

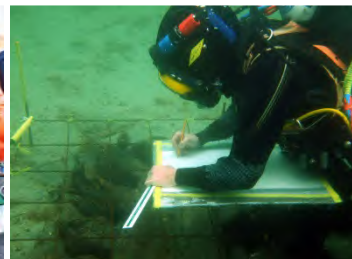
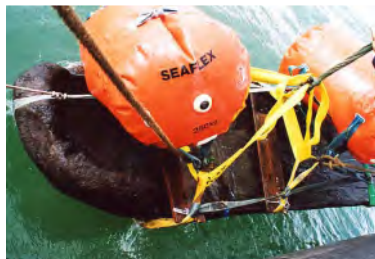
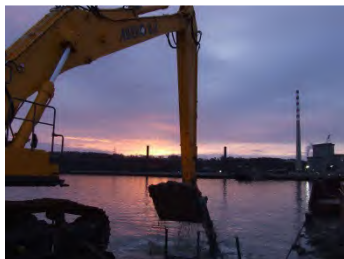
Appendix 13.2. Underwater Archaeological Impact Assessment (UAIA)



**Underwater Archaeological Impact Assessment (UAIA)
Proposed Outfall
Mortarstown WWTP
River Barrow, Mortarstown Upper
Carlow Town**

22D0069, 22R0225

**Report Update
March 2025**





**Underwater Archaeological Impact Assessment (UAIA)
Proposed Outfall
Mortarstown WWTP
River Barrow, Mortarstown Upper
Carlow Town**

22D0069, 22R0225

Report Issued
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Client
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AtkinsRéalis for Irish Water
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LIST OF ABBREVIATIONS

ADCO	The Archaeological Diving Company Ltd
DHLGH	Department of Housing, Local Government and Heritage
DGPS	Differential Geographic Positioning System
ING	Irish National Grid
ITM	Irish Transverse Mercator
GNSS	Global Satellite Navigation System
E	Easting
N	Northing
NGR	National Grid Reference
NIAH	National Inventory of Architectural Heritage
OD	Ordnance Datum
OS	Ordnance Survey
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
SMR	Sites and Monuments Record
UAIA	Underwater Archaeological Impact Assessment
UAU	The Underwater Archaeology Unit

EXECUTIVE SUMMARY

Subject: UAIA, River Barrow.

Location: Mortarstown Upper Townland, Carlow.

Riverine Impact: Outfall Structure.

Survey Extent: ITM 671135E, 674967N - ITM 671059E, 674913N.

Note: this report has been updated to take into account a recent design change in the outfall route, one which has repositioned the outfall terminus to a point 7m downstream of the previous planned location. The repositioning of the outfall terminus remains well within the boundaries of the river area subject to assessment in August 2022 and does not affect the efficacy of the survey and/or findings of the UAIA report; recommendations and archaeological mitigation therein remaining unchanged.

The Archaeological Diving Company Ltd (ADCO) was appointed by AtkinsRéalis, on behalf of Irish Water, to carry out an Underwater Archaeological Impact Assessment (UAIA) of the River Barrow at Mortarstown Upper, Carlow Town, where an upgrade to the existing Mortarstown Waste Water Treatment Plant (WWTP) is to take place. As part of the upgrade works, it is proposed to insert a new outfall structure on the east bank of the River Barrow at ITM 671120E, 674929N (centrepoint); positioned at a point 15m downstream of the existing WWTP outfall.

The proposed upgrade to the WWTP is in its design phase and it is understood that the following consultations have been made:

- Pre-planning submission to DAU, Ref. G Pre0099/2021
- Pre-application Consultation with Carlow County Council, Ref. PC01.310980

The UAIA comprised systematic visual inspection of the River Barrow, extending 45m upstream and 20m downstream of the river impact location. The assessment also sought to provide a detailed account of riverbed topography, to assess the potential of riverbed deposits to retain archaeological material, and identify any additional features/structures of archaeological or historic significance that may be present. This work included a walkover survey of the attendant bank structure. In addition, targeted metal-detection was employed to help assess the bankside/riverbed area and highlight any metallic concentrations present.

No archaeologically significant features, structures, or deposits were encountered for the river assessment area. Likewise, metal-detection across a series of riverbed areas did not yield any items of interest.

The on-site work was carried out on 9th August 2022, under licence from the DHLGH; licence numbers 22D0069, and 22R0225.

The current report, based on the current level of information available, recommends that further on-site archaeological assessment of the river area in advance of construction is not required. However, it is recommended that archaeological monitoring of ground/riverbed disturbances during construction be undertaken by a suitably qualified archaeologist, experienced in riverine archaeology, with the proviso to resolve fully any archaeological material observed at that point.

The recommendations in the report are subject to the approval of the National Monuments Service at the Department of the Housing, Local Government and Heritage (DHLGH).

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1.0 INTRODUCTION

The Archaeological Diving Company Ltd was appointed by AtkinsRéalis, on behalf of Irish Water, to carry out an Underwater Archaeological Impact Assessment (UAIA) of the riverbed and bankside area at the proposed location of a new outfall structure associated with the planned upgrade to the existing Mortarstown Waste Water Treatment Plant (WWTP), (Figure 1). The proposed upgrade to the WWTP is in its design phase and it is understood that the following consultations have been made:

- Pre-planning submission to DAU, Ref. G Pre0099/2021
- Pre-application Consultation with Carlow County Council, Ref. PC01.310980

The UAIA was carried out in accordance with Section 5 of the National Monuments Act (2004 Amendment) by a team of underwater archaeologists and a certified surveyor on the 9th August 2022, under licence from the DHLGH; licence numbers 22D0069 and 22R0225. The onsite work included the following items:

1. Comprehensive assessment, including sample metal-detection, of the riverbed surrounding the proposed outfall structure; extending 45m upstream and 20m downstream of the impact centrepont.
2. Systematic inspection of the bank side area (east bank), above and below the waterline.
3. Total Station and GNSS recording/positon-fixing with resulting data referenced to Irish Transverse Mercator and to Malin Head Ordnance Datum.

The following report presents the findings from the UAIA and assesses the potential level of impact arising from the proposed development, providing a set of specific mitigation measures relating to the proposed development.

2.0 PROPOSED DEVELOPMENT¹

As part of the upgrade to Mortarstown WWTP it is proposed to construct a new outfall structure, on the east bank of the River Barrow, at a point 15m downstream of the existing outfall location (Figure 2).

The outfall pipe will exit on the western side of the WWTP at ITM 671286E, 674837N, before travelling eastward for a distance of c. 193m, to reach its riverside terminus at ITM 671112E, 674924N (centre-point). The outfall pipe will have an internal diameter of 900mm, with an external diameter of between 1080mm-1180mm. A concrete headwall will be constructed at the outfall location and sheet-piles (*Larson* clutch) are to form the outer (in-river) limit of the headwall structure. It is anticipated that the new structure will extend a maximum distance of c. 2m into the river channel, reaching a point c. 1.5m below the lowest water-level experienced but the river.

¹ Proposed outfall details extracted for Project Drawing No. 5161805_EWE_DR_MOR_1103 (Rev. 3) and an EIAR project summary document provided by ATKINS.

3.0 RECEIVING ENVIRONMENT

The following section provides a concise account of the heritage asset surrounding the river assessment area and is primarily focused on the watercourse and its adjoining townlands.

Carlow derives its name from the Irish *Ceatharlach*, which is thought to translate as the 'place of cattle (or) herds', although, an entry in Lewis's Topographic Dictionary presents an interesting, but less plausible alternative:

This town, called, till within a comparatively recent period, *Catherlough*, or *Catherlagh*, is supposed to have derived its name, signifying the Irish Language "the city on the lake", from its proximity to a large sheet of water which formerly existed here.²

The county provided a particular focus for prehistoric activity across the southeast of the country, with frequent dolmens, bullauns, standing-stones, and cairns dotting Carlow's undulating landscape. A prime example of which, *Brownshill Dloimen* (RMP CW007-010; mega-lithic tomb), is located only 4km from the assessment area, positioned on the eastern outskirts of Carlow Town. The early Christian period is also well catered for and includes prominent monastic sites at St. Mullin's (founded by St. Moling in the seventh-century) and St. Laserian's Cathedral (Old Leighlin), built in the thirteenth-century on the site of a church founded by St. Gobban in 632 A.D.

During the medieval period, the manorial system was to become well established within the county, comprising a settlement economy developed as part of the Anglo-Norman occupation; the agriculturally-rich lands that comprise much of Carlow being considerably sought after during that period. Carlow Castle (RMP CW007-018002-), located within the town centre (close to the River Barrow) is a prominent reminder of this. The castle, thought to have been built by William Marshal in the early part of the thirteenth century, comprises a large masonry keep with semi-circular towers (*bastions*) located at each corner.

The town's political influence peaked in the mid-fourteenth century, the Duke of Clarence relocating (from Dublin) the Exchequer of the Kingdom (Lordship of Ireland) to Carlow between 1361 and 1374. At this time, the town underwent further reinforcement, the town's defensive walls being constructed and wider fortifications strengthened.

Carlow's borders were frequently tested by the surrounding Gaelic lordships, predominantly to the east and north of the county. As a result, the present-day extent of the county reflects the core Norman holdings established in the twelfth and thirteenth centuries.

² Samuel Lewis, 1837, A Topographic Dictionary of Ireland comprising several Counties, Cities, Boroughs, corporate, Market & Post Towns, Parishes & Villages, extract from entry on Carlow Town History.

During the eighteenth and nineteenth centuries, Carlow comprised a prosperous market town that attended a fertile farming hinterland and burgeoning export trade in agricultural produce; the latter being facilitated by the town's ready access to the River Barrow and associated canal system.

3.1 River Navigation and Trade

The River Barrow rises in the Slieve Bloom Mountains, from where it flows in a roughly south-east direction for a distance of 192km to reach its confluence with River Suir and the River Nore at Waterford.

The river flows eastwards from its mountain course, flowing across the lowland bogs of counties Laois and Offlay, before turning south on the eastern side of the Castlecomer Plateau, after which it flows through the market towns of Athy, Carlow, and Graigueenamanagh.

The river's Suir, Barrow, and the Nore, known as the *Three Sisters*, have formed important routes in the Southeast's transportation network since the medieval period. Small flat-bottomed boats, called '*Clarachwns*', carried loads of up to four-tons and facilitated medieval trade on the River Barrow. However, by the eighteenth century, another traditional boat-type known as a 'Barrow Boat' was to also become widely used. This vessel comprised a single, fore-mounted, square sail that could be lowered when moving beneath bridges and/or other riverine obstacles. Two oars were also used for propulsion and a simple, removable, rudder-board was employed for steering the boat. An early nineteenth-century engraving depicts a similar boat-type being pulled upstream, through a shallow stretch of the River Nore, near Thomastown in Co. Kilkenny (Plate 1).³

Fishing cots were also prominent on the *Three Sisters*. Cots operating on the River Barrow were primarily used for snap net-fishing and it is estimated that over 1000-men were engaged in this activity during the nineteenth century. These boats were double-ended, usually 21-foot long with a beam of 36-inches at the top and 24 inches at the bottom. A description is provided in a passage written by the Rev. Graves in the mid-nineteenth century:

Cots are still used on the tidal and upper waters of the Nore, Suir, and Barrow. They are narrow, flat-bottomed boats, generally from 15 to 20 feet in length, and sharp at both ends. They are propelled by a pole in shoal water, and by a paddle, of peculiar shape, in the deeper parts of the river. A skilful cot-man will guide his frail boat, with perfect safety, either up or down the most turbulent portions of the stream. These cots are now generally used in fishing for salmon with nets. Cot, in Irish, means a small boat.⁴

³ A print by George Miller & Robert Gibbs c.1813 - 1816 depicts a boat been pulled upstream on the River Nore, in the vicinity of Brownsbarn, Co. Kilkenny [source: Bangerter R., Kirby B., and O. Ryan, *Thomastown Industrial Heritage Project*, TCRT, Heritage Grant Awarded Project, 2010].

