12 Archaeology, Architectural and Cultural Heritage

12.1 Introduction

This chapter describes the likely significant effects of the proposed development on archaeology, architectural and cultural heritage.

Chapter 4 provides a full description of the proposed development whilst **Chapter 5** describes the Construction Strategy. The following aspects are particularly relevant to the archaeology, architectural and cultural heritage assessment:

- Design:
  - Likely significant effects of the proposed development on architectural heritage and setting; and
  - Likelihood of encountering archaeological remains associated with the footprint of the proposed development.
- Operation:
  - Likely significant effects of the proposed development on architectural heritage and setting during operation.
- Construction:
  - Likelihood of encountering archaeological remains during intrusive works including subsurface construction and open cut construction of the outfalls and interceptor sewers; and
  - Underpinning works to Arklow Bridge.

It should be noted that this assessment has had regard to the ongoing data gathering and assessment of the archaeology, architectural and cultural heritage as part of the proposed Arklow Flood Relief Scheme. This work is currently being carried out by Courtney Deery and ADCO on behalf of the Office of Public Works and Wicklow County Council. As such, references to this ongoing assessment are made, where relevant, within this assessment chapter.

12.2 Assessment Methodology

12.2.1 General

This assessment determines, as far as reasonably possible from existing records, the nature of the cultural heritage resource within the footprint and a defined vicinity of the proposed development using appropriate methods of study.

As outlined by the Chartered Institute for Archaeologists[1], desk-based assessment is a programme of study of the historic environment within a specified area or site on land, the inter-tidal zone or underwater that addresses agreed research and/or conservation objectives. It consists of an analysis of existing written, graphic, photographic and electronic information in order to identify the likely heritage assets, their interests and significance and the character of the study area, including appropriate consideration of the settings of heritage assets.

Desk based assessment leads to the following:

- Determining the presence of known archaeological and built heritage sites that may be affected by the proposed WwTP development;
- Assessment of the likelihood of finding previously unrecorded archaeological remains during the construction programme;
- Determining the impact (direct/ indirect) upon the known cultural heritage sites in the surrounding area (receiving environment); and
- Identifying mitigation measures based upon the results of the above research; and
- Describing the residual impact on the archaeological, architectural and cultural heritage resource.

Research for this assessment has been undertaken in a number of phases. The first phase comprised a paper survey of publicly available archaeological, architectural, historical and cartographic sources. The second phase involved a field inspection of the proposed development site. Phases one and two were carried out in early 2018 and the third phase included full marine archaeological investigations, including a marine geophysical survey (in April 2017), dive inspections and an inter-tidal survey (April 2018).

12.2.2 Guidance and Legislation

This assessment has been undertaken having regard to general EIA guidance as described in **Section 1.4.3 of Chapter 1** and the following legislation and guidelines were also consulted as part of the assessment.

- National Monuments Act 1930 to 2014;
- The Planning and Development Acts 2000 to 2018;
- Heritage Act, 1995, as amended;
- Heritage Act 2018;
- Frameworks and Principles for the Protection of the Archaeological Heritage, 1999, (formerly) Department of Arts, Heritage, Gaeltacht and Islands; and
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 and the Local Government (Planning and Development) Acts 2000-2018.

[1] Chartered Institute for Archaeologists 2017 Standards & Guidance for Desktop Assessments

12.2.3 Study Area

The archaeological and cultural heritage receiving environment is defined as an area measuring 200m from the planning boundary for the proposed development. The architectural heritage receiving environment is defined as an area measuring 150m from the edge of the planning boundary for the proposed development.

Measurements have been taken from the proposed development boundary to the upstanding remains of a site or structure. Where there are no upstanding remains, the measurement is taken to the centre of the site as indicated within Figure 12.1.

12.2.4 Consultation

Following the initial research, a number of statutory and voluntary bodies were consulted to gain further insight into the cultural background of the receiving environment and study area, as follows:

- Two meetings were held with the Department of Culture, Heritage and the Gaeltacht (DCHG) on 16 January 2018 and 19 June 2018.

The following were also informally consulted to gain baseline data for the study area:

- Units in the DCHG including the Heritage Service, National Monuments and Historic Properties Section which include a number of datasets: Record of Monuments and Places; Sites and Monuments Record; Monuments in State Care Database; Preservation Orders; Register of Historic Monuments; Architectural Advisory Unit and Underwater Archaeology Unit;
- National Museum of Ireland, Irish Antiquities Division: topographical files of Ireland;
- National Inventory of Architectural Heritage: County Wicklow; and
- Wicklow County Council: Planning Section.

In undertaking this assessment, consultation has also taken place with the archaeological and cultural heritage specialists (Courtney Deery and ADCO), undertaking the archaeological, architectural and cultural heritage assessment for the proposed Arklow Flood Relief Scheme.

12.2.5 Paper Survey

A paper survey is a document search undertaken as part of the desktop study of the baseline data. The following sources were examined and a list of areas of archaeological, architectural and cultural heritage potential was compiled:

- Record of Monuments and Places for County Wicklow;
- Sites and Monuments Record for County Wicklow;
- Monuments in State Care Database;
- Preservation Orders;

- Register of Historic Monuments;
- The Shipwreck Inventory of Ireland;
- Topographical files of the National Museum of Ireland;
- Cartographic and written sources relating to the study area;
- Wicklow County Development Plan 2016 - 2022 (County Development Plan);
- Arklow and Environs Local Area Plan 2018 - 2024 (Arklow LAP);
- National Inventory of Architectural Heritage County Wicklow (Architectural & Garden Survey);
- Aerial photographs; and
- Excavations Bulletin (1970 – 2017).

Further information is provided below on the key data sources:

Record of Monuments and Places (RMP)

Section 12(1) of the National Monuments (Amendment) Act 1994 provides that the Minister for Arts, Heritage, Gaeltacht and the Islands (now the Minister for Culture, Heritage and the Gaeltacht) shall establish and maintain a record of monuments and places where they believe there are monuments. The record comprises of a list of monuments and relevant places and mapping showing each monument and relevant place in respect of each county in the State. Sites recorded on the RMP all receive statutory protection under the National Monuments Act. All recorded monuments are referred to as Archaeological Heritage (AH sites) within this appraisal.

Sites and Monuments Record (SMR)

The SMR holds documentary evidence and records of field inspections of all known archaeological sites and monuments. Some information is also held about archaeological sites and monuments whose precise location is not known e.g. only a site type and townland are recorded. These are known to the National Monuments Section as ‘un-located sites’ and cannot be afforded legal protection. As a result these are omitted from the RMP. SMR sites are also listed on a website[2] maintained by the DCHG

National Monuments in the State Care Database

This is a list of all the National Monuments in the State guardianship or ownership. Each is assigned a National Monument number whether in guardianship or ownership and has a brief description of each monument.

A National Monument receives statutory protection and is described as ‘a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto’ (National Monuments Act, 1930, Section 2).

[2] www.archaeology.ie

The Minister for the Department of Environment, Heritage and Local Government (now the Minister for Culture, Heritage and the Gaeltacht) may acquire National Monuments by agreement or by compulsory order. The State or Local Authority may assume guardianship of any National Monument (other than dwellings). The owners of National Monuments (other than dwellings) may also appoint the Minister or the Local Authority as guardian of that monument if the State or Local Authority agrees. Once the site is in ownership or guardianship of the State, it may not be interfered with without the written consent of the Minister.

Preservation Orders List

Preservation Orders and/or Temporary Preservation Orders, can be assigned to a site or sites that are deemed to be in danger of injury or destruction. Orders are allocated under the National Monuments Act, 1930. Preservation Orders make any interference with the site illegal. Temporary Preservation Orders can be attached under the National Monuments Act, 1954. These perform the same function as a Preservation Order but have a time limit of six months, after which the situation must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with the written consent, and at the discretion, of the Minister (DCHG).

Register of Historic Monuments

This register was established under Section 5 of the National Monuments (Amendment) Act 1987 and requires the Minister to establish and maintain such a record. Historic monuments and archaeological areas included in the register are afforded statutory protection pursuant to the regime under the National Monuments Acts 1930 to 2014. The register also includes sites under Preservation Orders and Temporary Preservation Orders. All registered monuments are included in the RMP.

