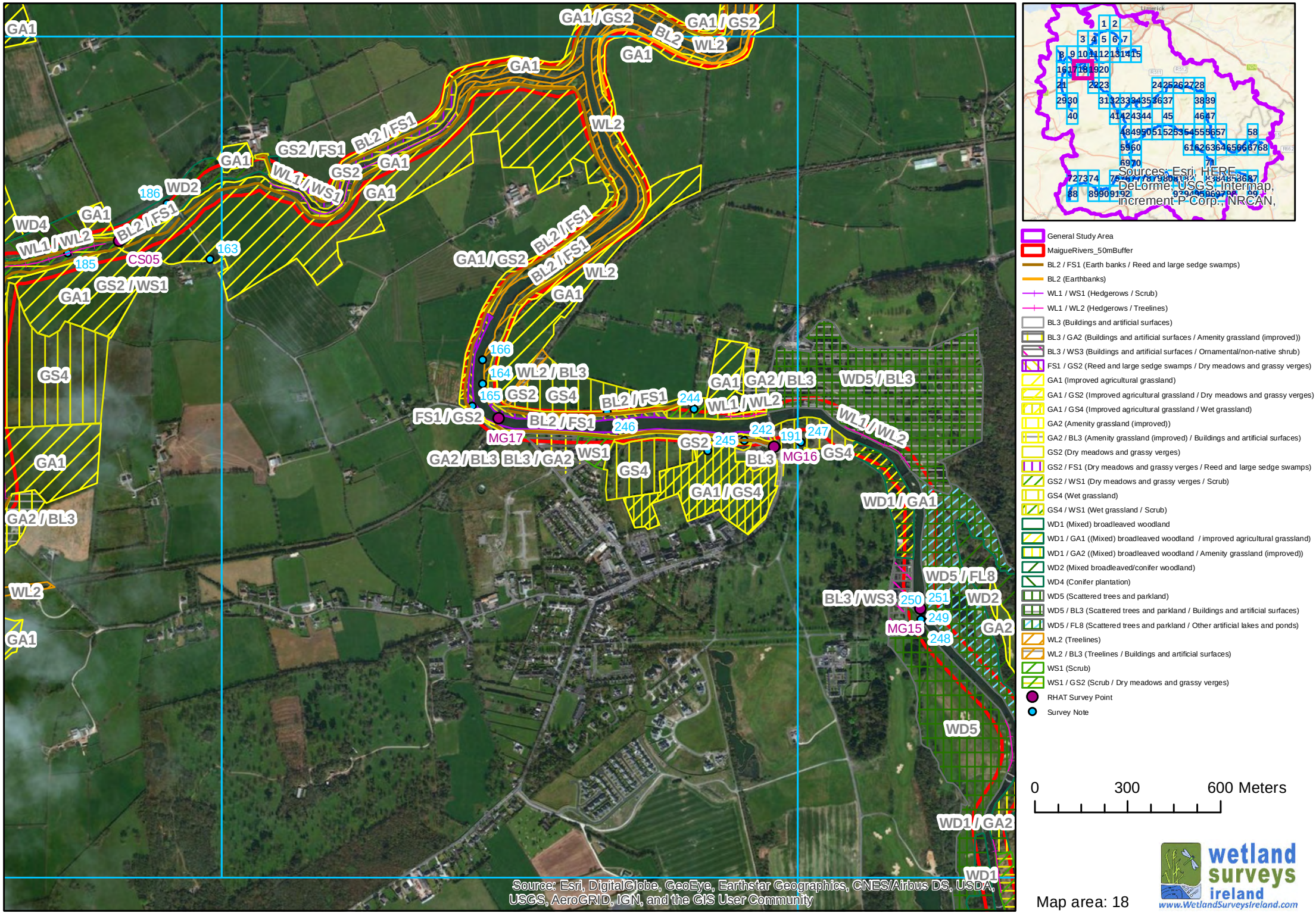
GA1
GA1 / GS2
GA1 / GS2
BL2
WL2
GA1
GA1
WL2
BL2 / FS1
GS2 / FS1
GA1
GS2
GA1
WL1 / WS1
GA1
186
WD2
WD4
GA1
WL1 / WL2
BL2 / FS1
185
CS05
163
GS2 / WS1
GA1
GS4
GA1
GA2 / BL3
WL2
GA1
GA1 / GS2
BL2 / FS1
BL2 / FS1
WL2
GA1
166
164
165
WL2 / BL3
GS2
GS4
FS1 / GS2
BL2 / FS1
BL2 / FS1
244
246
MG17
GA1
GA2 / BL3
WD5 / BL3
WL1 / WL2
WL1 / WL2
242
191
247
GS2
245
BL3
MG16
GS4
GA2 / BL3
BL3 / GA2
WS1
GS4
GA1 / GS4
WD1 / GA1
WD5 / FL8
BL3 / WS3
250
251
WD2
249
MG15
248
GA2
WL2
GA1
WD5
WD1 / GA2
WD1
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN,
General Study Area
MaigueRivers_50mBuffer
BL2 / FS1 (Earth banks / Reed and large sedge swamps)
BL2 (Earthbanks)
WL1 / WS1 (Hedgerows / Scrub)
WL1 / WL2 (Hedgerows / Treelines)
BL3 (Buildings and artificial surfaces)
BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
BL3 / WS3 (Buildings and artificial surfaces / Ornamental/non-native shrub)
FS1 / GS2 (Reed and large sedge swamps / Dry meadows and grassy verges)
GA1 (Improved agricultural grassland)
GA1 / GS2 (Improved agricultural grassland / Dry meadows and grassy verges)
GA1 / GS4 (Improved agricultural grassland / Wet grassland)
GA2 (Amenity grassland (improved))
GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
GS2 (Dry meadows and grassy verges)
GS2 / FS1 (Dry meadows and grassy verges / Reed and large sedge swamps)
GS2 / WS1 (Dry meadows and grassy verges / Scrub)
GS4 (Wet grassland)
GS4 / WS1 (Wet grassland / Scrub)
WD1 (Mixed) broadleaved woodland
WD1 / GA1 ((Mixed) broadleaved woodland / improved agricultural grassland)
WD1 / GA2 ((Mixed) broadleaved woodland / Amenity grassland (improved))
WD2 (Mixed broadleaved/conifer woodland)
WD4 (Conifer plantation)
WD5 (Scattered trees and parkland)
WD5 / BL3 (Scattered trees and parkland / Buildings and artificial surfaces)
WD5 / FL8 (Scattered trees and parkland / Other artificial lakes and ponds)
WL2 (Treelines)
WL2 / BL3 (Treelines / Buildings and artificial surfaces)
WS1 (Scrub)
WS1 / GS2 (Scrub / Dry meadows and grassy verges)
RHAT Survey Point
Survey Note
0
300
600 Meters
Map area: 18
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WL2
GA1 / GS2
WL2
BL2
GA1
BL2 / FS1
BL2 / FS1
WL2
GA1
GS4
GS4
GA1
BL3
237
240
239
GA1
GA1
238
GA1
WD1
GA1
GA1
GA1
BL3
BL3
GA1
GA1
GS4
BL2 / FS1
GA1
GA2 / BL3
WD5 / BL3
244
241
GS2
GS4
WL1 / WL2
246
BL2 / FS1
191
247
GA2 / BL3
GS2
245
242
MG16
GS4
BL3
GA1 / GS4
WD1 / GA1
BL3 / WS3
250
251
249
MG15
248
WD5 / FL8
GA2
WD2
252
WD5
WL1 / WL2
WD1 / GA2
WL1 / WL2
WD1
WS1 / GS2
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN,
General Study Area
MaigueRivers_50mBuffer
BL2 / FS1 (Earth banks / Reed and large sedge swamps)
BL2 (Earthbanks)
WL1 / WL2 (Hedgerows / Treelines)
BL3 (Buildings and artificial surfaces)
BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
BL3 / WS3 (Buildings and artificial surfaces / Ornamental/non-native shrub)
FS1 / GS2 (Reed and large sedge swamps / Dry meadows and grassy verges)
GA1 (Improved agricultural grassland)
GA1 / GS2 (Improved agricultural grassland / Dry meadows and grassy verges)
GA1 / GS4 (Improved agricultural grassland / Wet grassland)
GA2 (Amenity grassland (improved))
GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
GS2 (Dry meadows and grassy verges)
GS4 (Wet grassland)
GS4 / WS1 (Wet grassland / Scrub)
WD1 (Mixed) broadleaved woodland
WD1 / GA1 ((Mixed) broadleaved woodland / improved agricultural grassland)
WD1 / GA2 ((Mixed) broadleaved woodland / Amenity grassland (improved))
WD2 (Mixed broadleaved/conifer woodland)
WD5 (Scattered trees and parkland)
WD5 / BL3 (Scattered trees and parkland / Buildings and artificial surfaces)
WD5 / FL8 (Scattered trees and parkland / Other artificial lakes and ponds)
WL2 (Treelines)
WS1 (Scrub)
WS1 / GS2 (Scrub / Dry meadows and grassy verges)
RHAT Survey Point
Survey Note
0
300
600 Meters
Map area: 19
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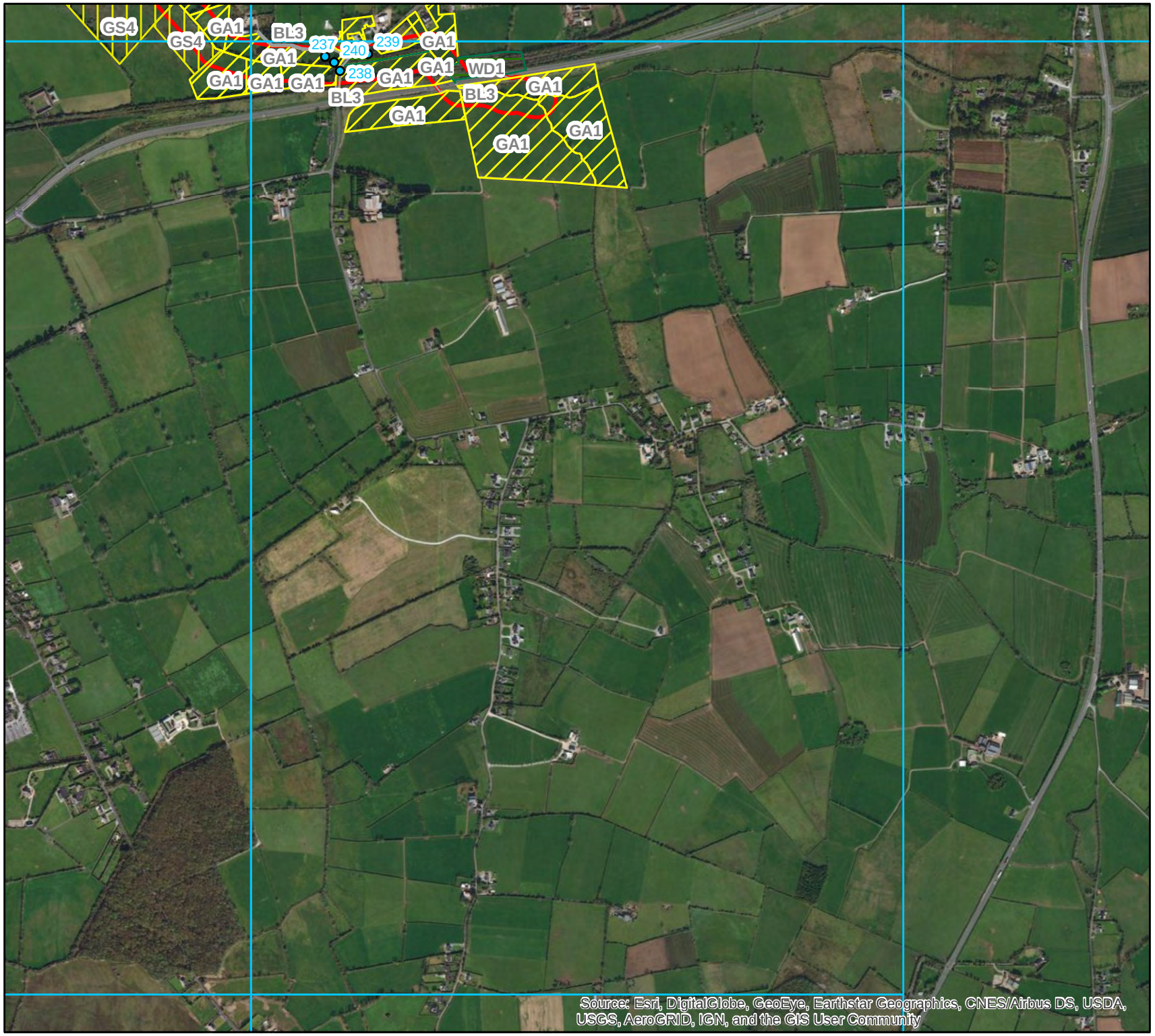

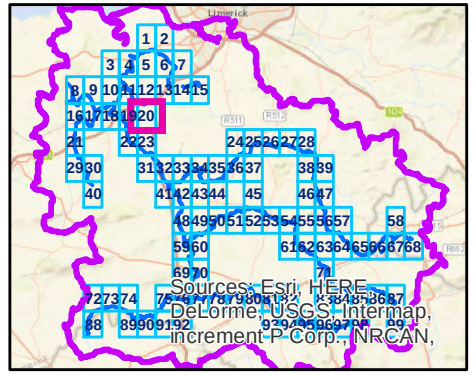

General Study Area
MaigueRivers_50mBuffer
BL3 (Buildings and artificial surfaces)
GA1 (Improved agricultural grassland)
GS4 (Wet grassland)
WD1 (Mixed) broadleaved woodland
Survey Note

0 300 600 Meters

Map area: 20

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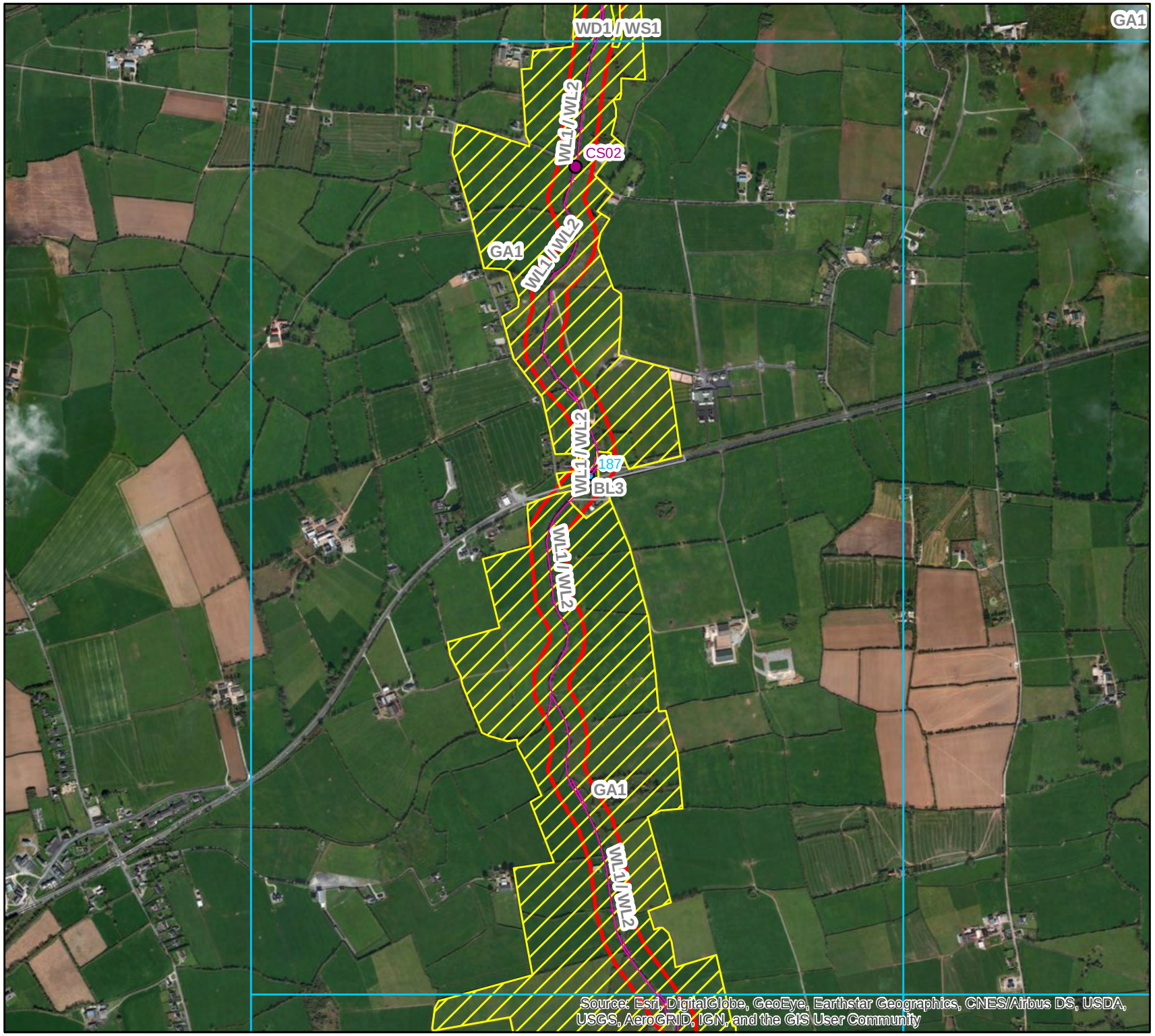

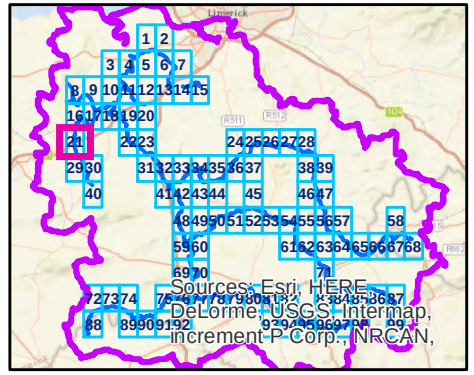

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
BL3 (Buildings and artificial surfaces)
GA1 (Improved agricultural grassland)
WD1 / WS1 ((Mixed) braodleaved woodland / Scrub)
RHAT Survey Point
Survey Note

0 300 600 Meters

Map area: 21

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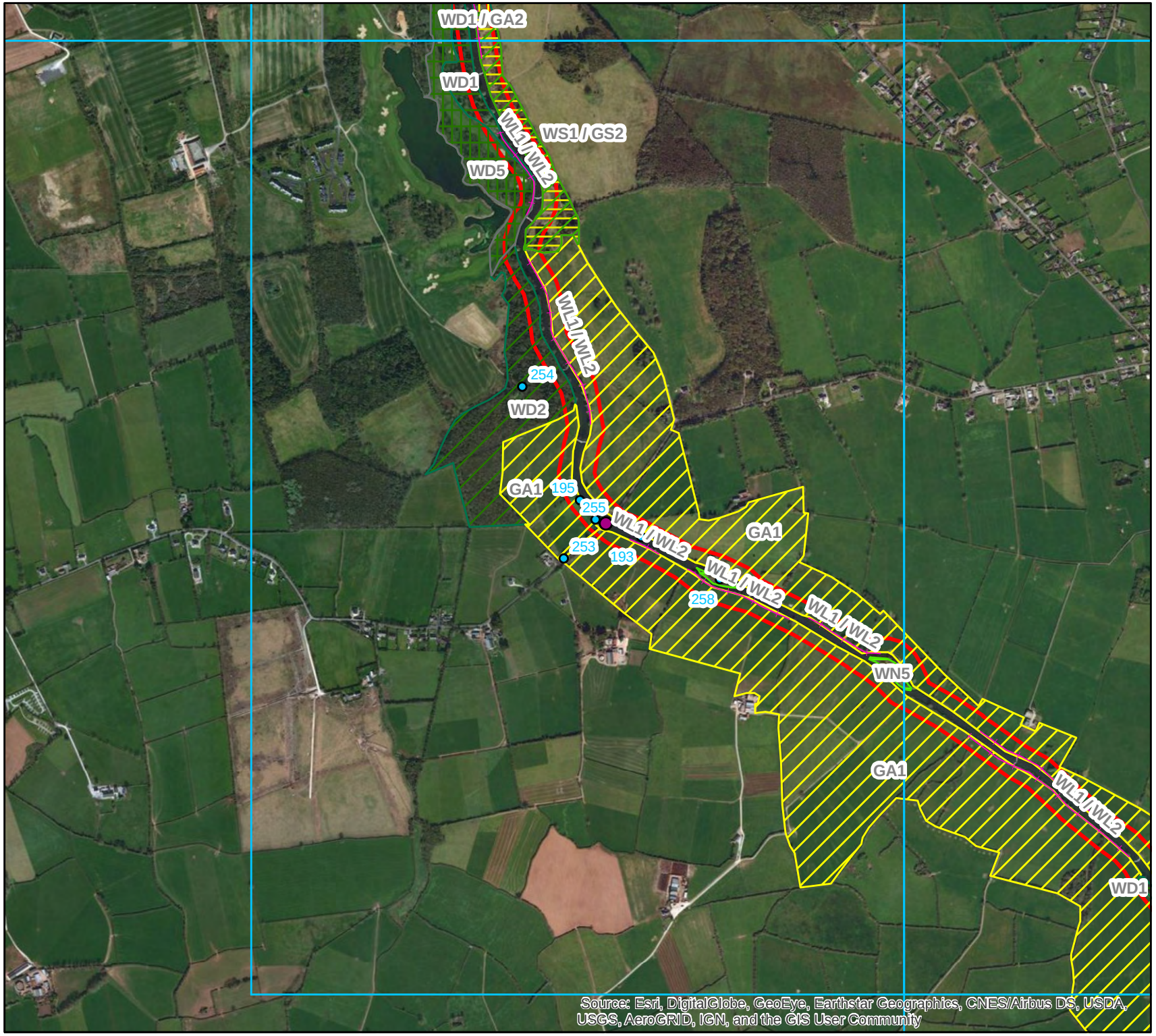

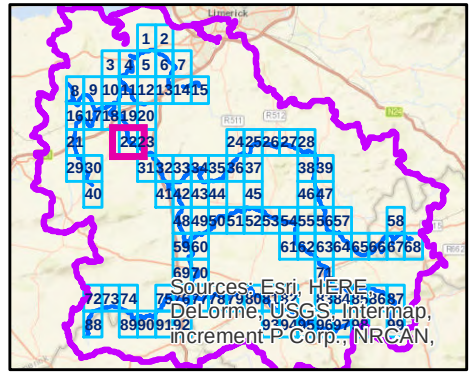

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- WD1 (Mixed) broadleaved woodland
- WD1 / GA2 ((Mixed) broadleaved woodland / Amenity grassland (improved))
- WD2 (Mixed broadleaved/conifer woodland)
- WD5 (Scattered trees and parkland)
- WN5 (Riparian woodland)
- WS1 / GS2 (Scrub / Dry meadows and grassy verges)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 22

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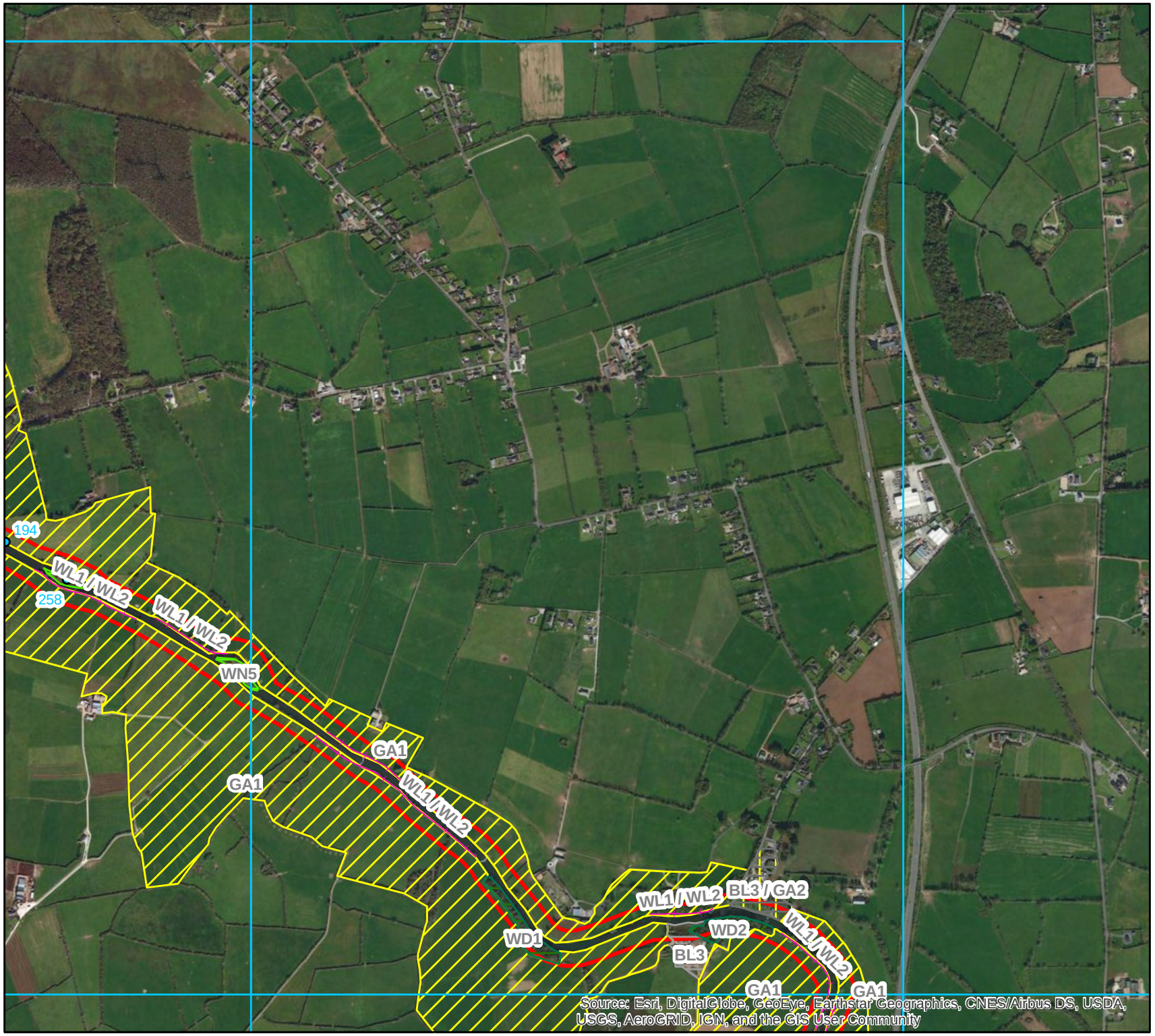

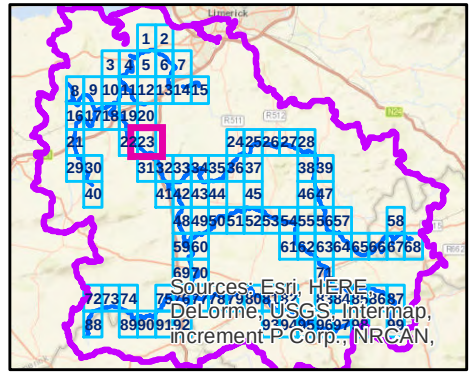

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- WD1 (Mixed) broadleaved woodland
- WD2 (Mixed broadleaved/conifer woodland)
- WN5 (Riparian woodland)
- Survey Note

0 300 600 Meters

Map area: 23

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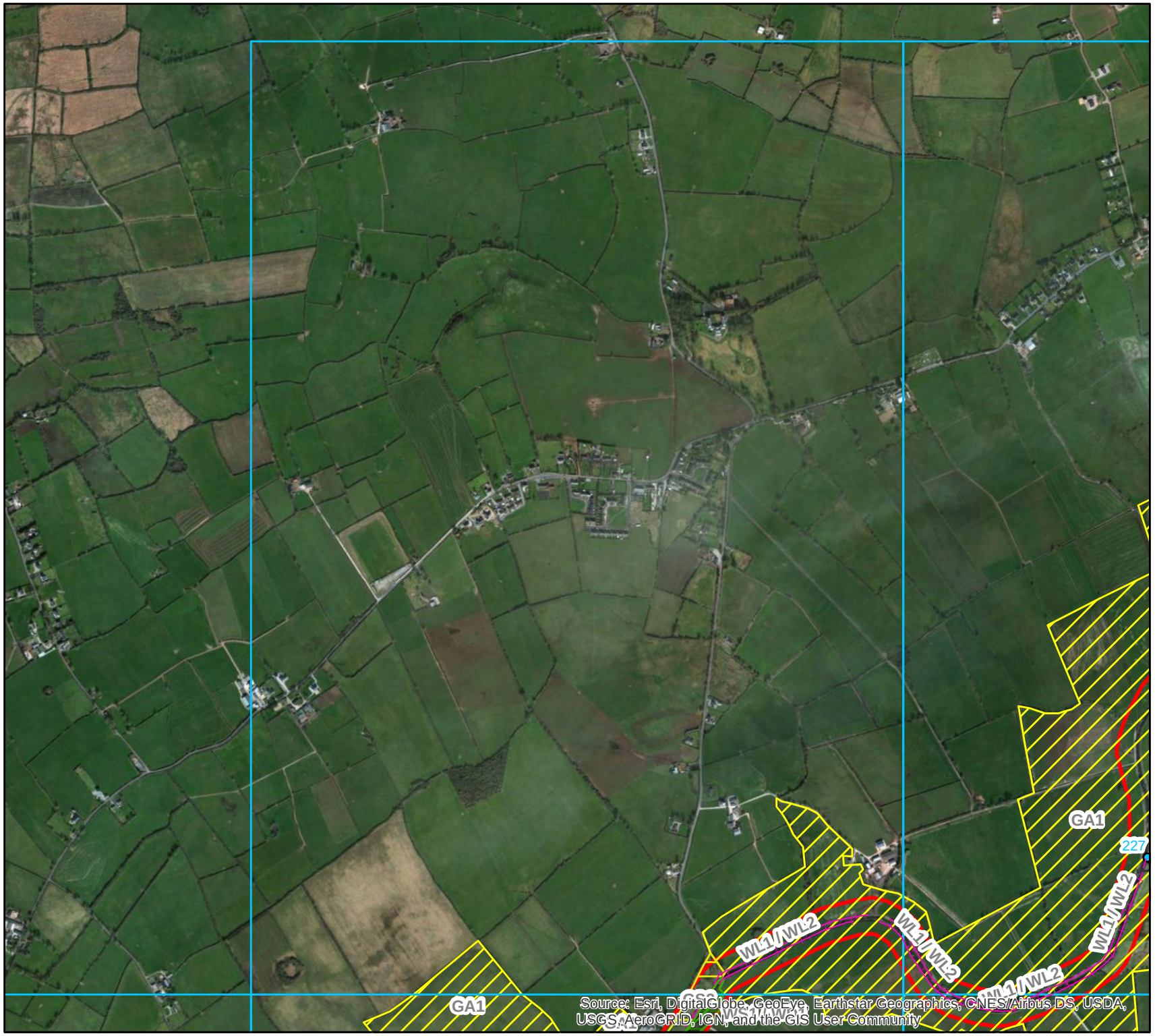

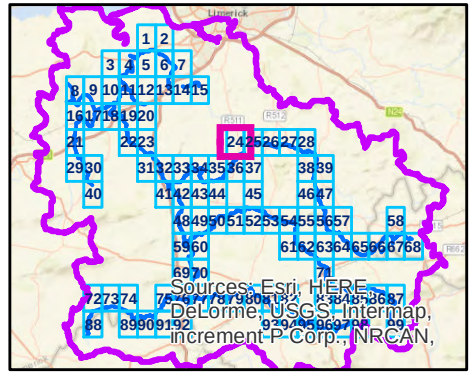

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
GA1 (Improved agricultural grassland)
GS2 (Dry meadows and grassy verges)
WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
Survey Note

0 300 600 Meters

Map area: 24

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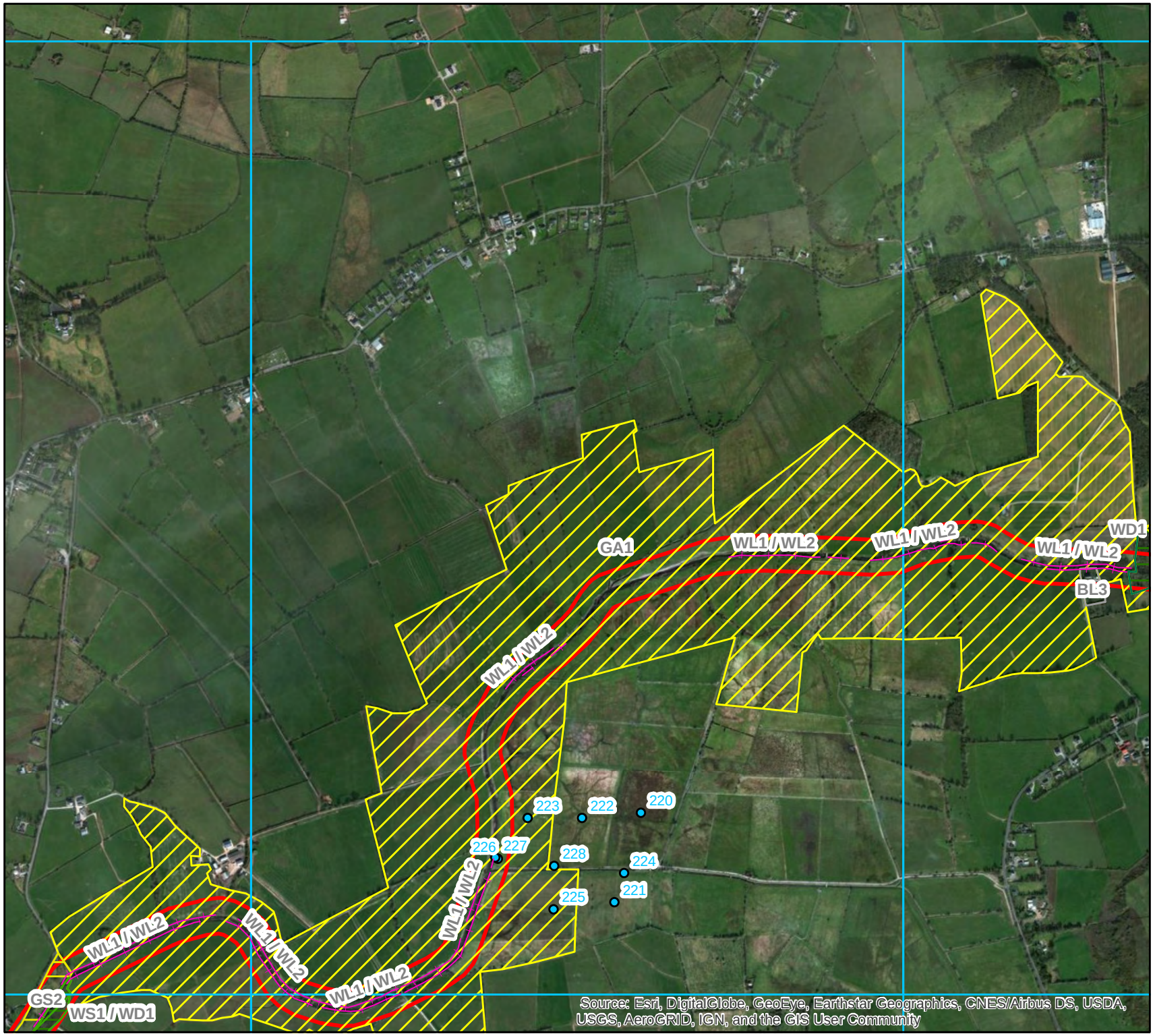

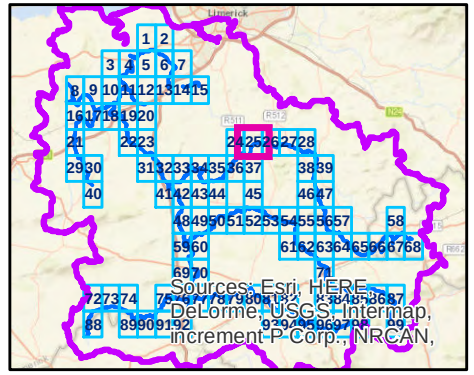

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- GA1 (Improved agricultural grassland)
- GS2 (Dry meadows and grassy verges)
- WD1 (Mixed) broadleaved woodland
- WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
- Survey Note

0 300 600 Meters

Map area: 25

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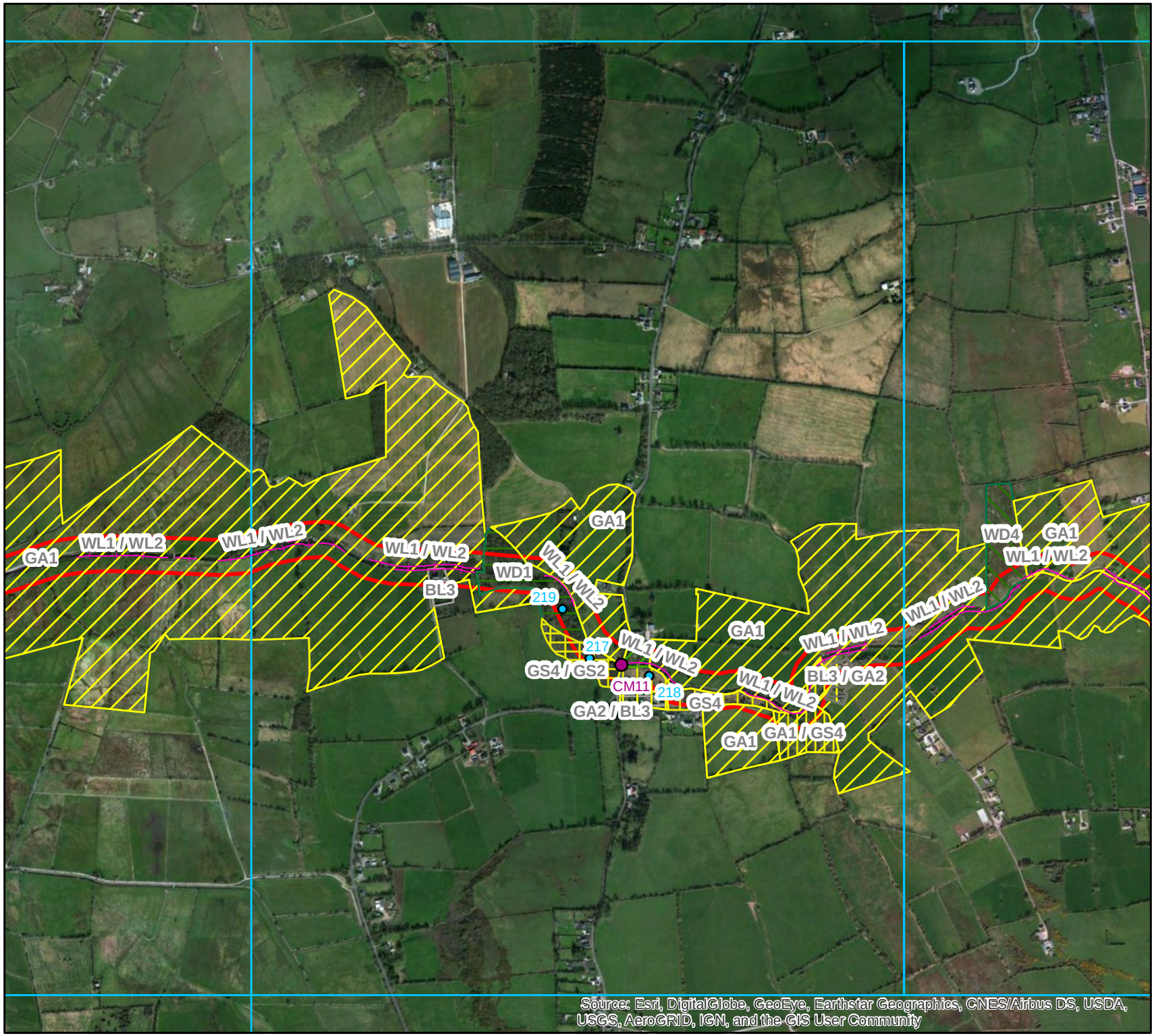

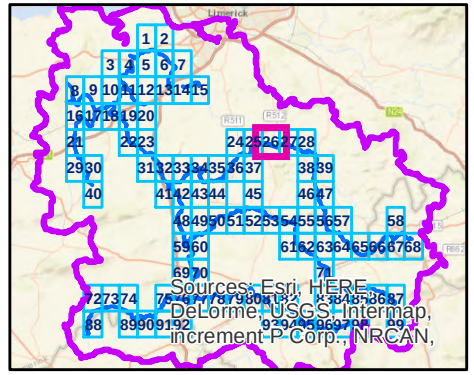

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
BL3 (Buildings and artificial surfaces)
BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
GA1 (Improved agricultural grassland)
GA1 / GS4 (Improved agricultural grassland / Wet grassland)
GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
GS4 (Wet grassland)
GS4 / GS2 (Wet grassland / Dry meadows and grassy verges)
WD1 (Mixed) broadleaved woodland
WD4 (Conifer plantation)
WS1 (Scrub)
RHAT Survey Point
Survey Note