⁴ Graves, Rev. J., 1856, 'The records of the ancient borough towns of the county of Kilkenny', *Journal of the Kilkenny & South-East of Ireland Archaeological Society*, Vol. 1, 84-93.

Larger vessels, comprising flat-bottomed barges, capable of carrying loads of up to 50-tons, were to become prevalent in the mid to late eighteenth-century, in the most part superseding the use of local boat types for goods transportation on the river. This coincided with the development of the Barrow Navigation which facilitated larger vessel types. Fishing cots, however, continued to be used into the early part of the twentieth-century and also remained popular as part of cot-racing events such as the Graiguenamanagh Regatta.

The Barrow Navigation route flows between Athy and St. Mullins for a distance of 68km, passing through Carlow, Bagenalstown, Leighlinbridge, Goresbridge, and Graiguenamanagh to terminate at a sea-lock system at Bahana Td., near St. Mullins. A series of lateral canals and associated locks were constructed to bypass any shallow areas and weir locations along the upstream route. Downstream, the navigation continues through tidal estuary to its confluence with the River Nore, at a point c. 5km upstream of New Ross. Access to the Irish Sea is provided via the Suir Estuary at Waterford, and the River Barrow is connected to the wider inland navigation network via the Grand Canal and the Grand Canal Barrow Line.

The development of a navigation strategy for the River Barrow was first proposed in 1703 with the submission of a bill to the Irish House of Commons. As part of this bill a programme of works that included the excavation of lateral canals, construction of accompanying lock-systems, and localised dredging of the riverbed, was suggested. However, this endeavour was not advanced until 1761, after continued petitioning of parliament. The Commissioners of Inland Navigation administered much of the subsequent navigation work, with the later phases of work being overseen by the Barrow Navigation Company. The project was initially financed through public funds, although these were later reduced as the enterprise moved to become self-financing. The Navigation of the River Barrow was completed in 1790.

The majority of the goods transported along the waterway constituted corn, malt, meal, and flour, with up to 60,000 tons being shipped annually. The importance of this trade is highlighted in Lewis's Topographical Dictionary of Ireland (1837) which notes the following regarding the Carlow's situation on the River Barrow:

From its advantageous situation on the Barrow, affording a facility of communication with the ports of Ross, Waterford and Dublin, the town has become the principal market for agricultural produce of the well-cultivated districts around it, and carries out an extensive trade in corn and butter; the latter is of a very superior quality, and meets with a ready sale in the London market. The trade down the river has, within the last 14 years, greatly increased, while the upwards has diminished, in consequence of the heavy tolls demanded on the canal conveyance to the metropolis. The quantity of corn and flour sent hence to Waterford and other ports for exportation has, within that period, advanced from 2000 to 15,000 quarters; and the quantity of butter weighed in the market and in private stores is at present not less than 35,000 firkins. The river Barrow is navigable from Athy, where the Grand Canal from Dublin joins it, and thence to its confluence with the river Suir, below Waterford; boats consequently pass from this place to

Dublin, Ross, and Waterford; there is a lock on the river, and good quays have been constructed for the accommodation of vessels employed in the trade.⁵

3.2 Cartographic Information

Examination of the OS historic mapping provides insight into surrounding land-use and any changes that may have affected the watercourse over time. Comparison between the OS First Edition map (1838) and OS 25-inch map (1907) suggests minimal changes to the river and wider landscape (Figures 3-4). Moreover, the present-day watercourse retains much of the cartographic character depicted on the later map edition.

The OS First Edition map depicts of broad river-channel, measuring c. 48m in average width (Figure 3). To the east, the waterway is bounded by a well-defined tow-path (Map Item 1), behind which lies a patchwork of medium to large sized agricultural fields. A roadway (present-day Leighlin Road) transects the field system (north-south), at a point c. 280m to the east of the River Barrow (Map Item 2).

A lightly wooded area (deciduous trees) is depicted on the west side of the river, comprising the formal grounds and driveway to a county house, annotated '*Erindale House*' (Map Item 3; NIAH 10300702). Erindale House and its associated structures (walled-garden, summerhouse, and out-buildings) are shown c. 200m to the south-southeast of the assessment area. A small rectangular structure, annotated '*Gate Lodge*' is also shown on the east side of the driveway entrance (Map Item 4). The gate lodge is positioned some 370m north-northeast of the assessment area; the driveway measures c. 600m in length (Map Item 5). The grounds associated with Erindale House, extend between the River Barrow (encompassing c. 1km of the river frontage) and the present-day R448 (Kilkenny) Road (Map Item 6).

As the river flows past Carlow, between Crossneen and Aughdoyne, it forms the boundary between Cos. Carlow and Laois; the two boundaries being shown as dot-and-dash lines that follow the course of the river, close to its centreline (Map Item 7).

Downstream of the assessment area (c. 180m) the waterway is divided into two, comprising a natural watercourse to the east and a navigable channel to the west (Map Item 8); the latter leading to a lock-gate at Clogrenan.

The OS 25-inch map provides for greater cartographic detail and annotation (Figure 4). Erindale House and its garden areas are now clearly defined and a small '*Well*' is also shown

⁵ Samuel Lewis, 1837, A Topographic Dictionary of Ireland comprising several Counties, Cities, Boroughs, corporate, Market & Post Towns, Parishes & Villages, extract from entry on Carlow Town Trade in the 1830s.

(Map Item 9). However the driveway, previously depicted, is no longer indicated and a field-boundary is shown, demarcating a parcel of the land to the north (Map Item 10); indicating a reduction in the land-holding associated with Erindale House.

On the west side of the river, the tow-path is demarcated and annotated '*Towing Path*' (Map Item 11). A crows-foot benchmark is also present, '*B.M. 158.7*', presumably inscribed on a Milestone (*M.S*) indicated at the same location; positioned a short distance upstream of the assessment area (Map Item 12).

The overall character of the river remains similar to that previously depicted and the channel also retains an average width of c. 48m. In addition, the wider landscape, comprising well-defined field systems, remains largely unchanged between the two historic map editions. Indeed, the present-day landscape remains relatively unaltered to the west, while noticeable development has taken place to the east, along the route of the R448. This is most notable with the construction of the Tyndale Institute, Mortarstown WWTP, and the urban spread southward of Carlow town.

3.3 Known Sites and Monuments

The Record of Monuments and Places (RMP) is a list of archaeological sites based on the Sites and Monuments Record (SMR) files, maintained by the National Monuments Section at the DHLGH. SMR entries include detailed descriptions of archaeological sites based on site visits, historic studies, and associated mapping where available. The SMR focuses on sites that are pre-1700AD in date. While later buildings are not well represented in the archive, all structures that are more than 100 years old are considered as archaeological sites today.

Only three (3) RMP sites are listed within 1.5km of the area under assessment, two (2) in Co. Laois and one in Co. Carlow (Figure 5, Table 1). None are directly related to the river area under assessment or are listed for the wider townland area (Mortarstown Upper).

RMP Number	ITM	Townland	Site Type	Proximity to Impact Location
LA037-015----	670607E, 675446N	Crossneen	Ring-ditch	980m north
LA037-018----	670652E, 675637N	Crossneen	Ring-ditch	1.5km north
CW007-034----	671724E, 673888N	Ballycarney	Enclosure	1.2km southeast

Table 1: Known sites and monuments listed in the RMP within a 1.5km radius of the proposed river impact location.

3.4 National Inventory of Architectural Heritage

The National Inventory of Architectural Heritage (NIAH) is a county-by-county database that identifies, records, and evaluates the post-1700 architectural heritage of Ireland as an aid to the protection and conservation of the nations' built heritage. The NIAH surveys provide the basis for the recommendations of the Minister for the DHLGH to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).

There are only two (2) NIAH sites listed for the townland of Mortarstown Upper (Figure 5, Table 2). The nearest of these is situated 217m to the south-southeast of the proposed river impact location. It comprises a Georgian county house, Erindale House, built c. 1810, and its formal gardens (NIAH number 10300702). The second comprises a small cottage, built c. 1855, located 800m to the east of the river impact location (NIAH number 10300710). Both are rated as being of Regional, Architectural, and Social importance.

A lock gate (NIAH number 10300703) is located c. 1.6km downstream of the river impact location, within the townland of Clogrenan.

NIAH Number	Townland/ ITM	Description [Rating]	Proximity to Impact Location
10300702	Mortarstown Upper 67007E, 674709N	Detached three-bay two-storey red brick house, c. 1810, with round-headed door opening, pointed-arch window openings (including Venetian windows), double bows and screen walls having niches. Extended to rear, c. 1840, comprising two-bay two-storey return to rear. Interior retains plasterwork decoration. Stable complex to site. Walled garden to site. Detached summerhouse to site. [Regional, Architectural, and Social importance].	217m south-southeast
10300710	Mortarstown Upper 671549E, 674638N	Detached five-bay single-storey thatched cottage, c. 1855, with return to rear. Extended to sides with corrugated-iron roofs. Re-thatched in 1998. [Regional, Architectural, and Social importance].	800m east

Table 2: Sites listed in the NIAH for the townland of Mortarstown Upper.

3.5 Topographic Archive

The National Museum of Ireland Topographical Files is the national archive of all known antiquities recorded by the National Museum. These files relate primarily to artefacts, but also include references to monuments and also contain a unique archive of records of previous archaeological excavations. The Museum's files present an accurate catalogue of objects reported to that institution from 1928. There is a computerised database of finds from the 1980s onwards. They are categorised by their location into county and further into townland,

town, city, street or river where they come from. There are rarely any grid co-ordinates to precisely locate find-spots. However, where find-spots of artefacts are established, they can prove an important indication of the archaeological potential of the related or surrounding area.

There are currently no entries in the topographic archive relating to the specific area under assessment.

3.6 Excavations Bulletin

The *excavations bulletin* provides a published and online summary of accounts of archaeological excavations undertaken throughout Ireland.⁶ Summaries may also be submitted for inter-tidal survey, underwater assessments, and the archaeological monitoring of marine/ riverine dredging works. The majority of the entries relate to development-led archaeological work.

There are two (2) entries available for the townland of Mortartown Upper, on the east side of the River Barrow, and one (1) for the Corssneen townland to the west (Table 3). None are located within close proximity to the river assessment area.