The Shipwreck Inventory of Ireland

This inventory includes all known wrecks for the years up to and including 1945 and approximately 12,000 records have been compiled and integrated into the shipwreck database thus far. An inventory of wrecks covering the coastal waters off counties Louth, Meath, Dublin and Wicklow was published in 2008. Wrecks over 100 years old and archaeological objects found underwater are protected under the National Monuments Acts 1930 to 2014. Significant wrecks less than 100 years old can be designated by Underwater Heritage Order on account of their historical, archaeological or artistic importance.

Topographical files of the National Museum of Ireland

This is the national archive of all known finds recorded by the National Museum of Ireland. This archive relates primarily to artefacts but also includes references to monuments and unique records of previous excavations. The find spots of artefacts are important sources of information on the discovery of sites of archaeological significance.

Cartographic sources

These are important in tracing land use development within the receiving environment of the proposed development as well as providing important topographical information on areas of archaeological potential and the construction of buildings. Cartographic analysis of all relevant maps has been made to identify any topographical anomalies or structures that no longer remain within the landscape.

The cartographic sources consulted include:

- Down Survey Barony Map of Wicklow (1655-8); and
- Ordnance Survey 6" and 25" maps of Co. Wicklow (1841, 1895-1900, 1928-29).

Documentary sources

Documentary sources (as identified above) were consulted to compile background information on the archaeological, architectural and cultural heritage receiving environment of the proposed development.

Development Plans

Development Plans contain a catalogue of all the Protected Structures, archaeological sites and Architectural Conservation Areas within every county. The development plans of relevance that were examined as part of this assessment include the County Development Plan and Arklow LAP.

The National Inventory of Architectural Heritage (NIAH)

The NIAH is a government based organisation tasked with making a nationwide record of locally, regionally, nationally and internationally significant structures, which in turn provides county councils with a guide as to what structures to list within the Record of Protected Structures. The NIAH have also carried out a nationwide desk based survey of historic gardens, including demesnes that surround large houses.

Aerial photographic coverage

This is an important source of information regarding the precise location of sites and their extent. It also provides information on the terrain and its likely potential for archaeology. Ordnance Survey aerial photographs (1995, 2000, 2005), Google Earth coverage (2003 - 2012) and Bing Maps were examined for this assessment.

Excavations Bulletin

This is a summary publication that has been produced every year since 1970. This summarises every archaeological excavation that has taken place in Ireland during that year up until 2010 and since 1987 has been edited by Isabel Bennett. This information is also available online[3] from 1970 - 2017.

[3] www.excavations.ie

Information from this resource is vital when examining the archaeological content of any area, which may not have been recorded under the SMR and RMP files.

12.2.6 Field Inspection

Terrestrial

Field inspection is necessary to determine the extent and nature of archaeological and architectural remains and can also lead to the identification of previously unrecorded or suspected sites and portable finds through topographical observation and local information. The archaeological and architectural field inspection was carried out during June 2018 and entailed:

- Noting and recording the terrain type and land usage;
- Noting and recording the presence of known and previously unknown features of archaeological, architectural or cultural heritage significance;
- Verifying the extent and condition of recorded sites and structures (RMPs/ RPS/ NIAH); and
- Visually investigating any suspect landscape anomalies to determine the possibility of their being anthropogenic in origin and of archaeological, architectural or cultural heritage significance

Aquatic

Marine archaeological investigations were required in order to inform the baseline conditions in the vicinity of the long sea outfall, along with the impact assessment. In April 2017 ADCO carried out a marine geophysical survey of a 20ha area around the proposed footprint of the outfall alignment. This was undertaken under licence 16R0219. A summary of the report is included within the baseline conditions and the report itself is available in **Appendix 12.1**.

Following the initial survey, an archaeological dive inspection of potential archaeological anomalies was carried out by ADCO in April 2018. This was carried out under licences 17D0078 and 17R0197. The works included a survey of the intertidal area along the eastern edge of the proposed development. A summary of the report is included within the baseline conditions and the report itself is available in **Appendix 12.2**.

ADCO have also completed an underwater survey of the Avoca River over a length of approximately 1km, including Arklow Bridge, as part of the proposed Arklow Flood Relief Scheme. The results of this survey were reviewed as part of this assessment. A summary of this work is given in **Appendix 12.2**.

12.2.7 Impact Assessment Methodology

In order to assess, distil and present the findings of this study, the following definitions apply.

- 'Cultural Heritage' where used generically, is an over-arching term applied to describe any combination of archaeological, architectural and cultural heritage features, where –
- The term 'archaeological heritage' is applied to objects, monuments, buildings or landscapes of an (assumed) age typically older than AD 1700 (and recorded as archaeological sites within the Record of Monuments and Places);
- The term 'architectural heritage' is applied to structures, buildings, their contents and settings of an (assumed) age typically younger than AD 1700;
- The term 'cultural heritage', where used specifically, is applied to other (often less tangible) aspects of the landscape such as historical events, folklore memories and cultural associations. This designation can also accompany an archaeological or architectural designation or describe features that have a more recent origin, but retain cultural heritage significance.
- For the purposes of this report the terms 'architectural heritage' and 'built heritage' have the same intended meaning and are used interchangeably.

12.3 Baseline Conditions

12.3.1.1 Archaeological and Historical Background

Arklow town is located in County Wicklow, on the east coast of Ireland. It is situated at the mouth of the River Avoca and is accessible via the N11 road or the Dublin/Rosslare railway line.

Prehistoric Period

There is some evidence to indicate that Wicklow was inhabited from the late Mesolithic period (5500-4000 BC). During this period people hunted, foraged and gathered food and appear to have had a primarily (but not exclusively) mobile lifestyle. The archaeological record is characterised mainly by discarded flint tools and the debris from their manufacture. Flint scatters are recorded from Ardanairy, near Brittas Bay and on Corporation Lands to the south of Wicklow town (Grogan and Kilfeather 1997, 1).

Considerable evidence has been identified that dates to the Neolithic period (4000-2400 BC) in County Wicklow. During this period communities became less mobile and their economy became based on the rearing of stock and cereal cultivation. This transition was accompanied by major social change. Agriculture demanded an altering of the physical landscape, forests were rapidly cleared and field boundaries constructed. There was a greater concern for territory, which saw the construction of large communal ritual monuments called megalithic tombs, which are characteristic of the period.

The while most of the main prehistoric tomb types have been identified in County Wicklow, passage tombs appear to have been of particular importance during the Neolithic period. A number of these tombs were built across the Wicklow Mountains, which commanded great views across the Plain of Dublin, Dublin Bay and Wicklow.

The Bronze Age (2400-800 BC) in Wicklow is largely represented by burial monuments, including wedge tombs, barrows and urn burials. A number of these burial and ritual monuments survive in the Ashford area of Wicklow. Standing stones, stone alignments and stone circles are generally associated with this period and are often thought to have a ritual significance. The townlands of Ballybetagh, Hollywood and Castleruddery contain stone circles dating from this era. Hillforts at Rathgall, Baltinglass Hill and Spinnans Hill provide evidence for late Bronze Age settlement in Wicklow. As with most parts of the country, *fulachta fiadh* or burnt mounds have been identified throughout the county. These are generally considered to be Bronze Age in date and may have been cooking and/or feasting sites. They are normally found close to a water source and are characterised by a horseshoe shaped mound. These mounds are formed by up-cast charcoal rich burnt stones, which often cover a pit, or trough. These troughs may be wood lined, and often survive intact within the damp conditions that *fulachta fiadh* are often found in.

There is not a large amount of archaeological evidence for prehistoric occupation within the town of Arklow; however, the SMR file does make reference to the 19th-century discovery of a possible bronze age burial mound. Although the exact site was never located it was reported to have been located to the north of the bridge over the River Avoca within the townland of Ferrybank. Pottery and burnt bones were found there by workmen.