0 300 600 Meters

Map area: 26

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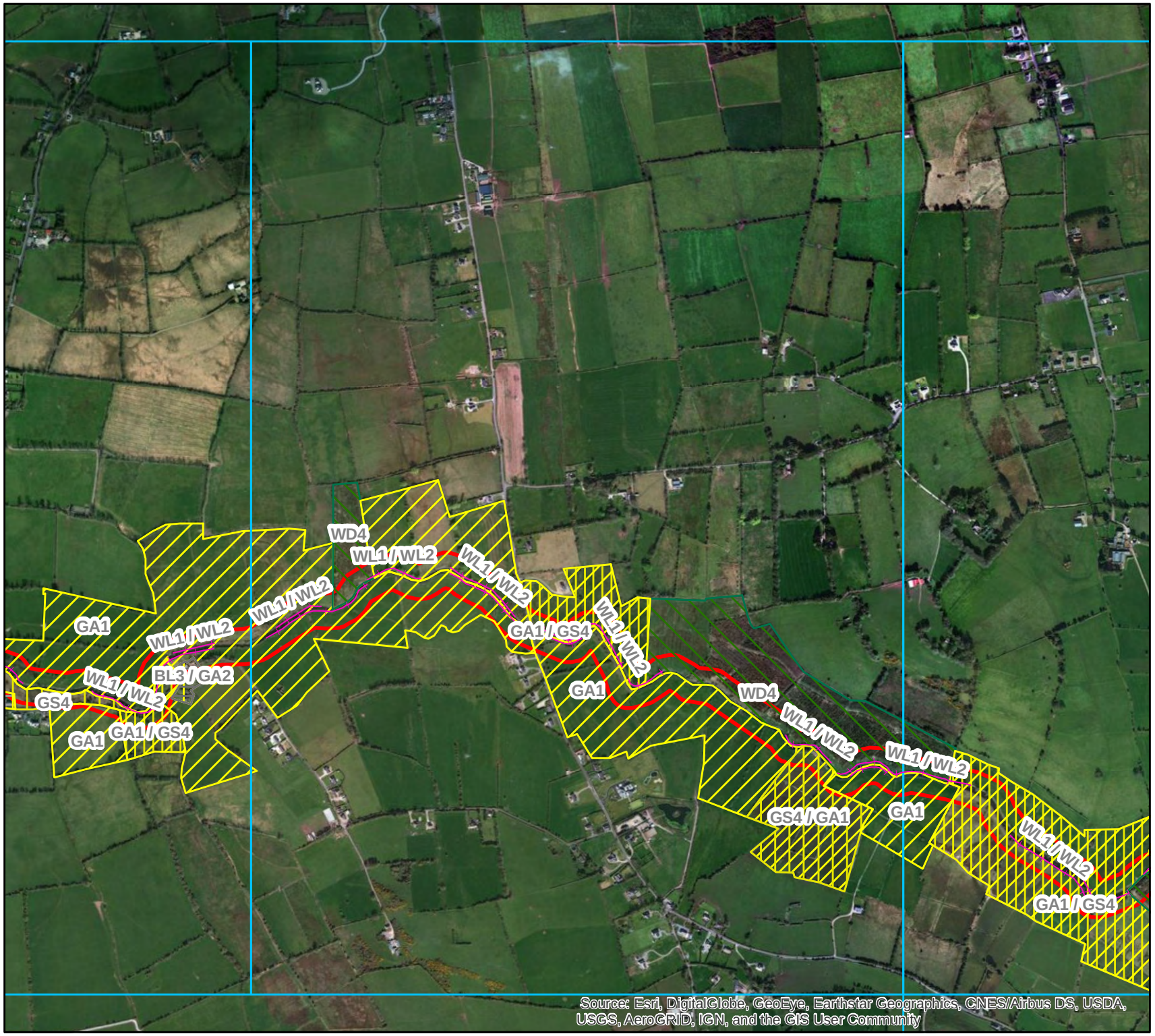

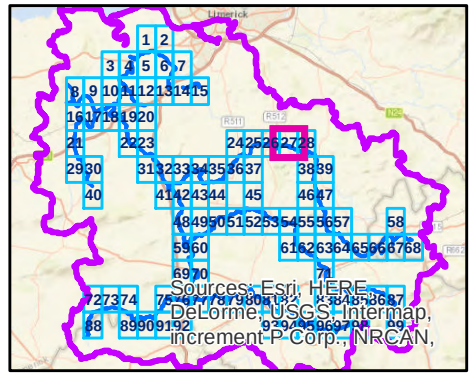

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS4 (Wet grassland)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- WD4 (Conifer plantation)

0 300 600 Meters

Map area: 27

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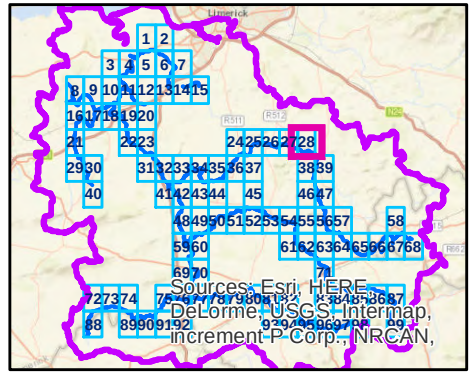

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
GA1 (Improved agricultural grassland)
GA1 / GS4 (Improved agricultural grassland / Wet grassland)
GS4 / GA1 (Wet grassland / Improved agricultural grassland)
WD4 (Conifer plantation)

0 300 600 Meters

Map area: 28

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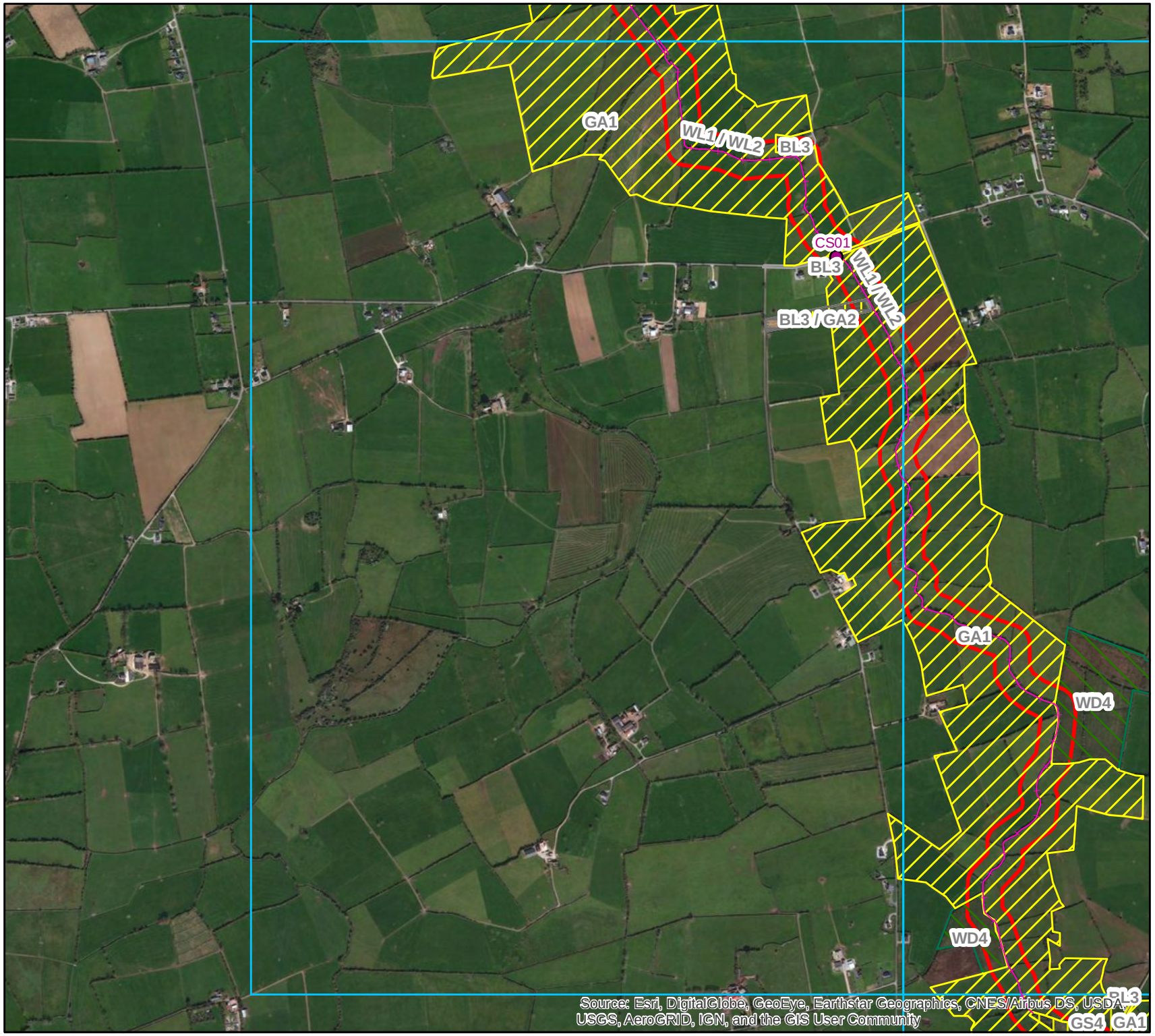

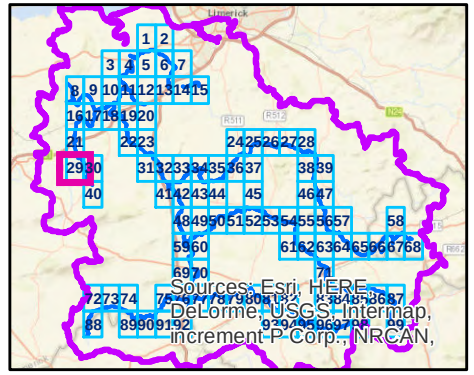

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- RHAT Survey Point

0 300 600 Meters

Map area: 29

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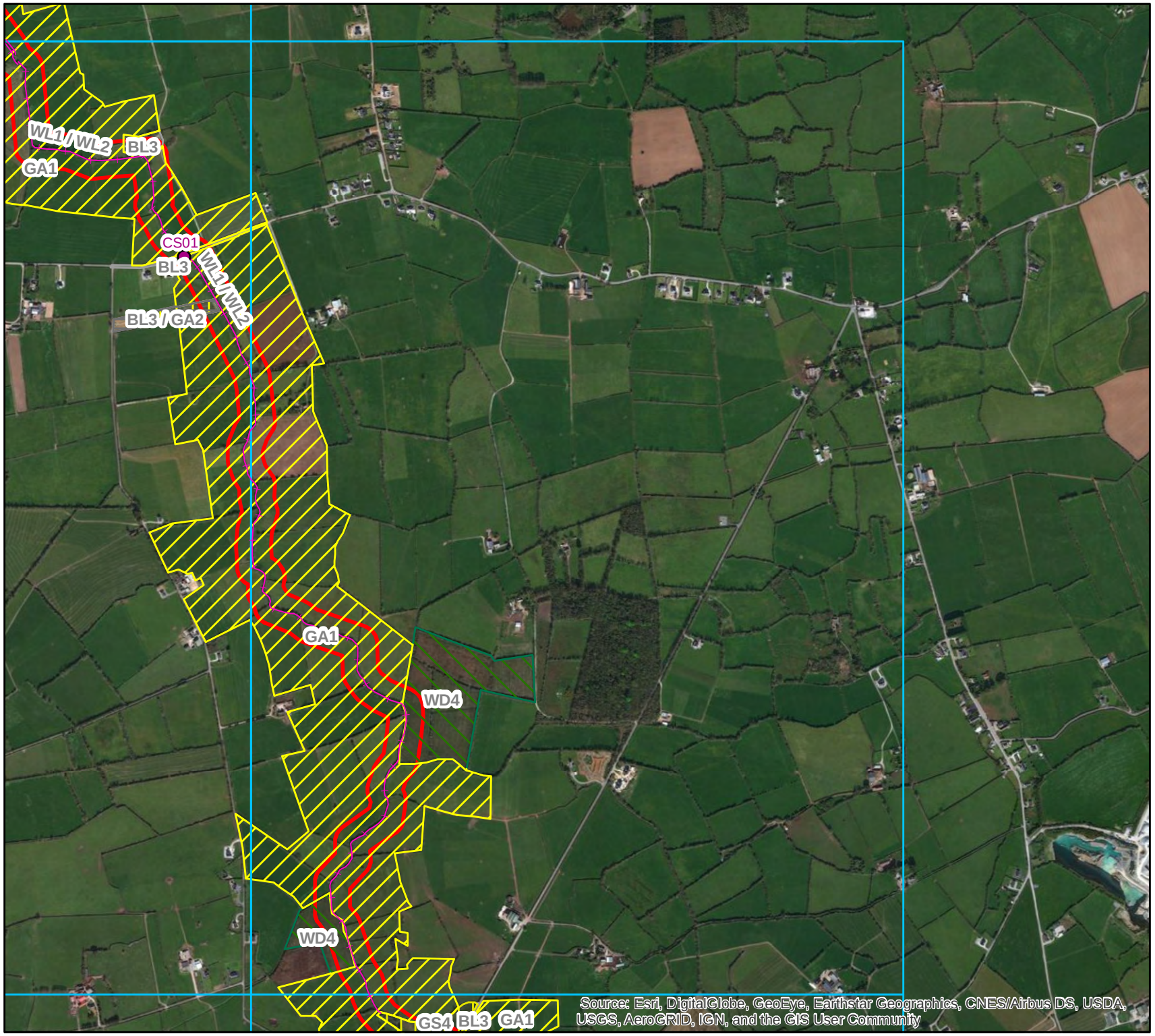

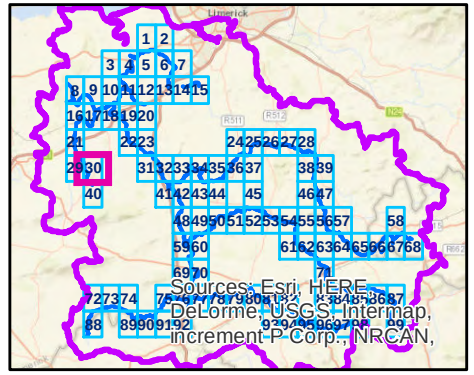

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- RHAT Survey Point

0 300 600 Meters

Map area: 30

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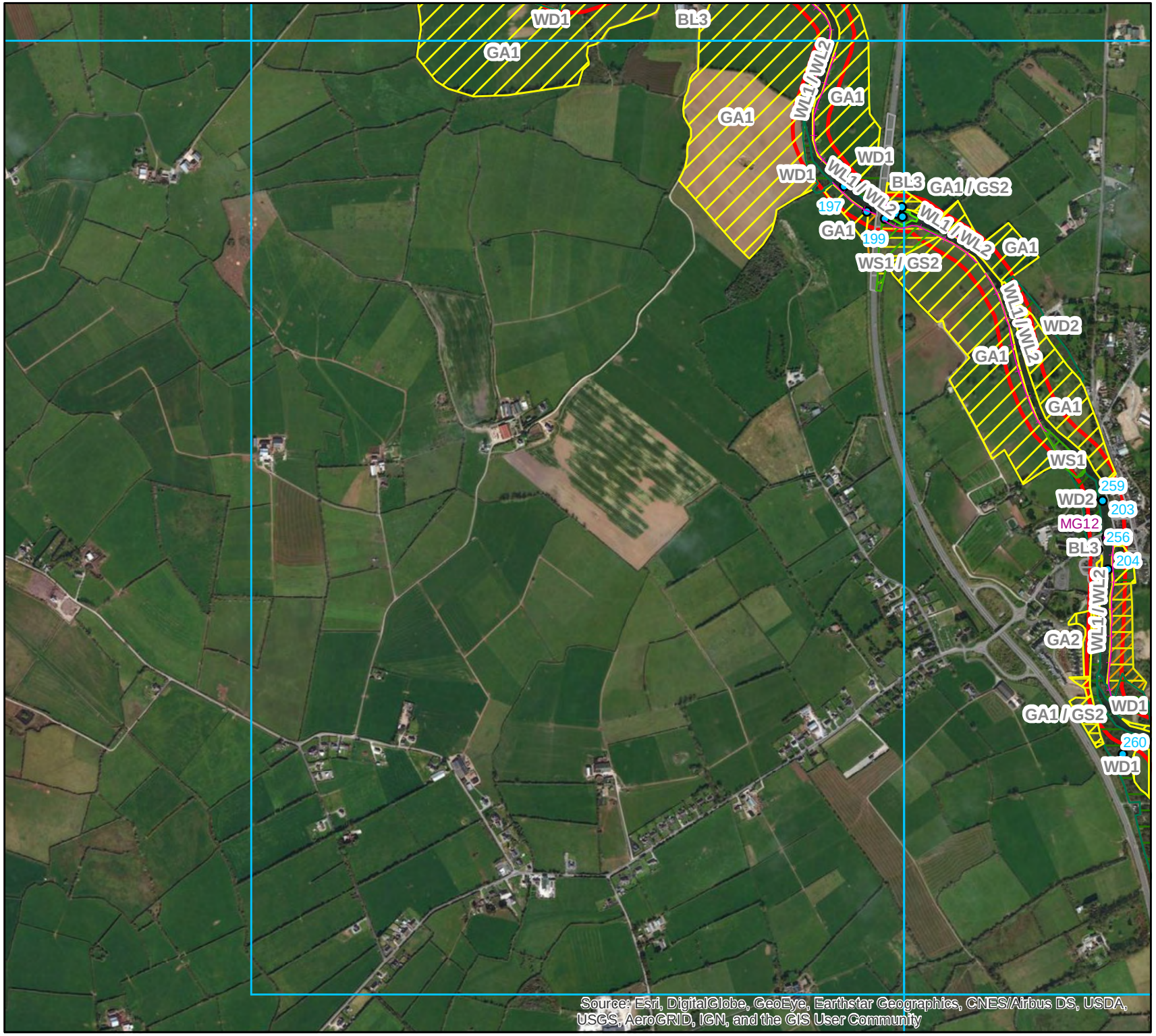

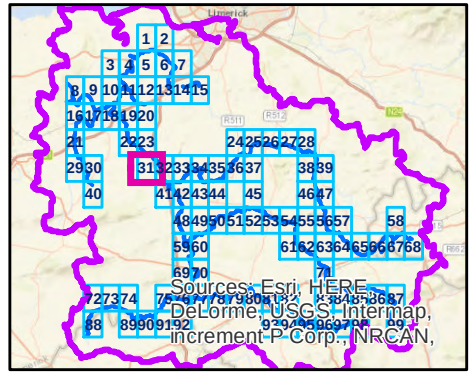

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- GA1 (Improved agricultural grassland)
- GA1 / GS2 (Improved agricultural grassland / Dry meadows and grassy verges)
- GA1 / WD1 (Improved agricultural grassland / (Mixed) broadleaved woodland)
- GA2 (Amenity grassland (improved))
- GA2 / WL2 (Amenity grassland (improved) / Treelines)
- GS2 / WL2 (Dry meadows and grassy verges / Treelines)
- WD1 (Mixed) broadleaved woodland
- WD2 (Mixed broadleaved/conifer woodland)
- WL2 (Treelines)
- WN5 (Riparian woodland)
- WS1 (Scrub)
- WS1 / GS2 (Scrub / Dry meadows and grassy verges)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 31

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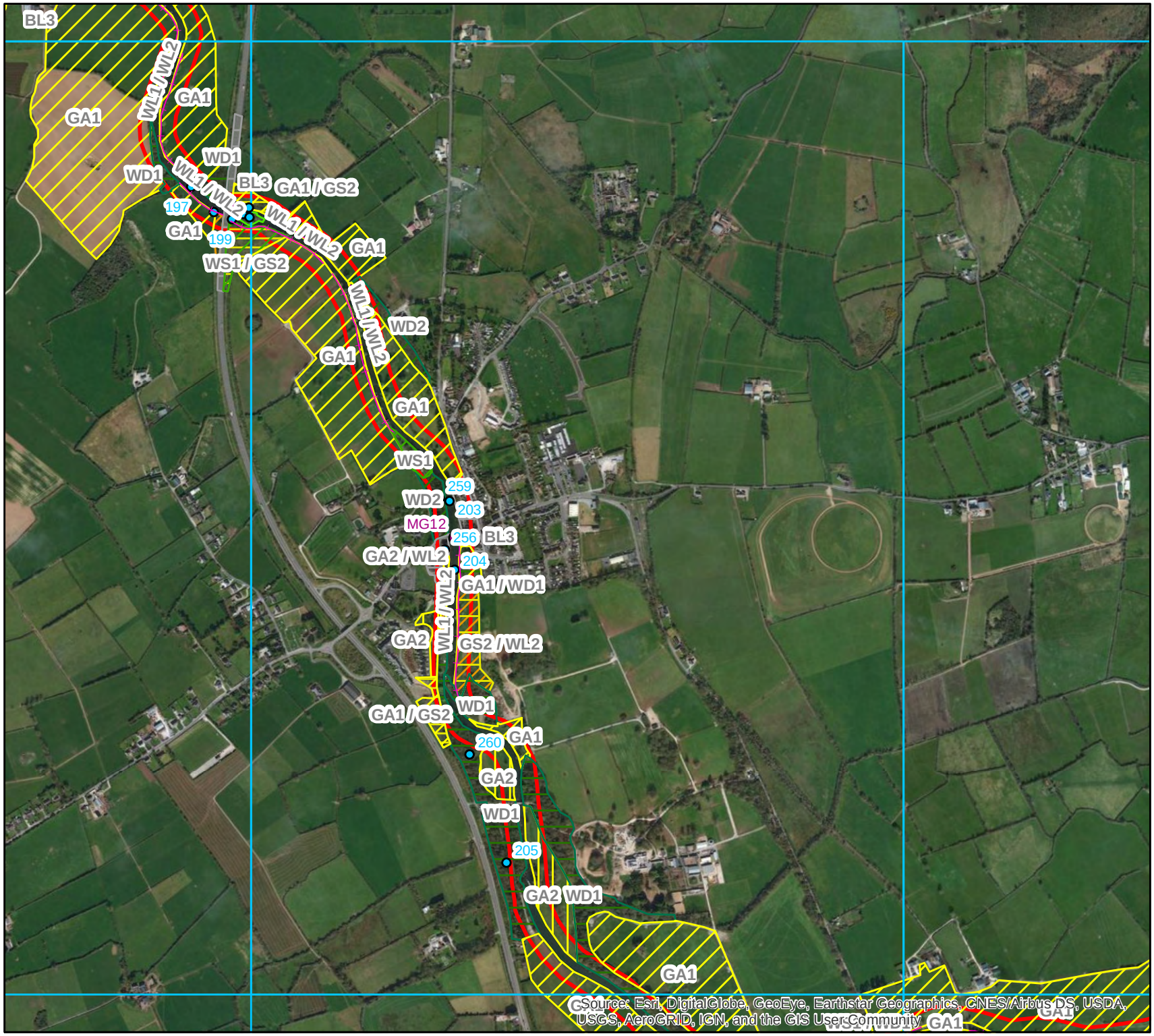

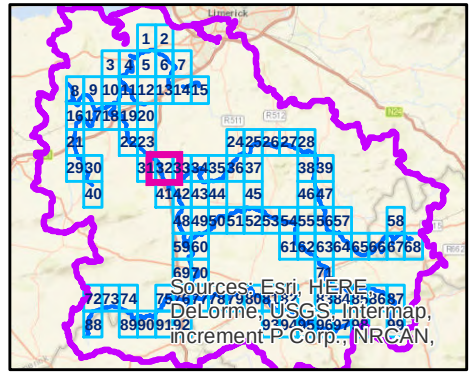

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- GA1 (Improved agricultural grassland)
- GA1 / GS2 (Improved agricultural grassland / Dry meadows and grassy verges)
- GA1 / WD1 (Improved agricultural grassland / (Mixed) broadleaved woodland)
- GA2 (Amenity grassland (improved))
- GA2 / WL2 (Amenity grassland (improved) / Treelines)
- GS2 / WL2 (Dry meadows and grassy verges / Treelines)
- WD1 (Mixed) broadleaved woodland
- WD2 (Mixed broadleaved/conifer woodland)
- WL2 (Treelines)
- WN5 (Riparian woodland)
- WS1 (Scrub)
- WS1 / GS2 (Scrub / Dry meadows and grassy verges)
- WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 32

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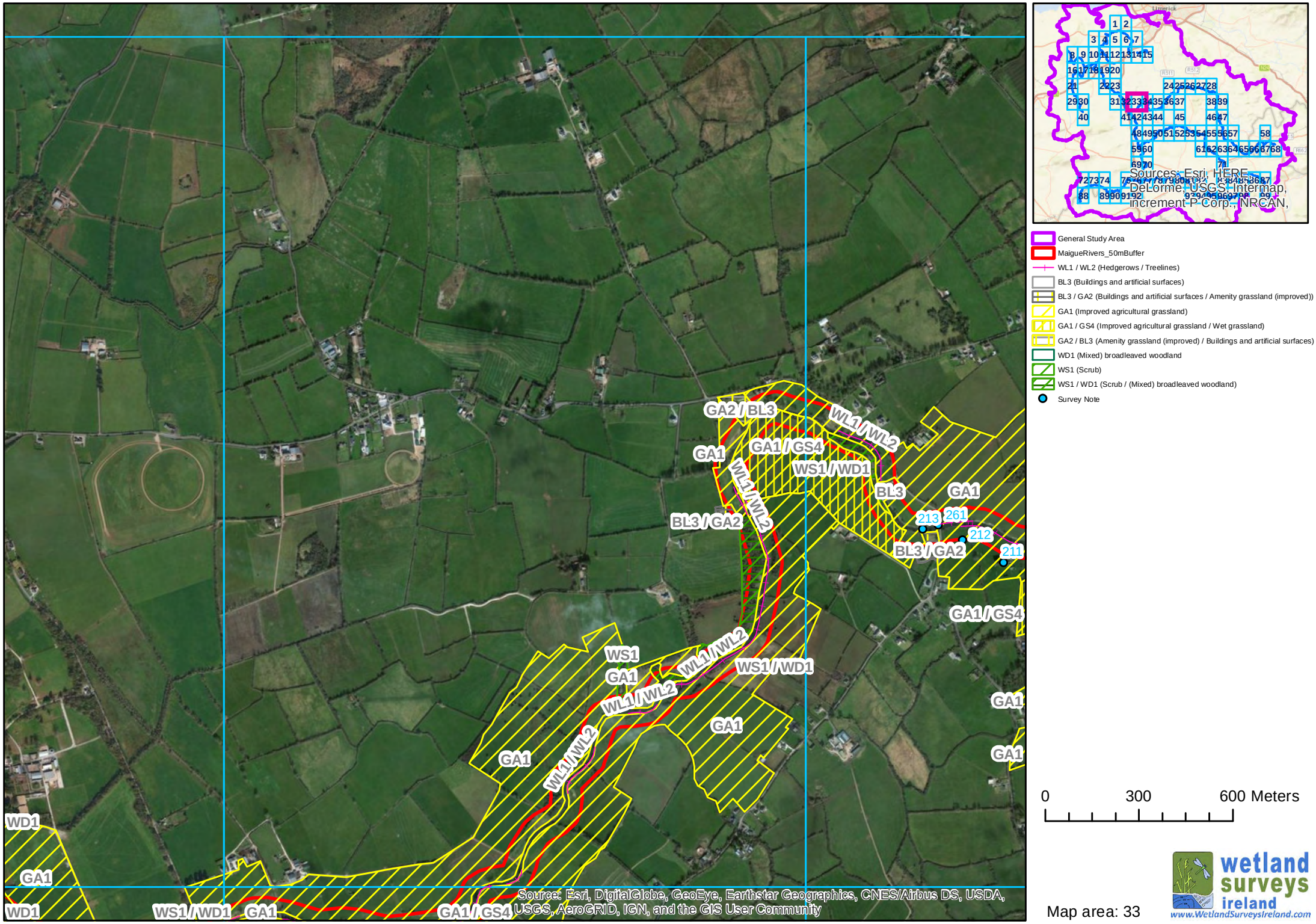

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- WD1 (Mixed) broadleaved woodland
- WS1 (Scrub)
- WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
- Survey Note

0 300 600 Meters

Map area: 33

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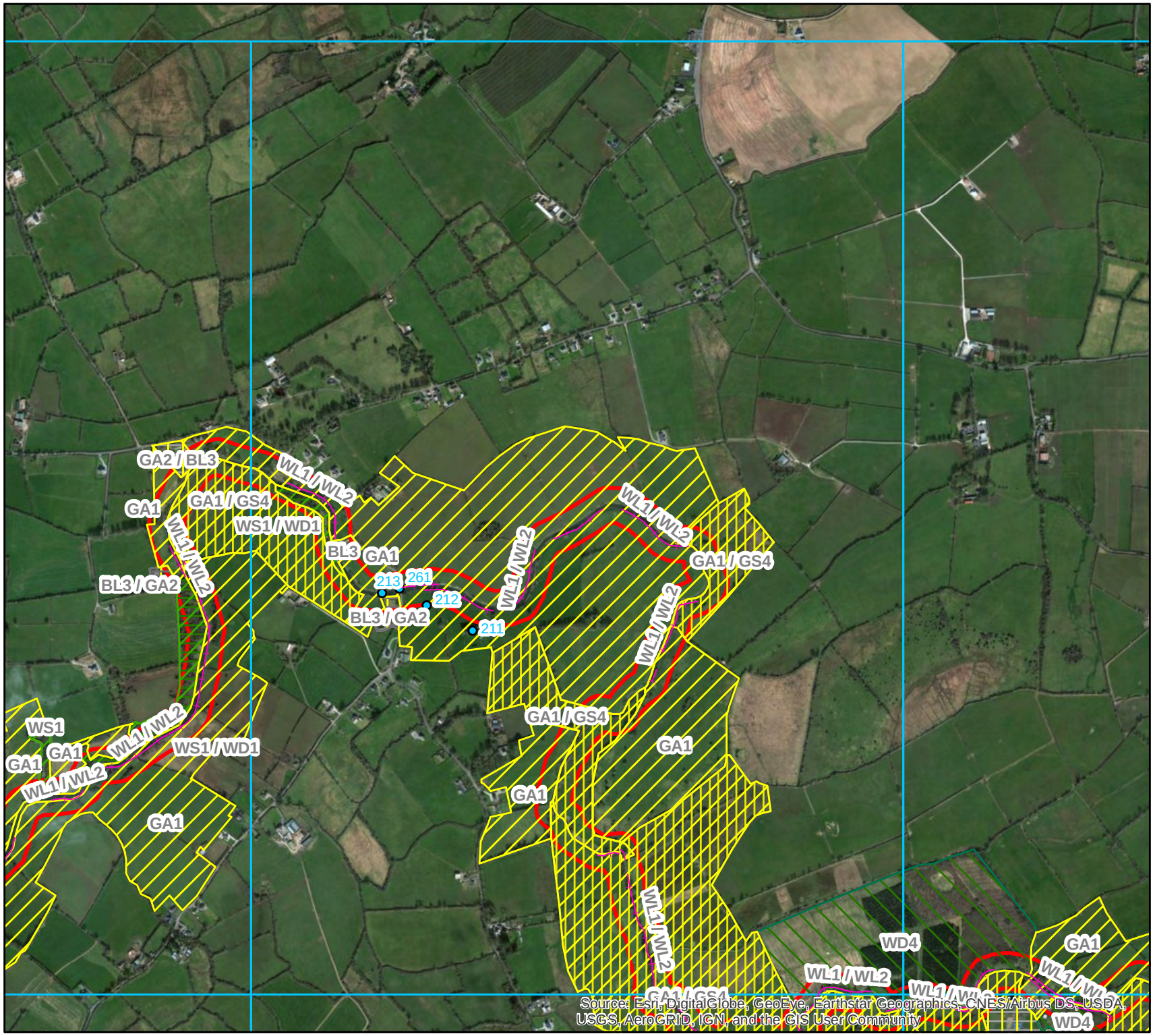

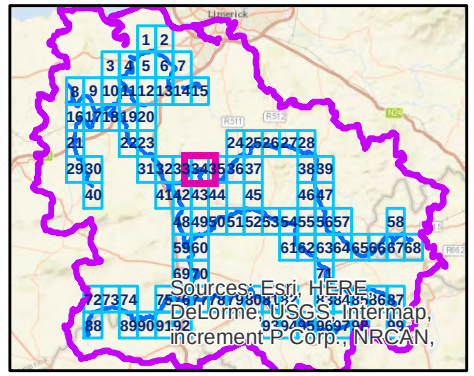

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- WD4 (Conifer plantation)
- WS1 (Scrub)
- WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
- Survey Note

0 300 600 Meters

Map area: 34

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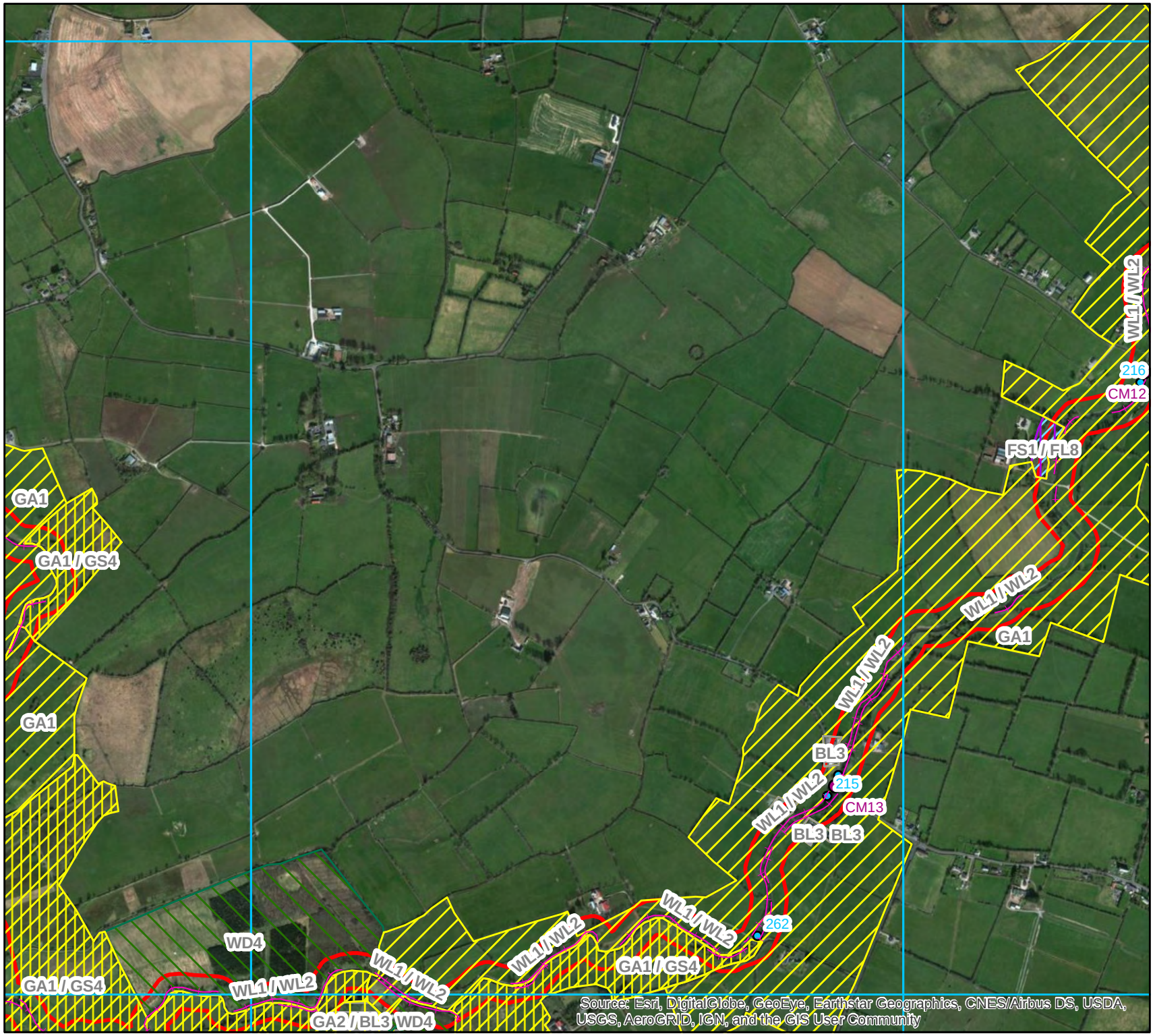

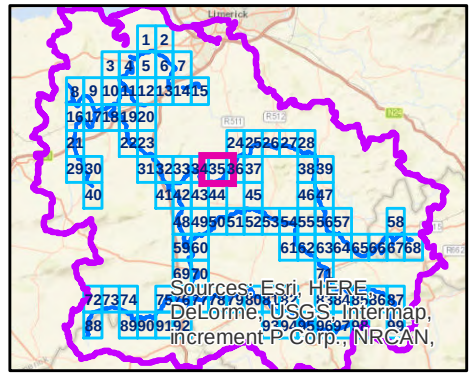

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- FS1 / FL8 (Reed and large sedge swamps / Other artificial lakes and ponds)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- WD4 (Conifer plantation)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 35

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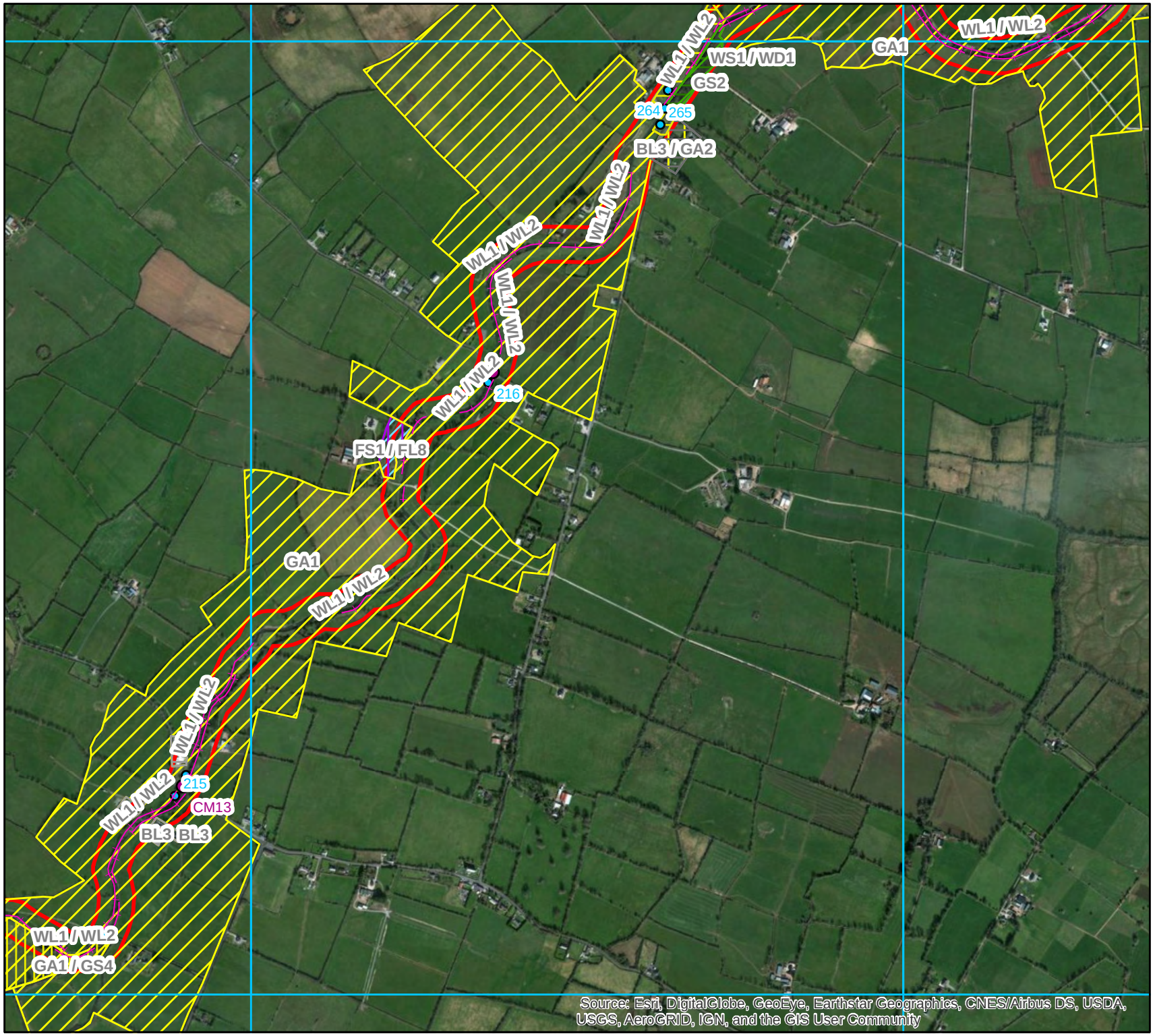

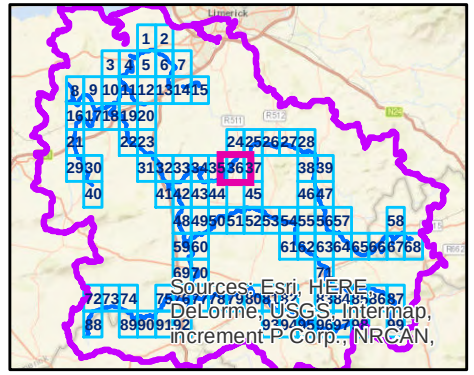

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- FS1 / FL8 (Reed and large sedge swamps / Other artificial lakes and ponds)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS2 (Dry meadows and grassy verges)
- WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 36

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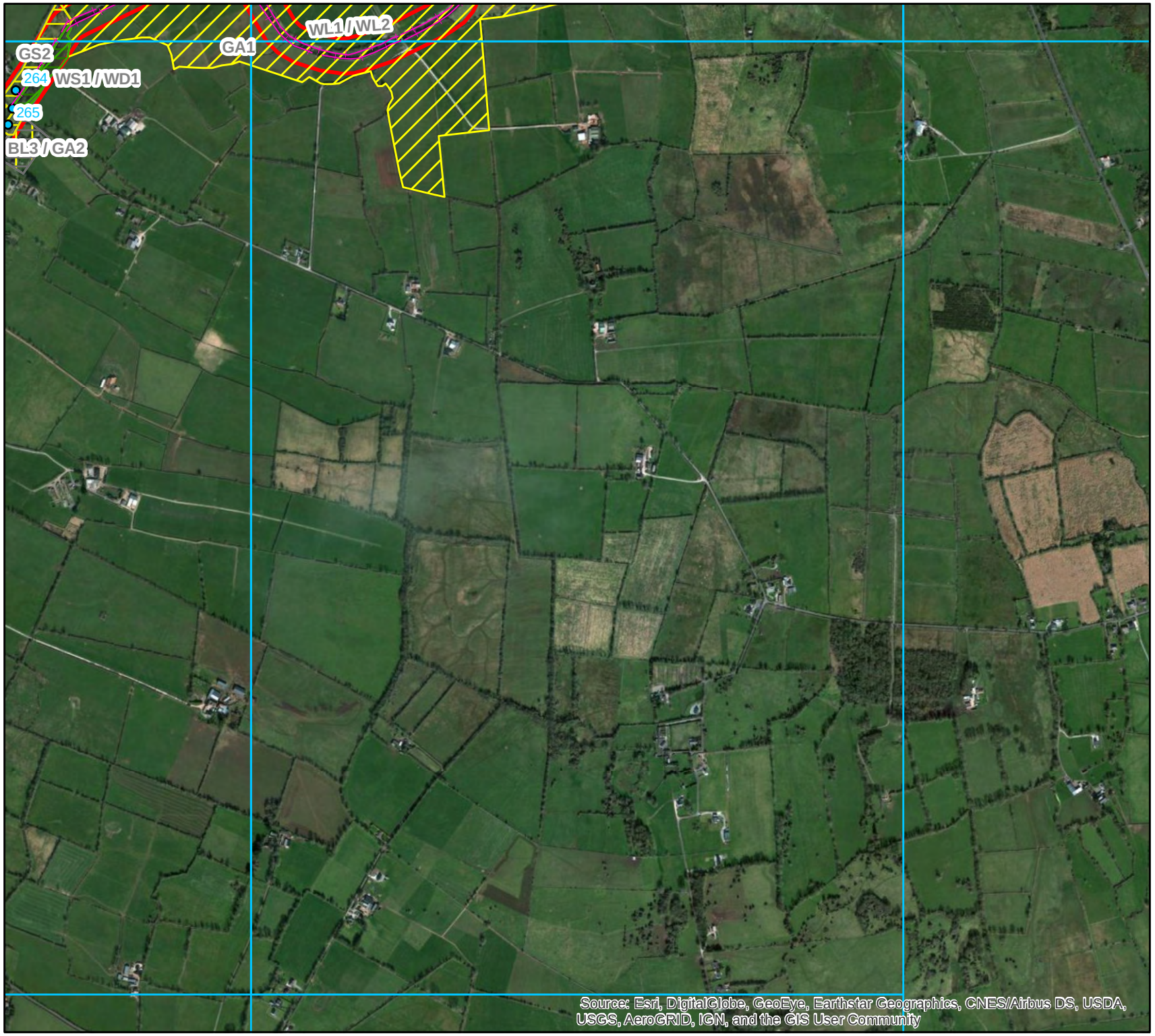