Licence Number	Townland/ ITM	Description	Proximity to Impact Location
14E0224	Mortarstown Upper 671195E, 674655N	Test trenching was carried out at the site of the proposed Carlow Vocational School and Carlow Institute of Further Education, a 4.45 ha green-field site in Mortarstown Upper, Co. Carlow. Eight test trenches totalling 1200m were excavated within the site following a geophysical survey. Topsoil was shallow and quite uniform, generally less than 0.25m across the area. Subsoil was grey brown sandy clay with frequent angular stones and frequent modern pottery sherds and glass shards. No archaeological finds or features were recorded.	350m south
16E0086	Mortarstown Upper 671182E, 674484N	An assessment was carried out at the site of the proposed IT Carlow Sports Campus, a 12.7ha green-field site in Mortarstown Upper, Co. Carlow. A geophysical survey of the site (16R0028) was carried out followed by targeted test trenching. A total of 22 trenches were mechanically excavated across the site under archaeological supervision. No archaeological material was recorded in any of the trenches.	600m south
LA037-017	Crossneen	In November 1972 human remains were	800m north

⁶ Isabel Bennett (ed.) *Excavations Bulletin: summary accounts of archaeological excavations in Ireland*, Wordwell./ www.excavations.ie

Licence Number	Townland/ ITM	Description	Proximity to Impact Location
	(Co. Laois)	discovered during bulldozing in a gravel pit just outside Carlow town. The bones were discovered approximately 0.46m below ground level. The landowner reported the find to the Garda Síochána, who informed the NMI. As the site was not investigated by the NMI, this report is based on Sergeant Lynn's account of the site. The skeleton was discovered approximately 0.46m below ground level and was apparently extended, aligned west/east. The head appeared to have been more elevated than the feet. No finds were noticed in the vicinity, nor was there anything to indicate a stone grave or wooden coffin. There had not been any surface indications of the presence of the grave before bulldozing. The human remains were not acquired but were reburied in St Mary's Cemetery, Carlow. In March 1980 a further report of human remains at Crossneen was received through Ellen Prendergast. In this case the discovery was made during bulldozing operations in advance of the construction of houses at Crossneen. The site was not investigated by NMI personnel. The exact location of the find is not known, but it appears to be on the western outskirts of Carlow town, either in the townland of Graigue or Crossneen-most likely Crossneen, given the number of quarries marked on the OS 6in. sheet in this townland (OS 6in. sheet 7, parish of Killestin, barony of Slievemargy) in the area known as Graiguecullen. SMR LA037-017-----.	

Table 3: Excavation bulletin entries for the townlands located either side of the river assessment area.

3.7 Conclusion

The section of watercourse under assessment appears to have remained, in the most part, largely unchanged to that depicted on the OS historic map editions. The relatively unaltered state of the watercourse, its status as a townland and county boundary, and the surrounding archaeological landscape clearly lends archaeological potential to the riverbed/bankside area under assessment.

4.0 SURVEY METHODOLOGY

The UAIA was undertaken by a team of five (5) archaeologists and a certified surveyor. Two members of the team were also experienced metal-detectorists. A systematic visual inspection of the riverbed was undertaken across the survey area. The onsite survey, although primarily focused on the immediate area of the proposed outfall structure, extended

a significant distance both upstream and downstream of the impact location to encompass a 68m x 44m area:

- ITM 671135E, 674967N (upstream extent)
- ITM 671059E, 674913N (downstream extent)

Water depth of ranged between 2.5m (channel sides) and 4m (centre of channel) was encountered for much of the watercourse on the day of survey. The assessment extended significantly beyond any potential impacts arising from the proposed bankside/in-river works. The assessment included, but was not limited to the following:

1. Comprehensive assessment, including targeted metal-detection, of the riverbed extending upstream and downstream of the river impact area.
2. Systematic inspection of the bank-side area (east bank), above and below the waterline.

The assessment, while primarily focussed on the immediate impacted area, also sought to record the riverbed topography and provide a detailed account of the wider river environment. As such, the survey commenced at a point 38m upstream of the impact area and progressed downstream for a distance of 30m.

A Total Station and GNSS (RTK) unit were used to record river profiles/cross-sections and position-fix any features encountered (Figures 6-8); referenced to Irish Transverse Mercator and Malin Head OD. In addition, a drone survey, gathering sufficient data to provide high resolution orthomosaic aerial imagery (ITM projection), of the river assessment area was also carried out (Figure 9). A *Fisher Aquanaught 1280U* metal-detector was employed for the magnetometer survey; operating at 2.4 kHz with sensitivity at 7 and discrimination operating between 0 and 4.

A finds retrieval strategy dealing with conservation issues, cataloguing, and locational recording was also in place to deal with any artefacts recovered during the survey.

4.1 Terminology

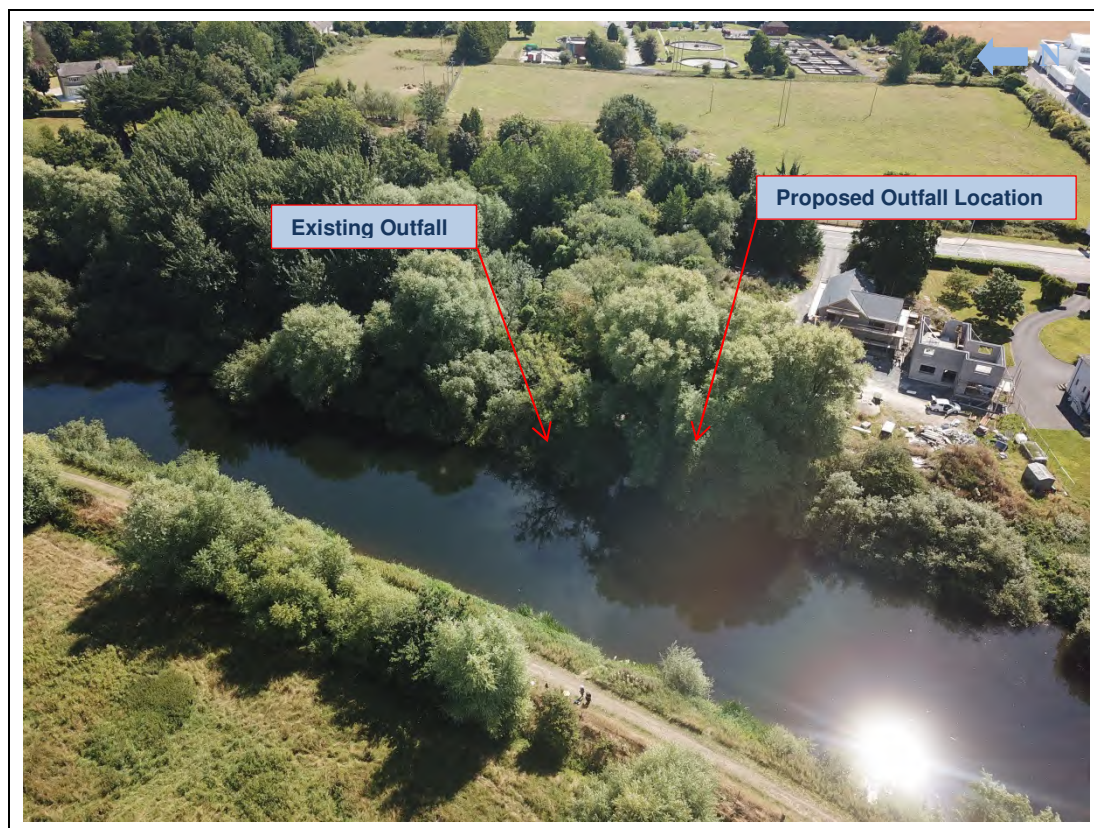
When referring to the degree of compaction observed for the riverbed deposits under inspection, the terms loose, medium, and hard are relative and do not relate to the measured properties of these deposits. All dimensions in this report are provided in either millimetres or meters according to scale. When referring to sediment grain size, the Wentworth scale has been adopted, as detailed in Table 4.

Size (mm)	Grade
>256	Boulder
>64	Cobble
>4	Pebble
>2	Granule (gravel)
>1	Very coarse sand

Size (mm)	Grade
>1/2	Coarse sand
>1/4	Medium sand
>1/8	Fine sand
>1/16	Very fine sand
>1/32	Coarse silt
>1/64	Medium silt
>1/128	Fine silt
>1/256	Very fine silt
<1/256	Clay

Table 4: Sediment grain size categories as applied to the riverbed deposits discussed in this report.

5.0 ARCHAEOLOGICAL ASSESSMENT



Site ID	n/a
Name	River Barrow
Site Type	River/ Townland/ County Boundary
Townland/s	Motarstown Upper, Crossneen
ITM	671135E, 674967N – ITM 671059E, 674913N (survey extent)
Channel width	37m-38m (in-water section)
Water depth	2.5m-4m
Feature/s	None
Find/s	22D0069:01 (glass bottle) and 22D0069:02 (ceramic mustard pot)
Figure/s	6-9

5.1 Topography

The River Barrow rises in the Slieve Bloom Mountains, northwest of the Ridge of Capard, in County Laois. It flows for a distance of 192km to its confluence with the River Suir above Waterford and has a catchment area of 3,067km². Much of the waterway is characterised by a discordant river pattern with entrenched meanders and a fluvial geomorphology comprising quaternary sediments that overlie bedrock deposits of carboniferous limestone; the bedrock surrounding the section of river under assessment being *Peliodal Cacrenitic* limestone of Milford Formation.

As the river flows past Carlow town and through the townlands of Mortarstown Upper, to the west, and Crossneen, to the east, it forms a broad, relatively straight, section of waterway that runs roughly north to south, parallel to the R448 roadway.

The west side of the river channel is delineated by a steep-sided (artificial) bank structure, measuring 3.8m in height. A section of navigation two-path, now forming part of the Barrow Way, is situated upon the topmost area of the bank. This feature provides a tangible reminder of the river navigation works that took place along much of the River Barrow in the mid-late eighteenth century (Plate 2).

The riverbed, along the base of the bank structure, falls away at a 45° angle for a distance of 3m, at which point it continues to decline, at a shallower angle (c. 25°-30°), towards the channel centre for a distance of 7.2m. The bank profile/ bed-level present across the western half of the waterway is consistent with historic and later dredging activity within the river; undertaken as a means of maintaining suitable channel depths for navigation.

In contrast, the east side of the channel retains a more natural character, the bed-level dropping slowly towards the channel centre over a distance c. 17m. In addition, the attendant bank structure maintains a natural appearance overall, only localised modern modifications to the structure being present. The east side of the river is heavily overgrown with both juvenile and mature tree species, including alder, sycamore, and ash (Plate 3). Heavily overgrown land is located behind the east bank, rising at a c. 50° angle for a distance of between c. 15m-20m.

The riverbed itself is composed, in the most part, of a compact deposit rounded to sub-rounded pebbles (<40mm) with occasional small cobbles (<100mm), overlying a substratum of coarse-sand and gravel (Plates 4-5). However, the riverbed becomes less uniform in nature along the west side of the channel; where larger cobbles and small boulders are also present (Plate 6). In addition, a degree of sedimentation is also taking place, river-flow evidently being slower along this side of the waterway (Plate 7). It was also noted that discharge from the

existing outfall has provided conditions favourable for the growth of an aquatic-weed; vibrant green in colour (Plate 8). This growth was observed coating the surface of any larger objects present within the vicinity of the outfall structure, particularly on its downstream side.

5.2 Visual Survey and Assessment

The archaeological assessment was comprehensive and systematic; significantly extending the survey both upstream and downstream of the river impact area. The riverbed remained largely free of visible surface debris, with only occasional bottles, beer cans, and other discarded material being observed. Only two (2) finds of interest were encountered, as detailed below (Table 5); see Figure 9 for mapped location.

Find Number	Location [ITM]	Description
22D0069:01 [Plate 9A]	671128E, 674954N	Early-twentieth century (spirit) bottle; slightly tapered body with applied string rim and bulbous neck.
22D0069:02 [Plate 9B]	671099E, 674936N	Victorian stoneware preserve jar; vertical ribbed decoration, date of manufacture 1890-1920.

Table 5: Surface finds encountered as part of the UAIA.

Moreover, historic dredging of the riverbed, along the western side of the river channel, has significantly reduced any archaeological potential present across that location. However, a relatively good holding-content can be ascribed to the eastern half of the river channel, where the riverbed/bank structure does not appear to have been subject to any impact from past dredging works. As such, the potential for material and/or deposits of archaeological significance to remain buried (at depth) within this area should still be considered moderate-high.

5.3 Metal-detection Survey

Metal detection was carried out over a 28m section of the riverbed, extending across the full width of the river channel (Plate 10). In addition, an attempt was made to metal-detect the impact location on the east bank, however this proved problematic due to the overgrown nature of the bankside area. Isolated hits were present and identified, but it was not possible to gain an overview of the m² quantity of targets present, as achieved elsewhere.