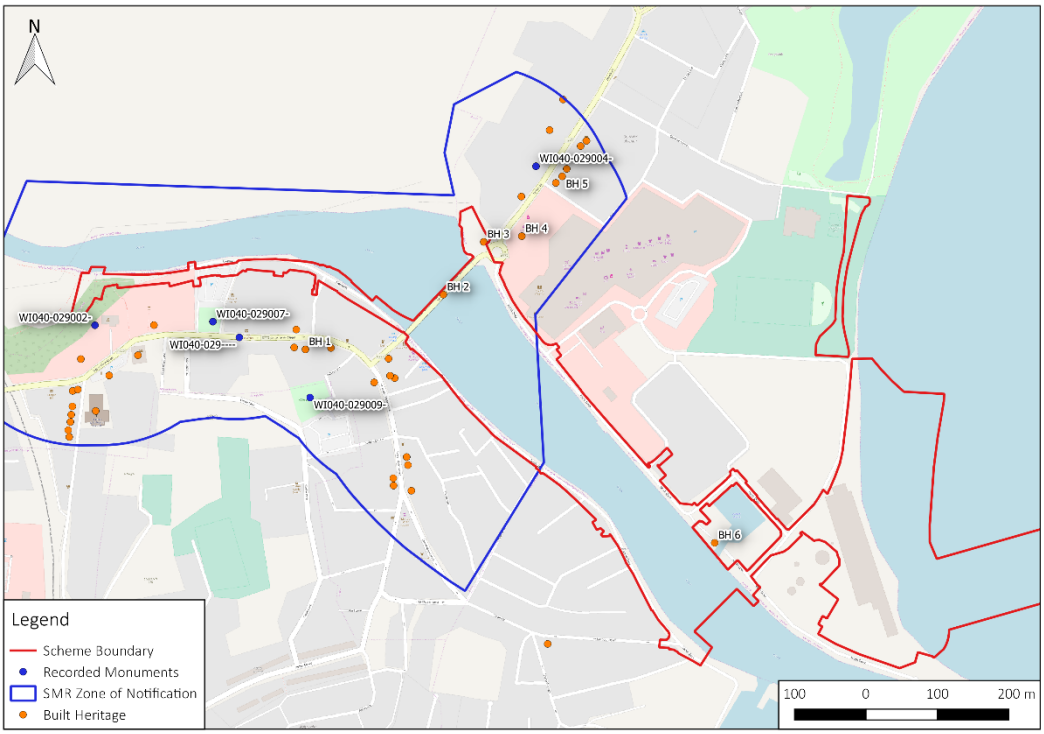

Figure 12.1: Extract from the RMP map showing recorded monuments and structures and the proposed development boundary

Early Medieval Period

During the early medieval period Ireland was not a united country but rather a patchwork of minor monarchies all scrambling for dominance, with their borders ever changing as alliances were formed and battles fought. Kingdoms were a conglomerate of clannish principalities with the basic territorial unit known as a *túath*. Byrne (1973) estimates that there were probably at least 150 kings in Ireland at any given time during this period, each ruling over his own *túath*. These kings were distributed strategically throughout the region and ruled over many tribal units.

The most common indicator of settlement during the early medieval period is the ringfort. Ringforts, (also known as *rath, lios, caiseal, cathair* and *dún*) are a type of defended homestead comprising of a central site enclosed by a number of circular banks and ditches. The number of ditches can vary from one (univallate) to two or three (bivallate or tri-vallate) and is thought to reflect the status and affluence of the inhabitants. Another morphological variation consists of the platform or raised ringfort – the former resulting from the construction of the ringfort on a naturally raised area. Ringforts are most commonly located at sites with commanding views of the surrounding environs which provided an element of security. While ringforts, for the most part, avoid the extreme low and uplands, they also show a preference for the most productive soils (Stout 1997, 107). One of the most recent studies of the ringfort (Stout, 1997) suggested that there are a total of 45,119 potential ringforts or enclosure sites throughout the island of Ireland. This figure has since been revised upwards to 'over 47,000 ringforts', while O'Sullivan et al suggest that there are 'at least 60,000 early medieval settlement enclosures on the island' (O'Sullivan et al., 2014).

Whilst there are no known early medieval sites in and within the town of Arklow, it is likely that the area was settled at this time due to the presence of the coastal resource and the River Avoca. During the latter part of this period, the Vikings named the settlement *Arnkell*, a Norse name meaning a low-lying meadow near a river. It is this name that the modern name of Arklow is derived from.

Medieval Period

Both Arklow and Wicklow became important medieval towns in the Anglo-Norman period. This is reflected by the presence of a zone of archaeological potential that surrounds the heart of the town (RMP WI040-029), which can be seen in Figure 12.1. In 1185 the manor of Arklow was granted to Theobald Fitzwalter by King John. Land was also granted for the Cistercians, but it seems that they never erected an abbey church in the area. A large amount of the land surrounding Arklow was parcelled up and given to the supporters of the English king. In 1264, Thomas, son of Theobald, granted land to the Dominicans, who established a friary within the southern portion of the town (WI040-029001). It is probable that this is the land outlined by the townland of Abbeylands. This area is also denoted within the Down Survey Barony map of Arklow.

During the early part of the 19th century, human remains were identified to the north-northeast of the Arklow Bridge. These were found within lintelled graves, or ‘long-cists’ and may represent the site of the Cistercian Monastery, which were usually established well outside of established settlements (WI040-029008).

The Fitzwalters held the position of chief Butler to the Monarch and because of this title, the Fitzwalters slowly adopted the name Butler as a surname. The denuded remains of Arklow Castle, thought to date to the 13th century and associated with the Fitzwalters, is located to the south of the proposed scheme (near the ‘Alps’ site) (WI040-029002). The Butler’s had other estates in different parts of Ireland and in the 14th century they decided to move their centre of operations to Kilkenny, with Kilkenny Castle becoming their main home. Caretakers were appointed to look after affairs in Arklow, including the castle, which may have replaced an earlier defensive structure

By the 14th century the Anglo-Normans had secured an area around Dublin, which they called the Pale, outside of which they had little influence or control. It varied in size as the fortunes of war dictated. Arklow was sometimes on the very southern tip and sometimes isolated from the rest of it, depending on how successful the attacks of the O' Byrnes and the O' Tooles were at any given time.

Post Medieval Period

During the Civil War against King Charles I, the leader of the Royalists in Ireland was James Butler, Earl of Ormonde. However, he was not successful against Cromwell, whom after capturing Drogheda, arrived in Arklow on 29 September 1649, on his way to Wexford. His Army camped across the river at Sheepwalk and prepared to attack. A message was sent calling on the garrison to surrender. If they agreed, everyone could go free, if they resisted everyone would be killed. The town surrendered to Cromwell and he held court within the castle, which he all but demolished on his departure. All that remained was a circular tower and part of the curtain wall, which are present today (WI040-029002).

Forty years later, England was engaged in another Civil War, which had less of an impact on Arklow. This time the forces of James II and William of Orange were fighting over the right to the Kingship. After his defeat at the Battle of the Boyne, James left his Irish supporters to the mercy of the Williamites. He headed for Waterford to take a ship to France, passing through Arklow on the way, where he stayed at Shelton Abbey. Tradition has it that whilst there James suffered from a nose bleed, which were a common ailment of his. The wood in the porch of the Abbey was stained by his blood, but cut out and kept as a souvenir. The wood remained at the Abbey until 1860, when a careless servant threw it out onto a rubbish fire.

The next major event was the Battle of Arklow on 9 June 1798. It is considered to be one of the most important events in the whole campaign for independence that took place at the end of the 18th century. While exact figures are not known it is generally agreed that there were approximately 3,000 garrison troops and between 10,000 and 12,000 fighting insurgents. The battle lasted roughly four hours and was fought on two main fronts. The first was around Coolgreany Road and Upper Main Street, the second was the Old Chapel Ground/Fair Green/Back Street/Lower Main Street area. The main prize was the bridge (see below), which had been built 40 years earlier and controlled access to Dublin. The garrison, though very much smaller than the insurgent force, were well trained, well-armed and had the use of artillery and barricade cover.

They won on both fronts, but their ammunition had run so low by late evening that had the rebels known, another charge might well have won the day. There are stories that during the erection of the quays to the east of Arklow Bridge (during the 19th century) that enormous heaps of bones were found, which are presumed to be the ‘fallen’ from a battle in 1798. Whilst this is cited in a local history website (countywicklowheritage.org), no other evidence for the identification of human remains during the erection of the quays has been found.