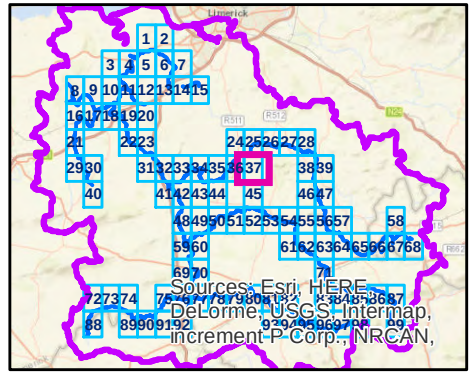

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
GA1 (Improved agricultural grassland)
GS2 (Dry meadows and grassy verges)
WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
Survey Note

0 300 600 Meters

Map area: 37

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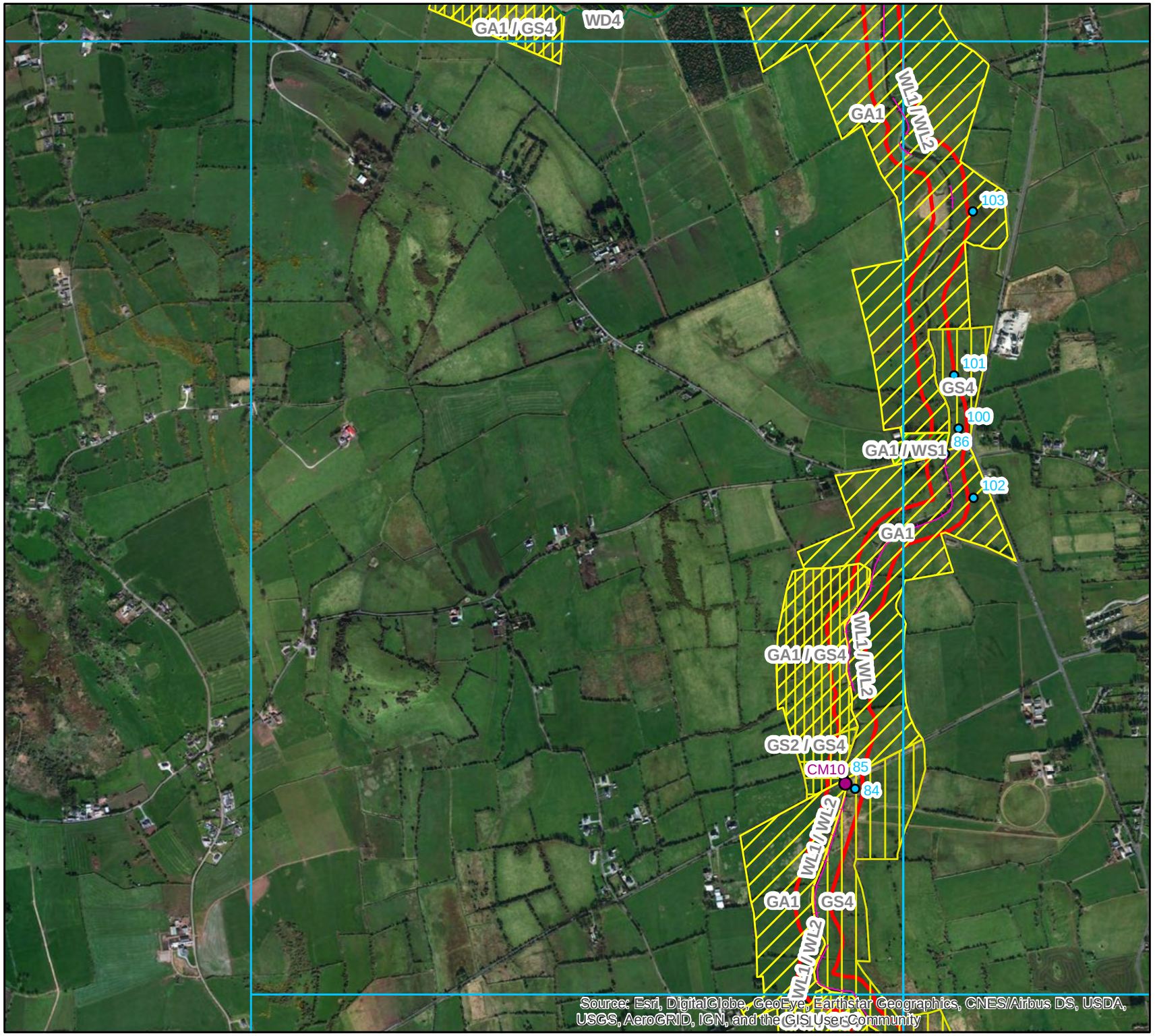

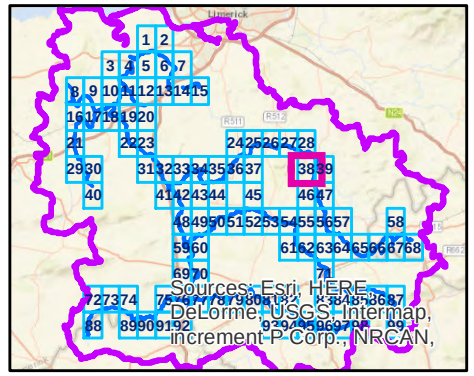

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA1 / WS1 (Improved agricultural grassland / Scrub)
- GS2 / GS4 (Dry meadows and grassy verges / Wet grassland)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 38

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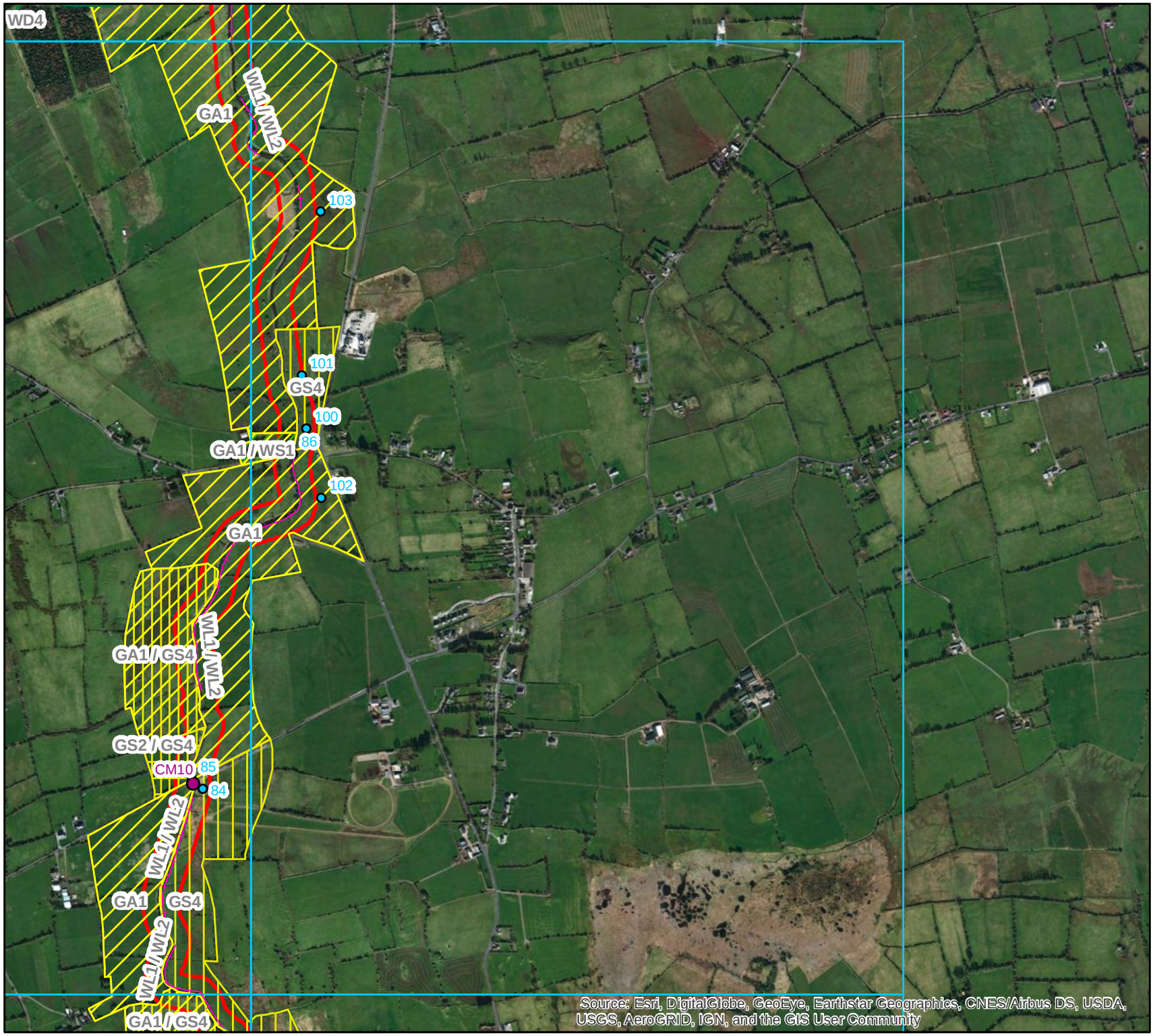

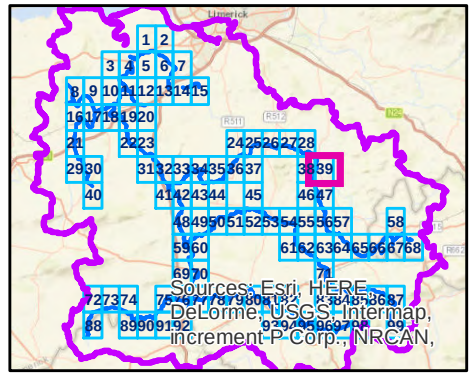

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA1 / WS1 (Improved agricultural grassland / Scrub)
- GS2 / GS4 (Dry meadows and grassy verges / Wet grassland)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 39

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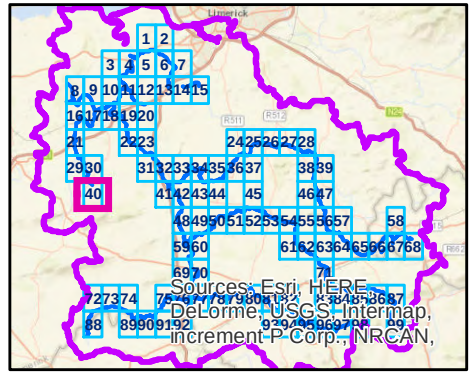

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
BL3 (Buildings and artificial surfaces)
GA1 (Improved agricultural grassland)
GA1 / GS4 (Improved agricultural grassland / Wet grassland)
GS4 (Wet grassland)
WD4 (Conifer plantation)
Survey Note

0 300 600 Meters

Map area: 40

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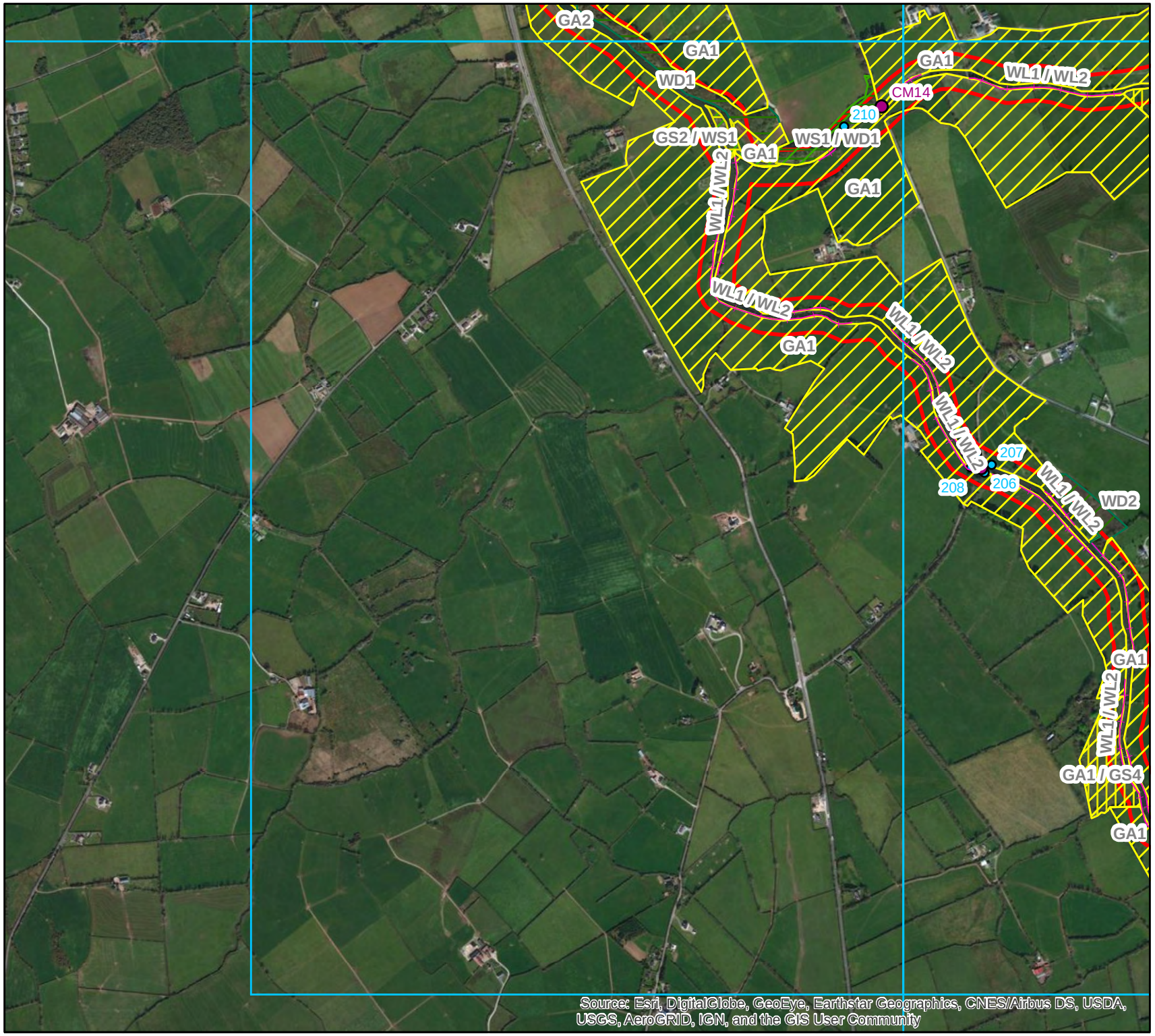

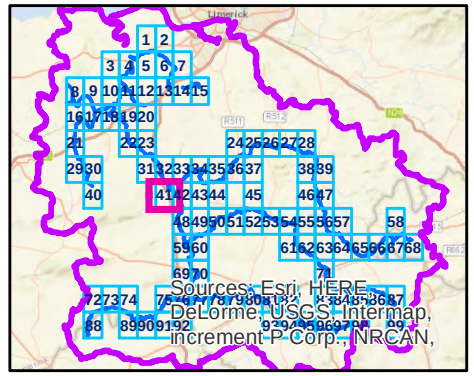

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 (Amenity grassland (improved))
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- WD1 (Mixed) broadleaved woodland
- WD2 (Mixed broadleaved/conifer woodland)
- WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 41

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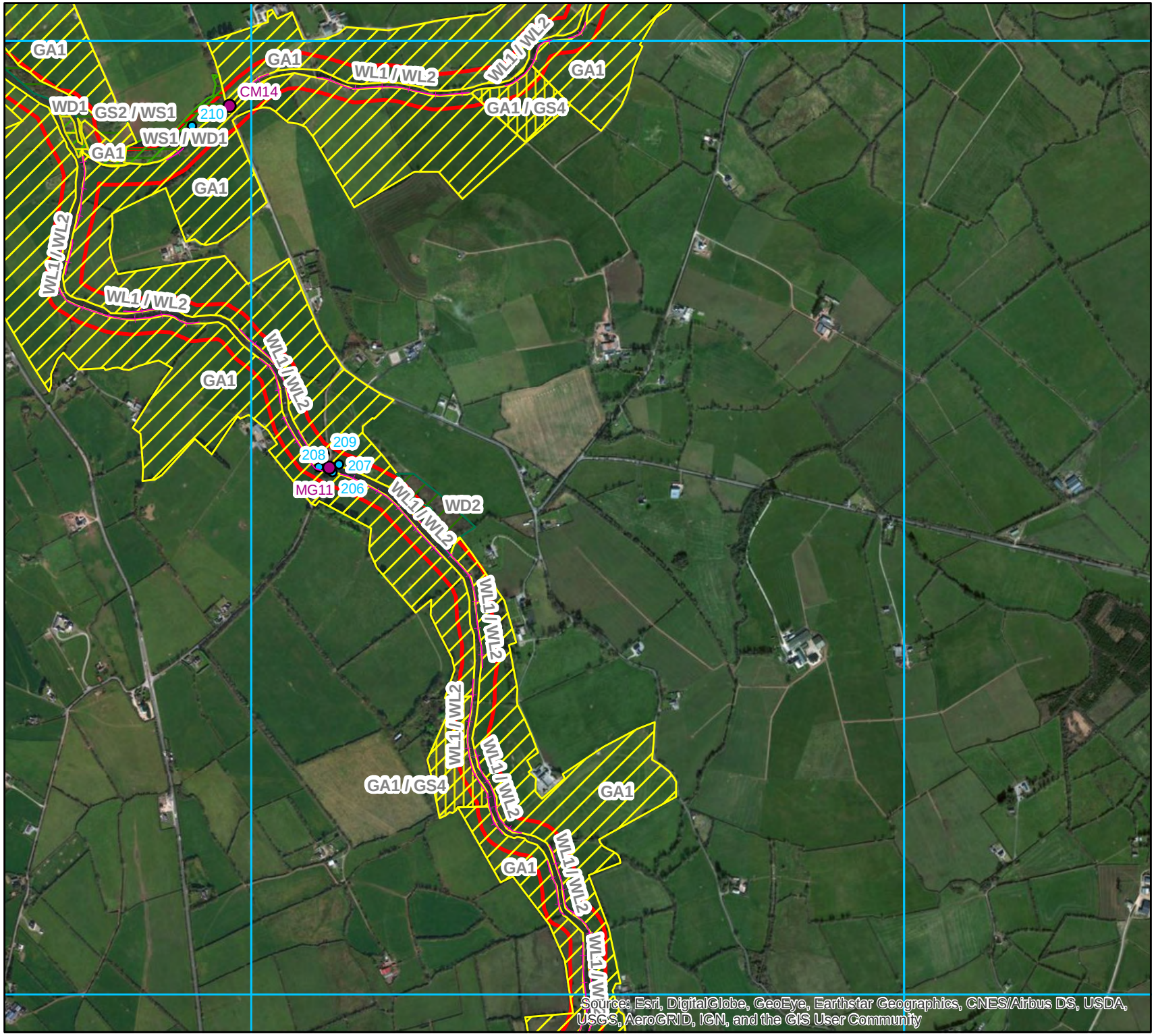

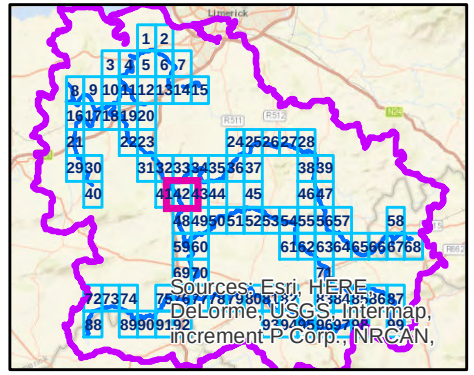

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- WD1 (Mixed) broadleaved woodland
- WD2 (Mixed broadleaved/conifer woodland)
- WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 42

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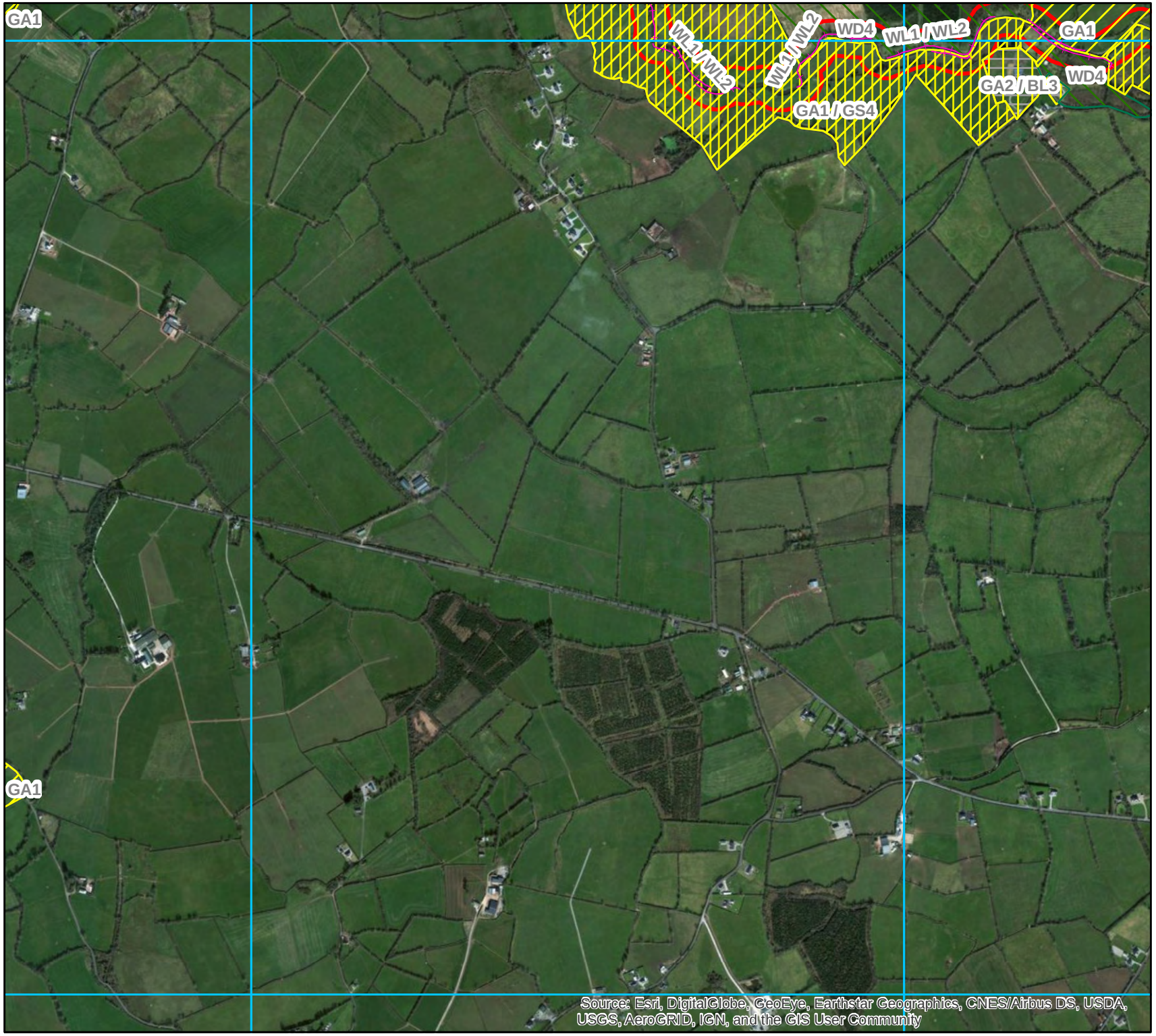

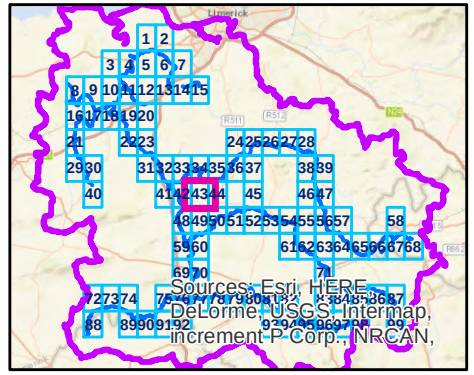

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
GA1 (Improved agricultural grassland)
GA1 / GS4 (Improved agricultural grassland / Wet grassland)
GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
WD4 (Conifer plantation)

0 300 600 Meters

Map area: 43

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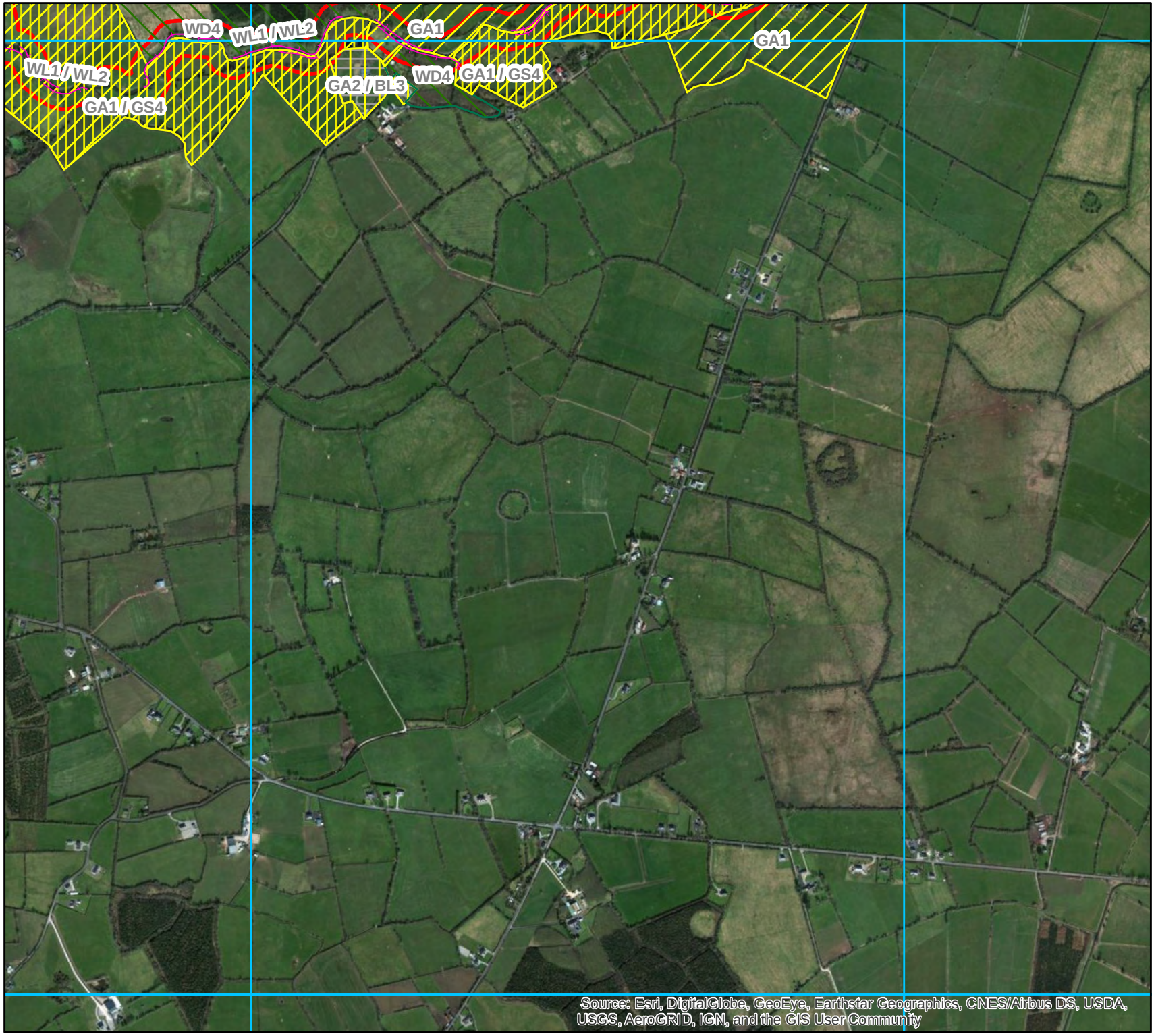

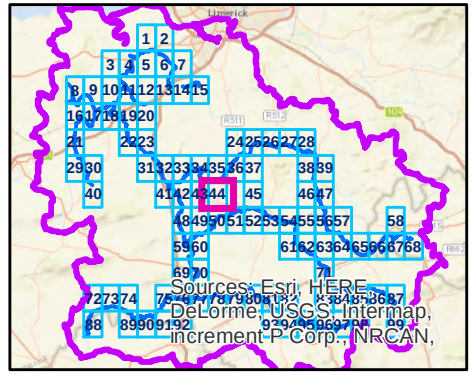

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
GA1 (Improved agricultural grassland)
GA1 / GS4 (Improved agricultural grassland / Wet grassland)
GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
WD4 (Conifer plantation)

0 300 600 Meters

Map area: 44

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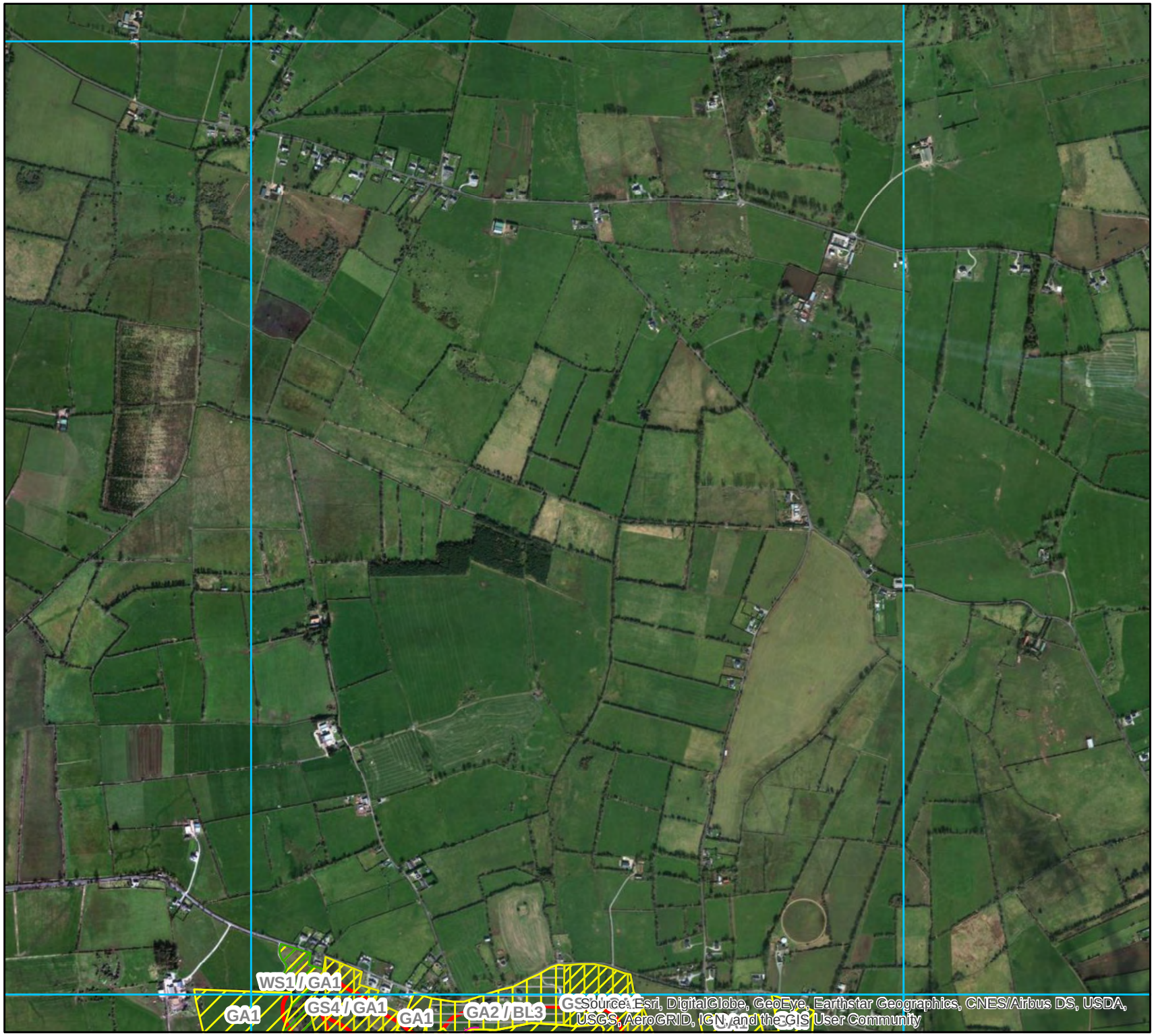

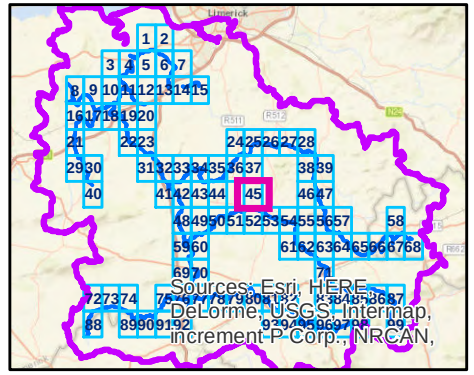

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- WD1 / WS1 ((Mixed) broadleaved woodland / Scrub)
- WS1 / GA1 (Scrub / Improved agricultural grassland)

0 300 600 Meters

Map area: 45

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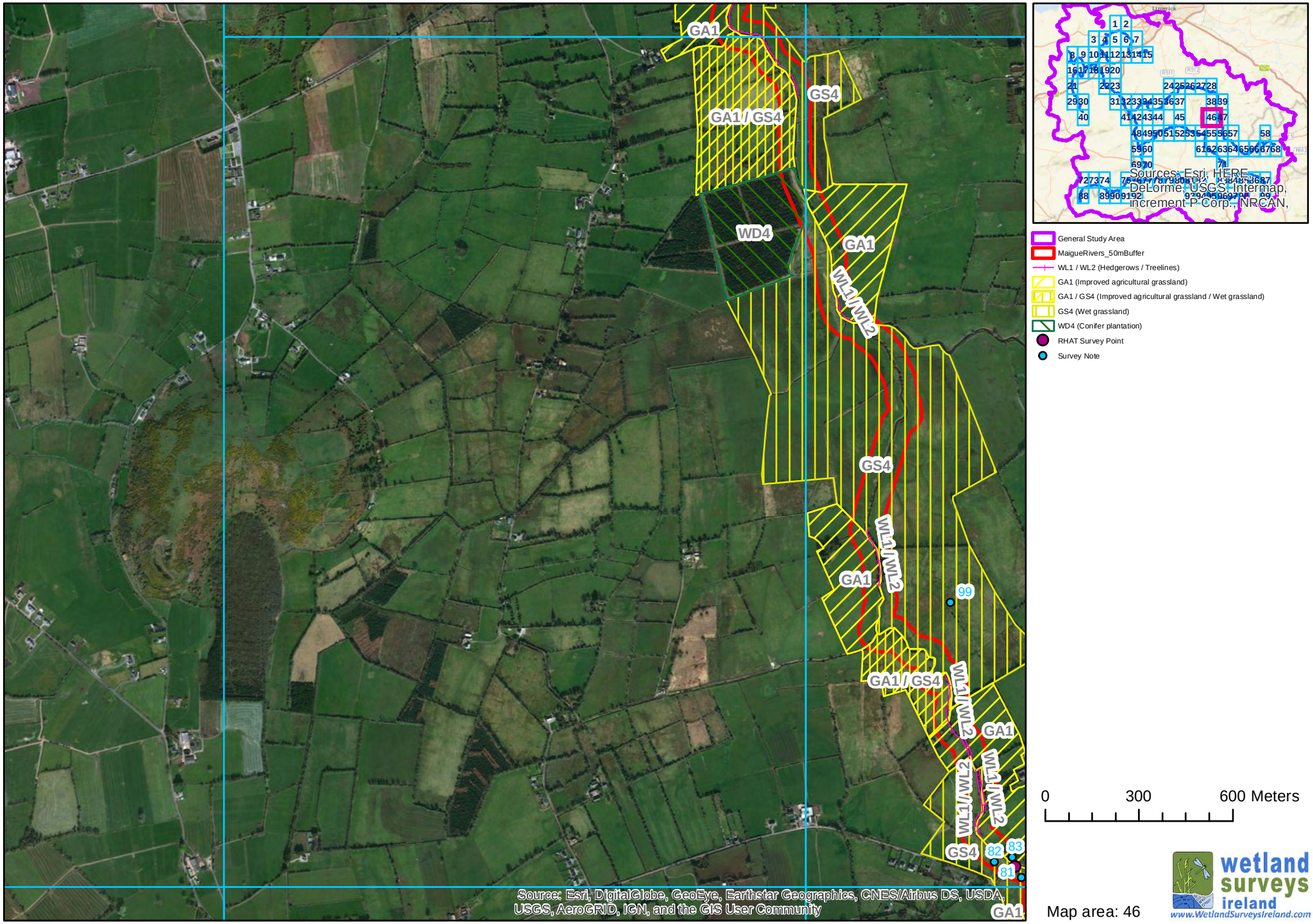

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 46

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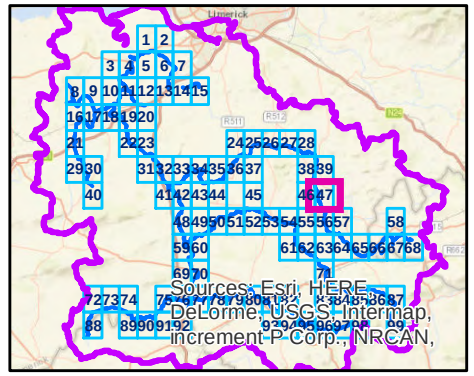

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 47

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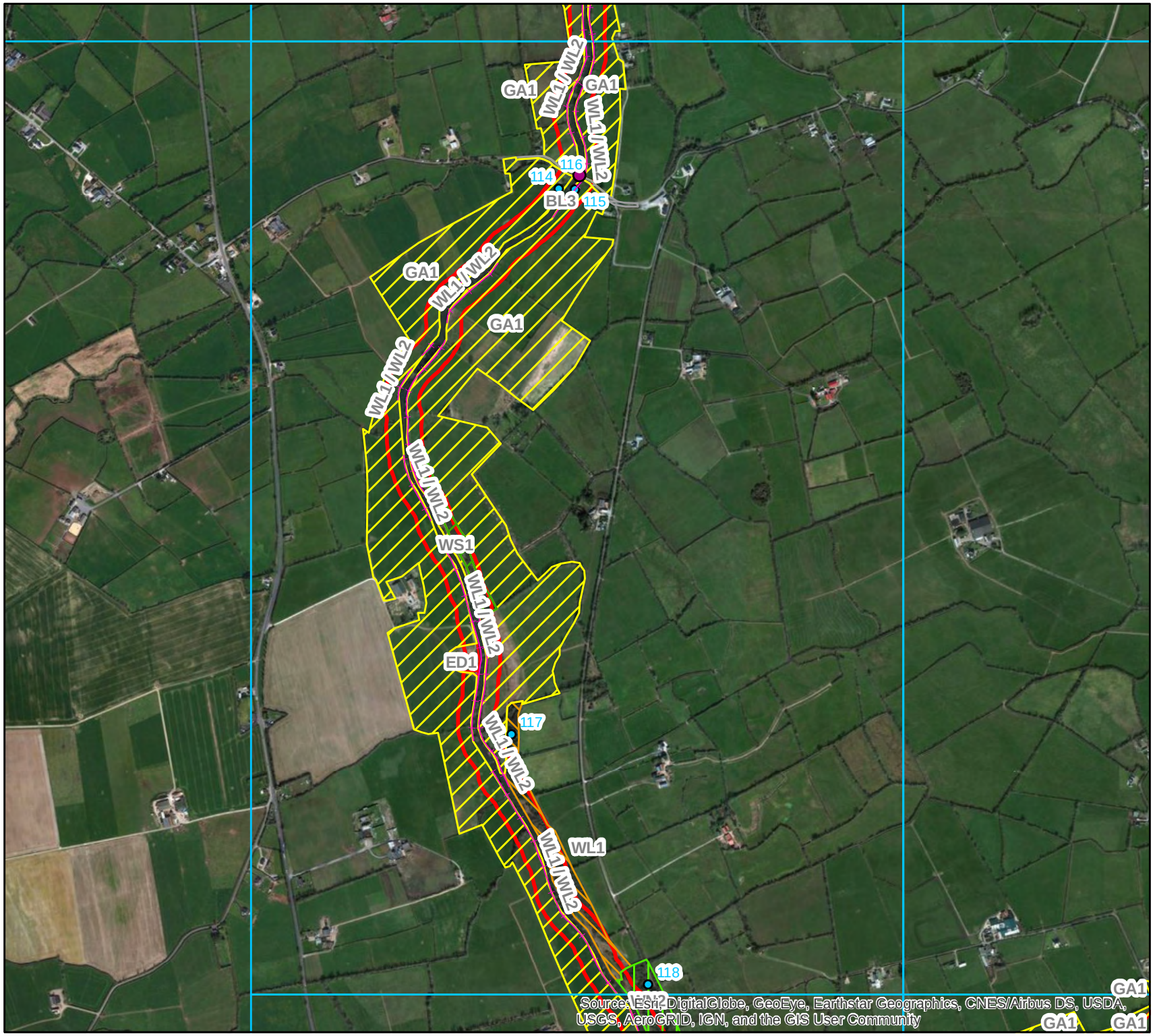