A consistent hit ratio was observed for the channel slopes on both side of the river, with 1-2 *ferrous* targets being encountered per m². However, metal-detection across this area did not yield any items of interest, any surface targets encountered being of modern origin; mainly representing items associated with leisure sailing and/or angling (Plate 11). A reduced hit ratio of 1 target every 2m² was encountered for the channel centre. Again, all surface finds from this area were of modern origin and included tin cans, aluminium drinks cans, modern coins, and a holy-medal. In conclusion, while the channel slopes do retain the potential to retain metallic items of archaeological/ historic significance, this potential is greatly reduced for the channel centre.

5.4 Conclusion

The on-site assessment was systematic and comprehensive, extending well beyond any impacts associated with the proposed outfall structure. No archaeologically significant features, structures, or deposits were observed for either the immediate impact location or the wider assessment area.

6.0 PROPOSED IMPACTS⁷

The outfall will impact the eastern bank of the River Barrow at ITM 671112E, 674924N (centre-point). It is understood that the outfall pipe will measure between 1080mm and 1180mmØ (OD) and that a concrete headwall will also be constructed at the outfall terminus. Sheet-piles (*Larson* clutch) are to form the outer (in-river) limit of headwall structure. It is anticipated that the new structure will extend a maximum distance of c. 2m into the river channel.

6.1 Impact Categories

Impact/effect categories will typically have regard to those set out in the '*Guidelines on the information to be contained in Environmental Impact Statements*', 2022, EPA; 'Advice notes on Current Practice (in preparation of Environmental Impact Statements)', 2003, EPA; Strategic Environmental Assessment (SEA), 2010; and Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes, no date, National Roads Authority.

Impacts are generally categorised as either being a direct impact, an indirect impact or as having no predicted impact:

Direct impact occurs when an item of archaeological or architectural heritage is located within the centreline of the proposed route alignment and entails the removal of part, or all, of the monument or feature.

Indirect impact may be caused where a feature or site of archaeological or architectural interest is located in close proximity of the proposed development.

No predicted impact occurs when the proposed route option does not adversely or positively affect an archaeological or architectural heritage site.

These impact categories are further assessed in terms of their quality i.e. positive, negative, neutral (or direct and indirect).

Negative Impact is a change that will detract from or permanently remove an archaeological or architectural monument from the landscape.

Neutral Impact is a change that does not affect the archaeological or architectural heritage.

⁷ This section does not purport to relate to precise engineering details but is rather an attempt to understand the nature of the impact on the potential archaeological environment, based on the supplied data.

Positive Impact is a change that improves or enhances the setting of an archaeological or architectural monument.

A significance rating for these impacts is then given i.e. slight, moderate, significant or profound.

Profound applies where mitigation would be unlikely to remove adverse effects. This is reserved for adverse, negative effects only. These effects arise where an archaeological or architectural site is completely and irreversibly destroyed by a proposed development.

Significant is an impact that, by its magnitude, duration or intensity alters an important aspect of the environment. An impact like this would be where the part of a site would be permanently impacted upon leading to a loss of character, integrity and data about the archaeological or architectural feature/site.

Moderate is a moderate direct impact that arises where a change to the site is proposed which, though noticeable, is not such that the archaeological integrity of the site is compromised and which is reversible. This arises where an archaeological or architectural feature can be incorporated into a modern day development without damage and that all procedures used to facilitate this are reversible.

Slight is an impact that causes changes in the character of the environment that are not significant or profound and do not directly impact or affect an archaeological or architectural feature or monument.

Imperceptible is an impact capable of measurement but without noticeable consequences.

In addition, the duration of Impacts is assessed and has been sub-divided into the following categories:

- **Temporary Impact**, where an Impact lasts for one year or less
- **Short-term Impacts**, where an Impact lasts one to seven years
- **Medium-term Impact**, where an Impact lasts seven to fifteen years
- **Long-term Impact**, where an Impact lasts fifteen to sixty years.
- **Permanent Impact**, where an Impact lasts over sixty years.

Potential impacts associated with the proposed development and corresponding impact classifications have been tabulated in Table 6 below. There are no impacts (primary or secondary) to any known archaeological material, deposits, or features arising from the proposed works.

Proposed works	Location	ITM	Potential Impacts	Classification of Impact
Terminus of outfall pipe, and associated structures, including headwall and sheet piles.	Riverbed/ Bankside Area	671112E, 674924N	While there is no known impact to any visible archaeologically or historically significant features, the potential for buried (sub-surface) features, deposits, or material remains moderate-high.	Direct, negative, impact to any sub-surface features; moderate and permanent in nature.

Table 6: Nature and classification of riverine impacts arising from the proposed development.

7.0 RECOMMENDATIONS

7.1 Pre-construction Measures

No further ameliorative measures are recommended in advance of construction works taking place at the proposed outfall location. However, given the River Barrow's long use as a navigation route and the degree to which it was utilised for same, from at least the seventeenth-century onwards, it is recommended that construction phase archaeological monitoring of the outfall installation works takes place.

7.2 Construction Phase Measures

Archaeological Monitoring is recommended for the excavation/removal of any bankside/riverbed deposits as part of the proposed works. This work is to be carried out by a suitable qualified archaeologist with expertise in riverine archaeology. The archaeological work should be carried out in accordance with the terms of Section 5 of the National Monuments Act (2004 Amendment).

RETAINING AN ARCHAEOLOGIST/S. An archaeologist should be retained for the duration of the relevant works. The archaeologist should be familiar with and experienced in river/estuarine environments and have a good understanding of riverine archaeology and its associated features.

THE TIME SCALE for the construction phase should be made available to the archaeologist, with information on where and when ground disturbances and/or dredging will take place.

SUFFICIENT NOTICE. It is essential for the developer to give sufficient notice to the archaeologist/s in advance of the construction works commencing. This will allow for prompt arrival on site to monitor the ground disturbances. As often happens, intervals may occur during the construction phase. In this case, it is also necessary to inform the archaeologist/s as to when ground disturbance works will recommence.

DISCOVERY OF ARCHAEOLOGICAL MATERIAL. In the event of archaeological features or material being uncovered during the construction phase, it is crucial that any machine work cease in the immediate area to allow the archaeologist/s to inspect any such material.

ARCHAEOLOGICAL MATERIAL. Once the presence of archaeologically significant material is established, full archaeological recording of such material is recommended. If it is not possible for the construction works to avoid the material, full excavation would be recommended. The extent and duration of excavation would be a matter for discussion between the client and the statutory authorities.

ARCHAEOLOGICAL TEAM. It is recommended that the core of a suitable archaeological team be on standby to deal with any such rescue excavation. This would be complimented in the event of a full excavation.

SECURE SITE OFFICES and facilities should be provided on or near those sites where excavation is required.

FENCING of any such areas would be necessary once discovered and during excavation.

ADEQUATE FUNDS to cover excavation, post-excavation analysis, and any testing or conservation work required should be made available.

MACHINERY TRAFFIC during construction must be restricted as to avoid any of the selected sites and their environs.

SPOIL should not be dumped on any of the selected sites or their environs.

PLEASE NOTE: All of the above recommendations are based on the information supplied for the proposed Outfall, River Barrow, Mortarstown WWTP, Co. Carlow. Should any alteration occur, further assessment maybe required.

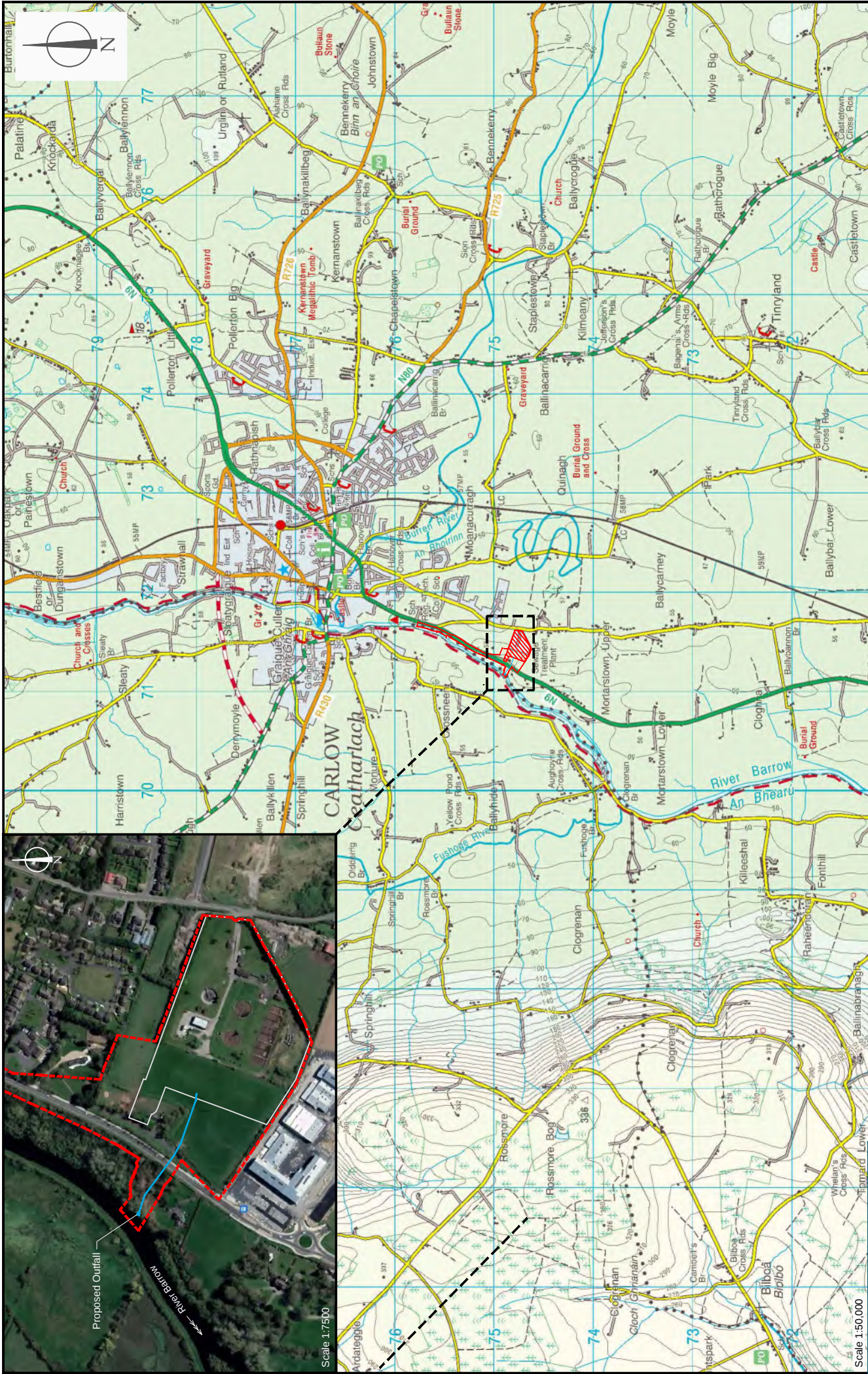
PLEASE NOTE: Recommendations are subject to the approval of The Department of Housing, Local Government, and Heritage and the National Museum of Ireland.