Arklow Bridge is a protected structure (RPS A26) and is included within the NIAH survey as being of regional significance (NIAH Ref.: 16322046). The structure is one of the longest post medieval bridges in Ireland and originally consisted of 19 arches. It was constructed by Andrew Noble who committed suicide in 1759 and is buried at ‘Ennercilly’. The eastern elevation is rubble masonry with roughly dressed voussoirs and cut waters. Originally constructed in 1746, bridge was widened to its western side during 1959. O’Keeffe and Simington (2016, 58) note that works on the bridge during the 1970s identified the remains of wickerwork mats under some of the bridge piers during underpinning works, which may be associated with an earlier structure. However, it is possible that an earlier bridge (as indicated on Moll’s maps of 1714 and 1728) may have been a timber structure, as there is a wide fortification pier at the centre of the present bridge (ibid). It remains possible that the river crossings depicted within Moll’s maps may represent fording points rather than an earlier bridge and that the presence of wickerwork mats does not necessarily mean the presence of an earlier structure.

During the later part of the 19th century, Arklow became more industrialised and docks were established along the banks of the Avoca River, between the bridge and the piers that defined entrance into the sea.

Prior to this the area was characterised by estuarine sands and channels. A chemical works was established at the mouth of the Avoca, which by 1895 had been purchased by a company called Kynoch and was producing cordite. Part of the factory site forms part of the proposed WwTP site today (Figure 12.2). The factory initially employed 260 people but expanded at the beginning of the 1900s after receiving large orders to supply troops during the Boer War in South Africa. Large orders followed, with the outbreak of the World War 1 and numerous new buildings were constructed to the north of the main factory. The number of employees increased to 5000 and special trains were put on in order to get the work force to the station from the surrounding countryside. Despite a large work force, the dangerous nature of what was being produced, meant that injuries were common. During the war, injuries were so common that a hospital was opened on site. This treated 900 injuries during the time it was active, 135 of which were defined as serious. In September 1917, a large explosion took place at the plant, where 27 men died and six were seriously injured. Although there were rumours of a German submarine attack, the explosion was deemed to have been accidental. The announcement of the closure of the factory came five months after the accident and after 1919 the site was dismantled and many of the buildings demolished (Cannon 2006). However, as the site had been purchased by a Mr David Frame for £90,000, he intended to recoup his investment and everything from the site was sold. Recycled bricks from the plant were used to the Ormonde Dance Hall and the old club house at Arklow lawn tennis club (Fitzgerald 2017).

Today nothing of the original 19th or early 20th century factory remains within the WwTP or its immediate surroundings. The site was developed during the 1980s and now contains the remains of a derelict plasterboard factory. A number of Kynoch bunkers do survive in a ruined condition approximately 900m to the north of the proposed WwTP, but many of the storage magazines have been reclaimed by the sea. Refer to **Section 14.3.8 of Chapter 14** for further detail on the industrial history of the WwTP site.

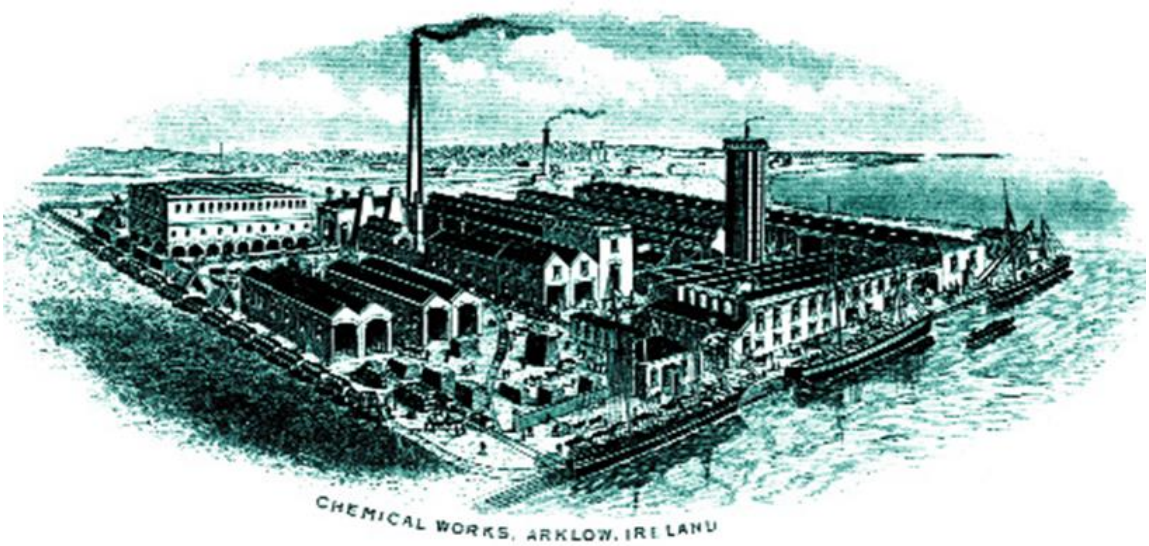

Figure 12.2: View northeast of the Arklow Explosive Factory (1895)

12.3.1.2 Summary of Previous Archaeological Investigations within the Receiving Environment

A review of the Excavations Bulletins (1970 – 2017) has shown that numerous excavations have been undertaken in the general vicinity of the proposed development, including several within and immediately adjacent to the proposed development.

Full monitoring of the Wicklow County Water Conservation Programme works in Arklow town was undertaken in 2014. These works took place in various locations around the town (Licence No.: 14E0054, C534, E4542, R356). Nothing of archaeological significance was noted in any of the works areas at that time.

Archaeological assessment took place at a residential development at South Quay, Arklow, Co. Wicklow (Licence No.: 98E0187), immediately to the south of the proposed development. This investigation produced pottery of 19th century date and redbrick rubble sitting directly on top of the natural subsoil.

Monitoring of construction works relating to the laying of a gas pipeline along Main Street identified large areas of post-medieval deposits confirming that the current streetscape has remained relatively unchanged (Licence No.: 00E0891).

Further works under this same licence were carried out along South Quay, within a portion of the works areas, although nothing of archaeological significance was encountered.

Development of a new retail/office building at 4 River Walk was monitored in 2006 (Licence No.: 05E1375). The site was located to the immediate south of the proposed development area. Works uncovered several layers of modern made-up ground sitting directly on top of sterile riverine gravels.

Additional testing was taken on Main Street (Licence No.: 07E0315), c.165m southwest of the works areas in the vicinity of the old cinema, however all materials found were post medieval in date and not deemed to have been of archaeological significance.

On the northern bank of the Avoca archaeological monitoring was undertaken at Ferrybank, in the immediate vicinity of the WwTP site, in advance of the laying of electricity cables. It was found that the ground consisted of reclaimed salt marsh. No finds of archaeological significance were noted.

Further along North Quay, approximately 15m from the interceptor sewer, archaeological monitoring was carried out at the site of the Bridgewater Shopping Centre. A large area was stripped during these works, however nothing of archaeological significance was encountered. North Quay was also subject to an archaeological dive survey (Licence Nos.: 06D059), as part of earlier investigations for the flood relief scheme. Another underwater survey was undertaken in the same area in 2012 as part of earlier iteration of Arklow Main Drainage Scheme (12D008). While no materials predating the 19th century quay construction was identified during either survey, it was noted that there was still the possibility of archaeological material surviving within the riverbed.

In 2007 a total of 21 test trenches were excavated in plots fronting onto Main Street Upper and the Parade Ground, 150m to the west of the proposed scheme as part of a request for further information from Arklow Town Council (Licence No.: 07E0315). The only feature of interest was noted as a probable 17th century cobble stone surface.

In 2005, archaeological monitoring and testing was also undertaken along River Walk without any archaeological discoveries (Licence No.: 05E1375).

In 2018 site investigations associated with the proposed development were subject to archaeological monitoring within the WwTP site. A total of 27 trial holes were monitored and these excavations revealed that the site is formed by reclamation material in the form of sand, stones and gravel. Some denuded structural remains were noted that may be directly associated with the former explosives factory. Nothing of archaeological significance was identified, with the exception of an ex-situ piece of worked flint.

12.3.1.3 Summary of Marine Geophysical Survey

In April 2017 ADCO carried out a marine geophysical survey within a 20ha area around the proposed footprint of the outfall alignment. This was undertaken under licence 16R0219. The full technical report itself is available in **Appendix 12.1**.

While there are more than 173 recorded wrecking events associated with Arklow, the Avoca River and the Arklow Coast, there are no known or recorded wrecksites within the area that was subject to survey. The closest site to the long sea outfall lies 3.1km southeast of the proposed outfall terminus.