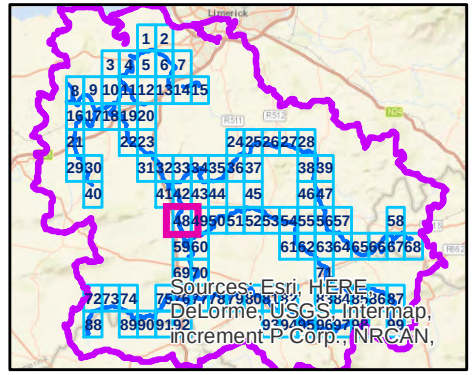

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- ED1 (Exposed sand, gravel or till)
- GA1 (Improved agricultural grassland)
- WL1 (Hedgerows)
- WN2 (Oak-ash-hazel woodland)
- WS1 (Scrub)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 48

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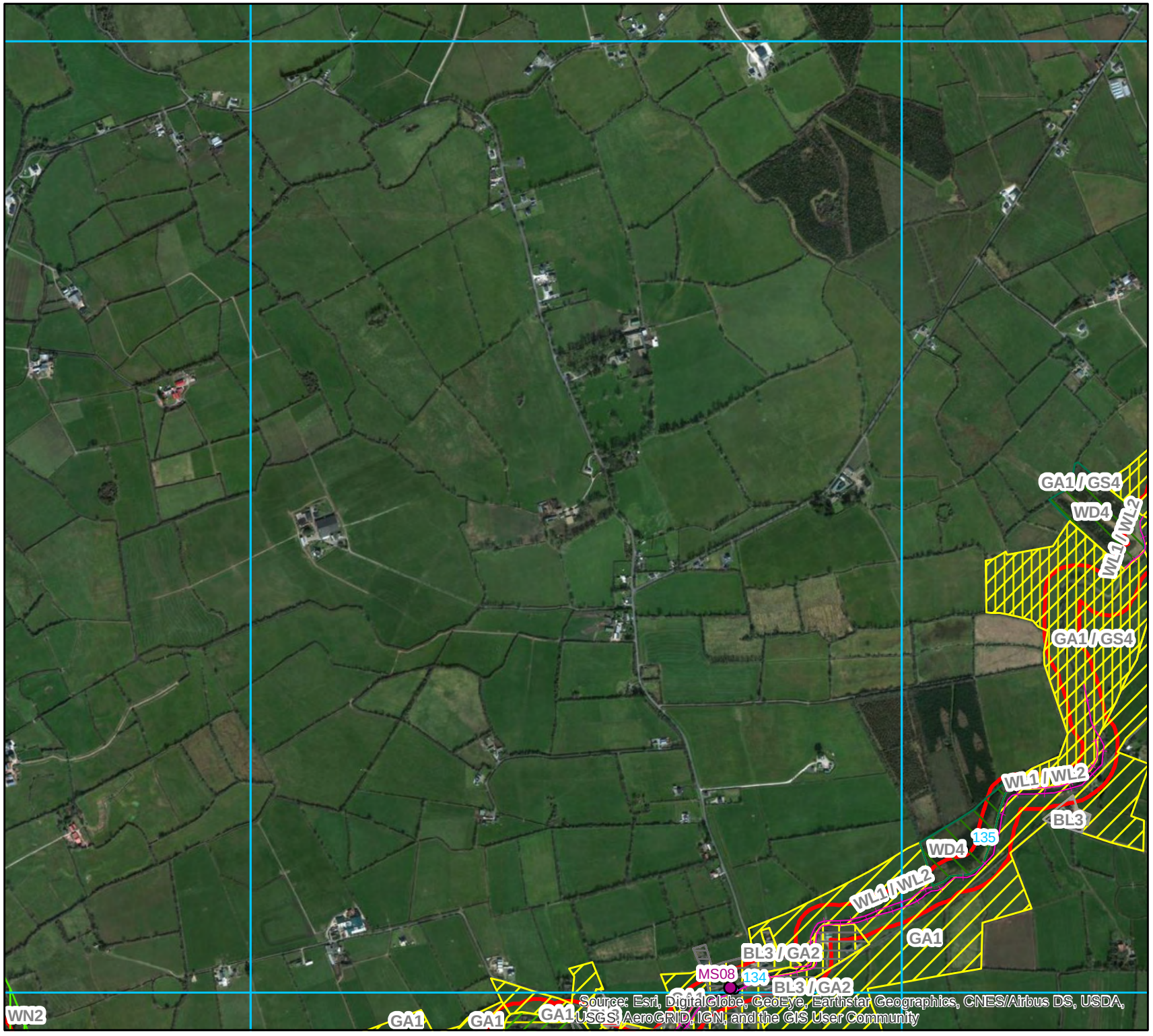

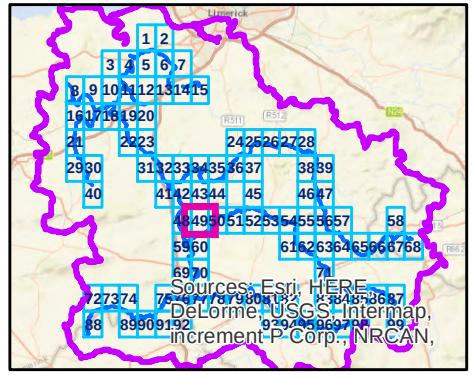

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- WD4 (Conifer plantation)
- WN2 (Oak-ash-hazel woodland)
- WS1 / GS2 (Scrub / Dry meadows and grassy verges)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 49

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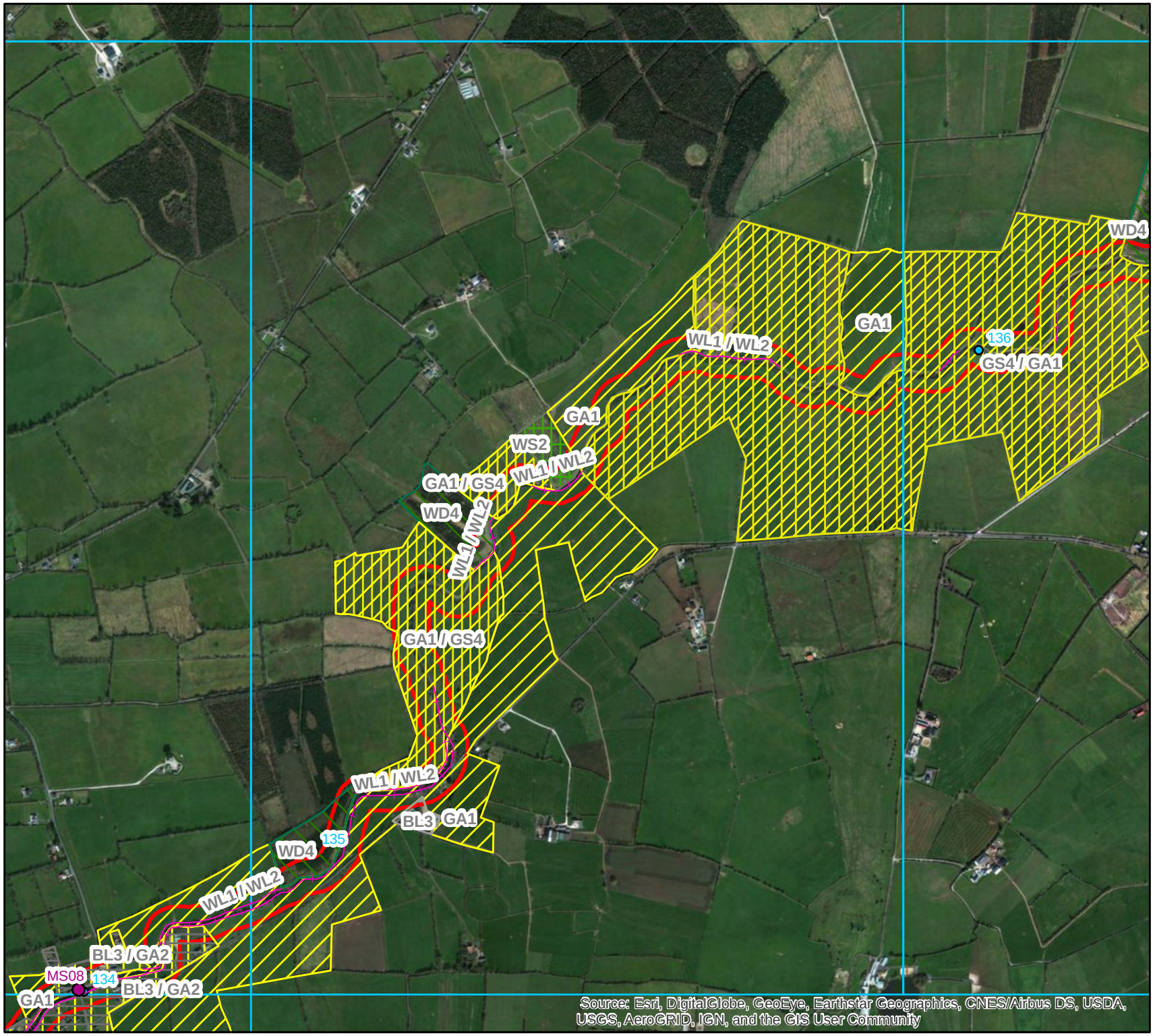

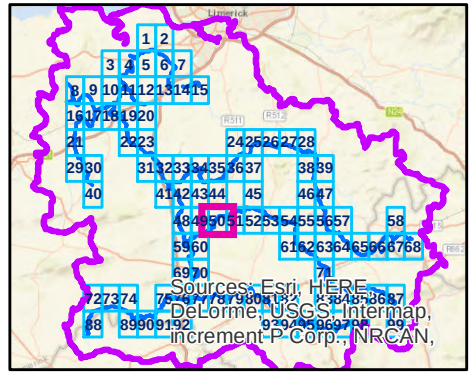

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- WD4 (Conifer plantation)
- WS2 (Immature woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 50

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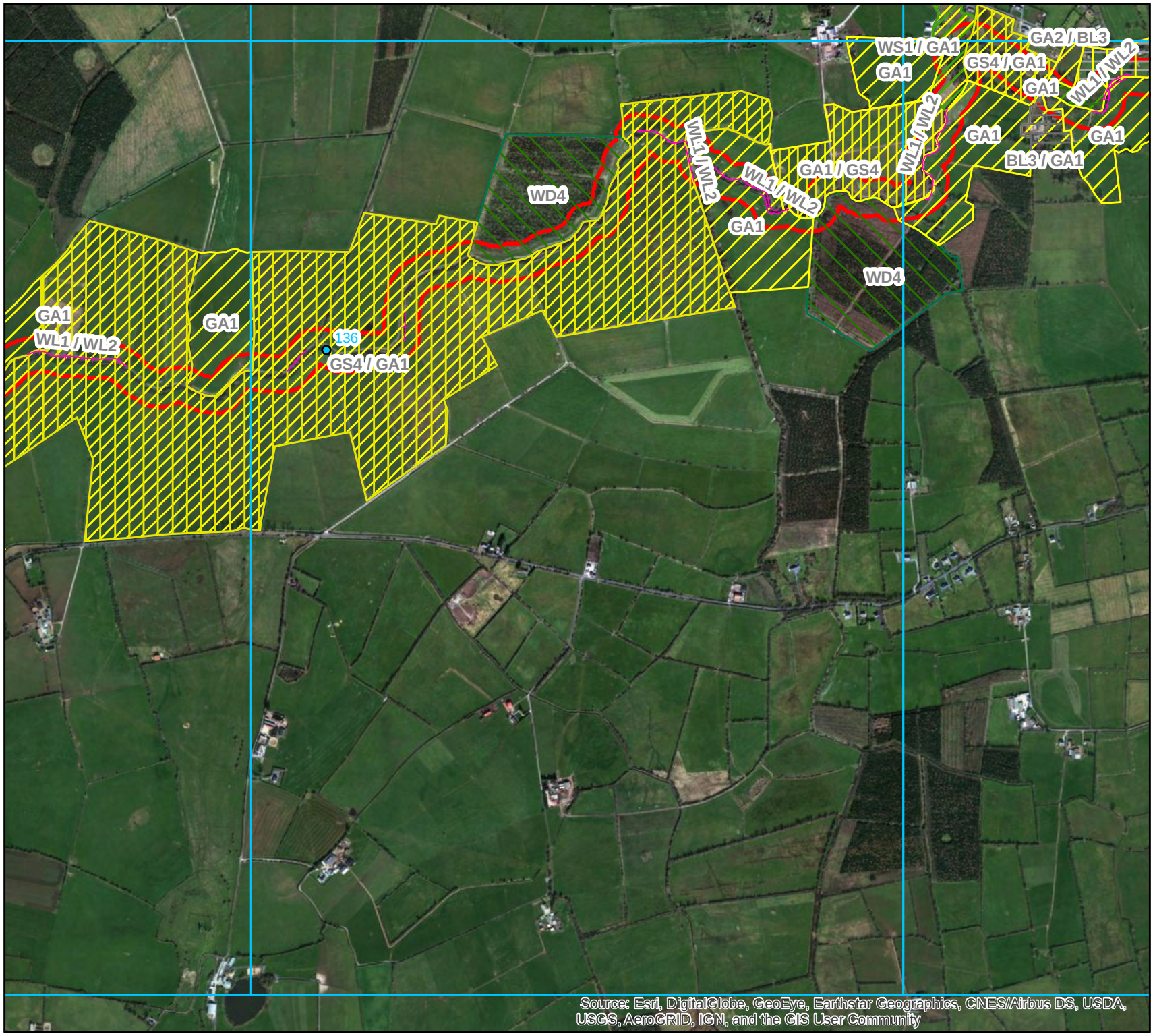

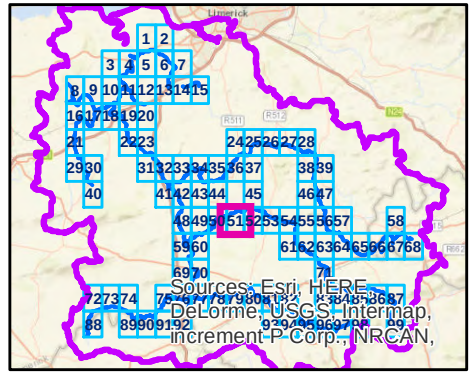

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 / GA1 (Buildings and artificial surfaces / Improved agricultural grassland)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- WD1 / WS1 ((Mixed) braodleaved woodland / Scrub)
- WD4 (Conifer plantation)
- WS1 / GA1 (Scrub / Improved agricultural grassland)
- Survey Note

0 300 600 Meters

Map area: 51

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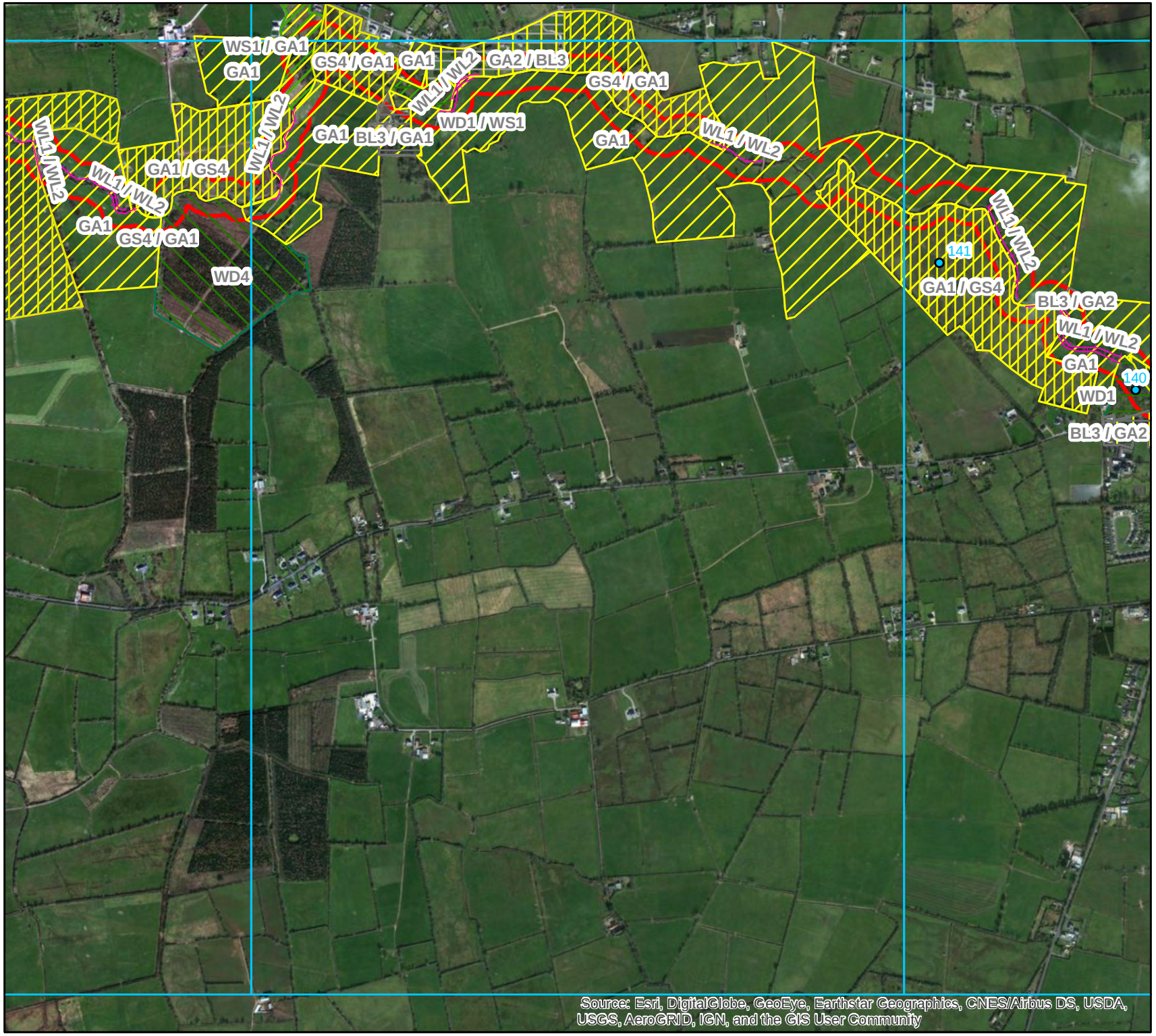

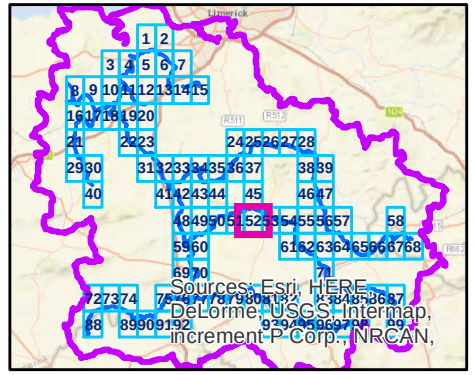

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 / GA1 (Buildings and artificial surfaces / Improved agricultural grassland)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS4 (Wet grassland)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- WD1 (Mixed) broadleaved woodland
- WD1 / WS1 ((Mixed) braodleaved woodland / Scrub)
- WD4 (Conifer plantation)
- WS1 / GA1 (Scrub / Improved agricultural grassland)
- Survey Note

0 300 600 Meters

Map area: 52

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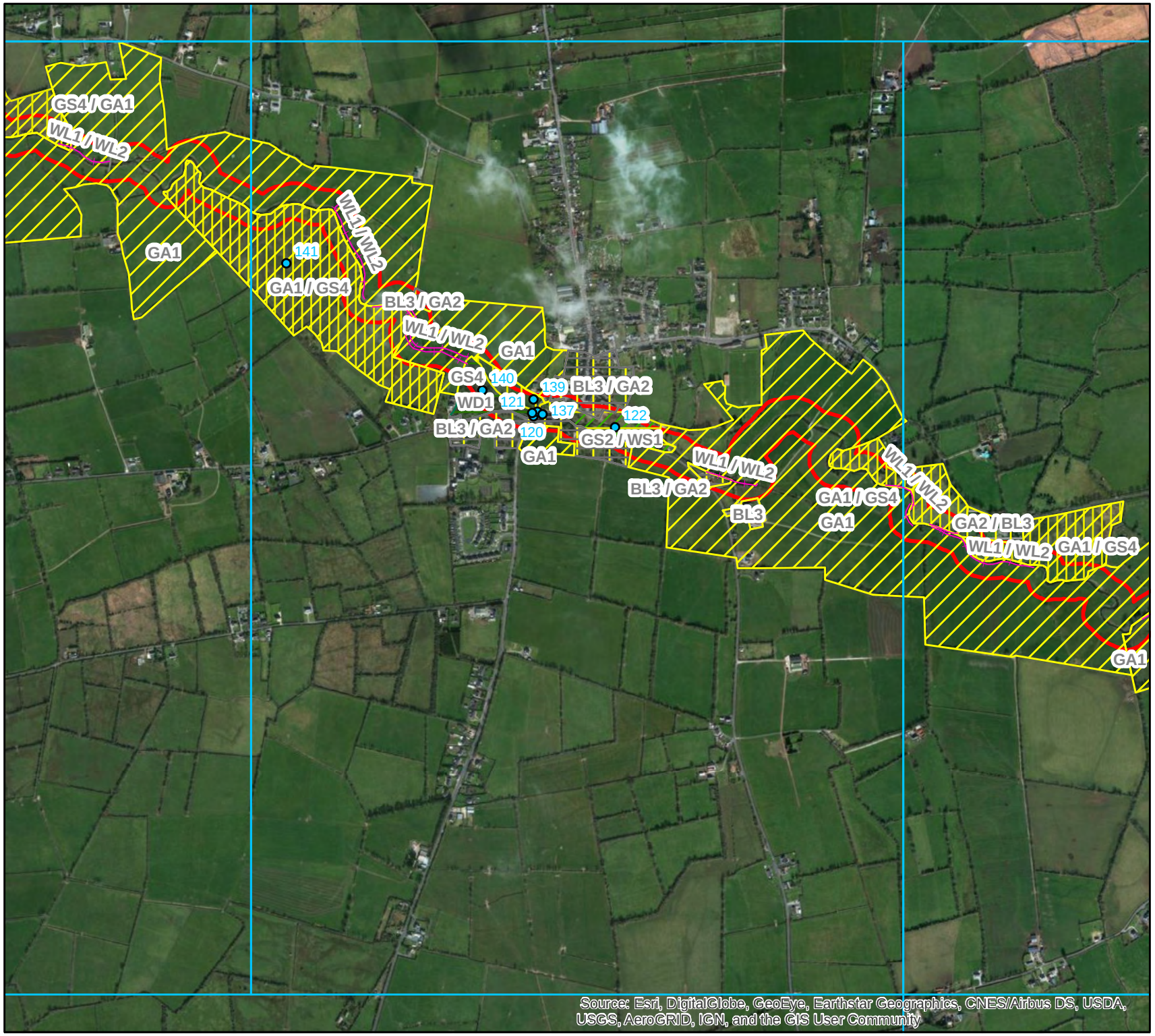

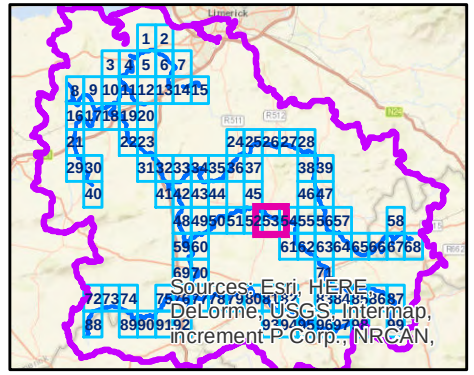

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 (Amenity grassland (improved))
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- GS4 (Wet grassland)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- WD1 (Mixed) broadleaved woodland
- Survey Note

0 300 600 Meters

Map area: 53

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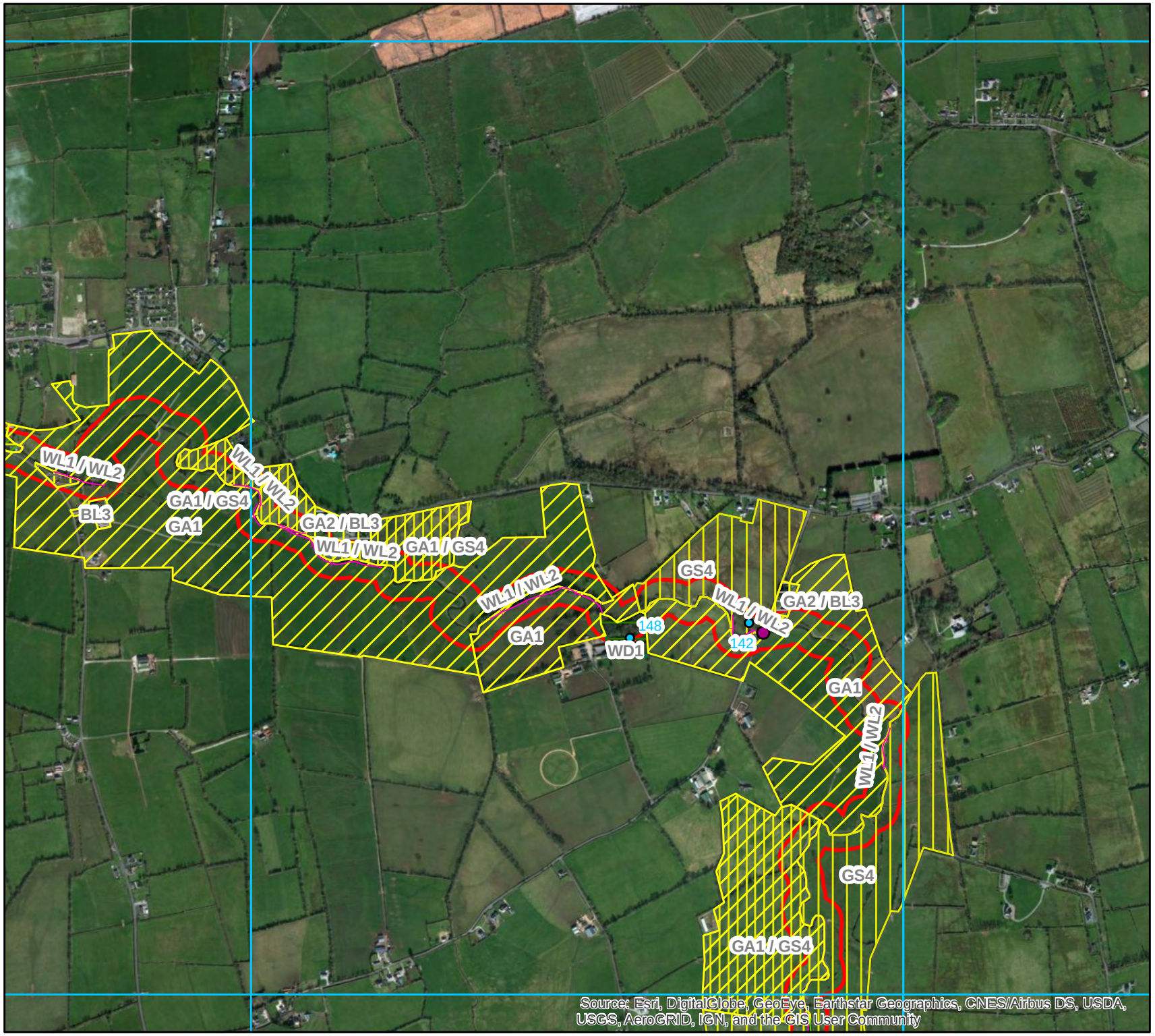

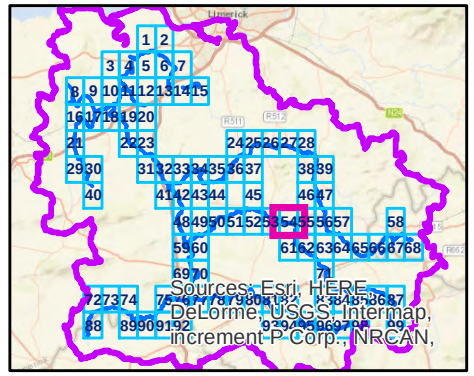

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- GS4 (Wet grassland)
- WD1 (Mixed) broadleaved woodland
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 54

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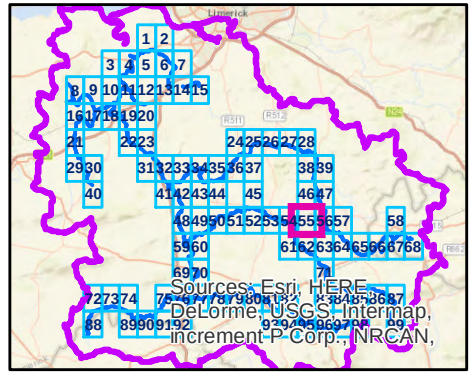

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS4 (Wet grassland)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 55

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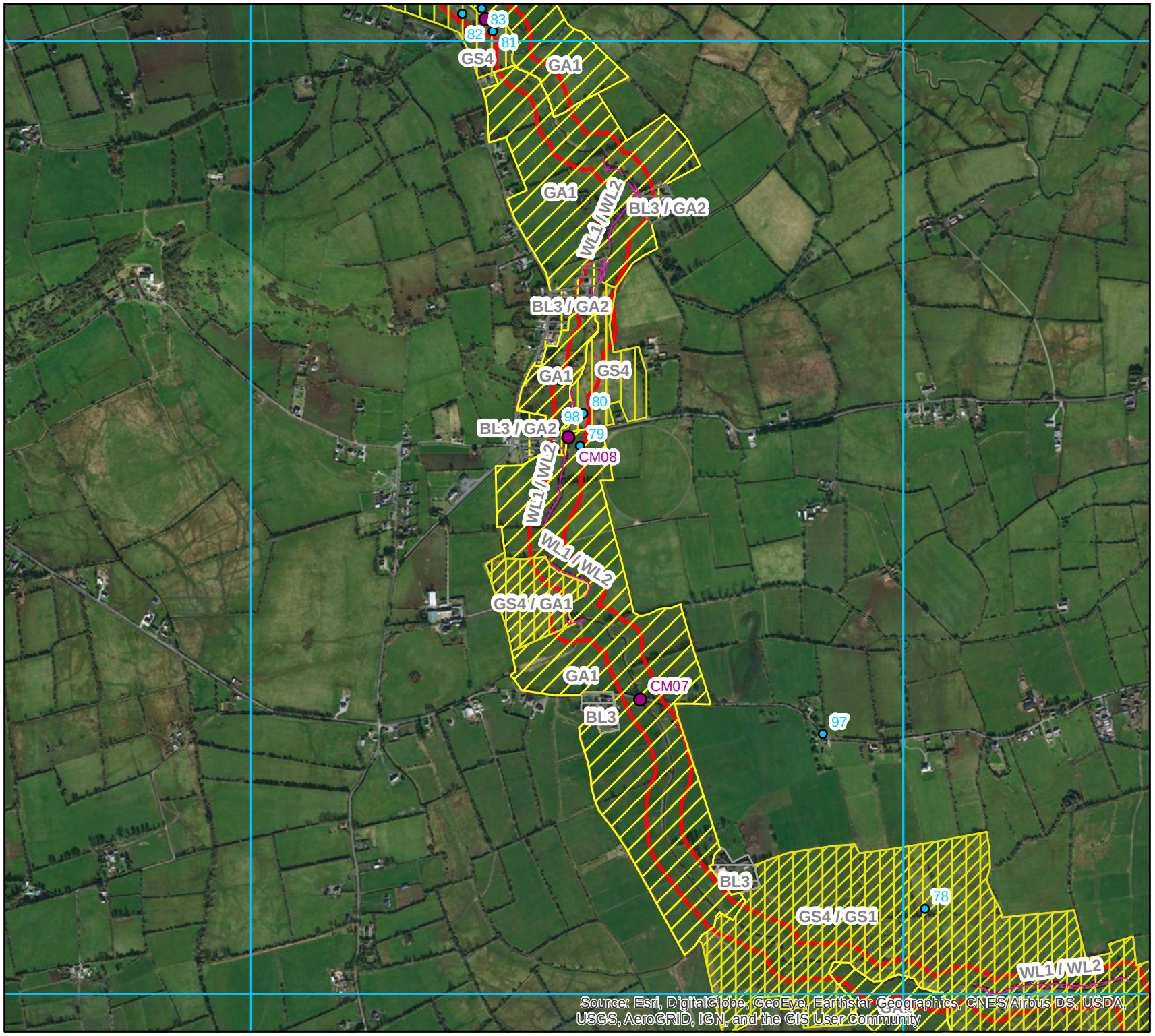

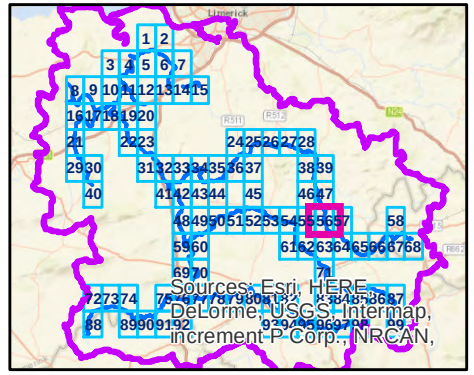

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GS4 (Wet grassland)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- GS4 / GS1 (Wet grassland / Dry calcareous and neutral grassland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 56

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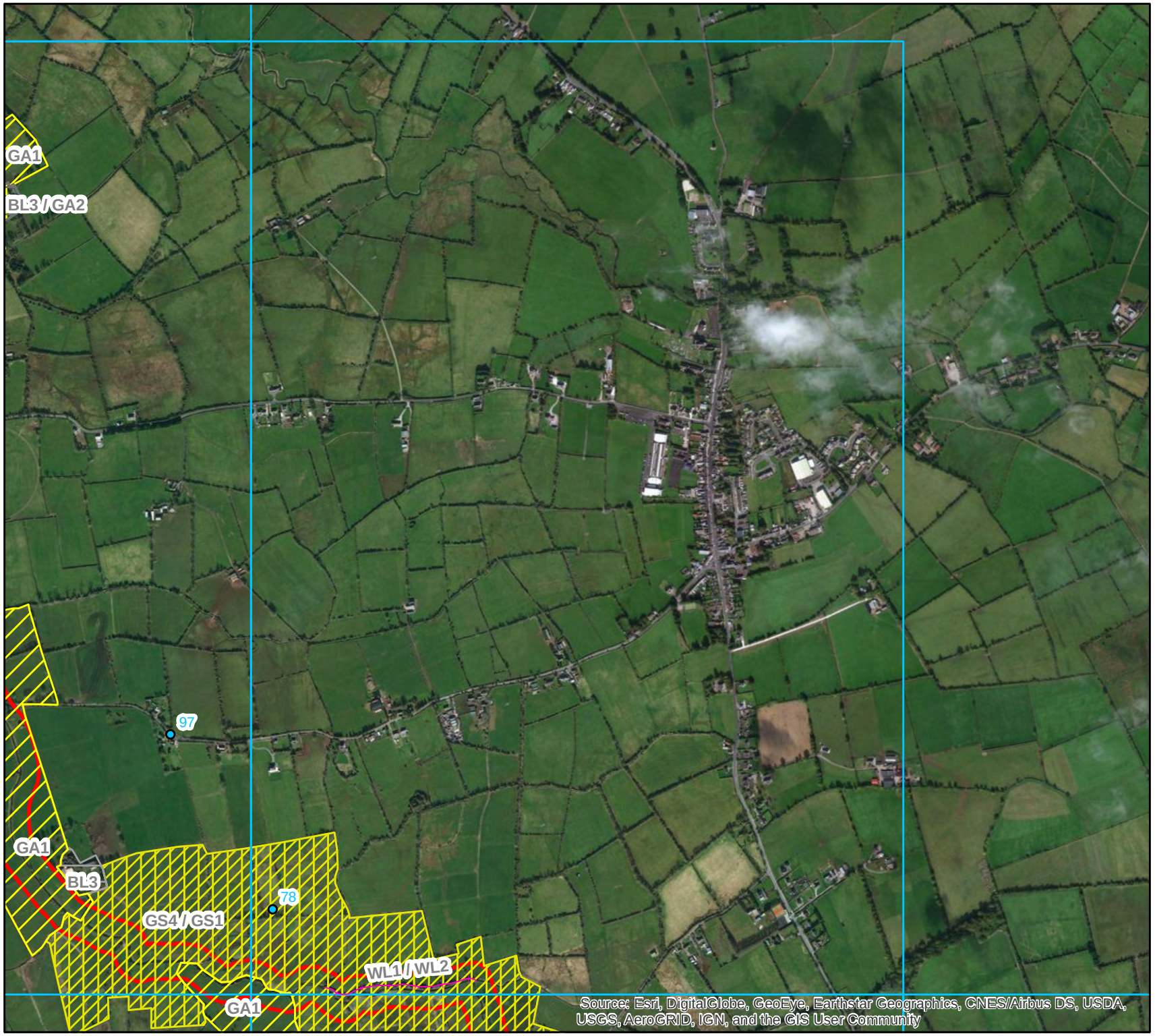

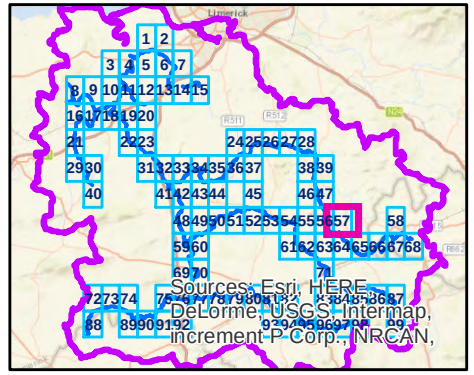

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
BL3 (Buildings and artificial surfaces)
BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
GA1 (Improved agricultural grassland)
GS4 / GS1 (Wet grassland / Dry calcareous and neutral grassland)
Survey Note

0 300 600 Meters

Map area: 57

wetland surveys ireland
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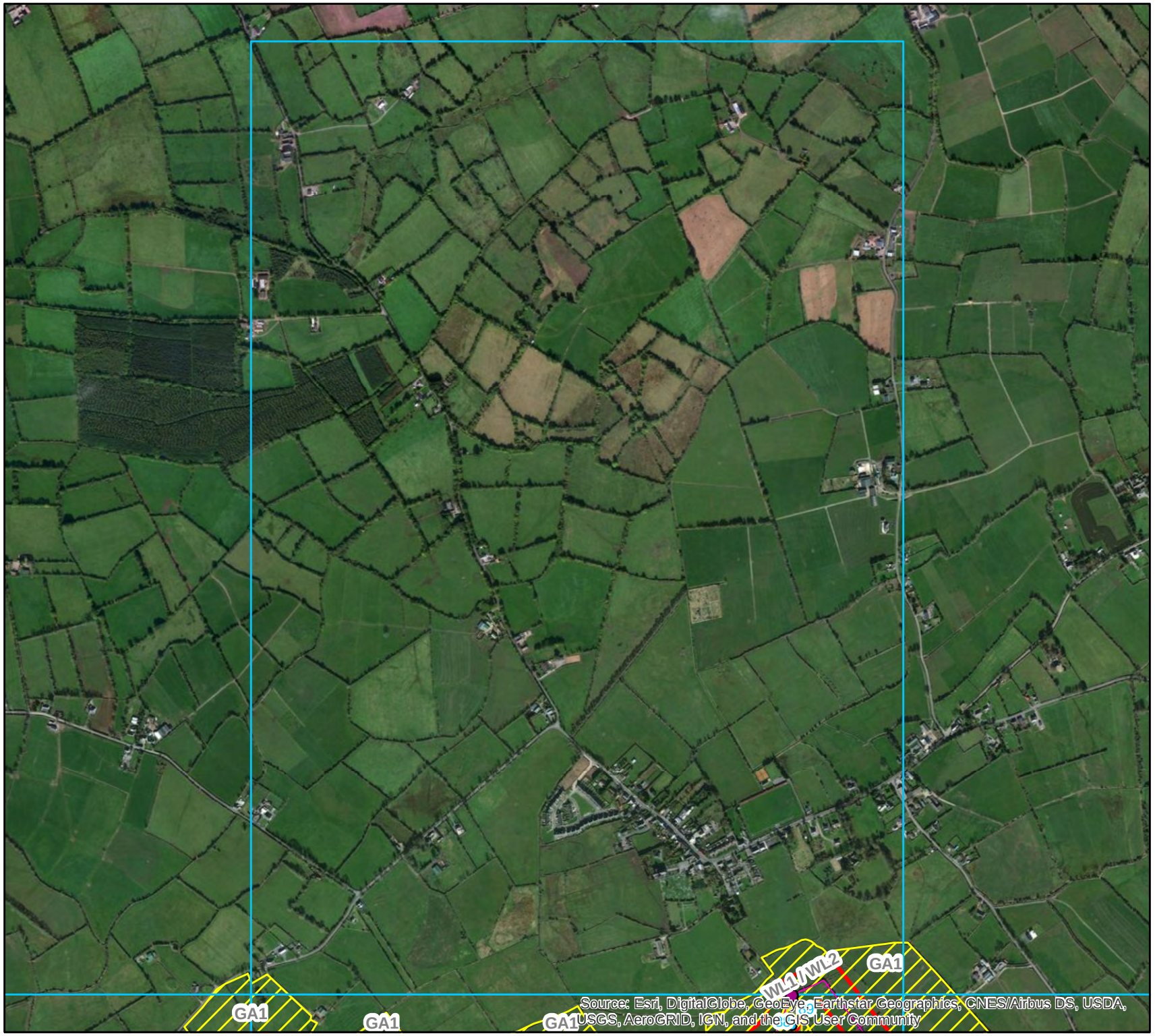
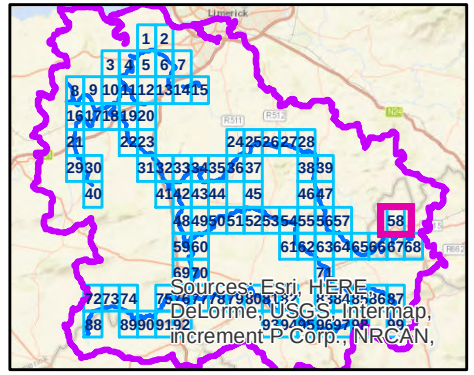