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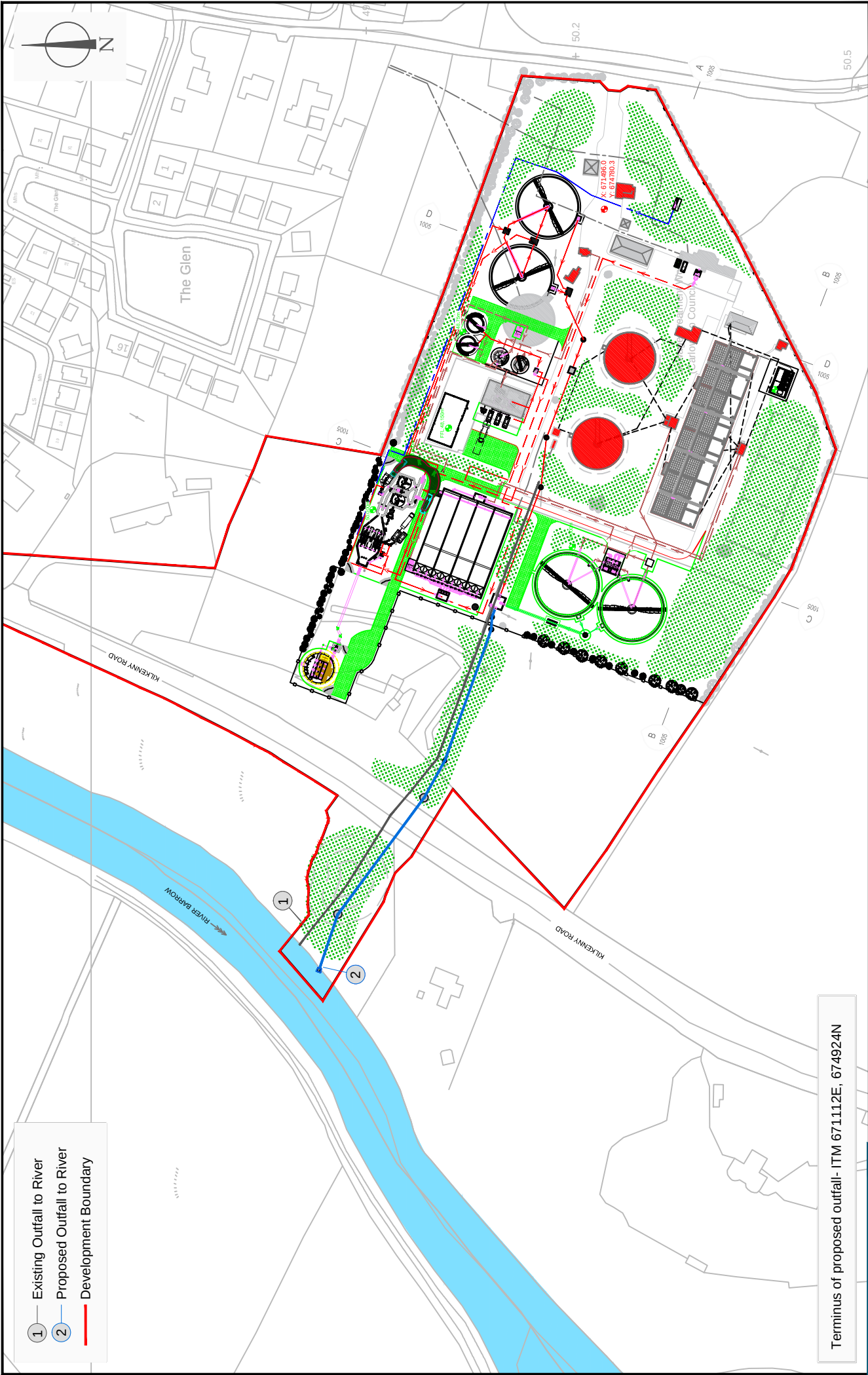
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8.0 ACKNOWLEDGEMENTS

Thanks are extended to Cormac Dunne, Senior Environmental at AtkinsRéalis. The Survey Team comprised Rex Bangerter (Archaeological Director), Jimmy Lenehan (Archaeologist/Metal Detectorist), Daniel Lenehan (Archaeologist/ Drone Pilot), Feargal Morrissey (Archaeological Assistant /Diving Engineer), Brian MacAllister (Archaeological Assistant), and Derek Copeland (Surveyor). The report was written by Bangerter.



Notes		Job/Exc No.	Compiled by	CAD reference	Client	Title
Source: Main- OS Discovery (1:50,000) Series Mapping Thumbnail- Google Earth (satellite image captured 19.07.21).		22D0069, 22R0225	R. Bangertel	RiverBarrow_Mortarstown	AlkinsRéalis/ Irish Water	Figure 1- OS Discovery Series map and satellite image showing location of proposed Outfall Structure at Mortarstown WWTP, Carlow.
A4	Date 25.03.25	Scale 1:50,000/1:7500	Drawing No. Figure 1	Project UAIA, Proposed Outfall, River Barrow, Mortarstown WWTP		



Notes		A4		Job/Exc No. 22D0069, 22R0225		Compiled by R. Bangerter		CAD reference RiverBarrow_Mortarstown		Client AkinsRéalis/ Irish Water		Title Figure 2- Extract from Project Drawing showing route of proposed Outfall Pipe, extending between the Mortarstown WWTP and the East Bank of the River Barrow.	
Source: Figure adapted from project drawing 5161805_EWE_DP_MOR_1103 [provided by AkinsRéalis, March 2025].				Date 25.03.25		Scale 1:2500		Drawing No. Figure 2		Project UAIA, Proposed Outfall, River Barrow, Mortarstown WWTP			

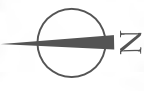


Terminus of proposed outfall- ITM 671112E, 674924N

CENTRE COORDINATES:
ITM 671132.674934

PUBLISHED: 08/06/2022
ORDER NO.: 50273022_1

MAP SERIES: **MAP SHEETS:**
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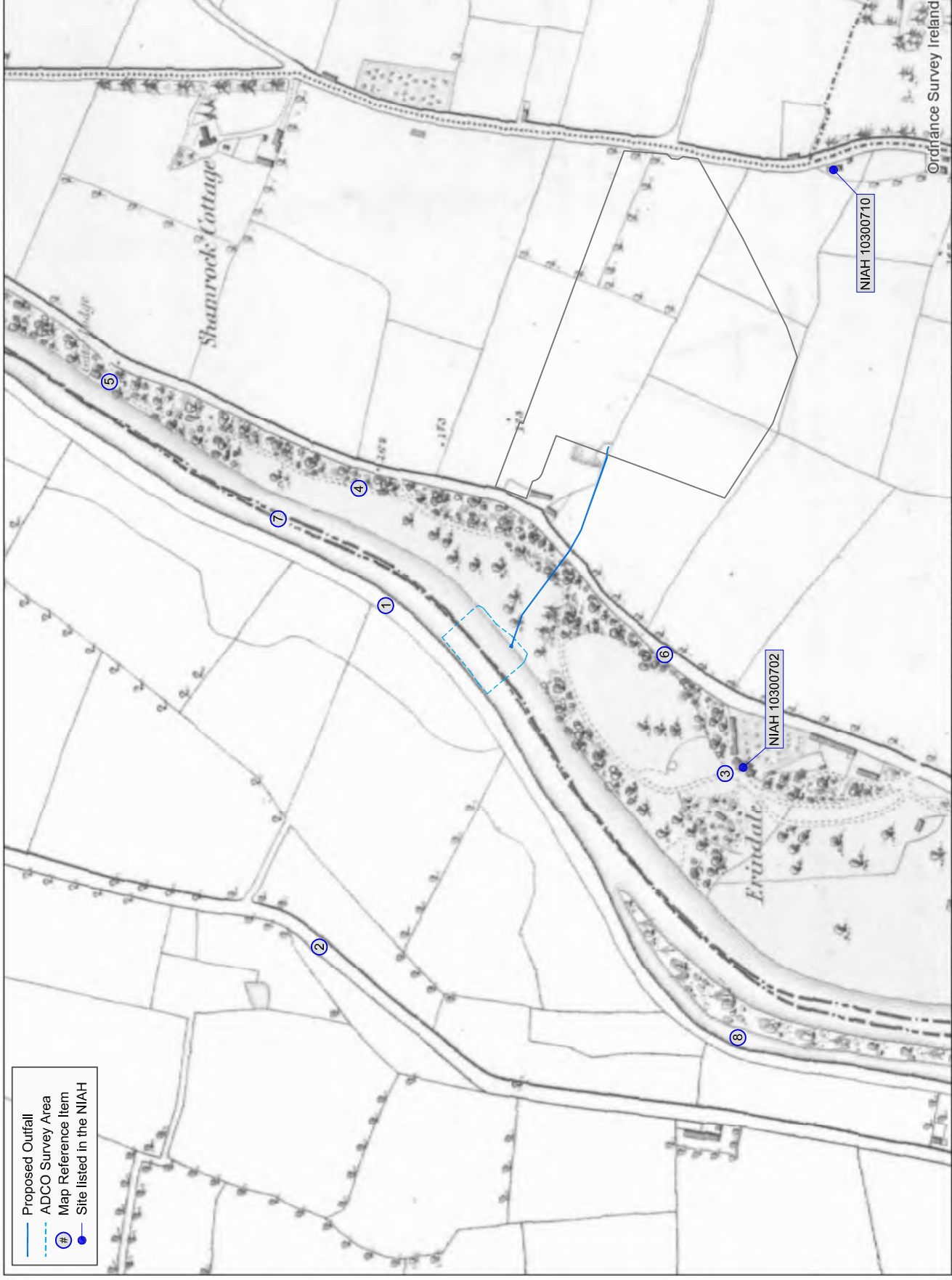
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2022



- Proposed Outfall
- ADCO Survey Area
- Map Reference Item
- Site listed in the NIAH



Notes
Map Source: OSI Historic Map Archive
[now Tallie Eireann].

A4

Job/Exc No.
22D0069, 22R0225

Date
25.03.25

Compiled by
R. Bangert

Scale
1:5000

CAD reference
RiverBarrow_Mortarstown

Drawing No.
Figure 3

Client
AkinsRéalls/ Irish Water

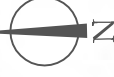
Project
UAAI, Proposed Outfall, River Barrow, Mortarstown
WWTTP

Title
Figure 3- Extract from OS First Edition (1838)
map with location of proposed Outfall Route,
ADCO Survey Area, Map Reference Items, and
NIAH sites superimposed.