The requirements for archaeologically-led marine geophysical survey in Ireland are set by the National Monuments Service and these are presented in the technical report in **Appendix 12.1**.

A series of 15 anomalies appeared in the side-scan sonar data. The majority of results were interpreted as rocks and were small-scale anomalies (approximately 1m in length). Six non-natural anomalies were identified (anomalies ss4, ss5, ss7, ss8, ss11, ss13), but none appeared to be obvious shipwreck remains.

The magnetometry data acquired across the survey areas reflected a series of localised variations that were, for the most part, small-scale variations and not sharply defined. A series of 16 variations occur within the survey area. A number of the anomalies possessed a strong magnetic signature, suggesting that they may contain metal content and be man-made in nature.

The survey concluded that whilst a number of anomalies had been detected, there was no clear indication of archaeologically significant remains, either within the planning boundary or on the seabed adjoining these areas that were surveyed. The survey recommended that five of the anomalies, (located within the alignment of the long sea outfall), be subject to further inspection in the form of a dive survey.

12.3.1.4 Summary of Aquatic Dive Inspections

In April 2018, ADCO carried out a dive inspection of the anomalies described above under licences 17D0078 and 17R0197. This included a survey of the intertidal area along the eastern edge of the WwTP site (Refer to **Appendix 12.2**).

The dive survey revealed that none of the five anomalies (identified during the geophysical survey) were deemed to be archaeological in nature. In addition, no archaeological features or deposits were evident along the intertidal area that was surveyed.

In tandem with the marine survey, additional archaeological survey was carried out within the river channel. This added to previous investigative work, which looked at the river channel adjoining the existing quaysides and certain alternative locations for the proposed river crossings for the interceptor sewer.

From the archaeological dive survey undertaken, two observations of relevance were noted:

- A ship's block constructed of wood was noted within the channel at a location upstream of the harbour, at ING 325056E 173125N; and
- A section of ship or boat wreckage was located a little upstream at ING 324977E 173248N, next to an existing foul outfall.

Arklow Bridge was surveyed in detail and a comprehensive record of its elements was prepared. A laser-scan image of the bridge's downstream elevation at its southernmost arches has been carried out.

In addition, the structural levels under the waterline were recorded using a Total Station to provide a comprehensive and metrically accurate record of the standing structure (Refer to **Appendix 12.2**).

12.3.1.5 Cartographic Analysis

Down Survey Map of the Barony of Arklow, 1656-58

Arklow Castle and several houses are portrayed on this map, but are representations of buildings rather than an accurate guide. The townland of Abbeyland is also marked further to the south of the town, but no buildings are marked within it.

First Edition Ordnance Survey Map, 1839, scale 1:10560

This is the first detailed depiction of the landscape containing the planning boundary (Refer to Figure 12.3). To the south of the river, the town is mainly constructed along one curvilinear street that is aligned west>east>southeast. Arklow Castle (WI040-029002) is located in the west of the town and is marked as being in ruins. There may have been a market square located to the southeast of the castle prior to the post medieval construction of a police station and post office.

There is no road indicated along the southern quays of the town. This area consists of garden plots that are associated with houses that front on to the main street, to the west of the bridge (RPS A26) and an open area to the east of the bridge. No roads have been established on the northern bank of the river, which is shown as an estuarine area characterised by sand dunes and river channels. The WwTP site is located within this area.

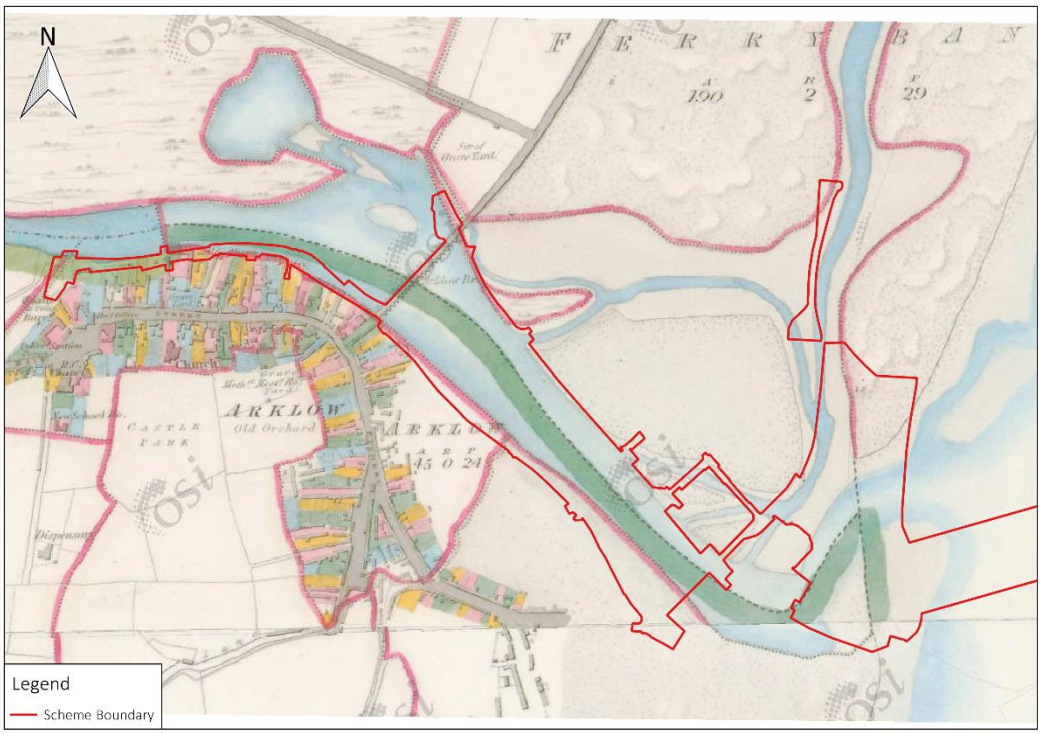

Figure 12.3: Extract from the first edition OS map, showing the planning boundary

Second Edition Ordnance Survey Map, 1886, scale 1:10560

By the time of releasing the second edition map in 1886, the town has grown a considerable amount, both to the south and north of the bridge (RPS A26). The northern quay to the east of the bridge has been established and a swivel bridge is marked along the quay to provide entrance to an estuarine channel to the northeast. A small structure marked as a Salvage Store is located adjacent to the bridge. This structure is extant today but is located outside of the site planning boundary.

At the WwTP site, structures are present that are annotated as the Arklow Chemical Works. The southern quay has yet to be established, although it appears that some earthworks are marked as present and the immediate area is annotated as being liable to floods. To the west of Arklow Bridge, the route of the proposed sewers is still shown as running through gardens associated with houses fronting onto the Main Street. The ruins of the castle are marked at the western end of the scheme (WI040-029002).

Ordnance Survey Map, 1910, scale 1:2500

This map shows the gradual development of the northern and southern quays to the east of Arklow Bridge (Refer to Figure 12.4). To the north of the northern quay the former estuarine area is marked as marsh and is gradually being reclaimed. A bridge is still marked into a small inlet along the north quay, although this is now much smaller than the channel shown on the previous map.

The Salvage Store remains present and annotated. The site of the Chemical Works is shown in detail (Refer to Figure 12.5). Multiple structures are marked, along with chimneys, tanks and a hydraulic press. A railway is marked running from the quay adjacent to the site, through the plant and continuing north. The railway provides access to a number of magazine bunkers marked along the coast. This coastal area has now been reclaimed by the sea.