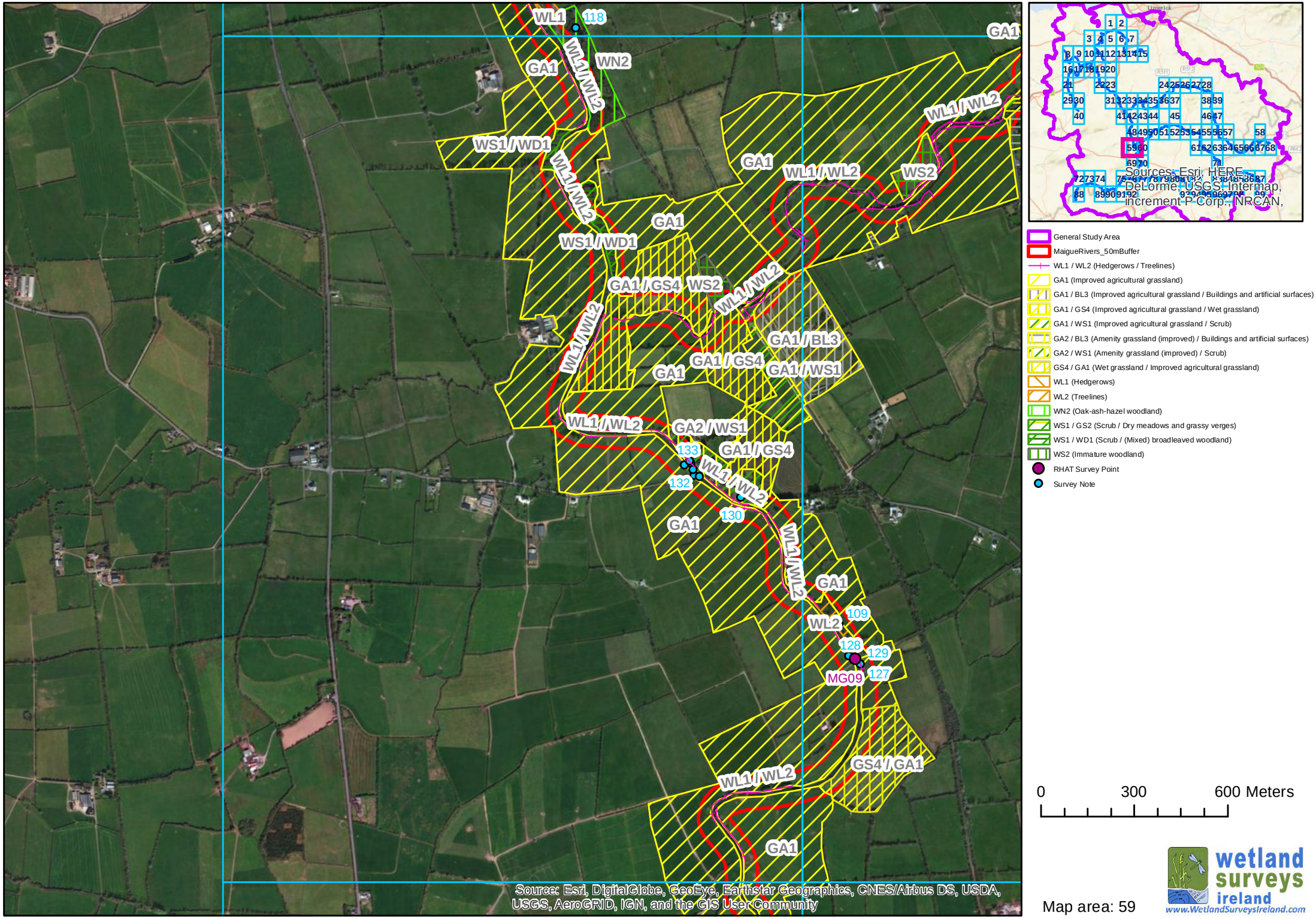


General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
GA1 (Improved agricultural grassland)
GS4 / GA1 (Wet grassland / Improved agricultural grassland)
RHAT Survey Point
Survey Note

0 300 600 Meters

Map area: 58

wetland surveys ireland
www.WetlandSurveysIreland.com


WL1
118
GA1
WL1/WL2
WN2
GA1
WS1 / WD1
WL1/WL2
GA1
WL1 / WL2
WS2
GA1
WS1 / WD1
GA1 / GS4
WS2
WL1 / WL2
WL1/WL2
GA1 / BL3
GA1 / GS4
GA1
GA1 / WS1
WL1 / WL2
GA2 / WS1
133
GA1 / GS4
132
WL1 / WL2
130
GA1
WL1/WL2
GA1
109
WL2
128
129
MG09
127
GS4 / GA1
WL1 / WL2
GA1
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN,
General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
GA1 (Improved agricultural grassland)
GA1 / BL3 (Improved agricultural grassland / Buildings and artificial surfaces)
GA1 / GS4 (Improved agricultural grassland / Wet grassland)
GA1 / WS1 (Improved agricultural grassland / Scrub)
GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
GA2 / WS1 (Amenity grassland (improved) / Scrub)
GS4 / GA1 (Wet grassland / Improved agricultural grassland)
WL1 (Hedgerows)
WL2 (Treelines)
WN2 (Oak-ash-hazel woodland)
WS1 / GS2 (Scrub / Dry meadows and grassy verges)
WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
WS2 (Immature woodland)
RHAT Survey Point
Survey Note
0
300
600 Meters
Map area: 59
wetland surveys ireland
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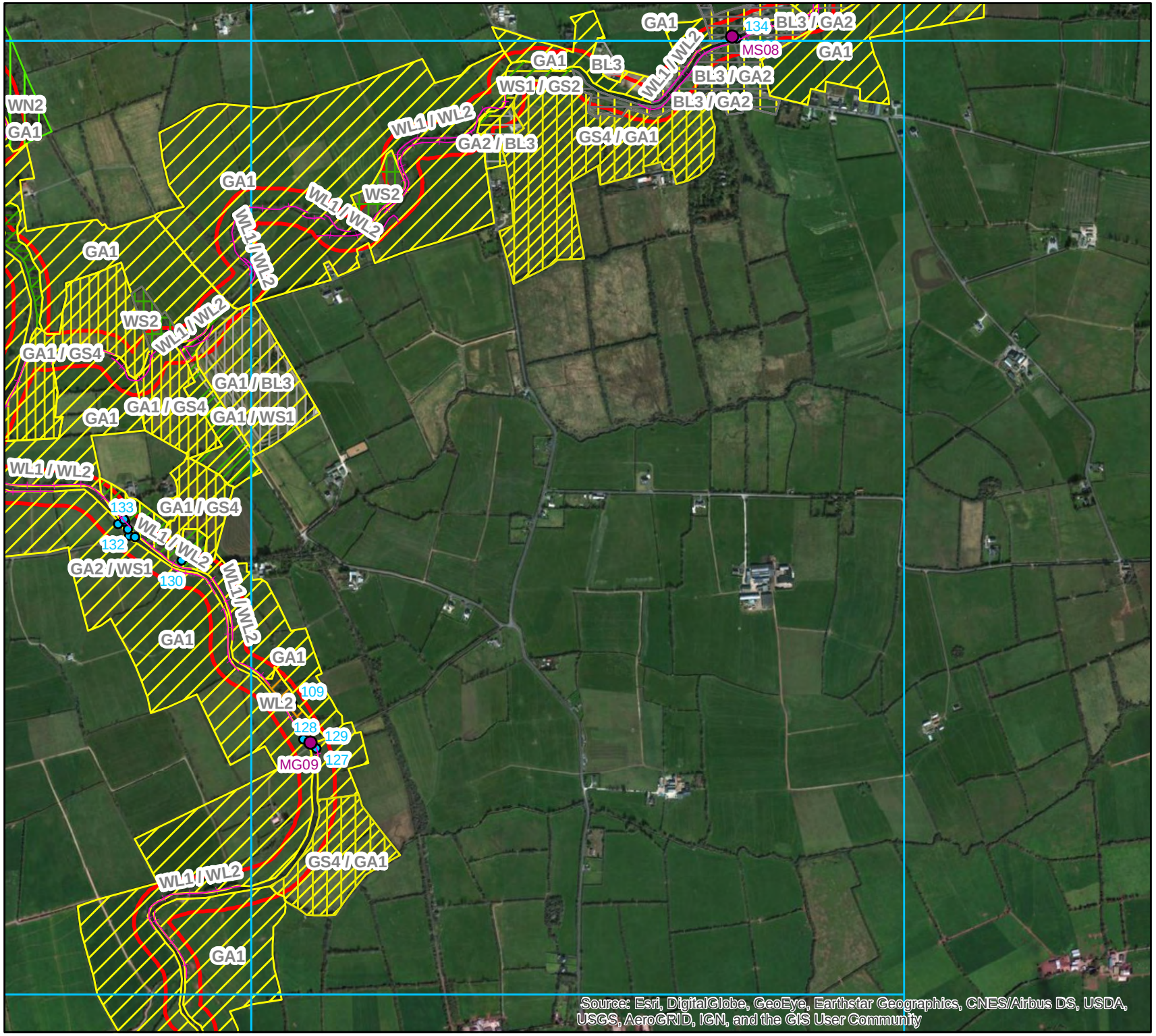

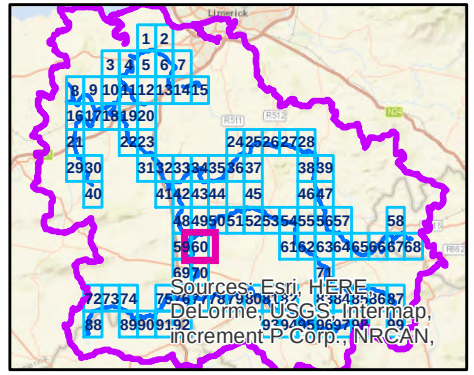

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / BL3 (Improved agricultural grassland / Buildings and artificial surfaces)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA1 / WS1 (Improved agricultural grassland / Scrub)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GA2 / WS1 (Amenity grassland (improved) / Scrub)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- WL2 (Treelines)
- WN2 (Oak-ash-hazel woodland)
- WS1 / GS2 (Scrub / Dry meadows and grassy verges)
- WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
- WS2 (Immature woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 60

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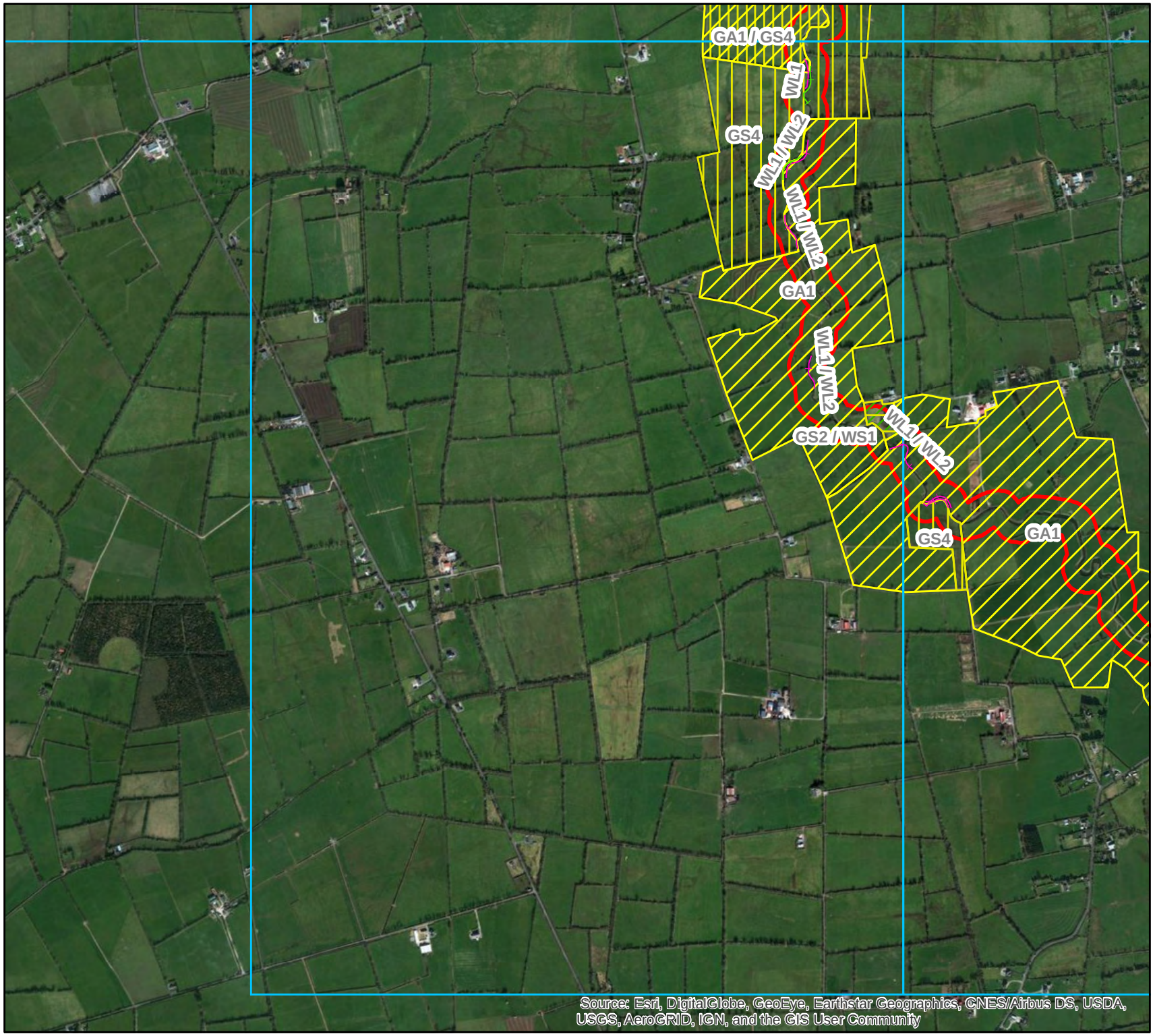

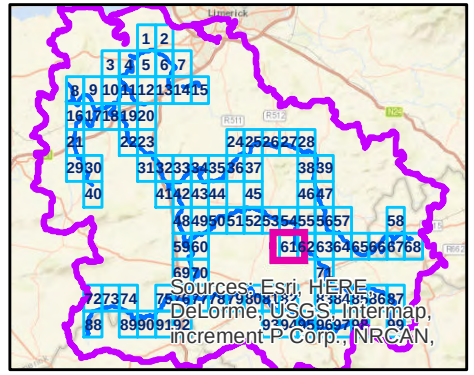

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- GS4 (Wet grassland)

0 300 600 Meters

Map area: 61

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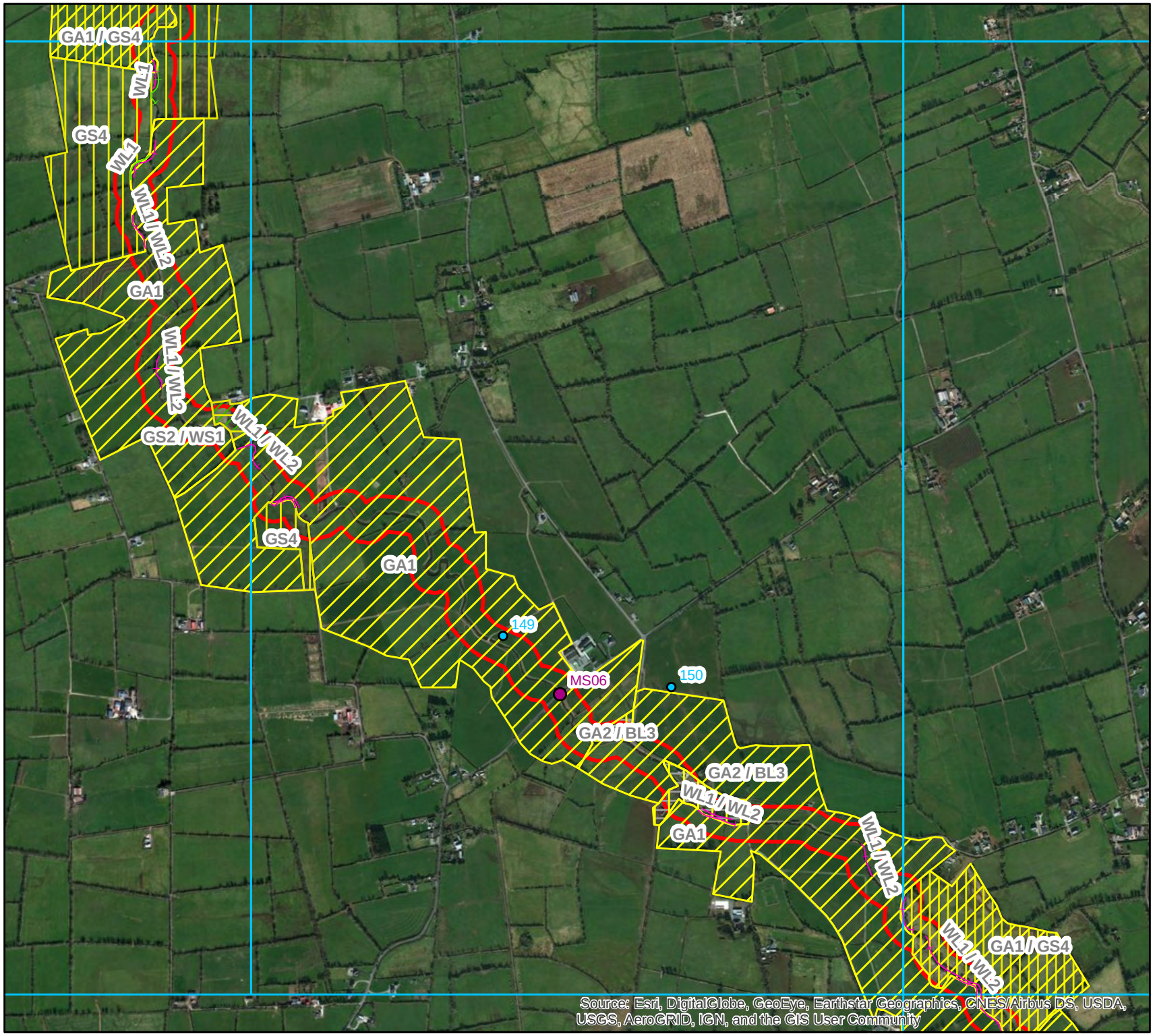

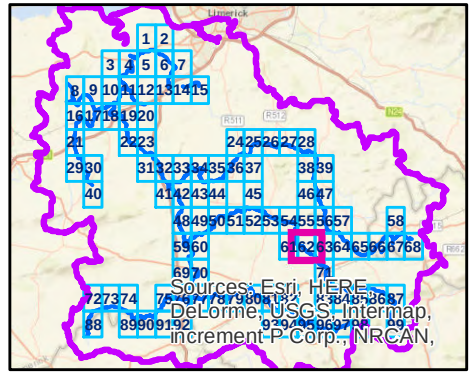

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- GS4 (Wet grassland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 62

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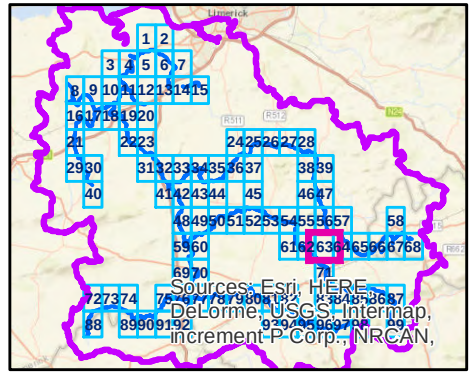

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS4 / GS1 (Wet grassland / Dry calcareous and neutral grassland)
- Survey Note

0 300 600 Meters

Map area: 63

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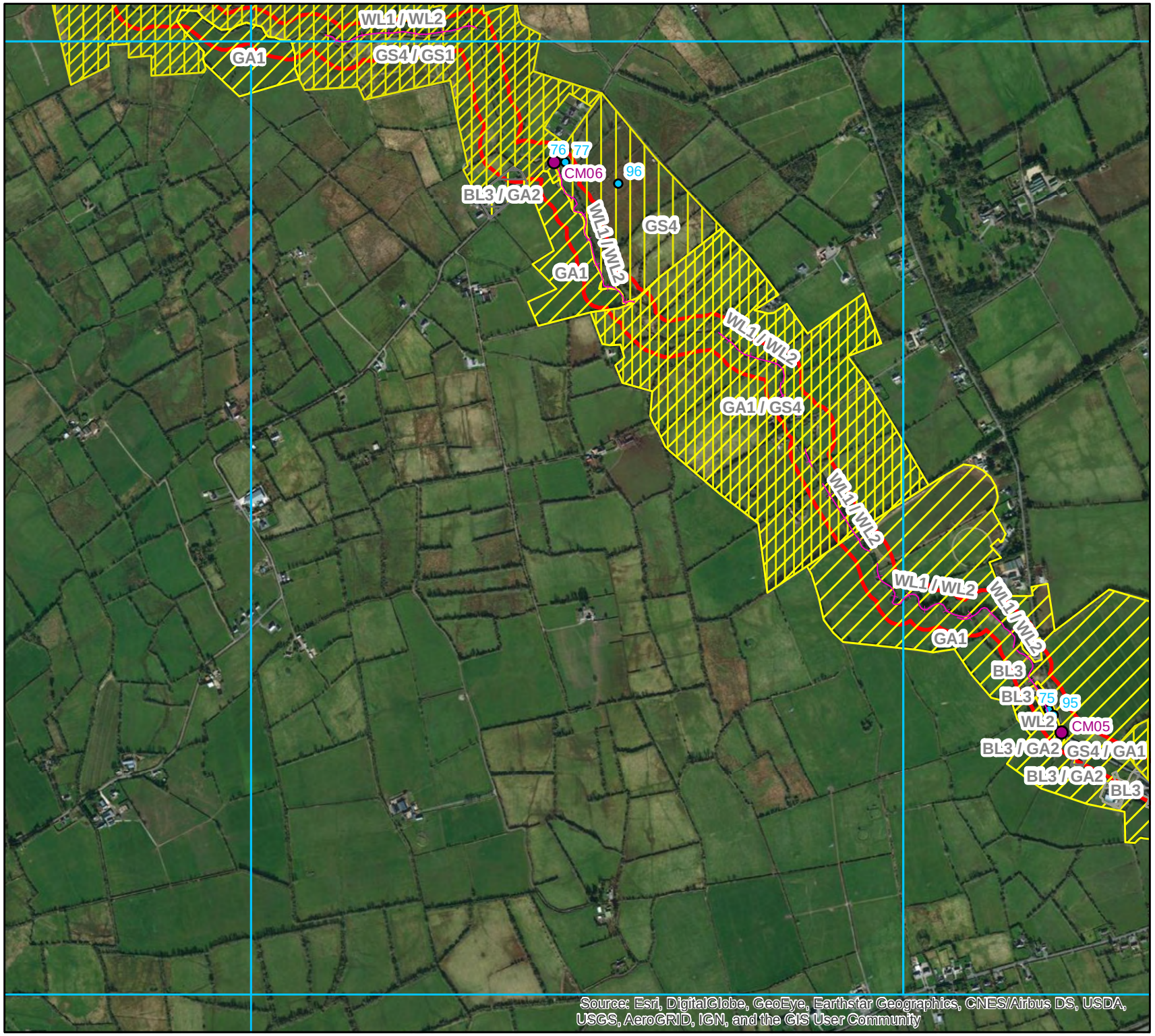

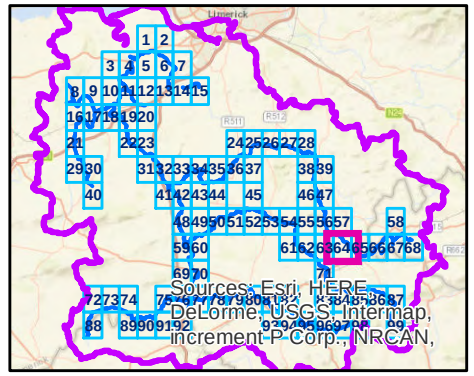

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS4 (Wet grassland)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- GS4 / GS1 (Wet grassland / Dry calcareous and neutral grassland)
- WL2 (Treelines)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 64

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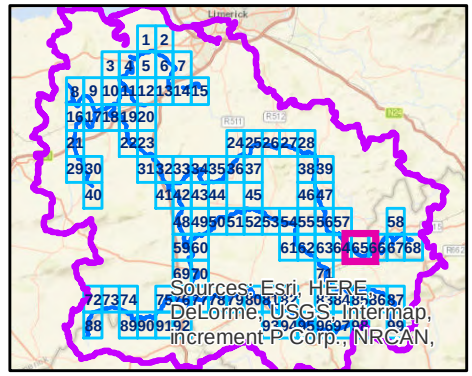

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / BL3 (Improved agricultural grassland / Buildings and artificial surfaces)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS2 / GA1 (Dry meadows and grassy verges / Improved agricultural grassland)
- GS4 (Wet grassland)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- WL2 (Treelines)
- WS1 / GA1 (Scrub / Improved agricultural grassland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 65

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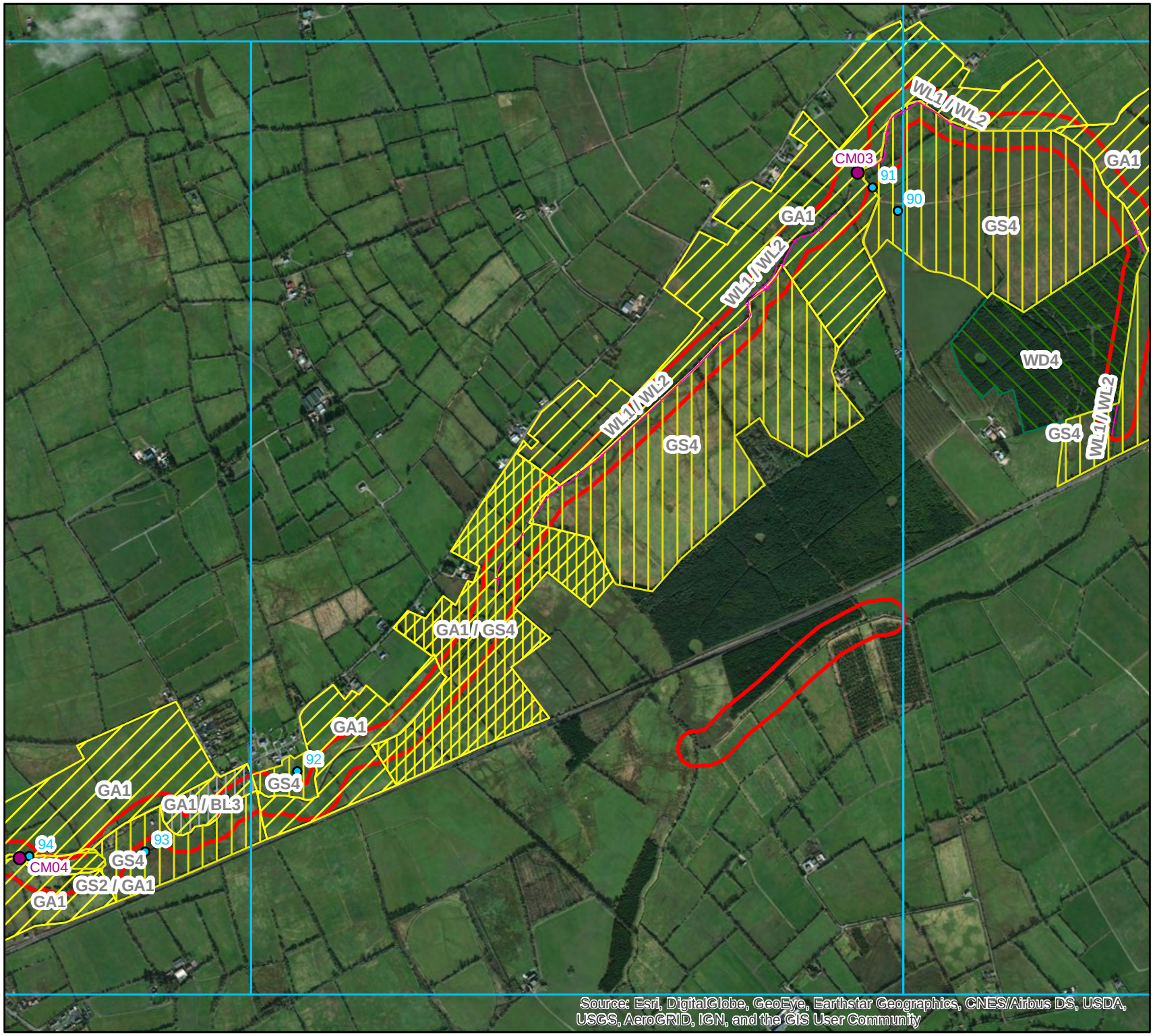

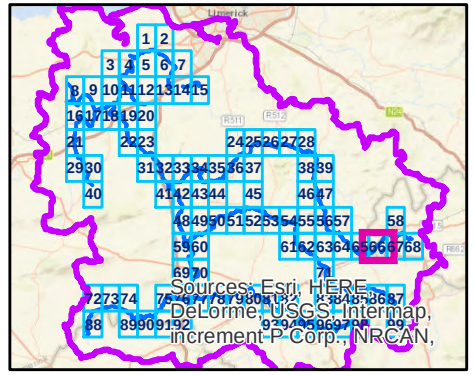

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / BL3 (Improved agricultural grassland / Buildings and artificial surfaces)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS2 / GA1 (Dry meadows and grassy verges / Improved agricultural grassland)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- WS1 / GA1 (Scrub / Improved agricultural grassland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 66

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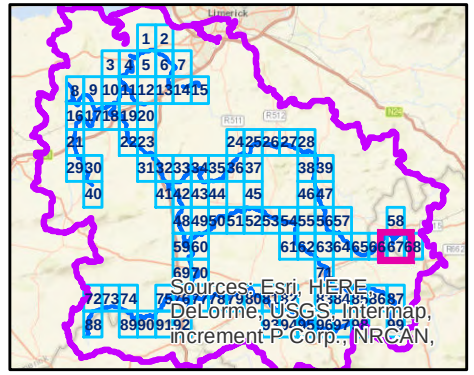

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS4 (Wet grassland)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- WD4 (Conifer plantation)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 67

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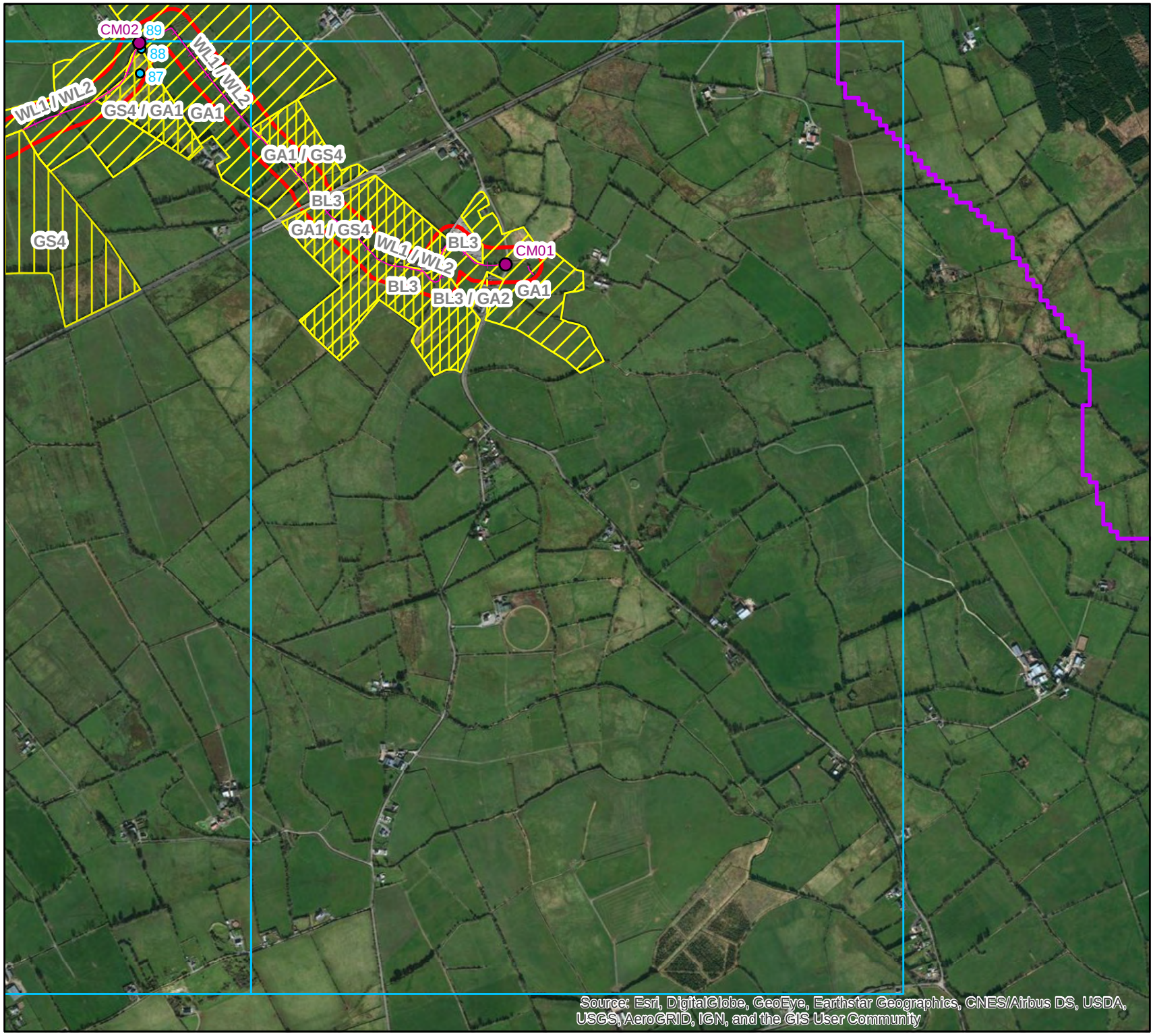

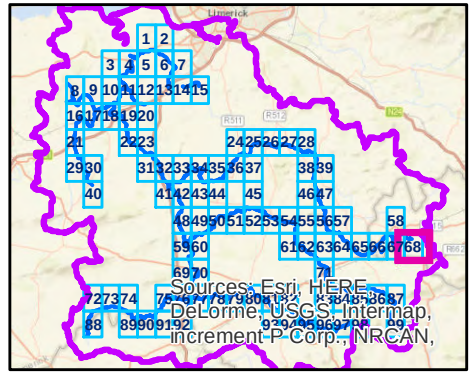

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS4 (Wet grassland)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 68

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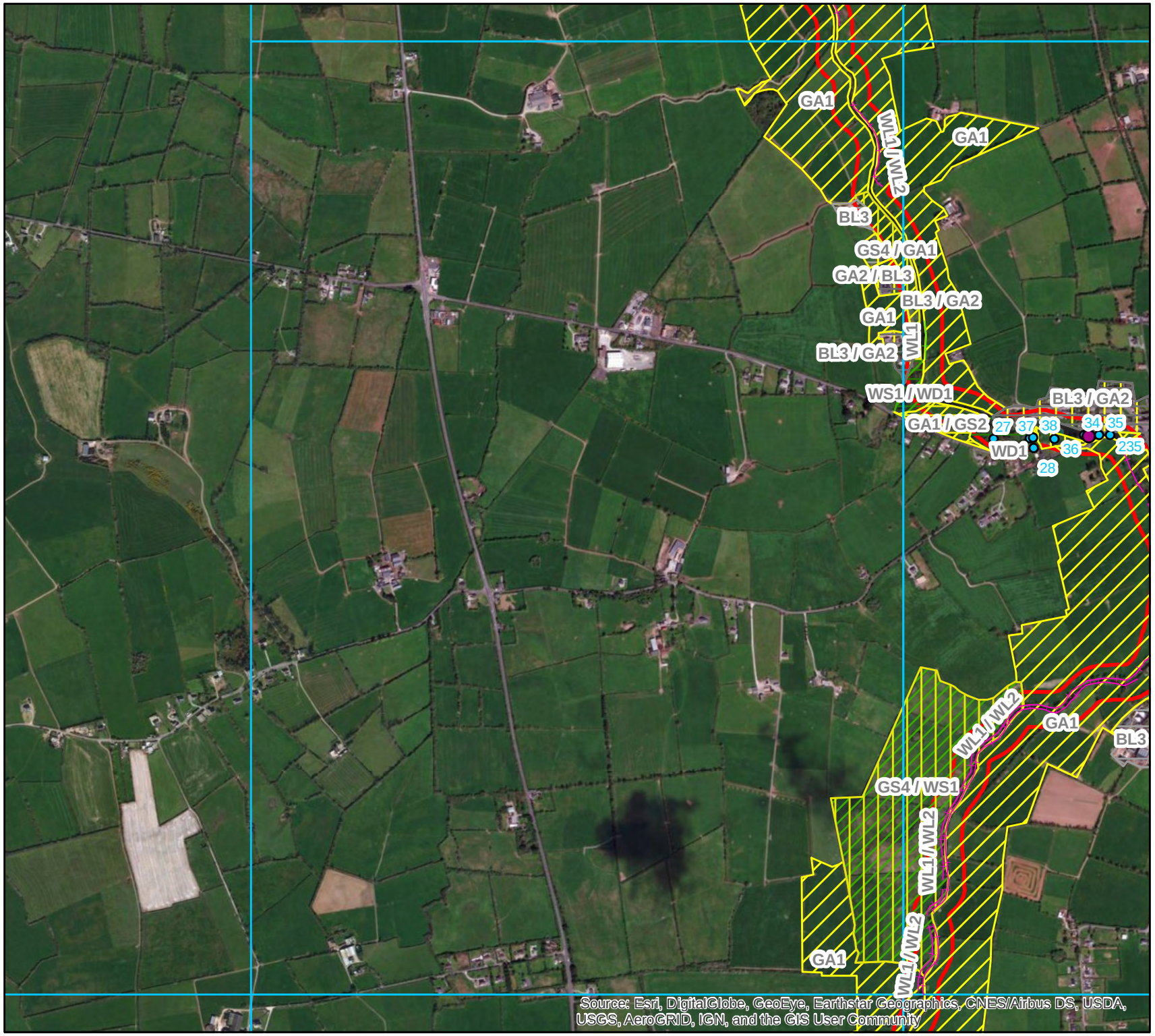

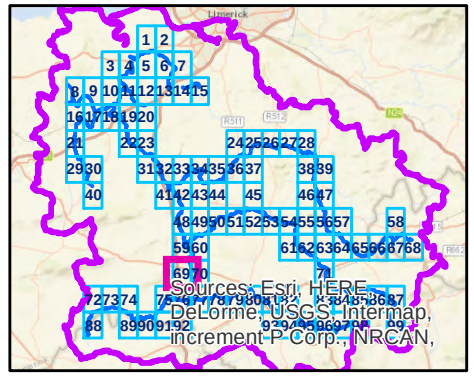

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS2 (Improved agricultural grassland / Dry meadows and grassy verges)
- GA2 (Amenity grassland (improved))
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- GS4 / WS1 (Wet grassland / Scrub)
- WD1 (Mixed) broadleaved woodland
- WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 69

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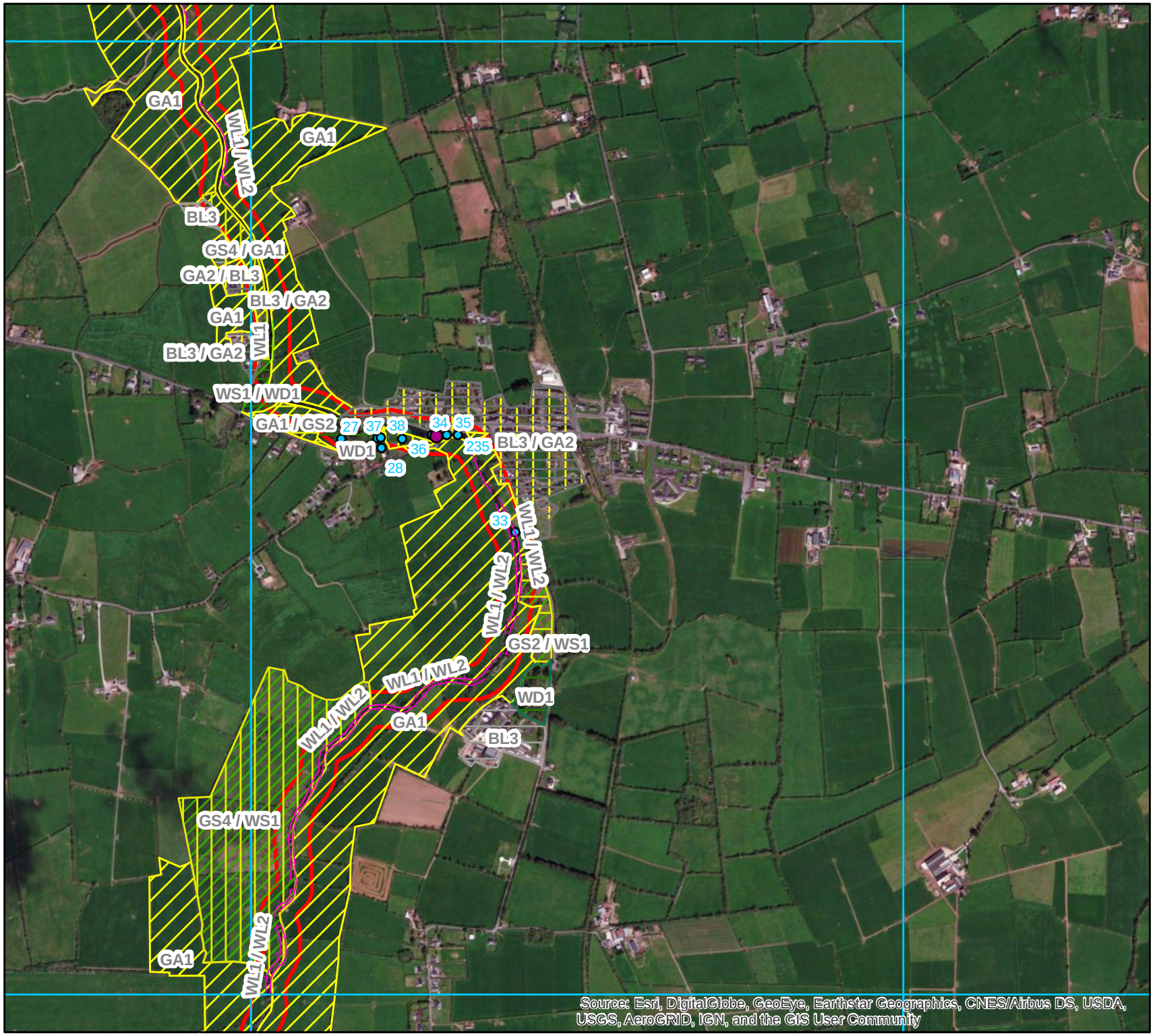