CENTRE
COORDINATES:
ITM 671080.674896

PUBLISHED:
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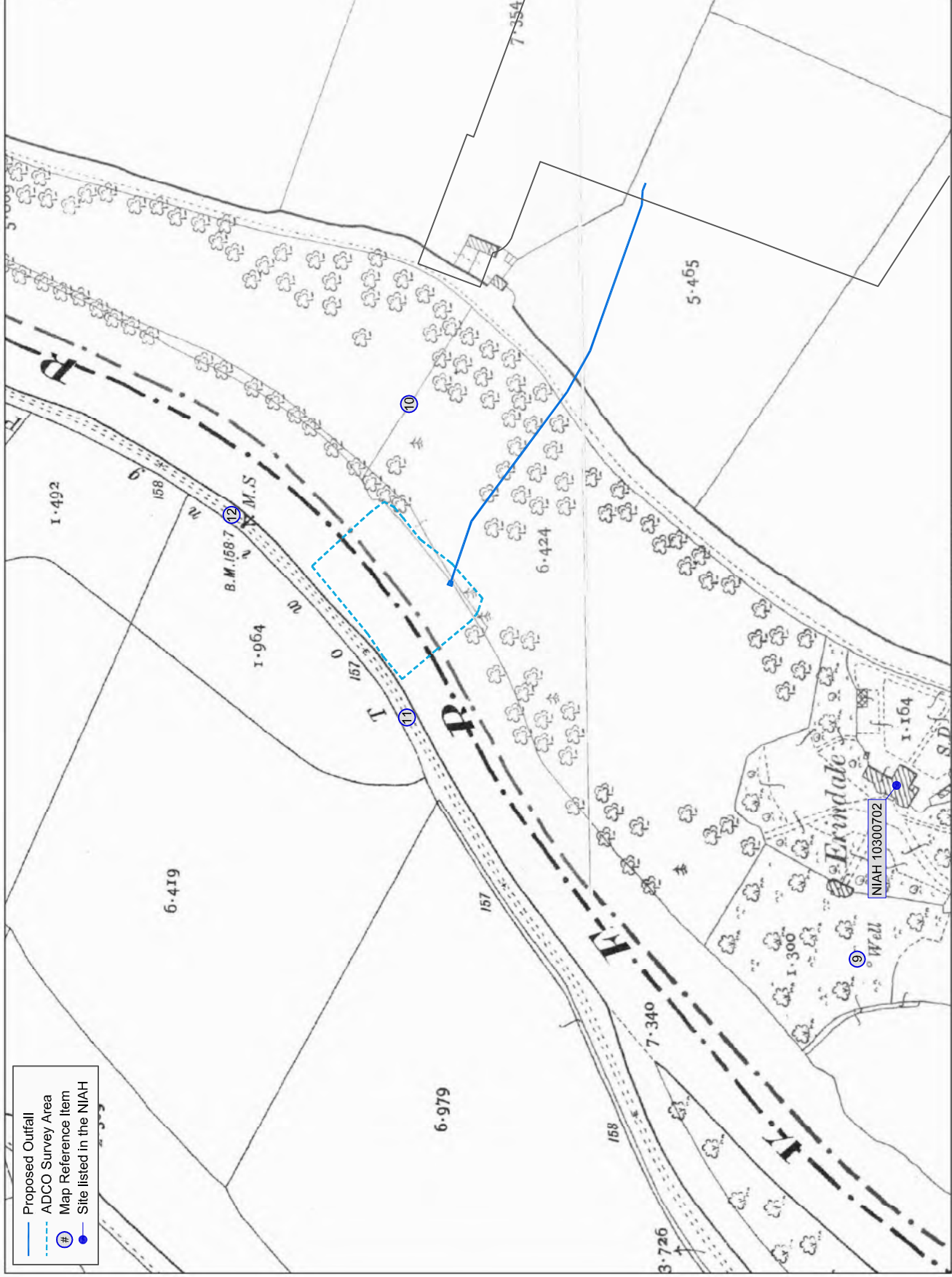
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0m 25m 50m



Proposed Outfall
ADCO Survey Area
Map Reference Item
Site listed in the NIAH

Notes
Map Source: OSI Historic Map Archive
[now Tallie Eireann].

ADCO

A4

Job/Exc No.
22D0069, 22R0225

Date
25.03.25

Compiled by
R.Bangerter

Scale
1:2500

CAD reference
RiverBarrow_Mortarstown

Drawing No.
Figure 4

Client
AkinsR&S/ Irish Water

Project
UAA, Proposed Outfall, River Barrow, Mortarstown
WMTP

Title
Figure 4- Extract from OS 25-inch Edition (1907)
map with location of proposed Outfall Route,
ADCO Survey Area, Map Reference Items, and
NIAH sites superimposed.

CENTRE COORDINATES:
ITM 671027, 674735

PUBLISHED: 22/09/2022
ORDER NO.: 50292899_1

MAP SERIES: MAP SHEETS:
6inch BW ED01 CW007
6inch BW ED01 LS037



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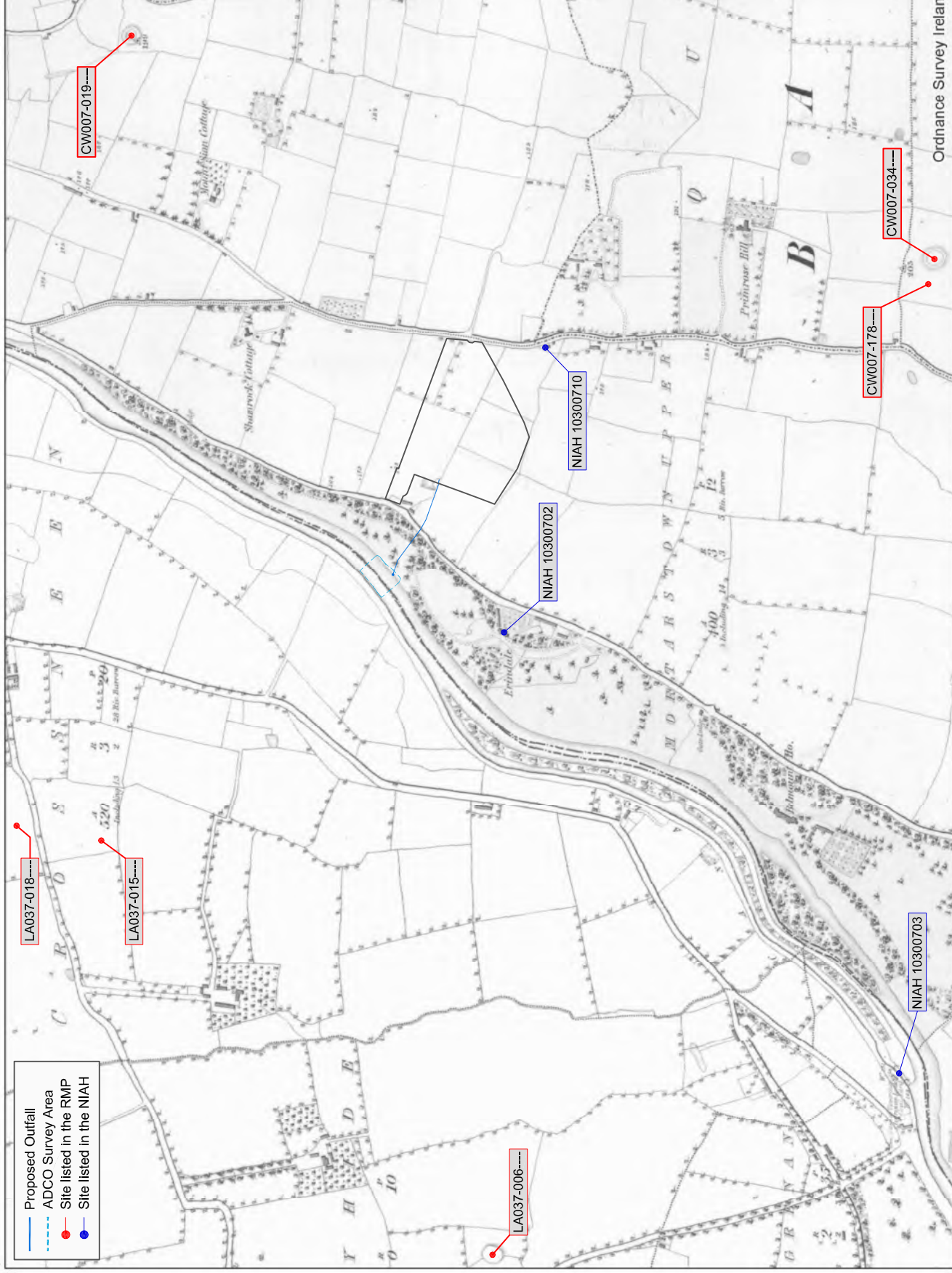
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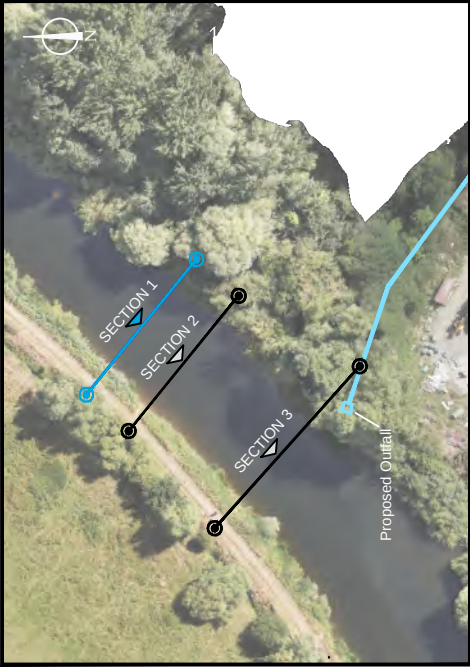
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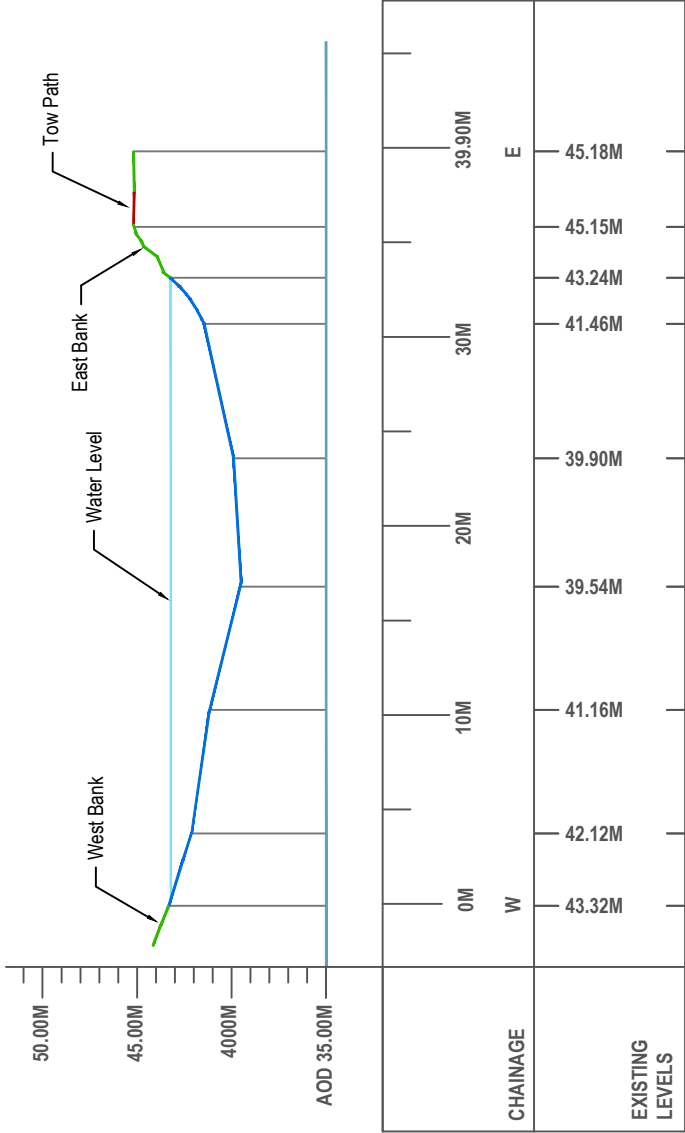


Notes			Title		
A4			Figure 5- Extract from OS First Edition (1838) map with ADCO Survey Area and surrounding Cultural Heritage Assets superimposed.		
			Client	AlkinsRalls/ Irish Water	
Job/Exc No. 22D0069, 22R0225		CAD reference RiverBarrow_Mortarstown	Project UAIA, Proposed Outfall, River Barrow, Mortarstown WMTP		
Date 25.03.25		Drawing No. Figure 5			
Compiled by R.Bangerter		Scale 1:10,000			



Scale 1:1750

RIVER BARROW SECTION 1



Scale 1:400



Notes
Source:
Main- Onsite survey using GNSS receiver with RTK
Thumbnail- ADCO Drone Survey.