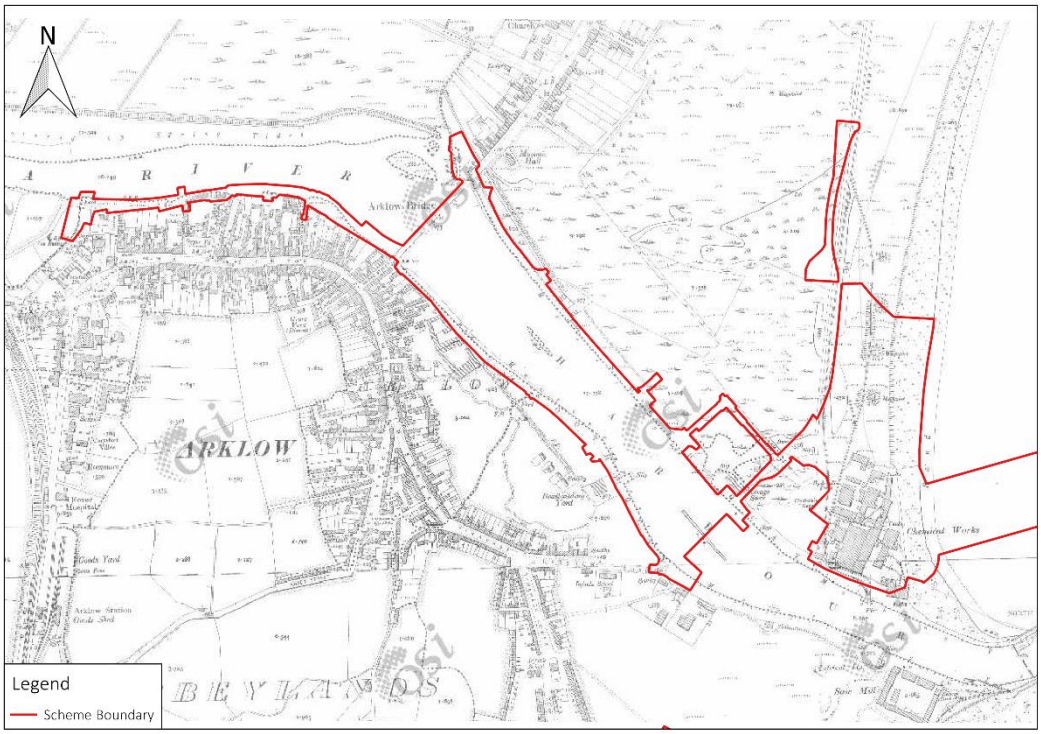

Figure 12.4: Extract from the 1910 OS map, showing the planning boundary

The southern quay is also marked, along with a number of structures, including a Saw Mill, Boat Building Yard and Smithy. To the west of the Bridge, the south bank of the river remains as being shown as garden plots associated with structures to the south. Arklow Castle remains marked as being in ruins. A small stream is shown running through the approximate location of the proposed combined sewer overflow upgrade before joining the Avoca River.

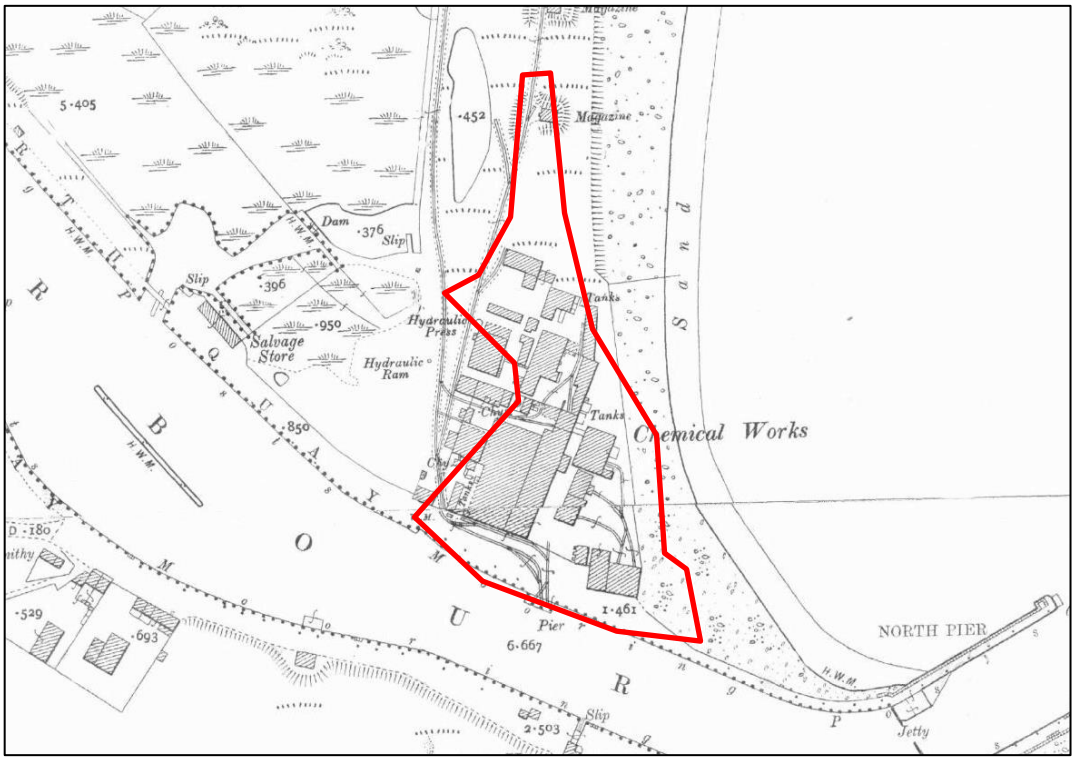

Figure 12.5: Extract from the 1910 OS map, showing detail of the WwTP site

12.3.1.6 County Development Plan

Archaeological Heritage

The County Development Plan recognises the statutory protection afforded to recorded monuments as does the Arklow LAP. Recorded Monuments within the receiving environment of the proposed development are detailed in **Appendix 12.3**, whereas aims and objectives relating to the archaeological resource are included in **Appendix 12.6**.

There are a total of eight monuments are recorded within the receiving environment of the proposed development (Refer to Table 12.1). The western section of the interceptor sewer is located within the zone of notification for the historic settlement of Arklow (WI040-029). The site of the ruined castle is located approximately 50m south of the proposed Alps SWO and stormwater tank.

Table 12.1: Recorded Monuments located within the receiving environment

RMP No.:	Classification:	Approximate distance from the planning boundary:	Statutory protection:
WI040-029-	Historic Town	0m	RMP
WI040-029001-	Religious house - Dominican friars	c.140m to the southwest	RMP
WI040-029002-	Castle - Anglo-Norman masonry castle	c.50m to the south	RMP
WI040-029003-	Church	c.70m to the south	RMP
WI040-029004-	Religious house - Cistercian monks	c.115m to the northeast	RMP
WI040-029007-	Graveyard	c.60m to the south	RMP
WI040-029008-	Graveyard	c.140m to the southwest	RMP
WI040-029009-	Graveyard	c.115m to the northeast	RMP

None of the sites are listed as National Monuments or are subject to Preservation Orders.

Built Heritage

The County Development Plan recognises the statutory protection afforded to protected structures, as does the Arklow LAP. Protected structures within the receiving environment of the proposed development are detailed in **Appendix 12.5**, whereas aims and objectives relating to the architectural resource are included in **Appendix 12.7**.

There are 16 protected structures located within the receiving environment of the proposed scheme (Refer to Table 12.2). The closest is Arklow Bridge (BH 1, RPS A26) as the interceptor sewer will pass beneath the southern-most arch of the bridge, within the river bed (**Figure 12.1**). The closest protected structure to the WwTP site is BH 4 (A29), which is located approximately 500m to the northwest.

Table 12.2: Protected Structures located within the receiving environment

BH No.	RPS No.	Townland	Classification	Description	Approximate distance from the planning boundary
BH 1	A05-A10, A22, A23, A24, A25, A27, A37, A38	Arklow	Arklow town (south)	The urban area to the south of the proposed development contains 13 protected structures. These primarily consist of residential or commercial buildings and one church.	35 - 150m south
BH 2	A26	Arklow/ Ferrybank	Bridge	Arklow Bridge, built c. 1755	0m
BH 4	A29	Ferrybank	Masonic Lodge	Lodge built c. 1900	50m northeast
BH 5	A30	Ferry Bank	House	19th century house	130m northeast

There are no Architectural Conservation Areas (ACAs) located within the receiving environment of the proposed development.

12.3.1.7 National Inventory of Architectural Heritage structures (BH sites) within the Receiving Environment

A review of the National Inventory of Architectural Heritage (NIAH) has shown that there are 27 NIAH structures located within the receiving environment of the proposed WwTP development. Of these 27 sites, 15 are also listed on the Record of Protected Structures. One of the structures (NIAH Ref.: 16322077), has been demolished since the survey was undertaken.

Inclusion within the NIAH does not confer statutory protection. However, as some of the buildings are listed within the Record of Protected Structures, these buildings are subject to statutory protection under the Planning and Development Acts 2000-2018.