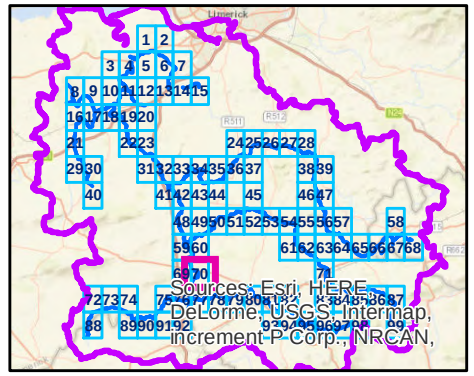

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GA1 / GS2 (Improved agricultural grassland / Dry meadows and grassy verges)
- GA2 (Amenity grassland (improved))
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS2 / WS1 (Dry meadows and grassy verges / Scrub)
- GS4 / GA1 (Wet grassland / Improved agricultural grassland)
- GS4 / WS1 (Wet grassland / Scrub)
- WD1 (Mixed) broadleaved woodland
- WS1 / WD1 (Scrub / (Mixed) broadleaved woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 70

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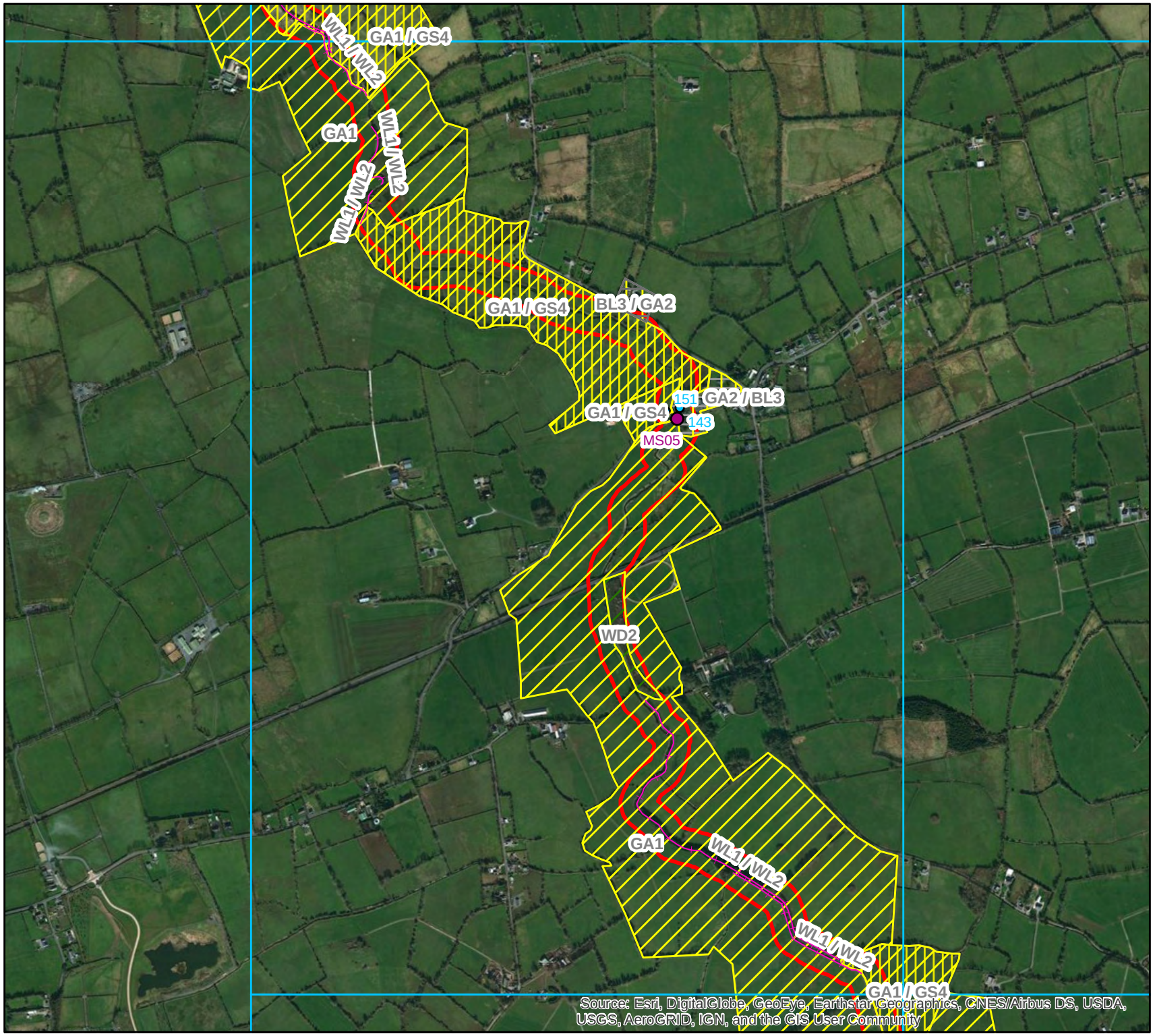

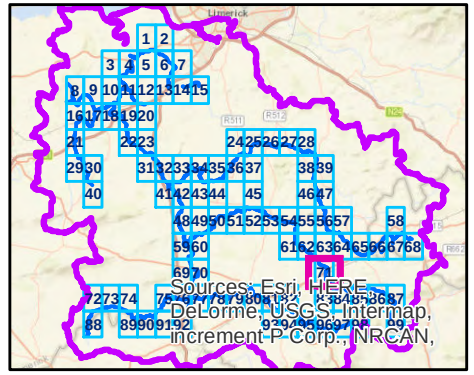

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
GA1 (Improved agricultural grassland)
GA1 / GS4 (Improved agricultural grassland / Wet grassland)
GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
WD2 (Mixed broadleaved/conifer woodland)
RHAT Survey Point
Survey Note

0 300 600 Meters

Map area: 71

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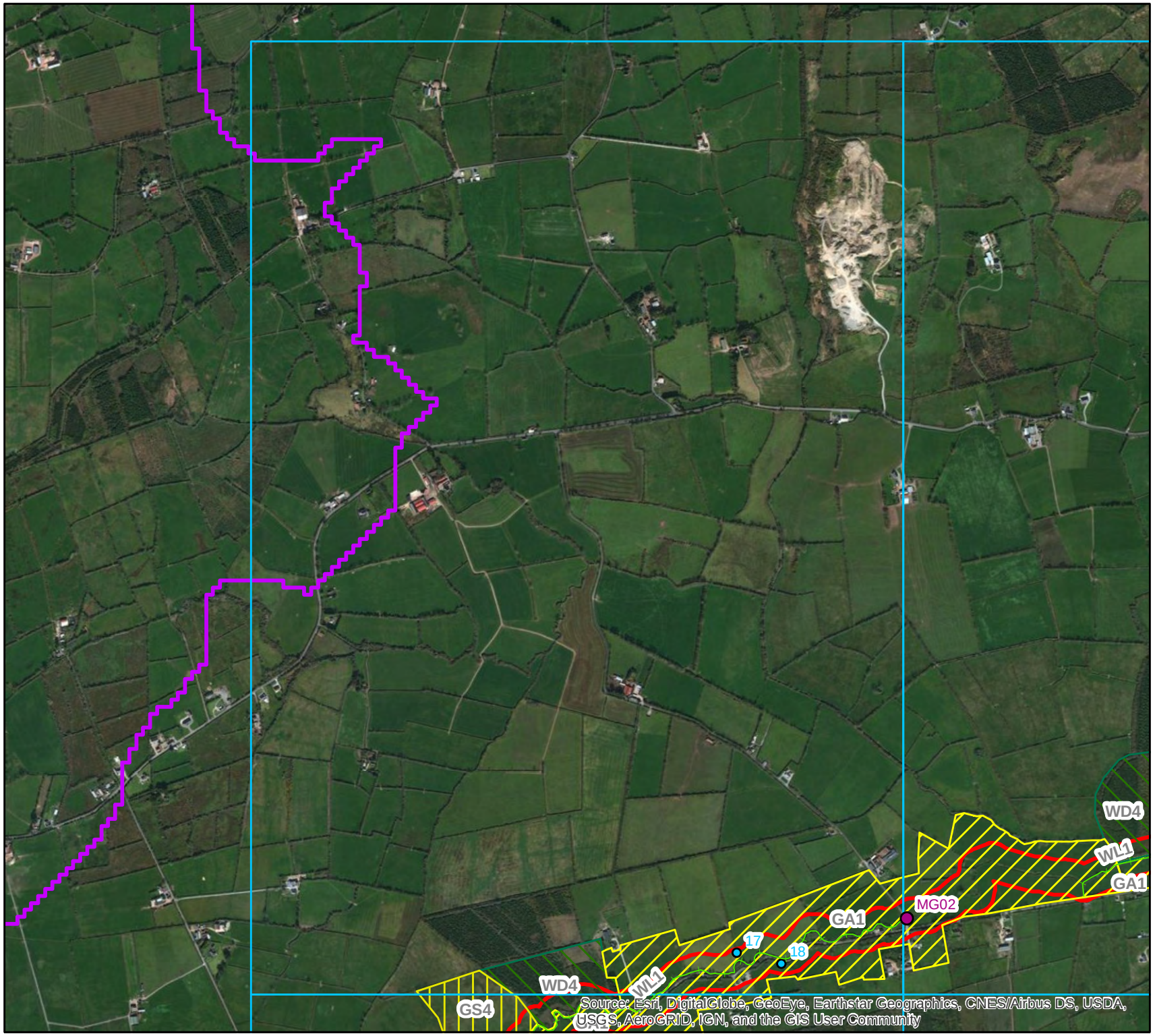

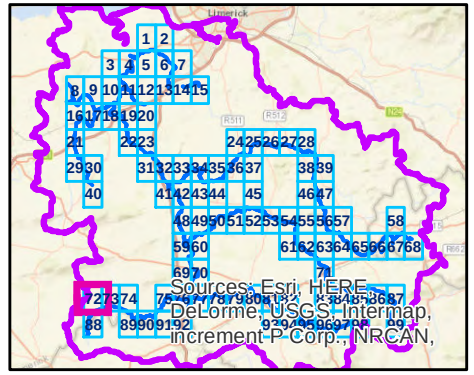

General Study Area
MaigueRivers_50mBuffer
WL1 (Hedgerows)
GA1 (Improved agricultural grassland)
GS4 (Wet grassland)
WD4 (Conifer plantation)
RHAT Survey Point
Survey Note

0 300 600 Meters

Map area: 72

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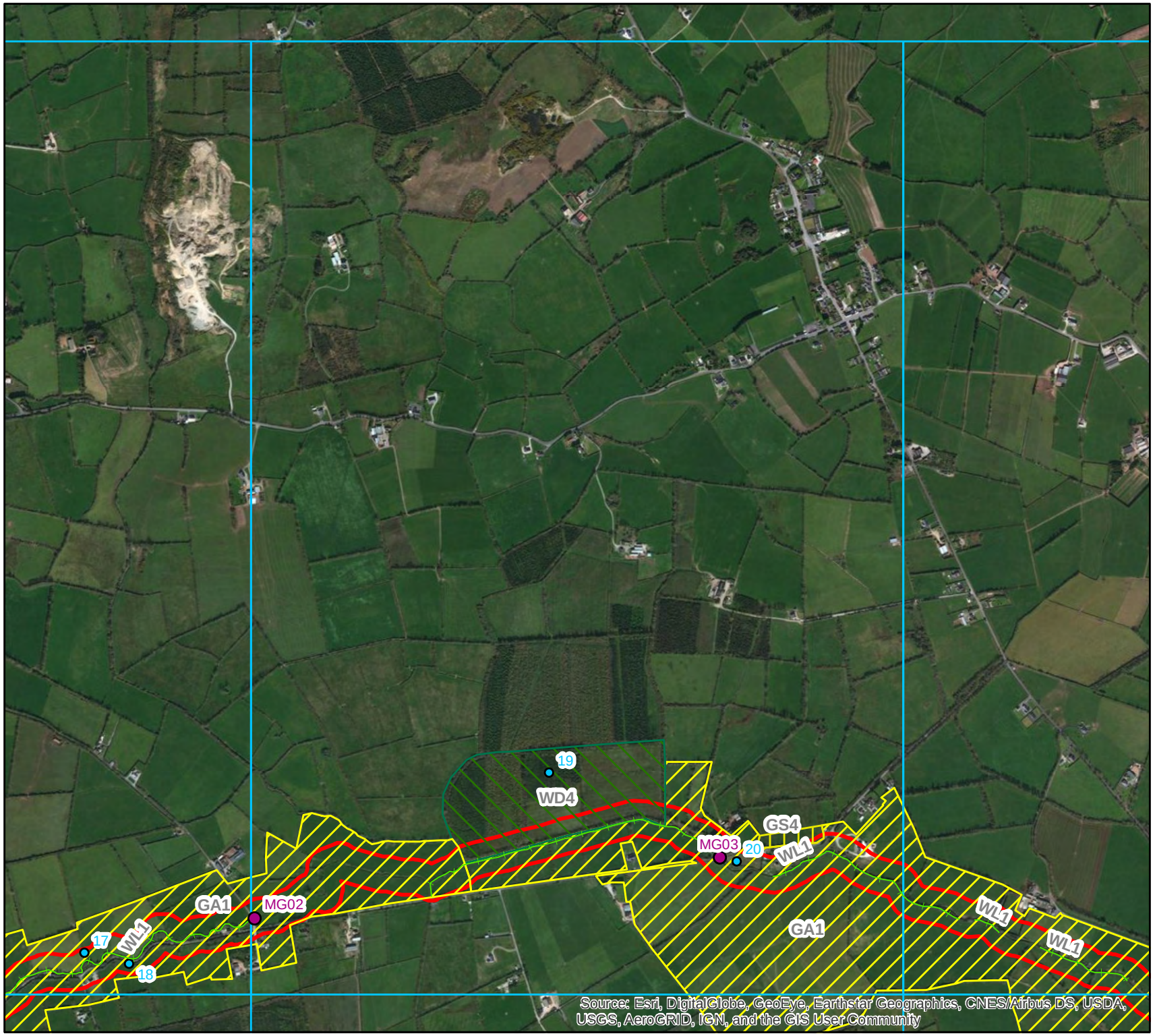

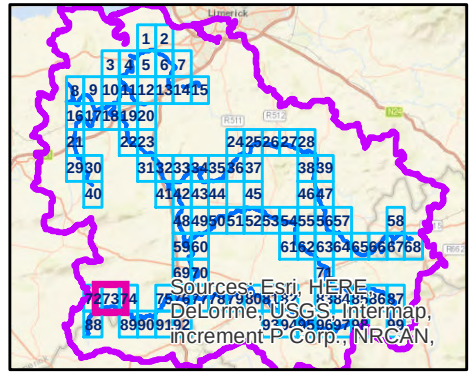

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- GA1 (Improved agricultural grassland)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 73

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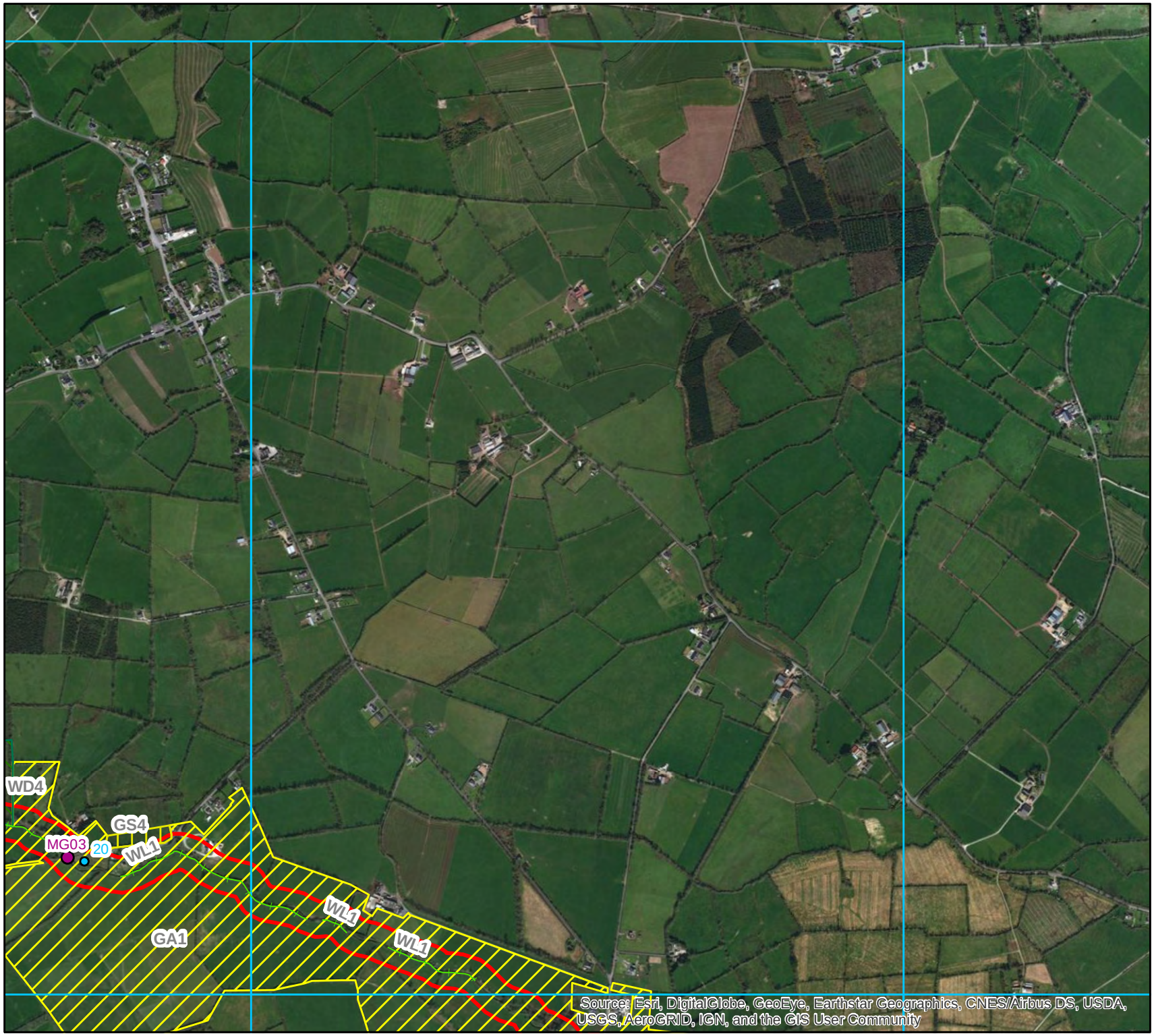

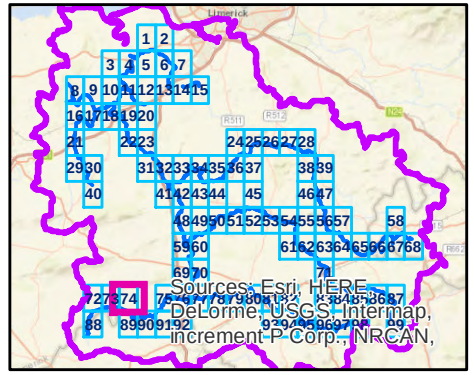

General Study Area
MaigueRivers_50mBuffer
WL1 (Hedgerows)
GA1 (Improved agricultural grassland)
GS4 (Wet grassland)
WD4 (Conifer plantation)
RHAT Survey Point
Survey Note

0 300 600 Meters

Map area: 74

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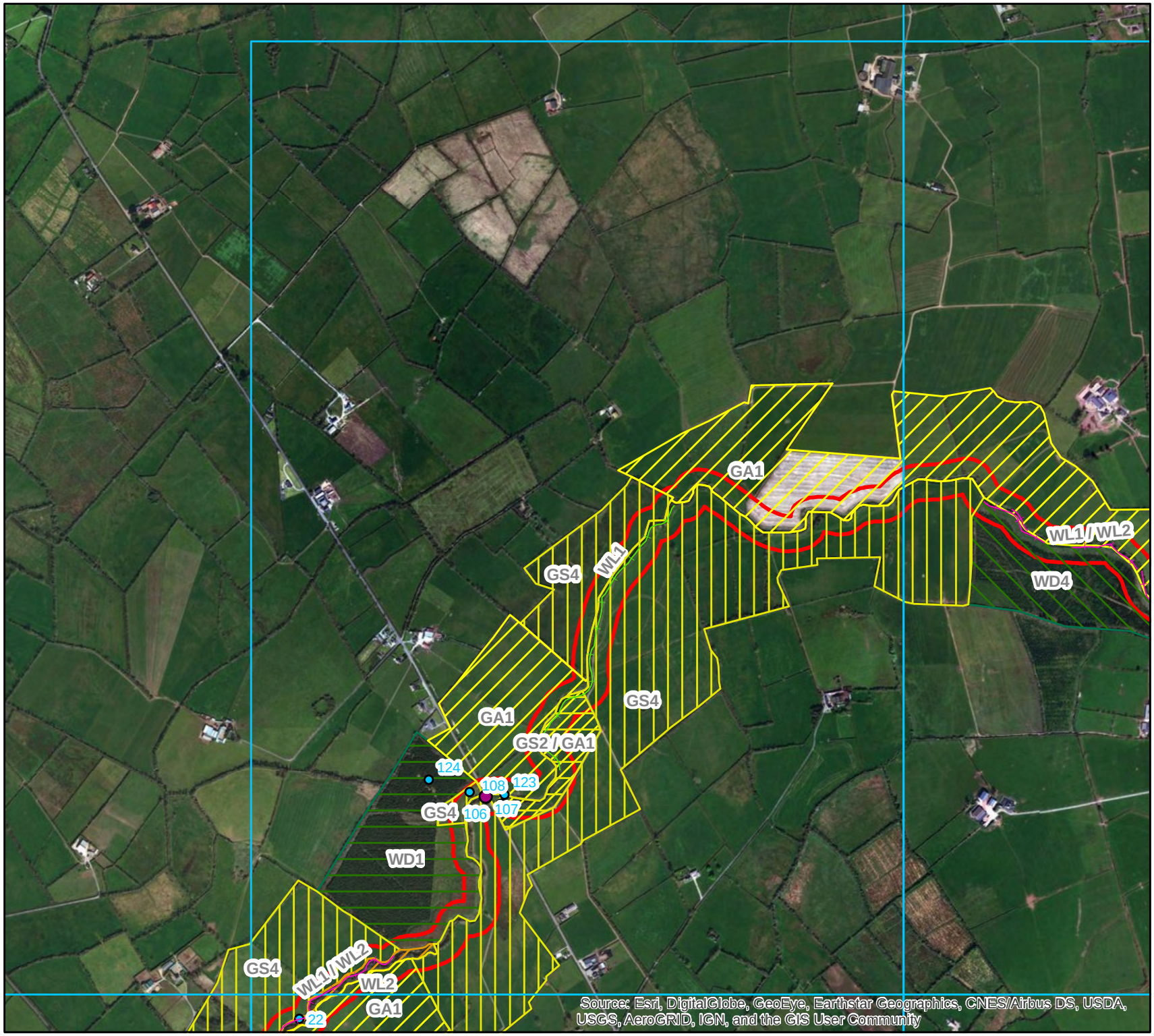
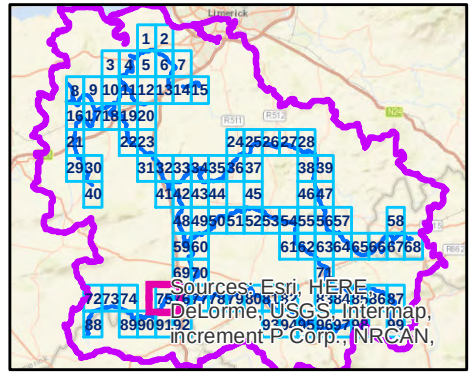


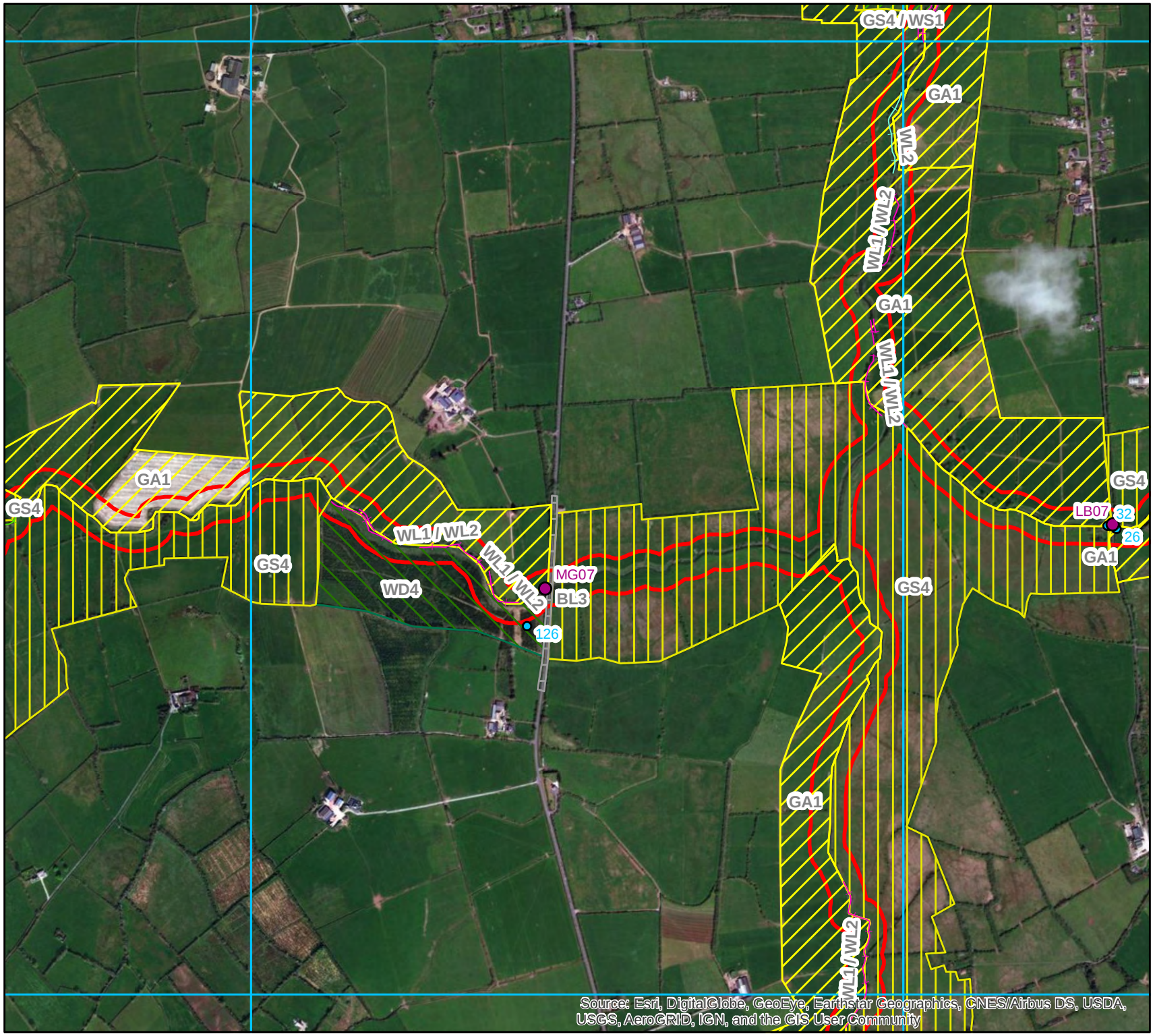


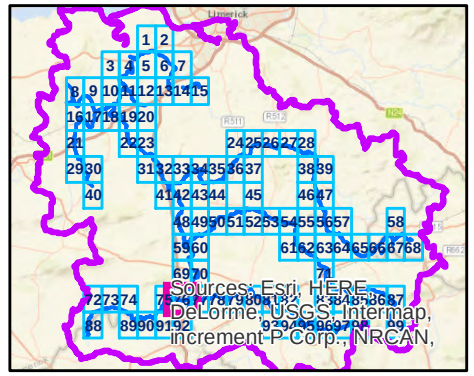
- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GS2 / GA1 (Dry meadows and grassy verges / Improved agricultural grassland)
- GS4 (Wet grassland)
- WD1 (Mixed) broadleaved woodland
- WD4 (Conifer plantation)
- WL2 (Treelines)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 75

wetland surveys ireland
www.WetlandSurveysIreland.com



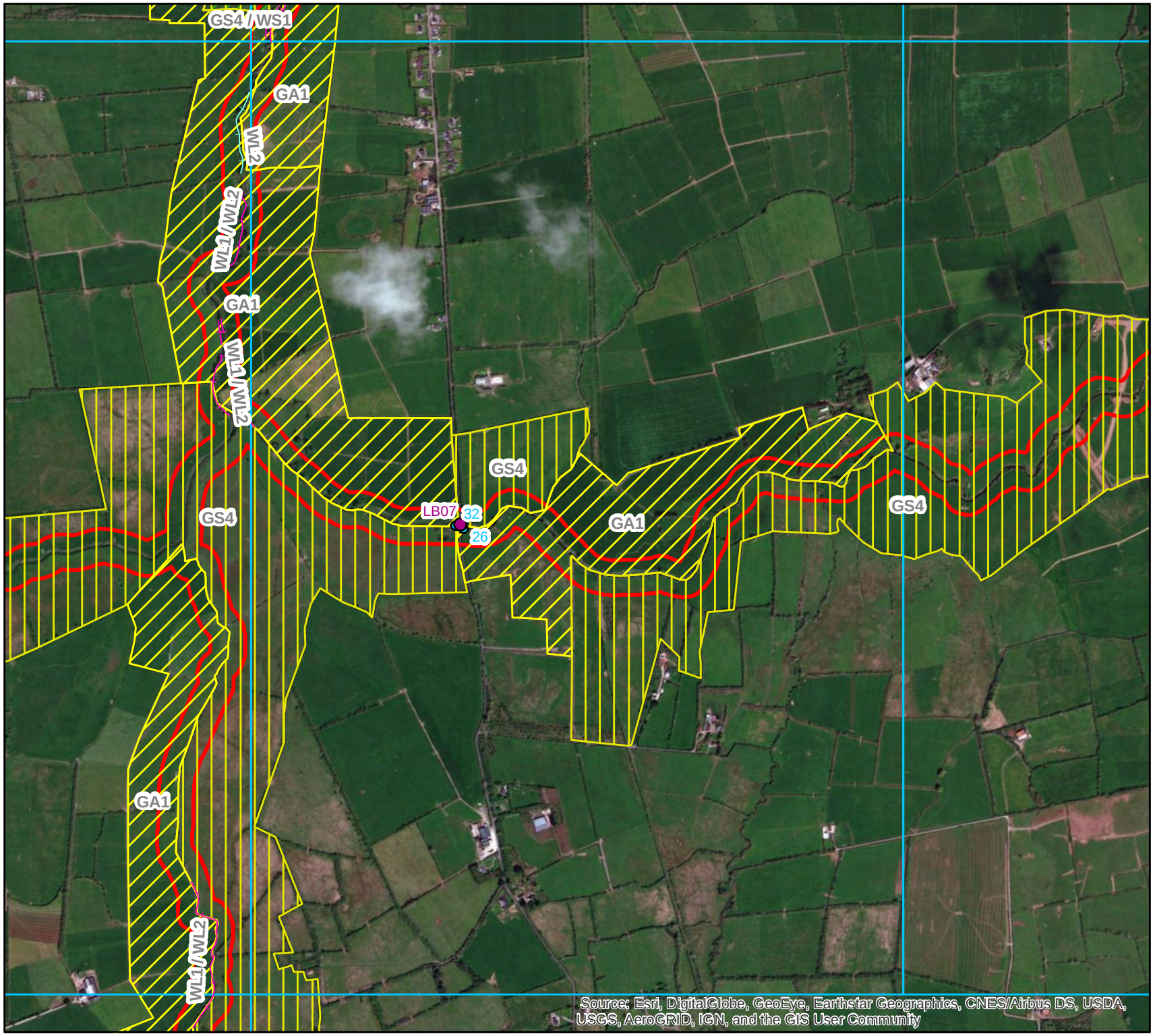


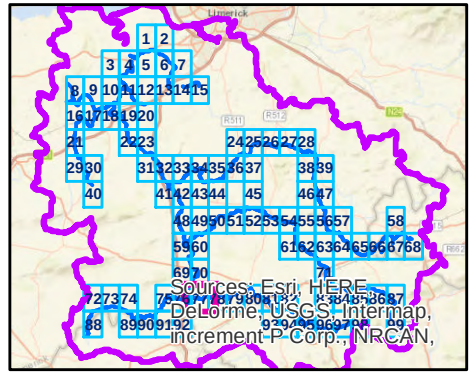
General Study Area
MaigueRivers_50mBuffer
WL1 (Hedgerows)
WL1 / WL2 (Hedgerows / Treelines)
WL2 (Treelines)
BL3 (Buildings and artificial surfaces)
GA1 (Improved agricultural grassland)
GS4 (Wet grassland)
GS4 / WS1 (Wet grassland / Scrub)
WD4 (Conifer plantation)
RHAT Survey Point
Survey Note

0 300 600 Meters

Map area: 76

wetland surveys ireland
www.WetlandSurveysIreland.com





- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- WL2 (Treelines)
- GA1 (Improved agricultural grassland)
- GS4 (Wet grassland)
- GS4 / WS1 (Wet grassland / Scrub)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 77

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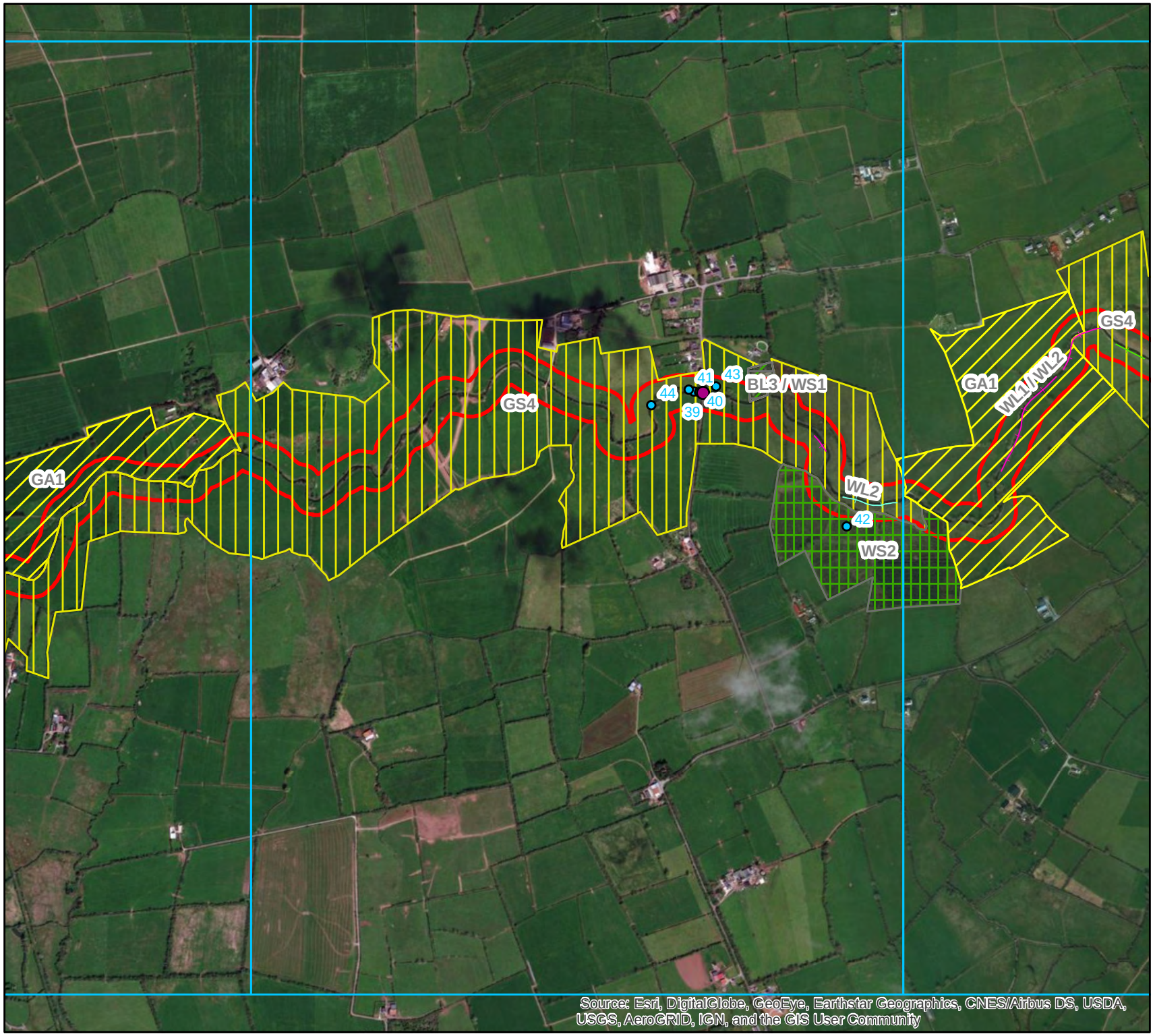

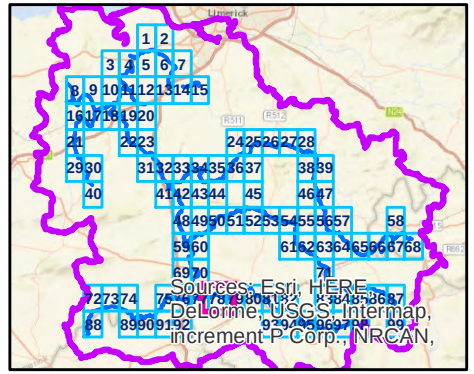

General Study Area
MaigueRivers_50mBuffer
WL1 (Hedgerows)
WL1 / WL2 (Hedgerows / Treelines)
WL2 (Treelines)
BL3 / WS1 (Buildings and artificial surfaces / Scrub)
GA1 (Improved agricultural grassland)
GS4 (Wet grassland)
WS2 (Immature woodland)
RHAT Survey Point
Survey Note

0 300 600 Meters

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Map area: 78

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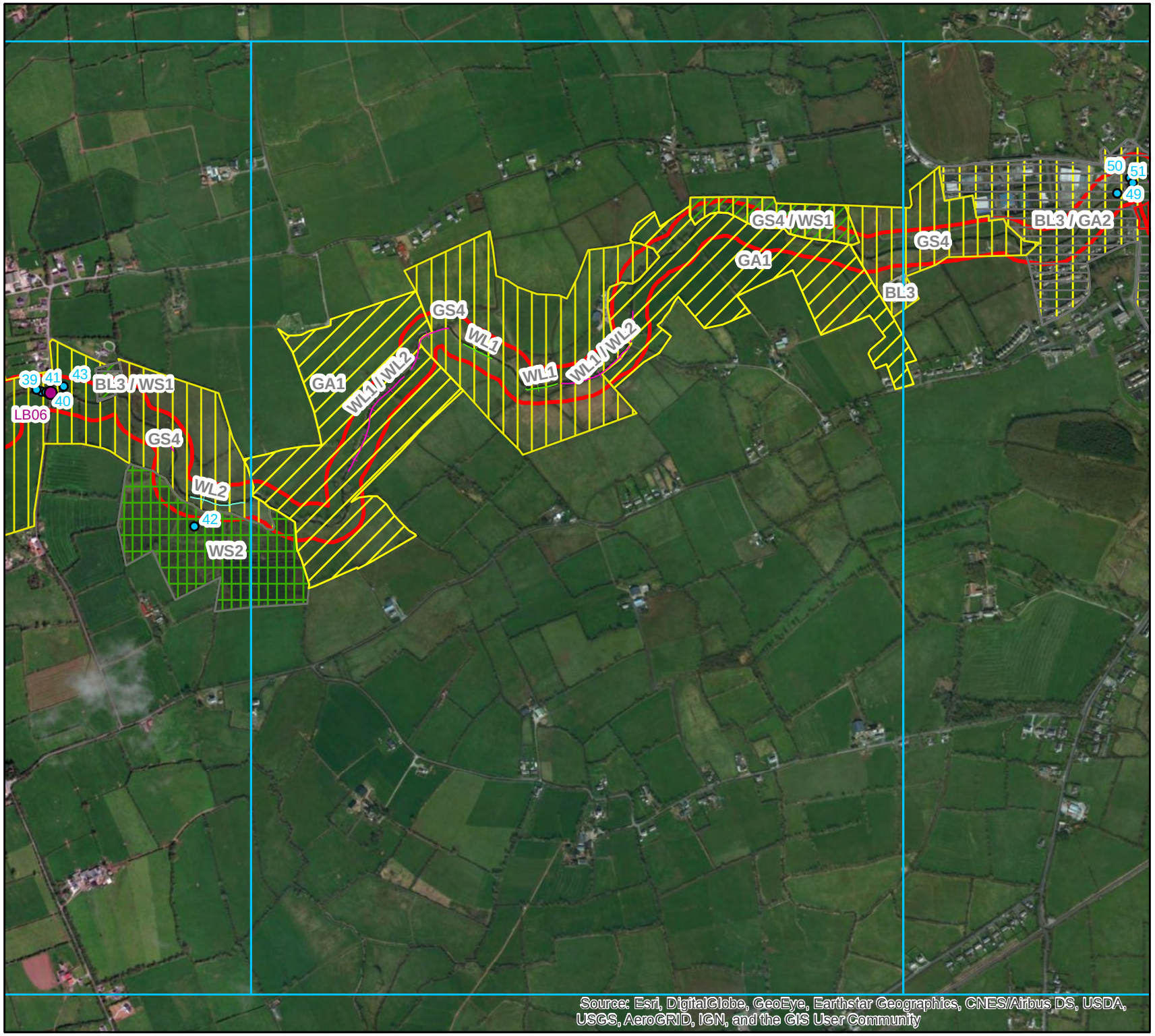

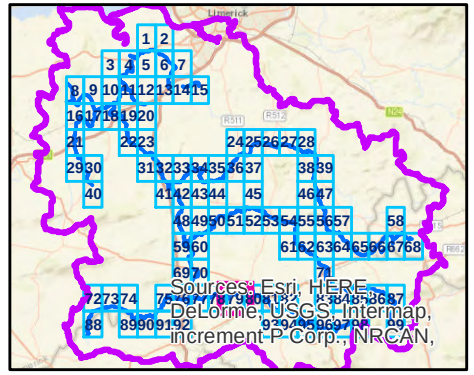

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- WL2 (Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- BL3 / WS1 (Buildings and artificial surfaces / Scrub)
- ED2 (Spoil and bare ground)
- GA1 (Improved agricultural grassland)
- GS4 (Wet grassland)
- GS4 / WS1 (Wet grassland / Scrub)
- WS2 (Immature woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 79