A4

Job/Exc No.
22D0069, 22R0225

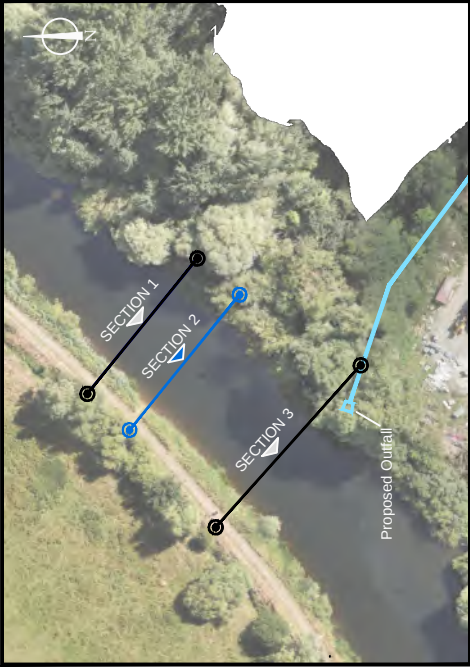
Compiled by
D. Copeland/
R. Bangerter

CAD reference
RiverBarrow_Mortarstown

Client
AkinsRéfais/ Irish Water

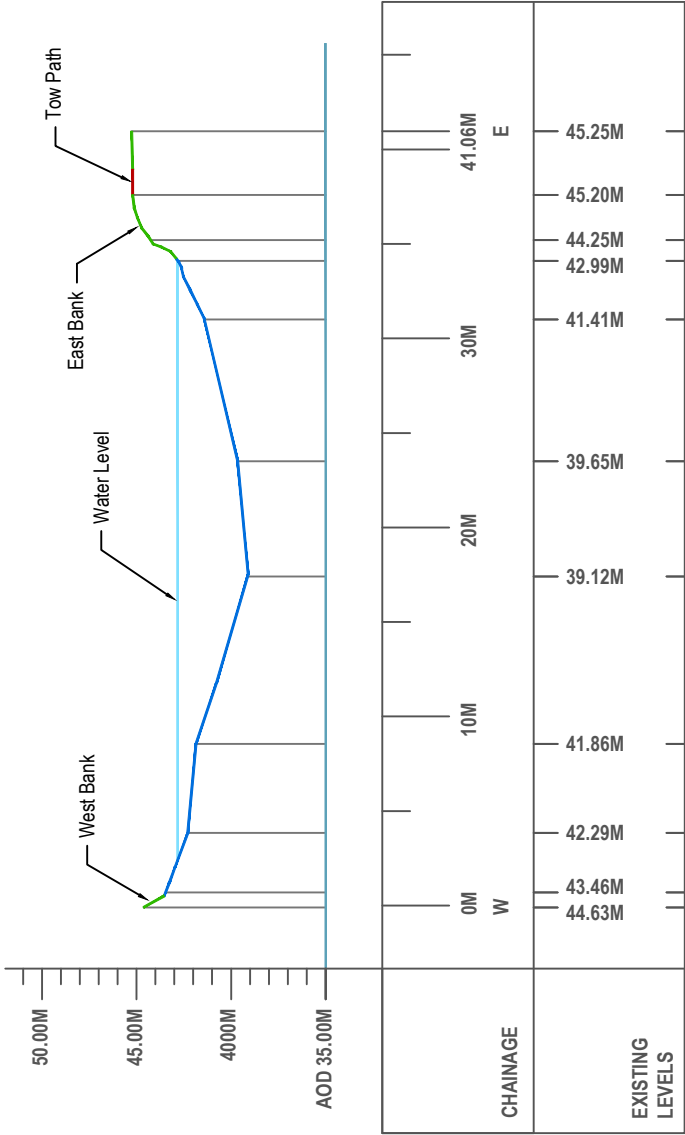
Project
UAIA, Proposed Outfall, River Barrow, Mortarstown WWTP

Title
Figure 6- Cross-section Number 1; taken at a point 48m upstream of proposed outfall location.



Scale 1:1750

RIVER BARROW
SECTION 2



Scale 1:400



Notes
Source:
Main- Onsite survey using GNSS receiver
with RTK
Thumbnail- ADCO Drone Survey.

A4

Job/Exc No.
22D0069, 22R0225

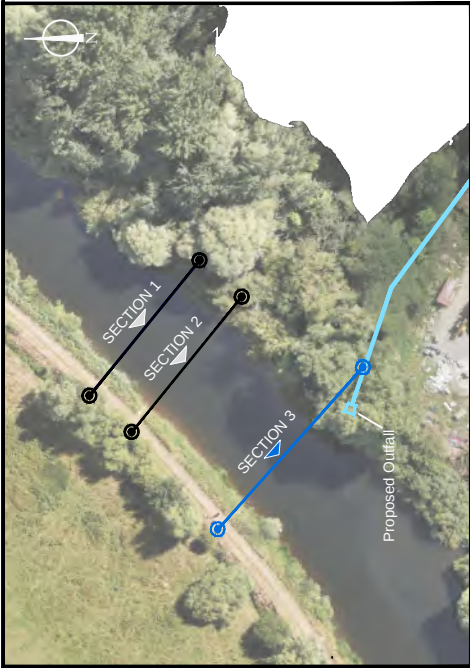
Compiled by
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CAD reference
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Client
AkinsRéalis/ Irish Water

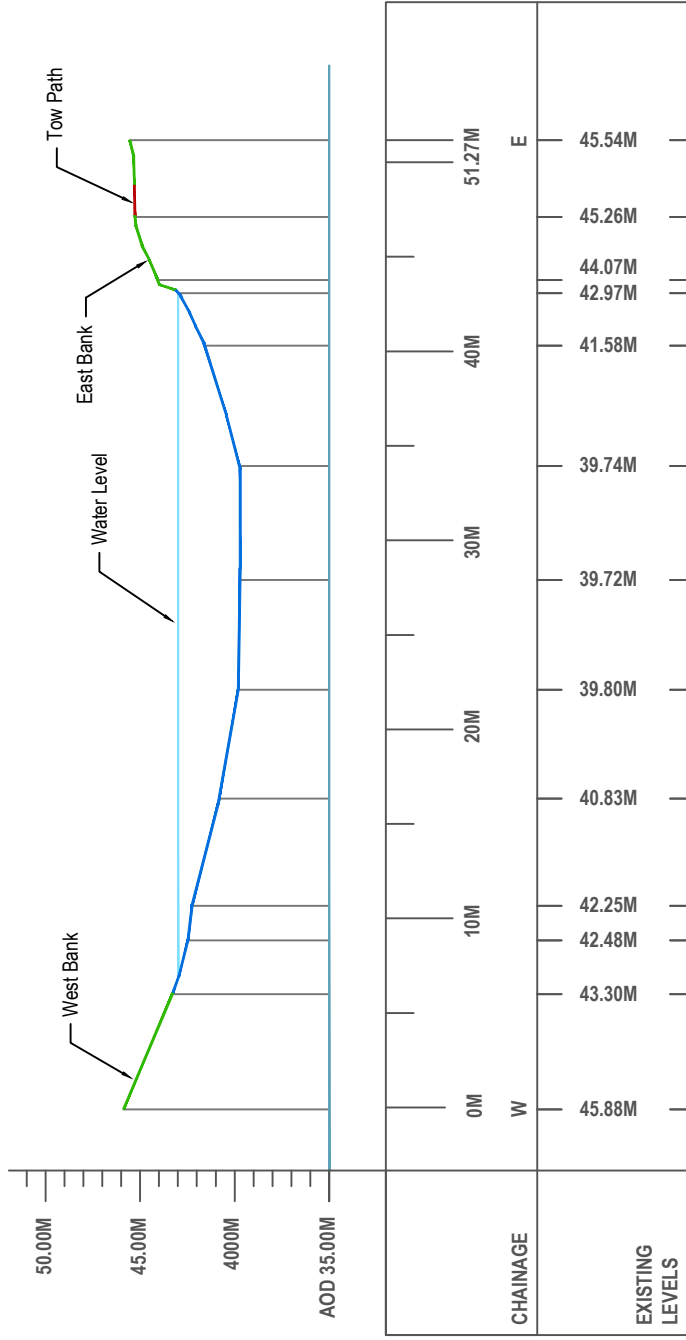
Project
UAA, Proposed Outfall, River Barrow, Mortarstown
WWTP

Title
Figure 7- Cross-section Number 2; taken at
a point 35.5m upstream of proposed outfall
location.



Scale 1:1750

RIVER BARROW SECTION 3



Scale 1:400



Notes
Source:
Main- Onsite survey using GNSS receiver
with RTK.
Thumbnail- ADCO Drone Survey.

A4

Job/Exc No.
22D0069, 22R0225

Compiled by
D. Copeland/
R. Bangerter

CAD reference
RiverBarrow_Mortarstown

Client
AlkinsRéalis/ Irish Water

Project
UAI, Proposed Outfall, River Barrow, Mortarstown
WWTP

Title
Figure 8- Cross-section Number 3; taken at
a point 3.6m upstream of proposed outfall
location.

Find Number/Location

Plate Number/Location

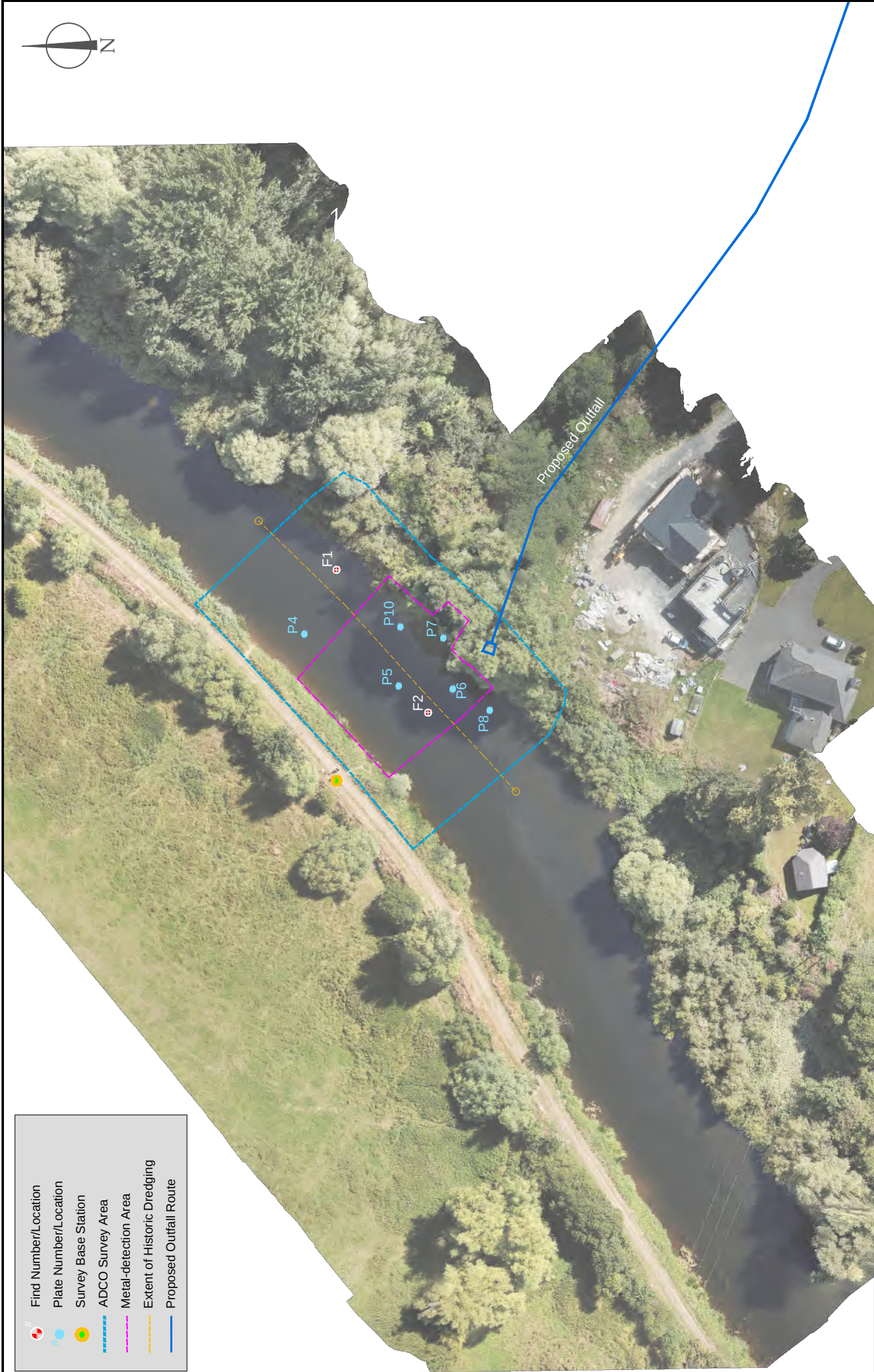
Survey Base Station

ADCO Survey Area

Metal-detection Area

Extent of Historic Dredging

Proposed Outfall Route



ADCO Notes A4 Job/Exc No. 22D0069, 22R0225 Compiled by R.Bangerter/ D.Copeland CAD reference RiverBarrow_Mortarstown Client AtkinsRéalis/ Irish Water Title Figure 9- Aerial orthomosaic image of the River Barrow with extent of ADCO Survey Area, proposed outfall route, and survey observations superimposed.	Source: Aerial Imagery captured using ADCO Drone. [Drone Survey undertaken by R.Bangerter & D.Lenehan]	
	Date 25.03.25 Scale 1:400/ 1:1750 Drawing No. Figure 9 Project UAIA, Proposed Outfall, River Barrow, Mortarstown WWTP	