Table 12.3: NIAH sites located within the receiving environment

BH No.	NIAH No.	Townland	Classification	Description	Approximate distance from the planning boundary
BH 1	16322017-20,	Arklow	Three houses	Three 19th century houses (all in the RPS)	150m south
BH 1	16322016	Arklow	Cinema	Early 20th century cinema	80m south

BH No.	NIAH No.	Townland	Classification	Description	Approximate distance from the planning boundary
BH 1	16322015	Arklow	Monument	Late 19th century monument	130m south
BH 1	16322013	Arklow	Shop	Late 19th century shop	40m south
BH 1	16322012	Arklow	Bank	Late 19th century bank (also in the RPS)	90m south
BH 1	16322034-35, 47, 48	Arklow	Shops/ Bank	Late 18th and 19th century shops. Early 20th century bank (also in the RPS).	55-75m southwest
BH 1	16322036, 37, 44, 35	Arklow	Shops/ House	Early to late 19th century houses/ shops (three also in the RPS).	35-70m southwest
BH 1	16322038-42	Arklow	Shops/ Houses	Early to late 19th century shops and houses.	110-130m southwest
BH 2	16322046	Arklow	Bridge	Mid-18th century bridge (also in the RPS)	0m
BH 3	16322077	Ferrybank	House	Demolished	N/a
BH 4	16322058	Ferrybank	Masonic Lodge	Early 20th century lodge (also in the RPS)	50m northeast
BH 5	16322076, 59-61	Ferrybank	Shop/ houses	Late 19th century shop and houses (one included in the RPS)	90-175m northeast
BH 6	16322030	Ferrybank	Beacon	Early 20th century shipping beacon	60m northwest

12.3.1.8 Results of Field Inspection

The field inspection sought to assess the proposed development, its previous and current land use, the topography and any additional information relevant to the report. During the course of the field inspection the proposed development and its immediate surrounding environs were inspected. The field inspection was carried out in June 2018 in dry, clear conditions.

The field inspection commenced at the western end of the proposed development at the site of the proposed Alps SWO and stormwater tank. The section of the site is located approximately 50m north of the ruins of Arklow Castle (WI029-029002) in an overgrown area that is bordered to the northwest and southeast by overgrown slopes (Refer to Figure 12.6). The historic mapping shows a stream running through this area, although it is no longer extant today.

Although the area is very overgrown, the tower of the castle is just visible through the trees to the south.

Figure 12.6: The Alps site, facing southwest

The proposed interceptor sewer runs in an easterly direction along the southern bank of the River Avoca. The first section is characterised by a modern footpath (Refer to Figure 12.7), which then joins River Lane and River Walk (Refer to Figure 12.8). This area represents made ground established to the north of the property boundaries to the south, which front onto Main Street. Although this section, the proposed development is located within the zone of archaeological potential for Arklow town and is in immediate proximity to the river, previous archaeological monitoring in this area failed to identify any features or deposits of archaeological potential.

Figure 12.7: Route of proposed interceptor sewer adjacent to the Avoca River, facing west (upstream)

Figure 12.8: Route of proposed interceptor sewer along River Lane, facing southeast

As the proposed interceptor sewer reaches Arklow Bridge (RPS A26), it enters the existing river channel to pass underneath the southernmost arch. The arch is obscured from the west by the 1960s widening works (Figure 12.9). However, it is clearly visible from the east (Figure 12.10). A rubble wall, with a rendered cement coping abuts the eastern elevation of the bridge, to the immediate south of the arch (Figure 12.11).

It is possible that the wall represents the denuded remains of a wall associated with the southern quay, but a large amount of alterations have been carried out in this area. It is clear from the historic mapping that both the North and South Quays post-date the construction of the bridge.

Figure 12.9: Arklow Bridge (RPS A26), facing east-southeast

Figure 12.10: Southernmost arch of Arklow Bridge (RPS A26), facing northwest

Figure 12.11: Wall abutting the south-eastern side of Arklow Bridge, facing northwest

The proposed interceptor sewer follows the path of South Quay as it re-joins the road from the river channel. This section of the roadway is bounded to the southwest by a mixture of modern and vernacular properties (**Figure 12.12**).

Figure 12.12: South Quay, facing southeast

The quay wall, although present in sections, has been subject to alteration and large sections have been rendered with cement (**Figure 12.13**). Just to the northwest of the harbour, the pipeline will be tunnelled across the river to the North Quay from South Quay.

Figure 12.13: South Quay wall, facing south-southeast

The proposed sewer will be tunnelled along the North Quay along existing modern roads. Sections of the North Quay wall is apparent bounding this stretch of the river. It is formed by roughly worked masonry blocks (**Figure 12.14**).

Figure 12.14: Section of the rubble North Quay wall, facing northeast

The surrounding development is modern in nature. The only structures of heritage merit is the early 20th century shipping beacon (NIAH Ref.: 16322030) (**Figure 12.15**), located 60m to the northwest and the former Salvage Store, which is a structure that fronts onto North Quay and dates to the early 19th century. The Salvage Store building is single storey, of roughly coursed masonry construction. Larger windows have been inserted at a later date into the fabric with red brick reveals (**Figure 12.16**).

The original vehicular entrance in the eastern gable end has been blocked up and a pedestrian entrance inserted. The Salvage Store is located outside of the planning boundary.

Figure 12.15: Early 20th century shipping beacon (NIAH Ref.: 16322030), facing northwest

Figure 12.16: Early 19th century Salvage Store, facing north

The WwTP site is currently occupied by a late 20th century factory associated with its former use as a plaster board production site (Figure 12.17). The factory is very derelict and includes a tall metal chimney stack.

Figure 12.17: Existing factory structure within the WwTP site, facing northeast

There are a number of ruined modern structures within the site, but nothing remains that relates for the former explosives factory. The site is bounded to the east by modern rock armour sea defences (Figure 12.18).

Figure 12.18: WwTP site with coastal rock armour, facing south

No previously unrecorded sites of archaeological potential were noted during the course of the field inspection. It is clear that there has been a large amount of modern development within the receiving environment, including the site of the proposed WwTP.

However, the proximity of the riverine and coastal resource does increase the archaeological potential that can be attributed to the landscape.

No previously unrecorded sites of architectural heritage merit were noted during the course of the field inspection, with the exception of the now altered, early 19th century former Salvage Store, located adjacent to the proposed scheme on the North Quay.

12.4 Likely Significant Effects

12.4.1 Assessment of effects during construction

12.4.1.1 Terrestrial Archaeology

Whilst it is clear that modern development within Arklow town and environs is likely to have impacted upon the potential archaeological resource, it remains possible that excavations associated with the laying of the interceptor sewers may have a negative effect on previously unrecorded archaeological remains. Negative effects have the potential to be permanent and range from significant to profound during construction.

The WwTP site is located within a reclaimed estuary and it is clear that modern construction has disturbed the site. No features of archaeological potential were noted during the excavation of site investigation pits on the WwTP site. It remains possible that excavations associated with the construction of the proposed development may have a negative effect on previously unrecorded archaeological remains. Negative effects have the potential to be permanent and range from significant to profound.

12.4.1.2 Aquatic Archaeology

The interceptor sewer will be constructed beneath the southernmost arch of Arklow Bridge (RPS A26). In order to carry out these works and to mitigate against potential flood risk, two arches will require underpinning. It is possible that any excavations to undertake these works may have a negative effect on previously unrecorded archaeological features or deposits that remain buried within the river bed. Negative effects on the archaeological resource have the potential to be permanent and range from significant to profound during construction.

During marine archaeological investigations to date, no features of archaeological potential have been identified within the alignment of the marine outfalls. The method of construction for the marine outfalls considered to have the potential for most impact are open cut methods (i.e. flood and float or bottom pull) where excavation of a trench is required to allow installation of the pipeline.

The seabed material will need to be removed to achieve the required depth and slope of the trench and trenching may be carried out through the use of dredging barges that would be either be anchored to the sea bed or jacked up using steel piles.

Despite the results of the investigative works undertaken to date, it remains possible that disturbances to the seabed will have a negative effect of archaeological deposits that are buried at a greater depth than the areas analysed by the geophysical and dive surveys. Negative effects on underwater archaeology have the potential to be permanent and range from significant to profound during construction.