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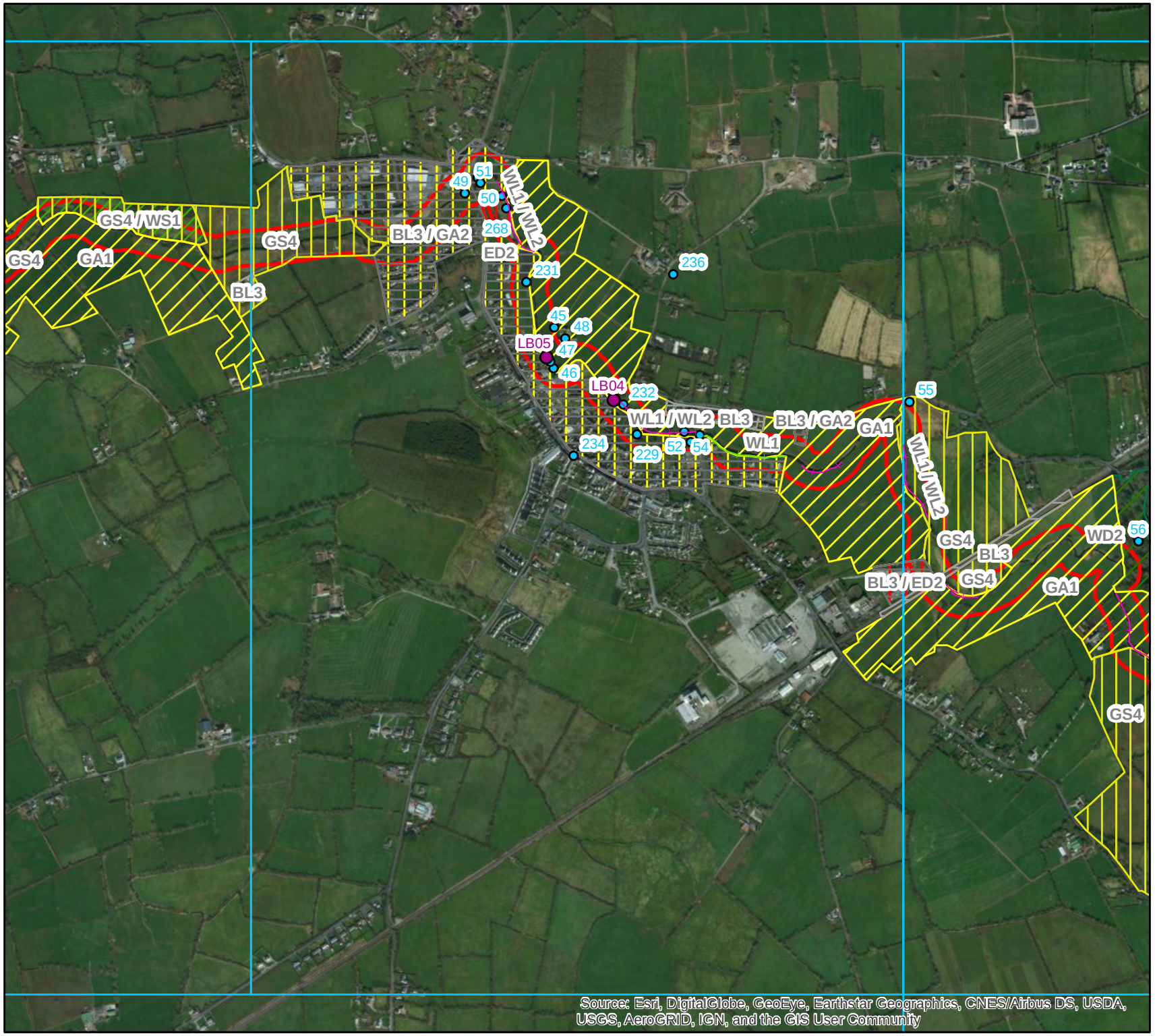

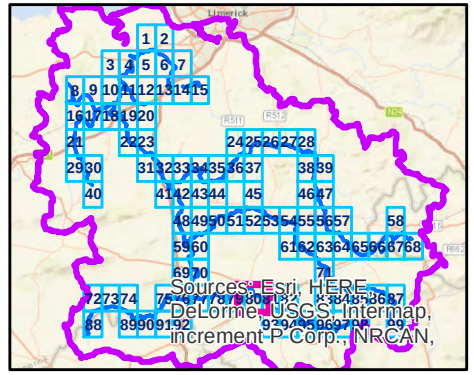

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / ED2 (Buildings and artificial surfaces / Spoil and bare ground)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- ED2 (Spoil and bare ground)
- GA1 (Improved agricultural grassland)
- GS4 (Wet grassland)
- GS4 / WS1 (Wet grassland / Scrub)
- WD2 (Mixed broadleaved/conifer woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 80

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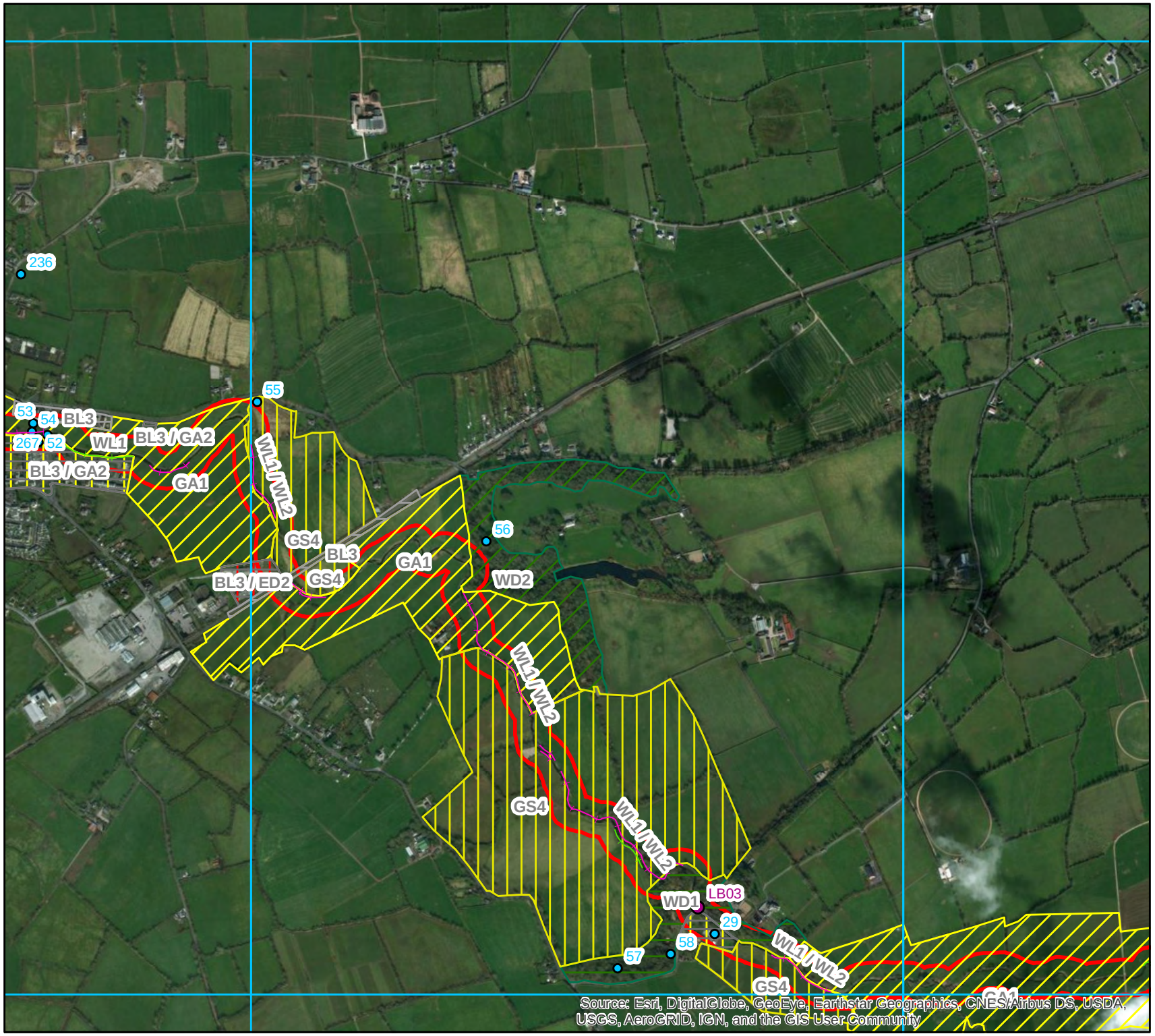

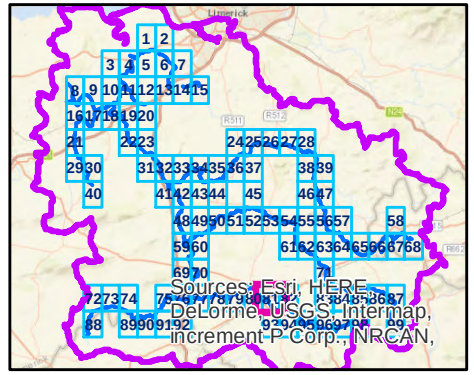

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / ED2 (Buildings and artificial surfaces / Spoil and bare ground)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GS4 (Wet grassland)
- WD1 (Mixed) broadleaved woodland
- WD2 (Mixed broadleaved/conifer woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 81

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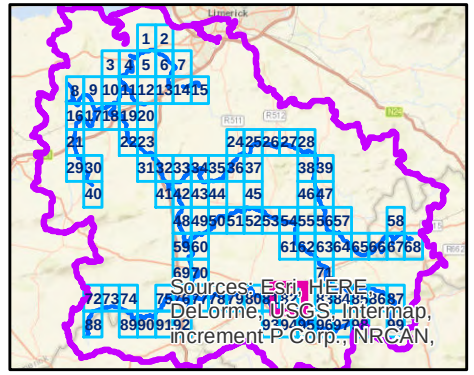

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
- GA1 (Improved agricultural grassland)
- GS4 (Wet grassland)
- WD1 (Mixed) broadleaved woodland
- WD2 (Mixed broadleaved/conifer woodland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 82

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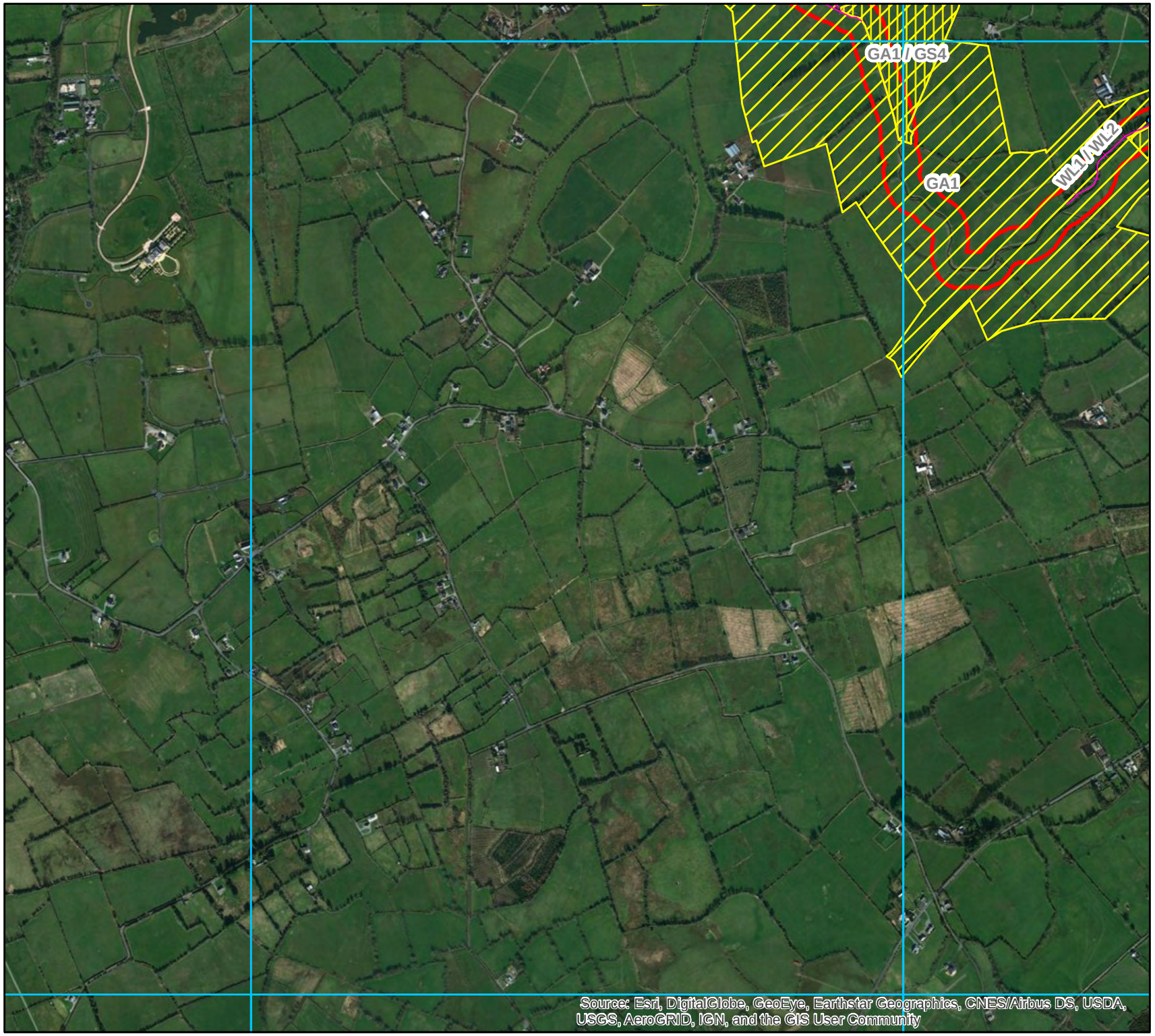

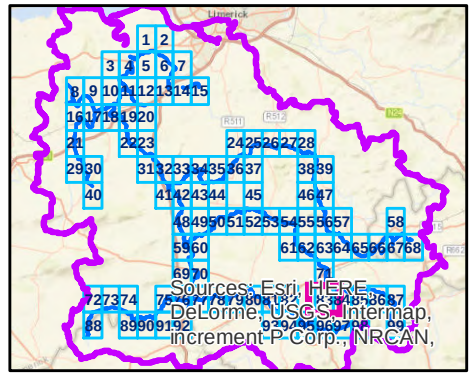

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- Survey Note

0 300 600 Meters

Map area: 83

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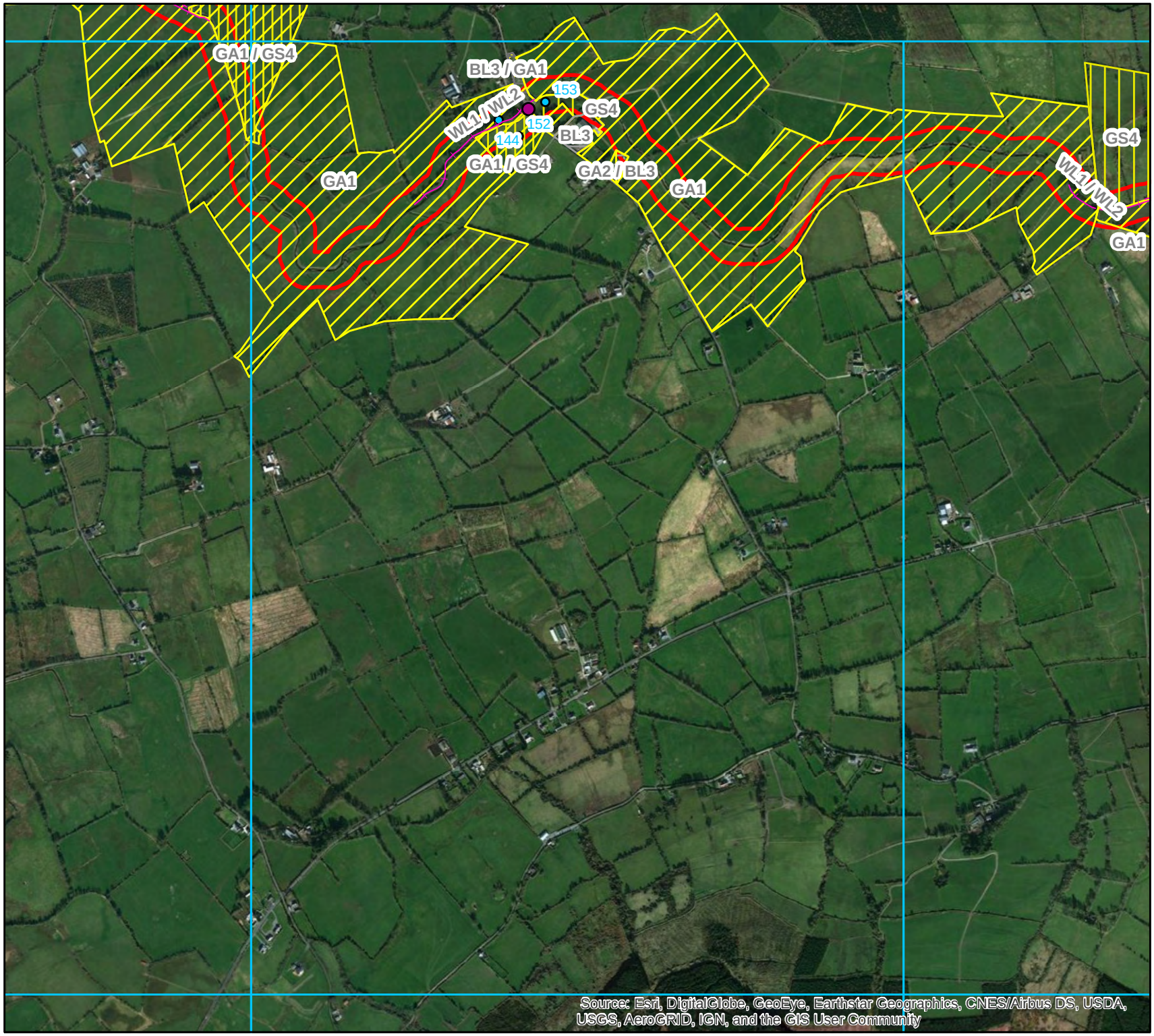

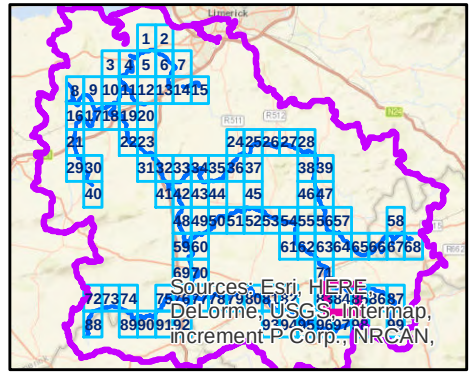

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- BL3 / GA1 (Buildings and artificial surfaces / Improved agricultural grassland)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS4 (Wet grassland)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 84

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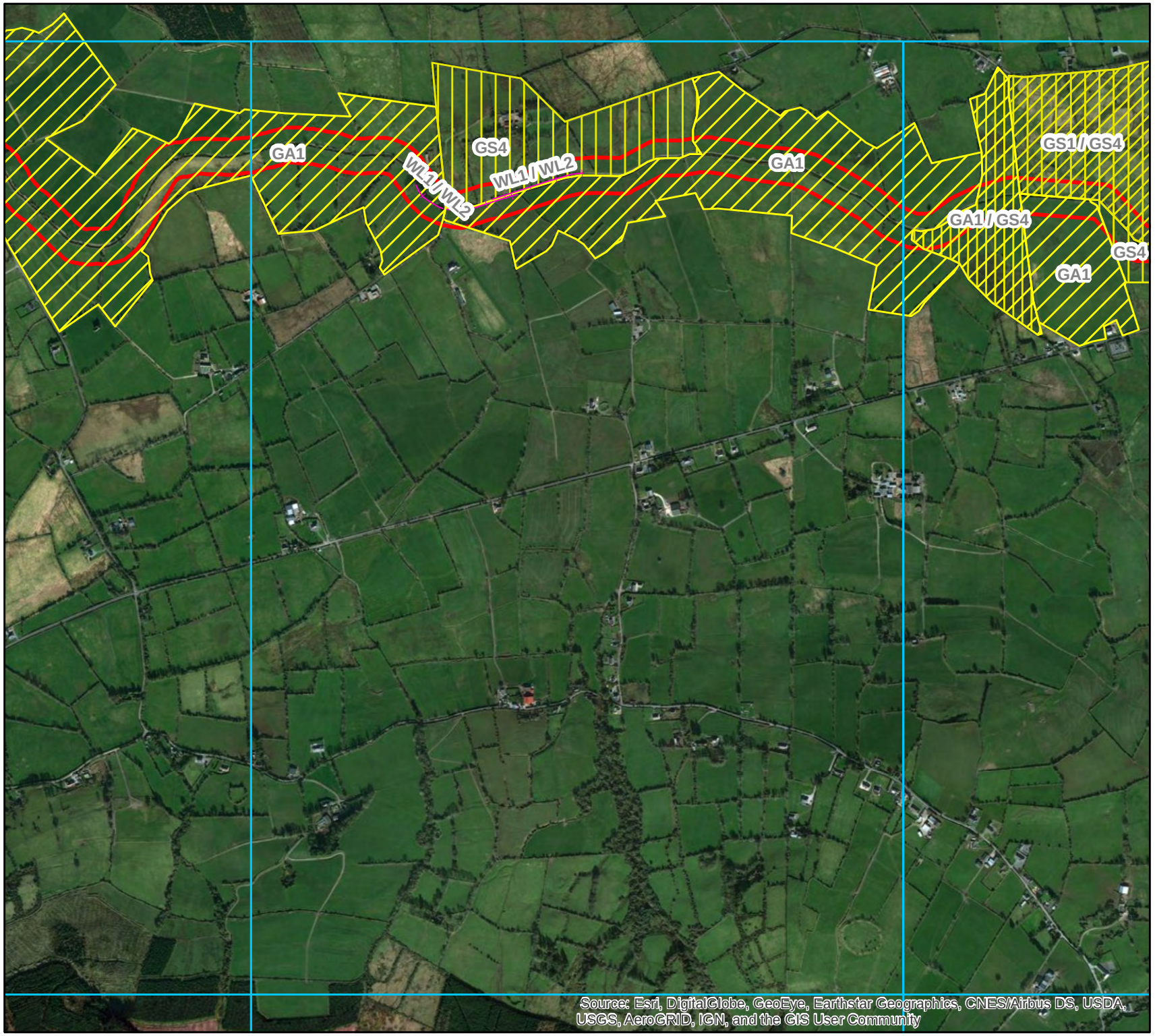

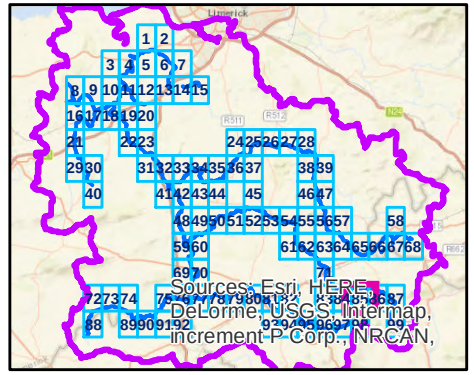

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS1 / GS4 (Dry calcareoud and neutral grassland / Wet grassland)
- GS4 (Wet grassland)

0 300 600 Meters

Map area: 85

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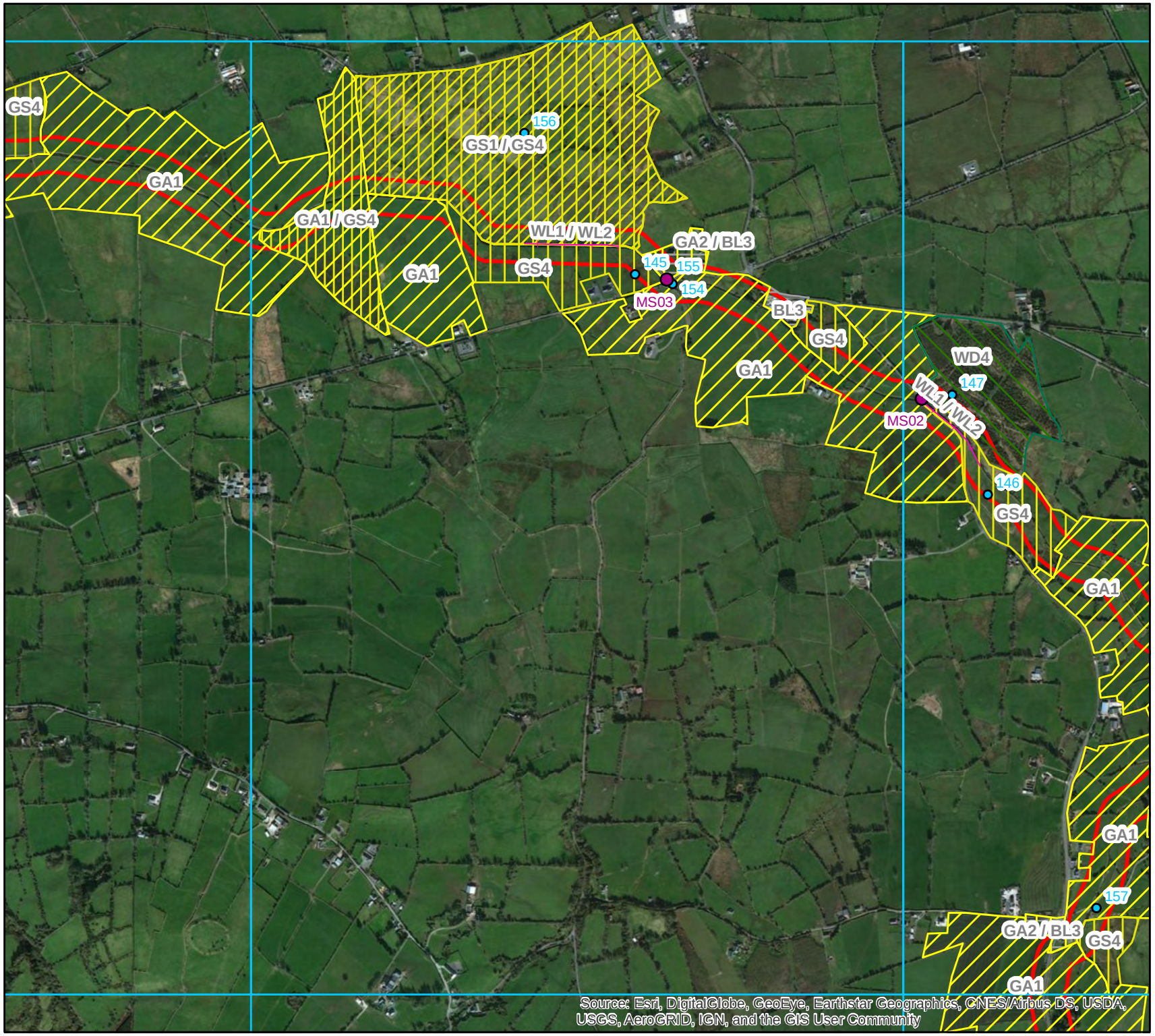

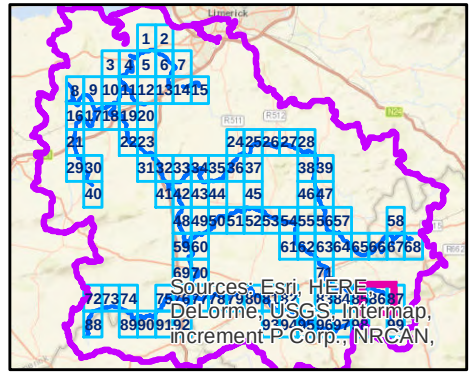

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS1 / GS4 (Dry calcareoud and neutral grassland / Wet grassland)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 86

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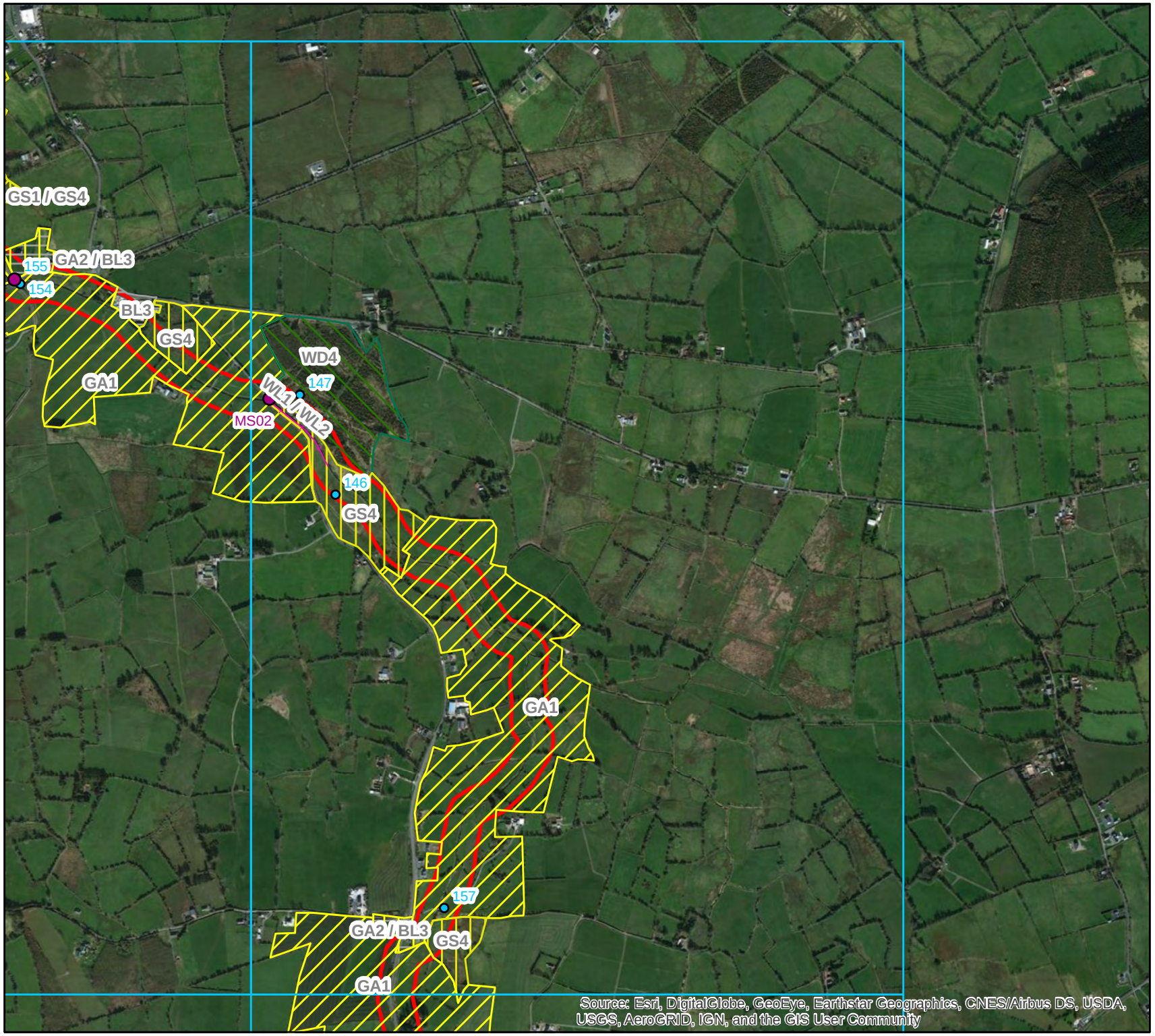

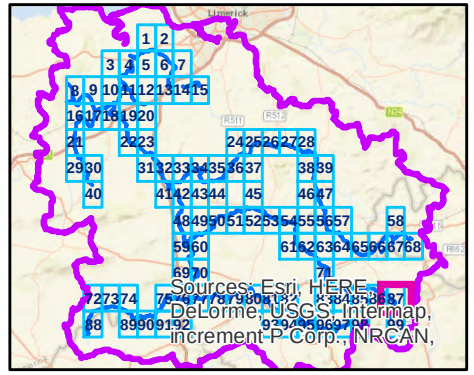

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- GA1 (Improved agricultural grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS1 / GS4 (Dry calcareoud and neutral grassland / Wet grassland)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 87

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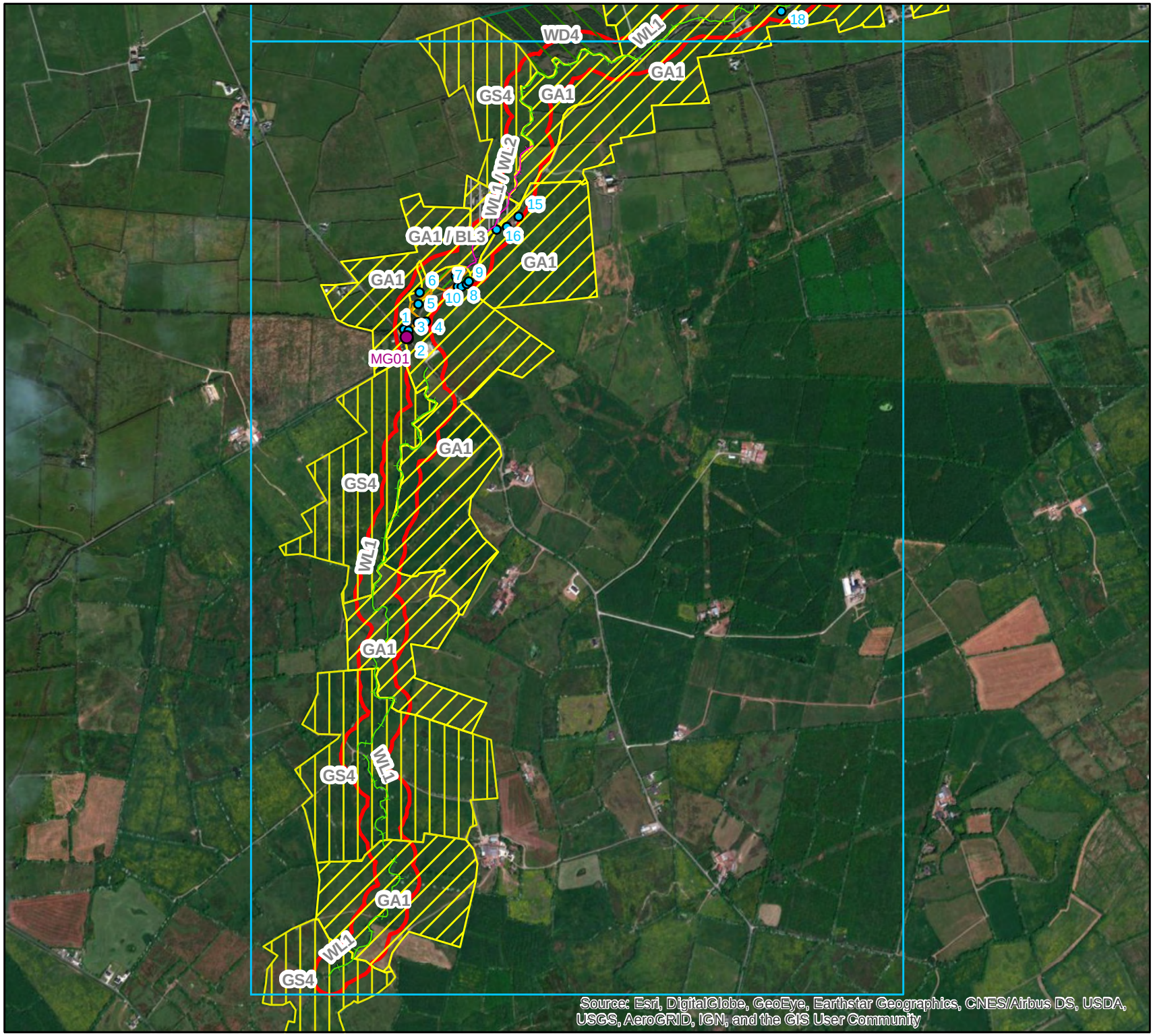

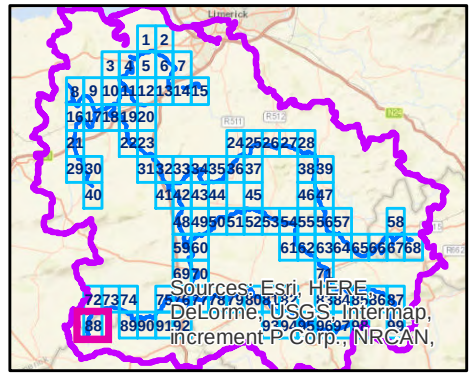

General Study Area
MaigueRivers_50mBuffer
WL1 (Hedgerows)
WL1 / WL2 (Hedgerows / Treelines)
GA1 (Improved agricultural grassland)
GA1 / BL3 (Improved agricultural grassland / Buildings and artificial surfaces)
GS4 (Wet grassland)
WD4 (Conifer plantation)
WL2 (Treelines)
WL2 / WS1 (Treelines / Scrub)
RHAT Survey Point
Survey Note

0 300 600 Meters

Map area: 88

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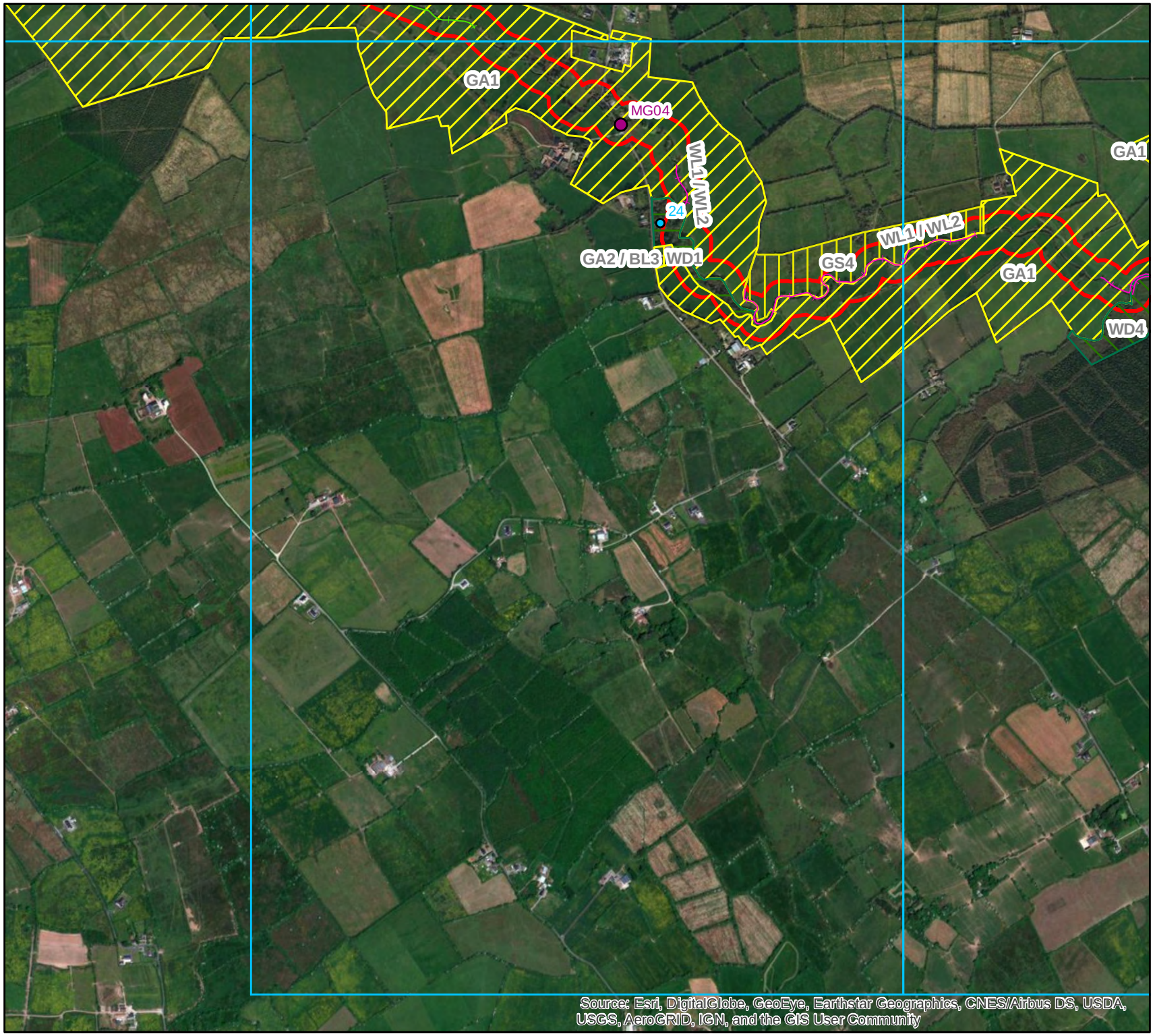

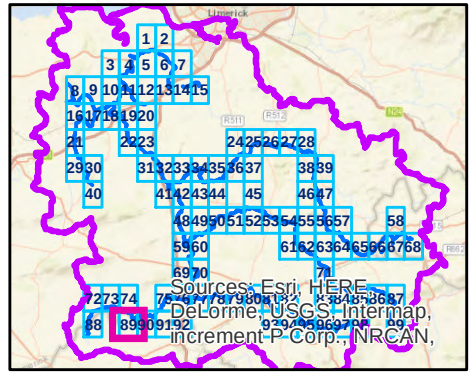

- General Study Area
- MaigueRivers_50mBuffer
- WL1 (Hedgerows)
- WL1 / WL2 (Hedgerows / Treelines)
- GA1 (Improved agricultural grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS4 (Wet grassland)
- WD1 (Mixed) broadleaved woodland
- WD4 (Conifer plantation)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 89