Plate 1: A print by George Miller & Robert Gibbs (c.1813 – 1816) depicts a boat being pulled upstream on the River Nore, in the vicinity of Brownsbarn, Co. Kilkenny (Source: Thomastown Industrial Heritage Project).



Plate 2: Northeast-facing (upstream) view of former tow-path located on the west side of the assessment area.



Plate 3: East-facing view of river assement area, showing the overgrown nature of the east bank.

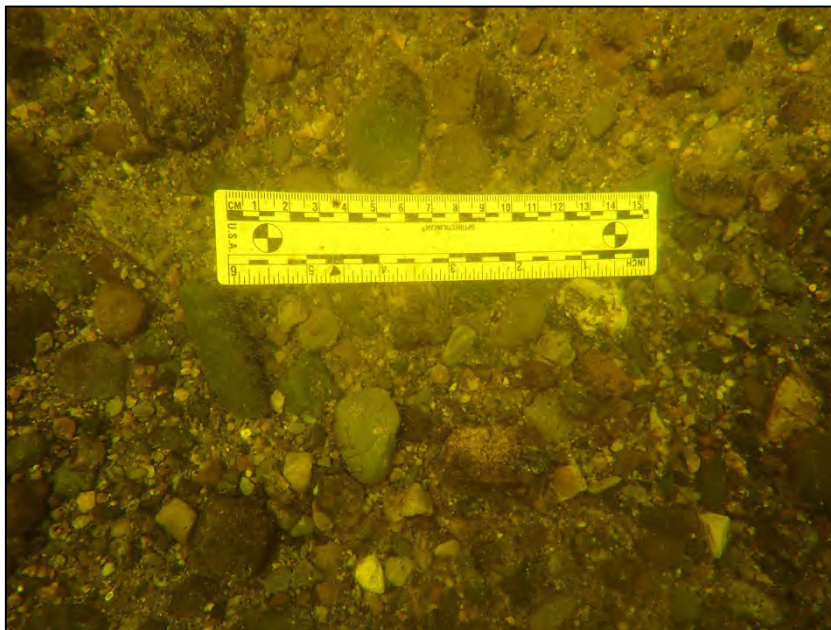


Plate 4: Underwater shot showing compositon of riverbed on west side of channel, ITM 671115E, 674961N (150mm scale).

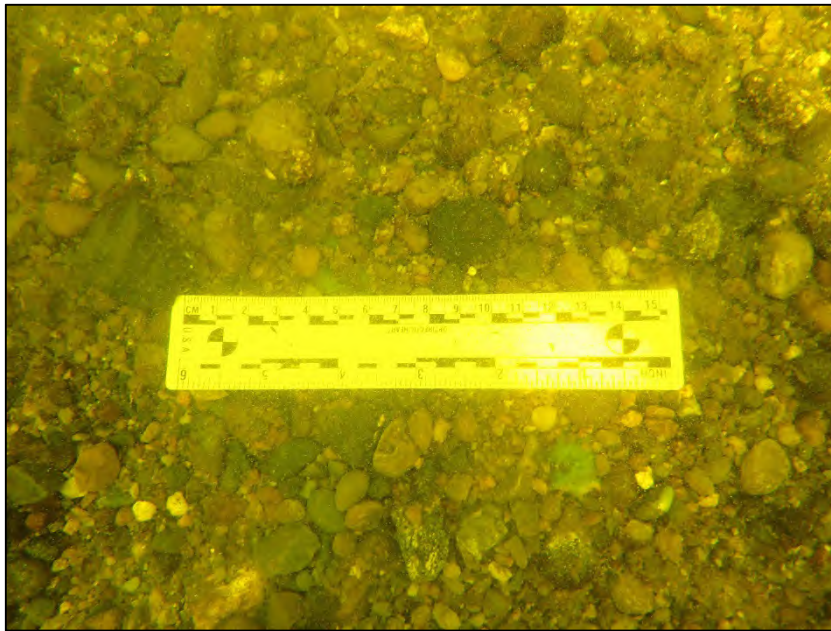


Plate 5: Underwater shot showing composition of riverbed at channel centre, ITM 671185E, 674942N (150mm scale).

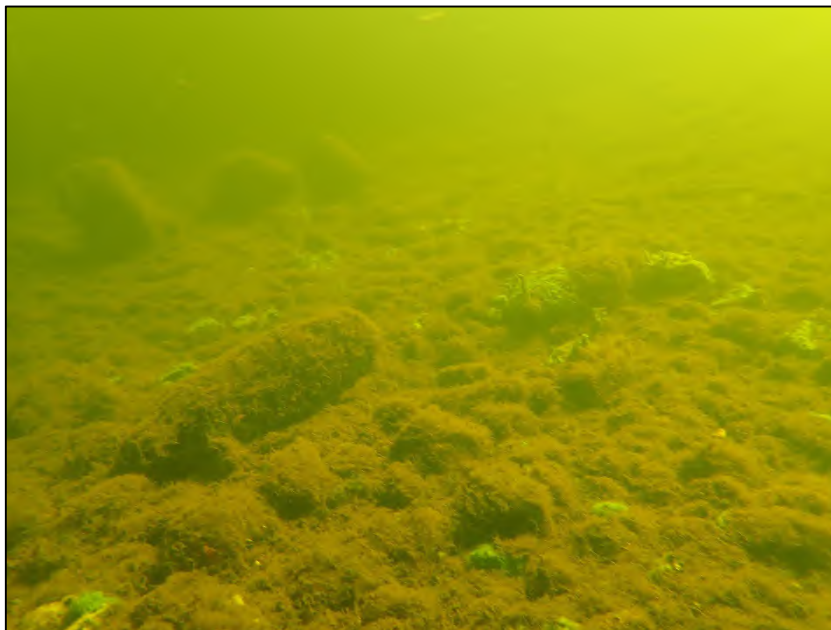


Plate 6: Underwater shot showing composition of riverbed on east side of channel, ITM 671104E, 674931N.



Plate 7: Example shot showing degree of sedimentation present along the base of the east bank; shot taken at point close to proposed outfall location.

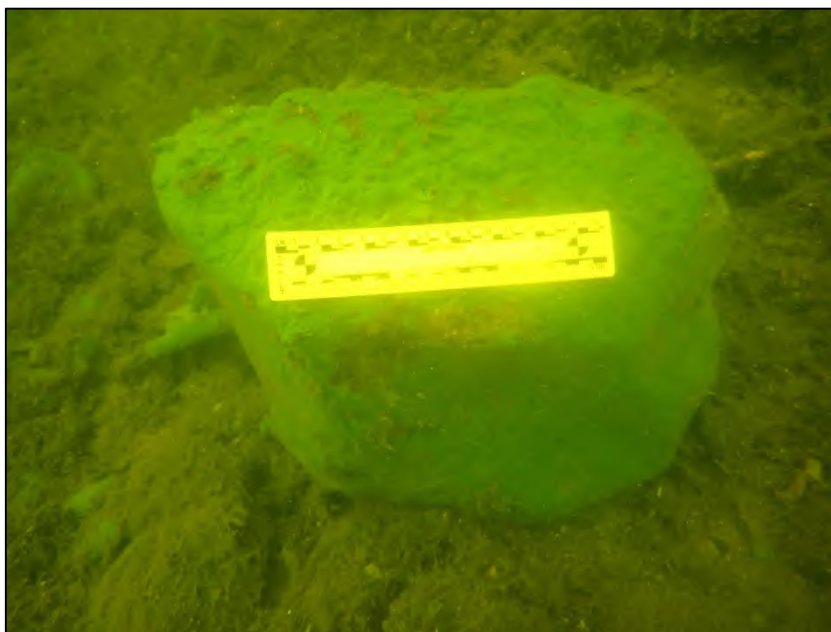


Plate 8: Isolated piece of limestone masonry, located downstream of existing outfall structure (150mm scale); note degree of weed-covering present.



Plate 9: [A] Early-twentieth century (spirit) bottle and [B] Victorian stoneware preserve jar recovered as part of the underwater survey (150mm scale)

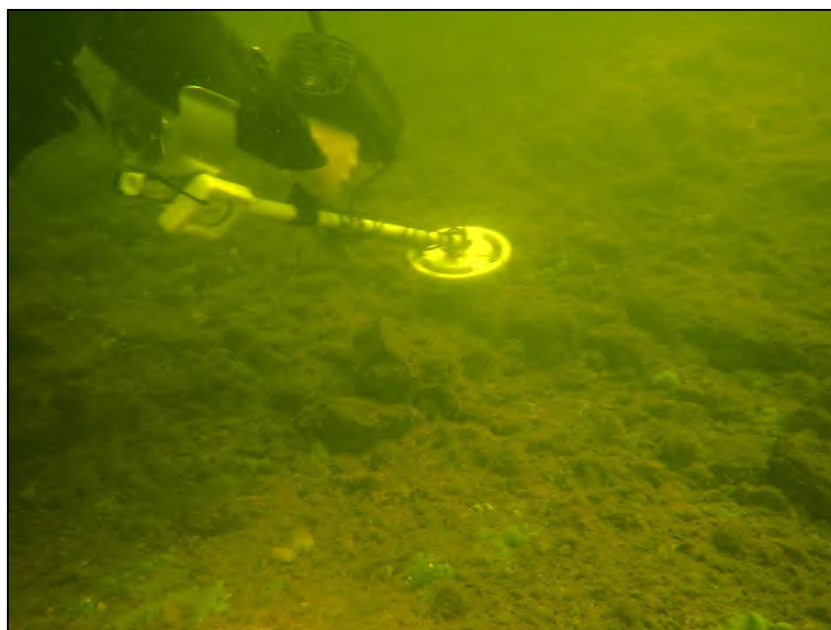
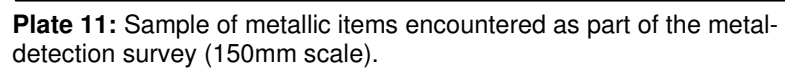


Plate 10: Working shot of metal-detection survey being undertaken on the east side of the river channel.





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