It is possible that ground disturbances to the intertidal area during the revetment upgrade may have a negative effect on previously unrecorded archaeological deposits that survive beneath the current seabed level. Negative effects have the potential to be permanent and range from significant to profound.

12.4.1.3 Architectural Heritage

The interceptor sewer will be constructed beneath the southernmost arch of Arklow Bridge (RPS A26). In order to carry out these works and to mitigate against potential flood risk two arches will require underpinning and the fabric of the structure will also require grouting.

It is possible that the proposed techniques may have a negative effect on the fabric of the bridge structure during the course of the underpinning works. Effects on architectural heritage during construction have the potential to range from Slight to Profound, may be temporary or permanent and may result from the following:

- Movement of loose masonry if grouting is over-pressurised;
- Risk of structural damage/settlement if underpinning is not carried out correctly; and
- Risk of structural damage due to associated vibration during piling technique.

12.4.1.4 Cumulative

A number of residential developments are proposed in Arklow town as discussed in **Section 2.6.6 of Chapter 2**. None of these proposals, in combination with the proposed development, are considered to represent a negative cumulative effect on the archaeological, architectural or cultural heritage resource.

Full consideration has been given to the proposed Arklow Flood Relief Scheme during this assessment. It is possible that the effects associated with the proposed underpinning of the Arklow Bridge (which will be carried out within two arches as part of the proposed development and the remaining arches as part of the Flood Relief Scheme) may be exacerbated as a result of the in combination construction of both schemes as a greater number of arches in the bridge would be underpinned. Impacts may range from Slight to Profound and may be temporary or permanent.

12.4.2 Assessment of effects during operation

12.4.2.1 Terrestrial Archaeology

No likely significant effects on terrestrial archaeology are anticipated during the operation of the proposed development.

12.4.2.2 Aquatic Archaeology

No likely significant effects on aquatic archaeology are anticipated during the operation of the proposed development.

12.4.2.3 Architectural Heritage

No likely significant effects on the architectural heritage are anticipated during the operation of the proposed development.

12.4.3 Do-nothing Scenario

If the proposed development were not to proceed there would be no negative impact on the archaeological, architectural or cultural heritage resource.

12.5 Mitigation Measures and Monitoring

12.5.1 Mitigation During Construction

12.5.1.1 Terrestrial Archaeology

- All ground excavations associated with the proposed development will be monitored by a suitably qualified archaeologist. This will enable the identification of any previously unrecorded features/ deposits of archaeological significance. Full provision will be made available to ensure the preservation by record of any such features, should that be deemed the most appropriate manner in which to proceed, following consultation with the DoCHG.
- All archaeological works will be carried out under the supervision of a project archaeologist, appointed on behalf of Irish Water, to ensure all mitigation measures are implemented.

12.5.1.2 Aquatic Archaeology

- All excavations associated with the outfalls and revetment upgrade, will be monitored by a suitably qualified underwater archaeologist. Works will be carried out under licence to the DCHG and full provision will be made to ensure the preservation by record of any features that may be identified, should that be deemed the most appropriate manner in which to proceed, following consultation with the DCHG.

- All excavations associated with interceptor sewer within the river channel (and any associated underpinning works) will be monitored by a suitably qualified underwater archaeologist. Works will be carried out under licence to the DCHG and full provision will be made available to ensure the preservation by record of any features that may be identified, should that be deemed the most appropriate manner in which to proceed, following consultation with the DCHG.
- All archaeological works will be carried out under the supervision of a project archaeologist, appointed on behalf of Irish Water, to ensure all mitigation measures are implemented.

12.5.1.3 Architectural Heritage

- All works to Arklow Bridge will be carried out under the supervision of a conservation engineer and/or registered conservation architect. A full assessment of potential effects will be undertaken once the preferred methodology has been selected for the underpinning works. This will lead to the production of a construction method statement that will ensure the historic fabric of Arklow Bridge is maintained throughout construction.

12.5.2 Mitigation During Operation

No likely significant effects to archaeology, architecture and cultural heritage during the operation of the proposed development have been identified. Therefore, no mitigation measures have been proposed with respect to effects from operation of the proposed development.

12.5.3 Monitoring

12.5.3.1 Monitoring During Construction

The mitigation measures recommended above, including the monitoring of works by qualified archaeologists and a conservation engineer, would support effective monitoring during construction to allow the further assessment of the scale of the predicted impacts and the effectiveness of the recommended mitigation measures.

12.5.3.2 Monitoring During Operation

No monitoring has been proposed with respect to effects from operation of the proposed development.

12.6 Residual Effects

12.6.1 Residual Effects during Construction

With the implementation of the mitigation measures detailed above no significant residual effects are predicted upon archaeological, architectural and cultural heritage resources.

12.6.2 Residual Effects during Operation

No significant residual effects are predicted upon archaeological, architectural and cultural heritage resources.

12.7 References

Bennett, I. (ed.) (1987-2010) *Excavations: Summary Accounts of Archaeological Excavations in Ireland*. Bray. Wordwell.

Bradley, J & King, H (1989) *Urban Archaeological Survey of County Wicklow* Office of Public Works

Brady, K (2008) *Shipwreck Inventory of Ireland: Louth, Meath, Dublin & Wicklow* The Stationary Office: Dublin

Byrne, F. J. (1973). *Irish Kings and High Kings*. London.

Cannon, A. (2006) *Arklow's Explosive History: Kynoch, 1895-1918* ***in*** *History* Ireland Vol. 14, Issue 1

Chartered Institute for Archaeologists (2014c) *Standards & Guidance for an Archaeological Watching Brief (Monitoring).*

Chartered Institute for Archaeologists (*2014b) Standards & Guidance for Archaeological Excavation.*

Chartered Institute for Archaeologists (2017) *Standards & Guidance for Desktop Assessments.*

Chartered Institute for Archaeologists (2014a) *Standards & Guidance for Field Evaluation.*

Department of Arts, Heritage, Gaeltacht and the Islands. (1999a) *Framework and Principles for the Protection of the Archaeological Heritage*. Dublin. Government Publications Office.

Department of Arts, Heritage, Gaeltacht and the Islands. (1999b) *Policy and Guidelines on Archaeological Excavation*. Dublin. Government Publications Office.

EPA (2015) *'Advice Notes for preparing Environmental Impact Statements' (Draft 2015)*

EPA (2017) *'Revised Guidelines on the information to be included in Environmental Impact Statements' (Draft 2017)*

Grogan, E & Kilfeather, A (1997) *Archaeological Inventory of County Wicklow* The Stationary Office, Dublin

National Inventory of Architectural Heritage (2006) *NIAH Handbook* edition June 2006

National Monument Service, Department of Culture, Heritage and the Gaeltacht. Sites and Monuments Record, County Wicklow.

National Museum of Ireland. Topographical Files, County Wicklow.

O'Keeffe, P. & Simington, T. (2016) (revised by Rob Goodbody) *Irish Stone Bridges* Irish Academic Press: Newbridge

O'Sullivan, A., McCormick, F., Kerr, T. R., Harney, L. (2014) Early Medieval Ireland AD 400-1100 the evidence from archaeological excavations Dublin: Royal Irish Academy

Stout, M. (1997). The Irish Ringfort. Dublin: Four Courts Press.

Wicklow County Council (2016) *Arklow and Environs Local Area Plan 2016-2024*

Wicklow County Council (2015) Wicklow County Development Plan 2015-2021

CARTOGRAPHIC SOURCES

Herman Moll's 'A New Map of Ireland', 1714

Herman Moll's 'A Pocket Companion of Ireland', 1728

Ordnance Survey maps of County Wicklow, 1840, 1886, 1910

William Petty's Down Survey Map of the Barony of Arklow, 1655-58

ELECTRONIC SOURCES

www.archaeology.ie – DoCHG website listing all SMR sites with aerial photographs

www.excavations.ie – Summary of archaeological excavation from 1970-2016

www.osiemaps.ie – Ordnance Survey aerial photographs dating to 1995, 2000 & 2005 and 6-inch/25-inch OS maps.

www.googleearth.com – Aerial photographs of the proposed development area

www.bingmaps.com – Aerial photographs of the proposed development area

www.buildingsofireland.ie – NIAH survey results for County Wicklow

http://wicklownews.net/2017/08/remembering-the-kynoch-explosion-by-michael-fitzgerald/ - 2017