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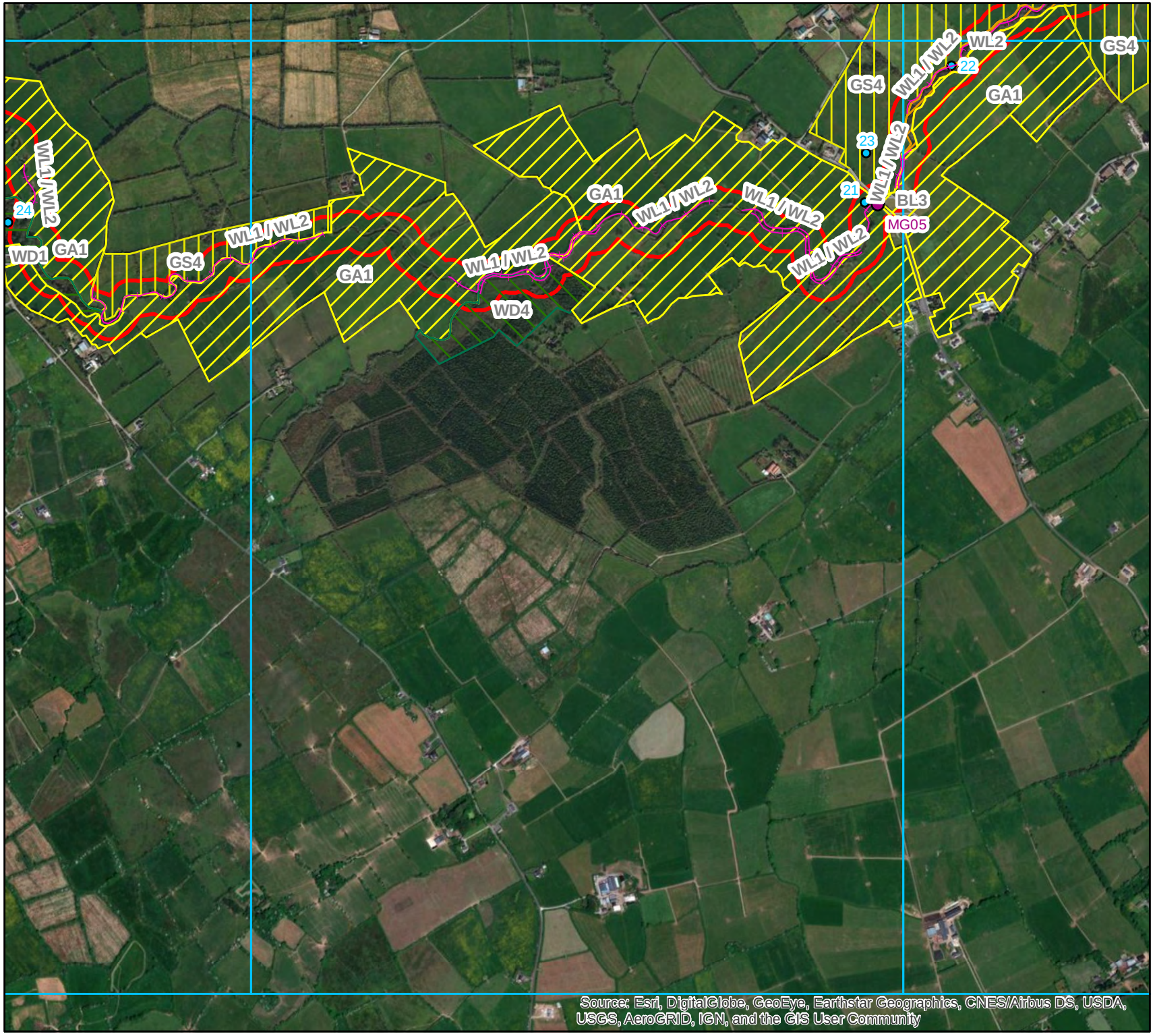

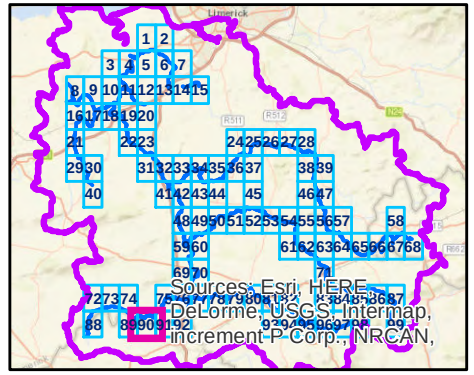

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- GA1 (Improved agricultural grassland)
- GA2 / BL3 (Amenity grassland (improved) / Buildings and artificial surfaces)
- GS4 (Wet grassland)
- WD1 (Mixed) broadleaved woodland
- WD4 (Conifer plantation)
- WL2 (Treelines)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 90

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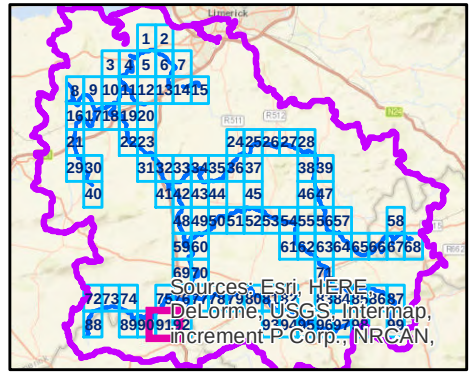

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- GA1 (Improved agricultural grassland)
- GS4 (Wet grassland)
- WL2 (Treelines)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 91

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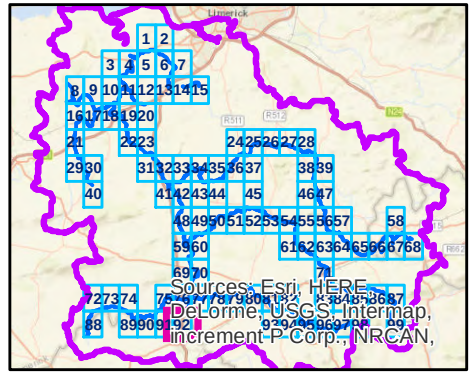

General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
GA1 (Improved agricultural grassland)
GS4 (Wet grassland)
Survey Note

0 300 600 Meters

Map area: 92

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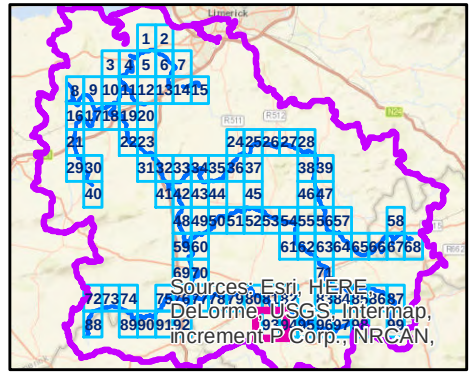

General Study Area
MaigueRivers_50mBuffer
WL1 (Hedgerows)
WL1 / WL2 (Hedgerows / Treelines)
GA1 (Improved agricultural grassland)
GS4 (Wet grassland)
WD1 (Mixed) broadleaved woodland
Survey Note

0 300 600 Meters

Map area: 93

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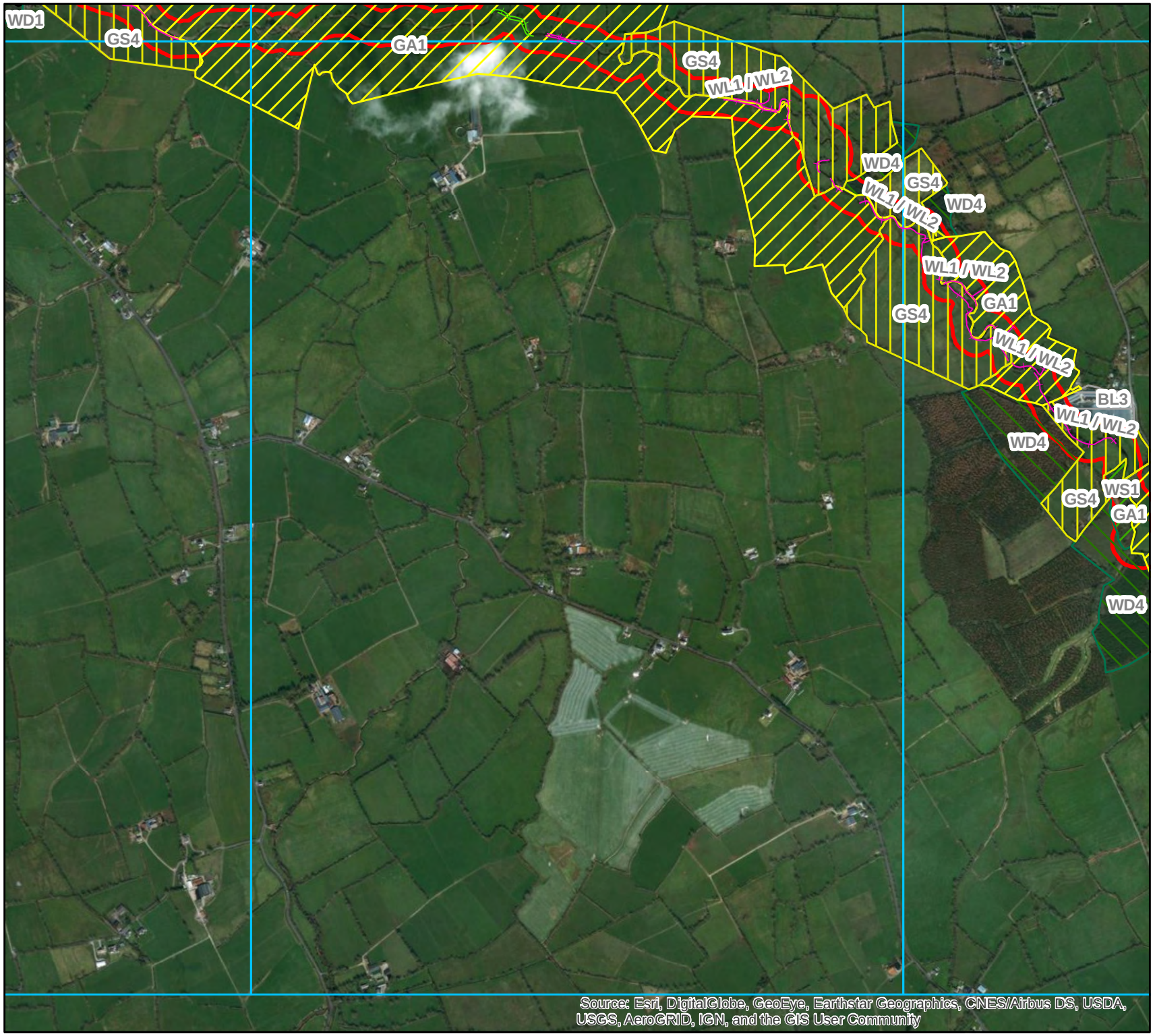

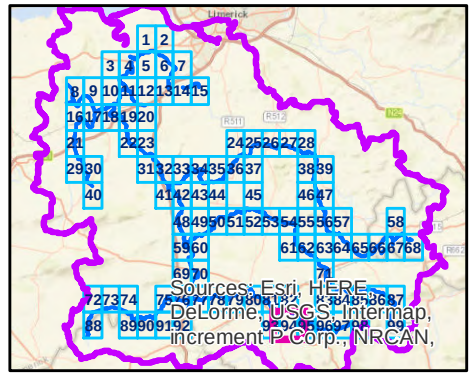

General Study Area
MaigueRivers_50mBuffer
WL1 (Hedgerows)
WL1 / WL2 (Hedgerows / Treelines)
BL3 (Buildings and artificial surfaces)
GA1 (Improved agricultural grassland)
GS4 (Wet grassland)
WD1 (Mixed) broadleaved woodland
WD4 (Conifer plantation)
WS1 (Scrub)
Survey Note

0 300 600 Meters

Map area: 94

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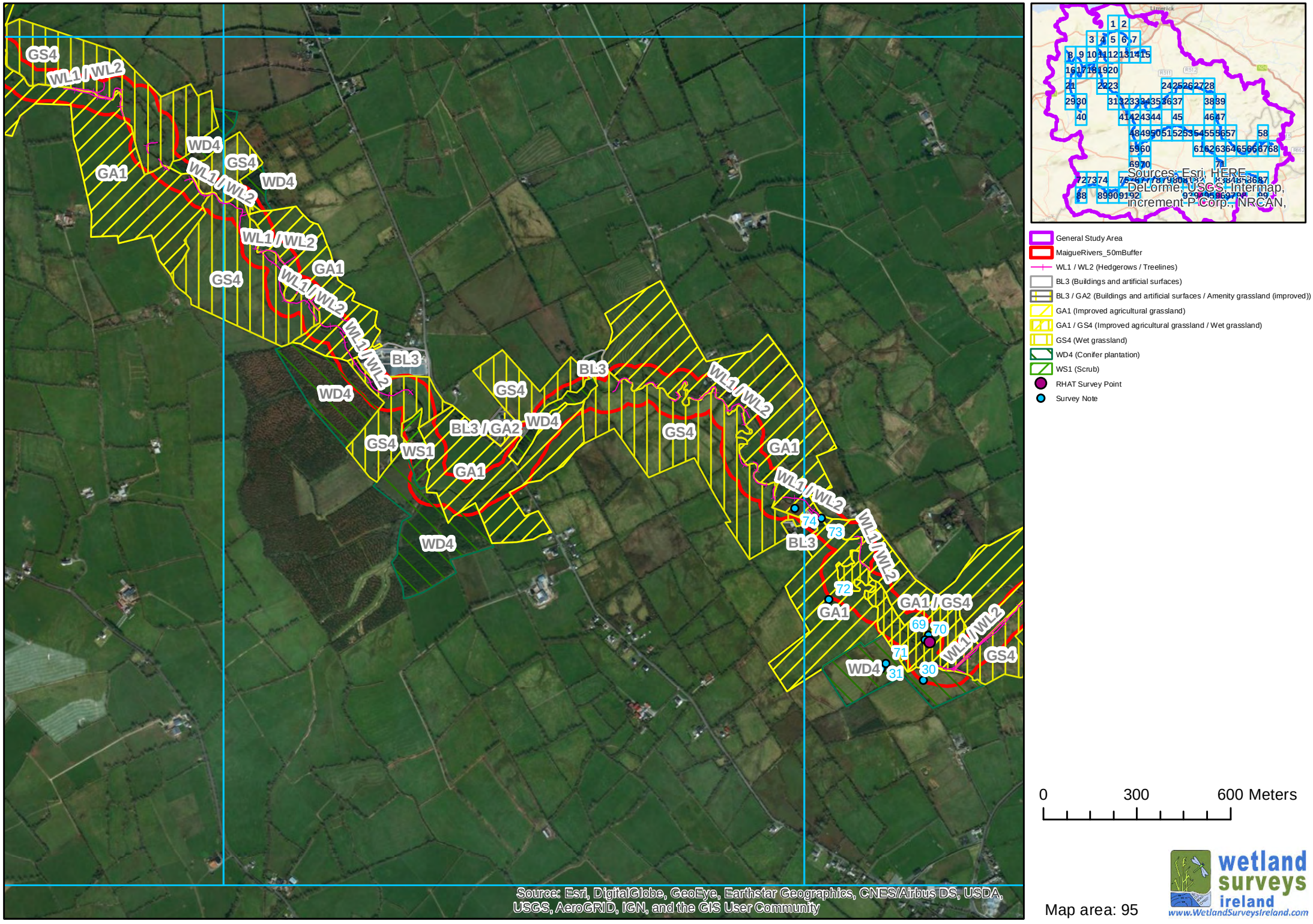
GS4
WL1 / WL2
WD4
GA1
GS4
WD4
WL1 / WL2
WL1 / WL2
GA1
GS4
WL1 / WL2
WL1 / WL2
BL3
WD4
GS4
BL3
BL3 / GA2
WD4
GS4
WS1
GA1
WD4
WL1 / WL2
GS4
GA1
WL1 / WL2
74
73
BL3
WL1 / WL2
72
GA1
GA1 / GS4
69
70
WL1 / WL2
GS4
71
WD4
31
30
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN,
General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
BL3 (Buildings and artificial surfaces)
BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
GA1 (Improved agricultural grassland)
GA1 / GS4 (Improved agricultural grassland / Wet grassland)
GS4 (Wet grassland)
WD4 (Conifer plantation)
WS1 (Scrub)
RHAT Survey Point
Survey Note
0
300
600 Meters
Map area: 95
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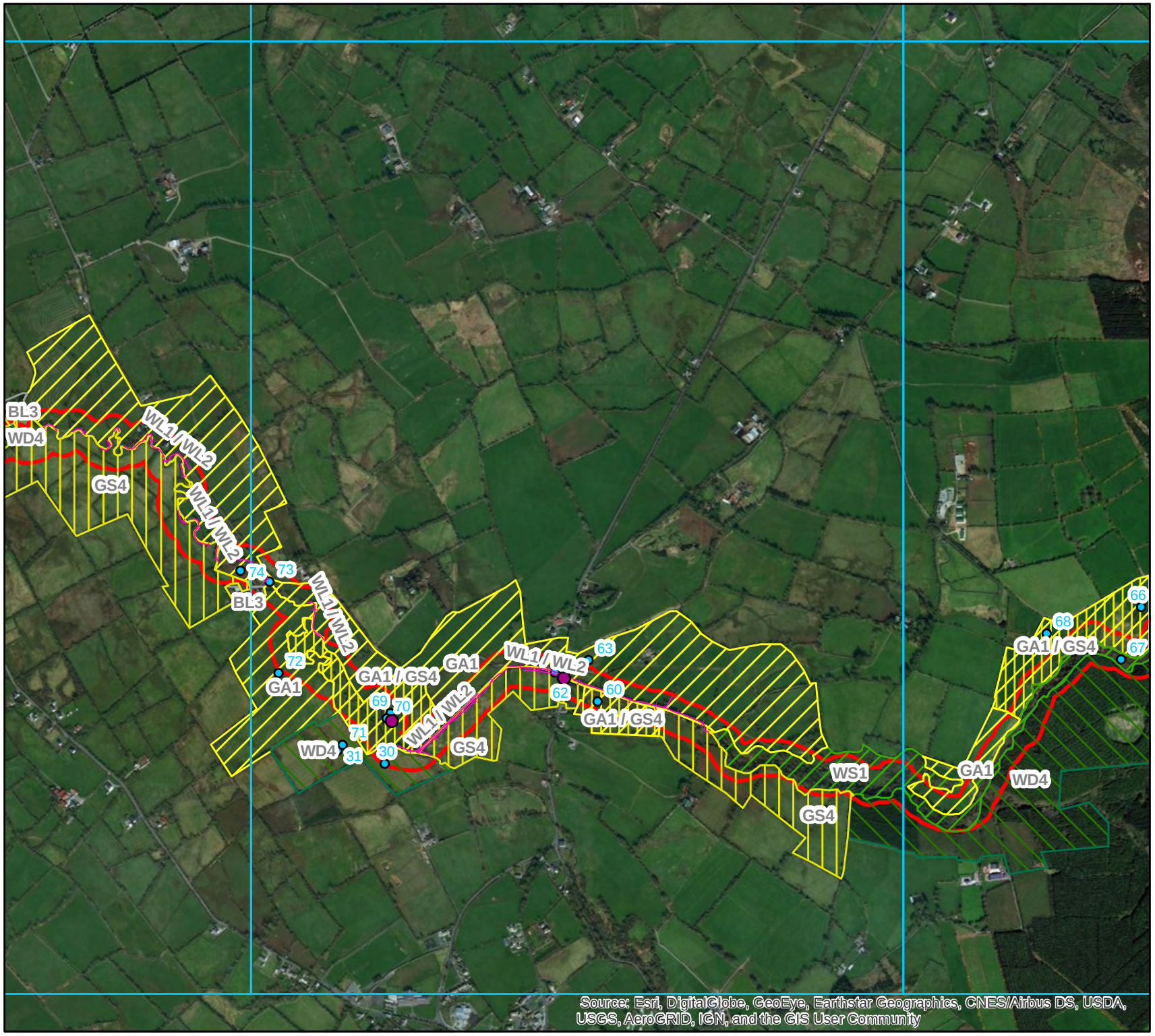

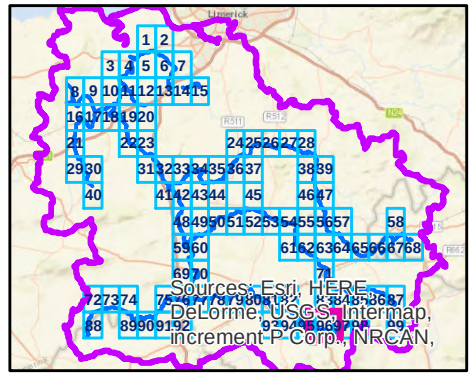

- General Study Area
- MaigueRivers_50mBuffer
- WL1 / WL2 (Hedgerows / Treelines)
- BL3 (Buildings and artificial surfaces)
- GA1 (Improved agricultural grassland)
- GA1 / GS4 (Improved agricultural grassland / Wet grassland)
- GS4 (Wet grassland)
- WD4 (Conifer plantation)
- WS1 (Scrub)
- RHAT Survey Point
- Survey Note

0 300 600 Meters

Map area: 96

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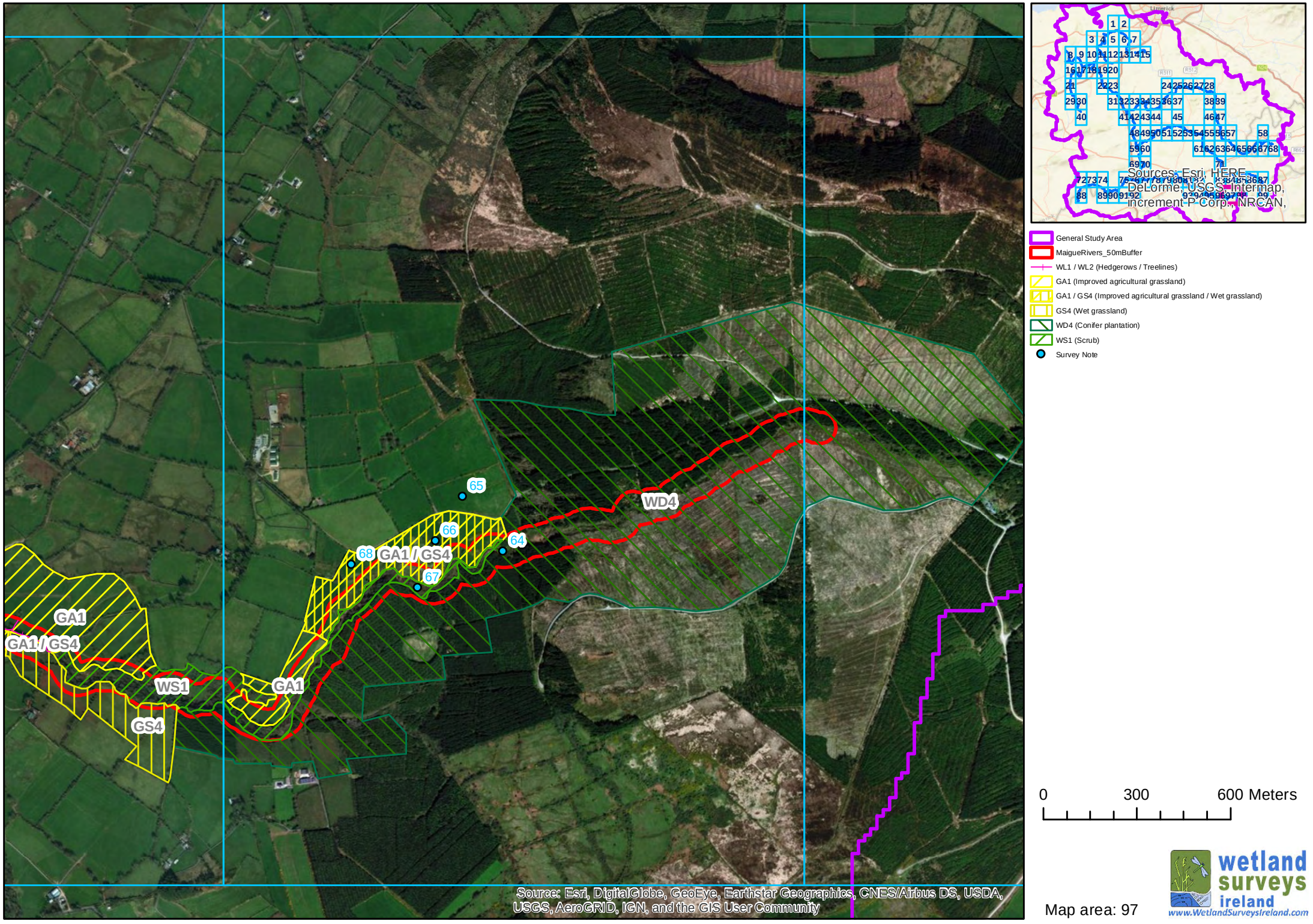
65
66
64
68
67
GA1 / GS4
WD4
GA1
GA1 / GS4
WS1
GA1
GS4
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN,
General Study Area
MaigueRivers_50mBuffer
WL1 / WL2 (Hedgerows / Treelines)
GA1 (Improved agricultural grassland)
GA1 / GS4 (Improved agricultural grassland / Wet grassland)
GS4 (Wet grassland)
WD4 (Conifer plantation)
WS1 (Scrub)
Survey Note
0
300
600 Meters
Map area: 97
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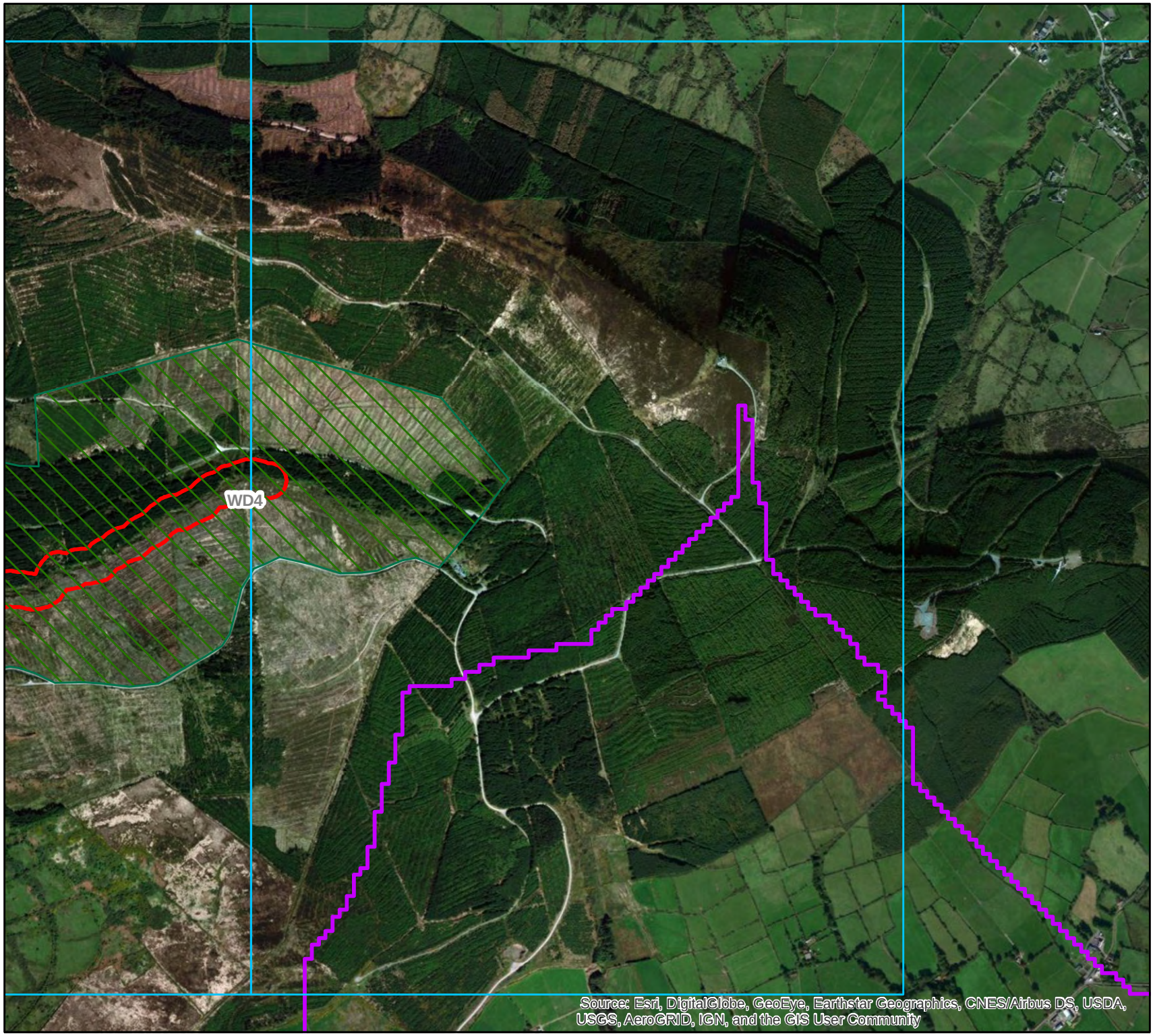

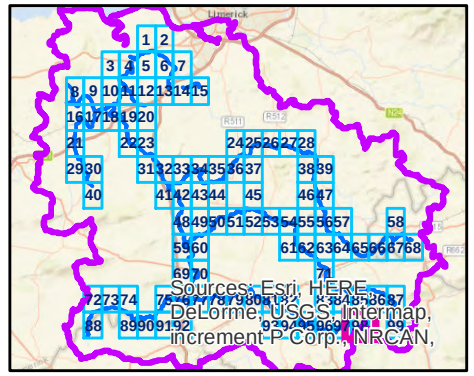

General Study Area
MaigueRivers_50mBuffer
WD4 (Conifer plantation)

0 300 600 Meters

Map area: 98

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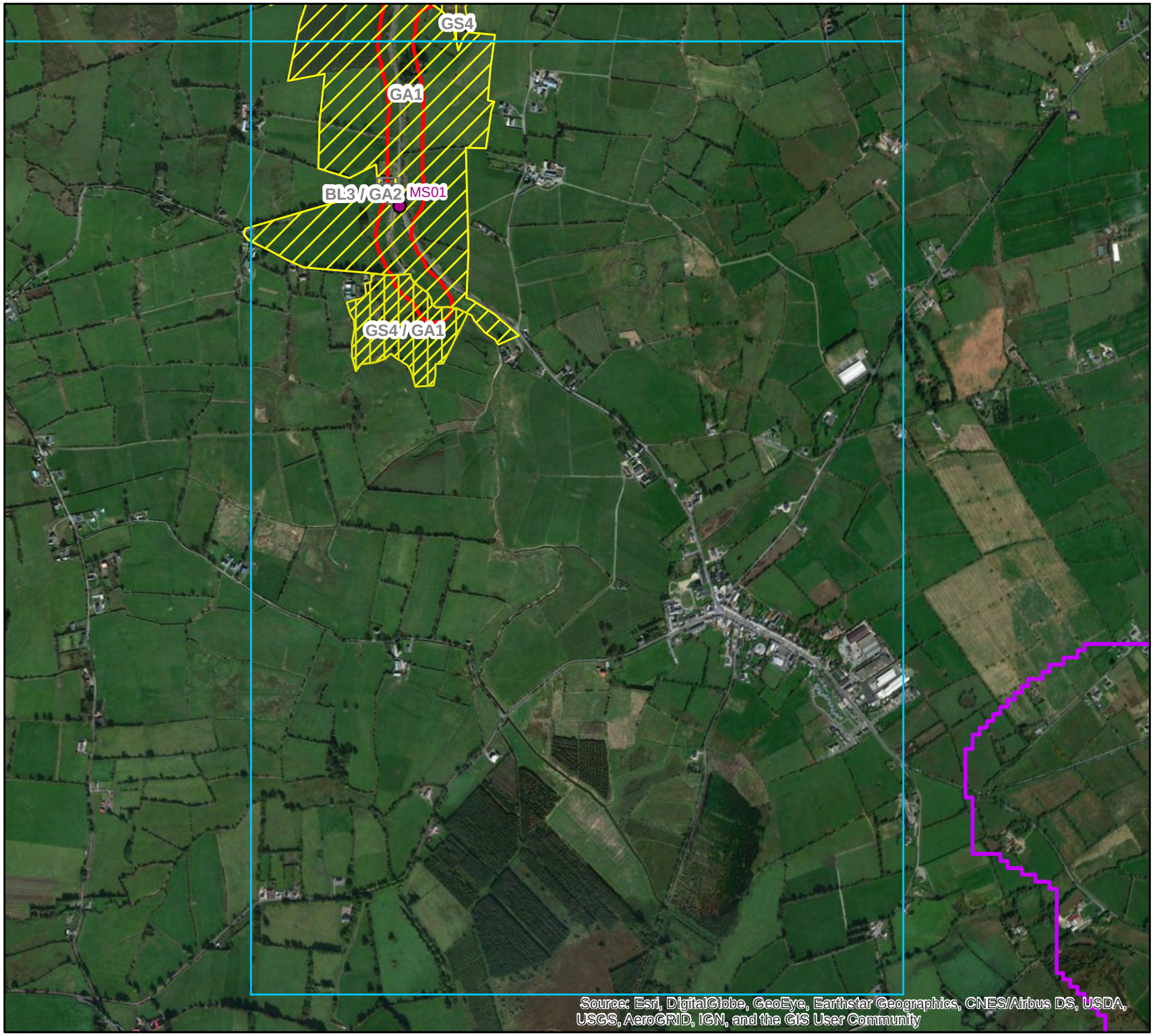

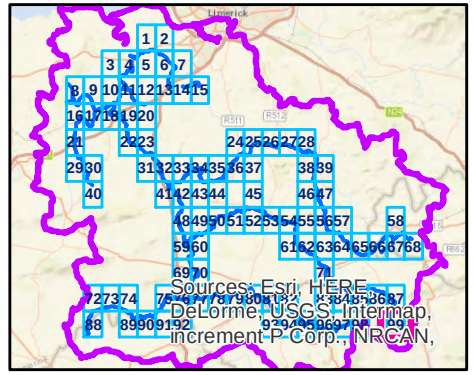

General Study Area
MaigueRivers_50mBuffer
BL3 / GA2 (Buildings and artificial surfaces / Amenity grassland (improved))
GA1 (Improved agricultural grassland)
GS4 (Wet grassland)
GS4 / GA1 (Wet grassland / Improved agricultural grassland)
RHAT Survey Point

0 300 600 Meters

Map area: 99

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Appendix IV – Species List

List of flora species recorded during field survey

Latin species name	English species name	Occurrence
Acer pseudoplatanus	Sycamore	Abundant
Achillea millefolium	Yarrow	
Aesculus hippocastanum	Horse chestnut	
Agrostis stolonifera	Creeping Bent	Abundant
Alisma plantago-aquatica	Water-plantain	
Alnus cordata	Italian Alder	
Alnus glutinosa	Alder	Frequent
Angelica sylvestris	Wild Angelica	Frequent
Anthoxanthum odoratum	Sweet Vernal-grass	Abundant
Anthriscus sylvestris	Cow Parsley	Abundant
Apium nodiflorum	Fool's-water-cress	Abundant
Arrhenatherum elatius	False Oat-grass	Dominant
Asplenium scolopendrium	Hart's-tongue Fern	
Aster tripolium	Sea Aster	
Betula pubescens	Downy Birch	Rare
Brachypodium sylvaticum	False-brome	Rare
Brassica rapa	Turnip	
Callitriche stagnalis	Common Water-starwort	Rare
Caltha palustris	Marsh-marigold	Rare
Calystegia sepium	Hedge Bindweed	Abundant
Cardamine pratensis	Cuckooflower	
Carex echinata	Star Sedge	Rare
Centaurea nigra	Common Knapweed	Frequent
Centranthus ruber	Red Valerian	
Cirsium arvense	Creeping Thistle	Abundant
Cirsium dissectum	Meadow Thistle	Frequent
Cirsium vulgare	Spear Thistle	Frequent
Convolvulus arvensis	Field Bindweed	Occasional
Corylus avellana	Hazel	
Crataegus monogyna	Hawthorn	Abundant
Cypress sp.	Cypress	
Dactylis glomerata	Cock's-foot	Abundant
Dryopteris affinis	Scaly Male-fern	
Elymus repens	Couch Grass	Occasional
Epilobium hirsutum	Great Willowherb	Abundant
Equisetum arvense	Field Horsetail	
Equisetum sp.	Horsetail	
Equisetum telmateia	Great Horsetail	Rare
Euonymus europaeus	Spindle	Occasional
Fagus sylvatica	Beech	Frequent
Festuca rubra	Red Fescue	
Filamentous Algae	Algae	Frequent
Filipendula ulmaria	Meadowsweet	Abundant

Latin species name	English species name	Occurrence
Fraxinus excelsior	Ash	Abundant
Galium aparine	Cleavers	Frequent
Galium palustre	Marsh-bedstraw	
Geranium robertianum	Herb-Robert	
Glyceria fluitans	Floating Sweet-grass	Occasional
Hedera helix	Ivy	Frequent
Heracleum mantegazzianum	Giant Hogweed	Invasive, Frequent
Heracleum sphondylium	Hogweed	Abundant
Holcus lanatus	Yorkshire-fog	Abundant
Hypericum androsaemum	Tutsan	
Impatiens glandulifera	Indian Balsam	Invasive, Rare
Iris pseudacorus	Yellow Iris	Frequent
Juncus acutiflorus	Sharp-flowered Rush	Frequent
Juncus effusus	Soft-rush	Frequent
Juncus inflexus	Hard Rush	
Lathyrus pratensis	Meadow Vetchling	Abundant
Lemna minor	Common Duckweed	Occasional
Ligustrum vulgare	Wild Privet	Frequent
Lolium perenne	Perennial Rye-grass	Abundant
Lonicera periclymenum	Honeysuckle	Occasional
Lotus pedunculatus	Greater Bird's-foot-trefoil	Abundant
Lychnis flos-cuculi	Ragged-Robin	Rare
Lythrum salicaria	Purple-loosestrife	Occasional
Malus sylvestris	Crab Apple	Rare
Mentha aquatica	Water Mint	Rare
Molinia caerulea	Purple Moor-grass	Rare
Myosotis laxa	Tufted forget-me-not	
Myriophyllum sp.	Water-milfoil	Frequent
Nasturtium officinale	Water-cress	Occasional
Nuphar lutea	Yellow Water-lily	Occasional
Odontites vernus	Red Bartsia	
Oenanthe crocata	Hemlock Water-dropwort	Frequent
Parietaria judaica	Pellitory-of-the-wall	
Persicaria amphibia	Amphibious Bistort	Rare
Petasites fragrans	Winter Heliotrope	Invasive
Petasites hybridus	Butterbur	Frequent
Phalaris arundinacea	Reed Canary-grass	Dominant
Phragmites australis	Common Reed	Occasional
Picea sitchensis	Sitka Spruce	
Pinus sylvestris	Scots Pine	
Poa pratensis	Smooth Meadow-grass	
Polypodium vulgare	Polypody	
Populus nigra	Black-poplar	Frequent
Populus tremula	Aspen	Rare
Potamogeton crispus	Curled Pondweed	Occasional
Potamogeton sp.	Pondweed	
Prunus laurocerasus	Cherry Laurel	Rare

Latin species name	English species name	Occurrence
Prunus spinosa	Blackthorn	Frequent
Quercus sp.	Oak	
Ranunculus acris	Meadow Buttercup	
Ranunculus flammula	Lesser Spearwort	Rare
Ranunculus peltatus	Pond Water-crowfoot	Occasional
Ranunculus repens	Creeping Buttercup	
Rosa canina	Dog-rose	
Rubus fruticosus agg.	Blackberry	Abundant
Rumex acetosa	Common Sorrel	
Rumex crispus	Curled dock	
Salix alba	White Willow	Frequent
Salix cinerea subsp. *cinerea*	Grey Willow	Abundant
Salix fragilis	Crack-willow	Frequent
Salix viminalis	Osier	Frequent
Sambucus nigra	Elder	Frequent
Schedonorus arundinaceus	Tall Fescue	Occasional
Schoenoplectus lacustris	Common Club-rush	Frequent
Scrophularia nodosa	Common Figwort	Frequent
Senecio aquaticus	Marsh Ragwort	
Senecio jacobaea	Common Ragwort	
Solanum dulcamara	Bittersweet	Occasional
Sonchus oleraceus	Smooth Sow-thistle	
Sparganium emersum	Unbranched Bur-reed	Rare
Sparganium erectum	Branched Bur-reed	Abundant
Succisa pratensis	Devil's-bit Scabious	Rare
Symphoricapus albus	Snowberry	Invasive, Occasional
Tilia cordata	Small-leaved Lime	
Torilis arvensis	Spreading Hedge-parsley	Frequent
Trifolium pratense	Red Clover	
Trifolium repens	White Clover	
Typha latifolia	Bulrush	Rare
Ulex europaeus	Gorse	
Ulmus glabra	Wych Elm	
Urtica dioica	Common Nettle	Dominant
Valeriana officinalis	Common Valerian	Frequent
Veronica beccabunga	Brooklime	
Veronica scutellata	Marsh Speedwell	Frequent
Vicia cracca	Tufted Vetch	Occasional
Vicia sativa	Common vetch	
Viola riviniana	Common Dog-violet	

List of fauna species recorded during field survey

Latin species name	English species name	Occurrence
Aeshna grandis	Brown Hawker Dragonfly	x 1
Aglais urticae	Small Tortoiseshell	Frequent
Alcedo atthis	Common Kingfisher	Frequent
Anas platyrhynchos	Mallard	x 6
Anax imperator	Emperor Dragonfly	x 1
Aphantopus hyperantus	Ringlet	Frequent
Apus apus	Common Swift	Frequent
Ardea cinerea	Grey Heron	Frequent
Buteo buteo	Common buzzard	x 1
Calopteryx splendens	Banded Demoiselle Damselfly	Frequent
Calopteryx virgo	Beautiful Demoiselle Damselfly	Frequent
Carduelis carduelis	Goldfinch	x 4
Chroicocephalus ridibundus	Black-headed gull	Occasional
Cinclus cinclus	Dipper	x 4
Columba palumbus	Wood pigeon	Frequent
Corvus cornix	Hooded crow	Frequent
Corvus frugilegus	Rook	Frequent
Corvus monedula	Jackdaw	Frequent
Cyanistes caeruleus	Blue tit	Frequent
Cygnus olor	Mute swan	Occasional
Delichon urbicum	House martin	Frequent
Egretta garzetta	Little egret	x 8
Enallagma cyathigerum	Common Blue Damselfly	Various
Erithacus rubecula	Robin	Frequent
Falco tinnunculus	Common Kestrel	x 2
Fringilla coelebs	Chaffinch	x 4
Gallinula chloropus	Moorhen	x1
Hirundo rustica	Swallow	Frequent
Maniola jurtina	Meadow brown	Frequent
Motacilla alba yarrellii	Pied wagtail	Frequent
Motacilla cinerea	Grey wagtail	Frequent
Neovison vison	American Mink	Reported
Numenius arquata	Curlew	x 1
Parus major	Great tit	Occasional
Phalacrocorax carbo	Cormorant	x 4
Pieris rapae	Small white	Occasional
Pyrrhula pyrrhula	Bullfinch	x 3
Regulus regulus	Goldcrest	x 2
Rhagonycha fulva	Soldier beetle	Frequent
Riparia riparia	Sand martin	x 10
Salmo salar	Atlantic Salmon	Reported
Salmo trutta	Brown trout	x 3
Taphrina alni	Alder tongue fungus	x 2
Troglodytes troglodytes	Wren	Frequent
Turdus merula	Blackbird	Frequent
Turdus philomelos	Song Thrush	x 4

Latin species name	English species name	Occurrence
Vanessa atalanta	Red Admiral	x 1
Vulpes vulpes	Fox	x2